Stratigraphic and Material Interpretations of Site Evidence: Investigations Towards the Nature of Archaeological Deposits

Volume I of II

Michael Gerald Berry

A thesis submitted in fulfilment of the requirements for the degree of Doctor of Philosophy

Department of Archaeology

University of York

2008

Abstract

This dissertation addresses the failure in common practice to fully integrate different parts of the archaeological record systematically, thus leading to a breakdown between excavation theory and practice. The relationship between deposit and assemblage, and thereby the use of deposit status designation is examined. A more accurate definition of status is adopted, overcoming the conceptual inadequacy linking find to deposit. The analysis of status is based on the following basic assumptions: firstly, that status is the relationship between the find and the context; secondly, that this relationship is based upon information on the function, chronology and spatial characteristics of the finds and contexts.

With the concept of deposit status established, this thesis presents a method that integrates all the relevant elements of the archaeological record that enable an understanding of deposit signatures; deposits and assemblages. Deposit types are examined, checking the relationships between basic physical descriptions and interpreted function. Assemblage data for ceramics and faunal remains are integrated based upon quantification that reflects their separate formation histories. The resulting deposit signatures provide a platform for new and interesting means of creating site narrative. The new narratives reflect developments and changes in deposit formation, and ultimately, the landuse history of a site.

This thesis demonstrates that the integration of finds and site data allows for more fruitful interpretation of excavation data. This approach helps to match site details with specific research agendas in both academic and commercial contexts, and can help achieve the maximum potential for research output.

Table of Contents
Volume I

Volume 2

Acknowledgments

This thesis is the result of the advice, aid and encouragement of many colleagues during the last three years. The work is my own and I accept responsibility for any mistakes or omissions, however, the completion of this thesis required the help provided by many people. It is my hope that this work addresses issues and concerns recognised by many archaeologists and is ultimately a valuable contribution to the practice of archaeology.

This dissertation would not have been possible but for the guidance of my friend and advisor, Professor Steve Roskams. To Steve I owe a great debt for his intelligence and ingenuity during our discussions. The ideas and theories that underlie the method developed in this thesis were founded during our many talks over the past years.

All the past and present members of my Thesis Advisory Panel have contributed vital guidance to this work. I am indebted to Tania Dickinson and Kevin Walsh for providing the necessary direction as head of my advisory panel. I am grateful to Martin Carver for challenging my ideas and making me think in different directions. Terry O'Connor provided crucial guidance on all things faunal, without which I would surely have been lost. The timely completion of this thesis comes as a result of the help of this group.

I owe a debt of gratitude to the examiners of this work. Paul Lane and Clive Orton both provided valuable critiques that helped shape the final product here. Their insights created a challenging and enjoyable discussion of this work, and I am better for it.

I wish to thank all those that made data available to me for study. Their contribution of time and advice is invaluable. I am indebted to Eleanor Breen, formerly at Historic Mount Vernon, for her encouragement and introduction to the Digital Archaeological Archive of Comparative Slavery. The efforts of Jillian Galle and all those at the DAACS serve as an example to us all. John Zant at Oxford Archaeology North kindly made the data from the Carlisle Millennium

Project available, and answered all of my many questions. The York Archaeological Trust was pivotal in making their archives and lab space available to me. I am most thankful to Ailsa Mainman, Christine Kyriacou, Mark Whyman and Rachel Cubitt. Finally, I am indebted to Mary Casey and the staff of Casey & Lowe Pty Ltd for allowing me to use the site archive from 109-113 George Street, Parramatta.

I must also thank the many people that contributed in one way or another to the pages that follow. This includes Michael Jones, Jenn Mann, Paula Gentil, Alisdair Brooks, Ben Gourley, and Cath Neal.

Finally, I want to make the deepest thanks to my wife Andrea for her unending support. She has believed in me more than I have believed in myself. Her tireless efforts and support during this PhD dissertation require thanks I lack the words to fully express.

Chapter 1
Introduction

1.1 General Introduction

The role of the finds assemblage in archaeological interpretation has evolved over many decades. The relationships between assemblages and their parent deposits have been treated in many different ways during the long development of archaeological field practice. A look at the last 40 years of archaeological excavation reveals a steady increase in the number and manner of controlled excavation methods. Methods such as single context planning and the Harris matrix have placed a focus upon establishing stratigraphic sequences and gaining better control over the recovery of finds. Overall, controlled excavation methods have been based on obtaining finds assemblages from clear contexts, rather than just recovering structural evidence and bits of treasure. This is, in part, a result of the development of contract driven archaeology. In order to justify the expense of both government and private sector investment, the recovery of cultural heritage was argued to be necessary not just at the individual artefact level but as a collective assemblage (Roskams, 1992: 27). However, this has not happened.

Richard Bradley (2006) addressed the resulting failure in output when he looked closely at the excavation report as its own literary genre. Bradley noted that the common format of a report sees stratigraphic evidence occupy one section, while the artefact analysis another. It is not always clear that any common aim exists among the authors of respective sections. Specialists can focus upon the finds themselves, only using excavation evidence to illuminate areas of their own concerns. As a result the format of the excavation report has not changed dramatically in 70 years (Bradley, 2006: 667).

The call for contextualised finds and clear stratigraphic sequences followed the development of the modern archaeological industry. As the practice of field archaeology developed, as an aspect of "rescue" archaeology, government and funding bodies became interested in establishing clear protocols. This lead to the development of deposit models as a part of the site evaluation process: constructing predictive methods of assessing the intensity of archaeological deposits within a specific area. As planning authorities developed formal guidelines for the treatment of archaeological remains, such as Planning Policy Guidance 16 (PPG 16) (DoE, 1990), and preservation in situ became accepted as a best case option, the need to assess and understand where high potential areas exist became important. The formal process of research design was an important development, however, deposit and assemblage remained in many of separate concerns.

More recent trends within the discipline have moved towards recognising and correcting some of the problems resulting from this development. The modern intensification of archaeological excavation, especially in urban settings, has drawn attention to the problems that forces of cultural and natural formation can pose to the interpretation of assemblages. The obscuring effects of infiltrated and residual finds within a deposit have been recognised as a barrier to good interpretation. The following thesis aims to demonstrate that new ways of constructing the narrative of a sites history is possible, but only if we develop a more sophisticated understanding of the relationship between deposit and assemblage.

1.2 Aims and Objectives

The developments discussed above were all done with the intention to improve archaeological practice, however, this dissertation will examine what is believed to have become a failing both in general method, as well as a break between theory and practice. In essence, a breakdown has occurred in archaeology, between the practices at the front end and the analysis at the back end. A great amount of energy and time is spent linking finds with site evidence at the contextual level while in the field, when at the analysis stage this information is often disregarded and interpretation is based upon finds assemblages from the site-wide or phase level. Despite warnings against the folly of developing a single "laundry list" approach to a site assemblage (Miller, 1991: 2), the technique remains the standard practice in archaeology. Analysis has not kept pace with the potential of controlled stratigraphic excavation. Overall, there has been little done to integrate different parts of the record in a systematic manner. When establishing sequence to tell a site's chronological story, excavators most commonly have either emphasised stratigraphy (as has long been the tradition in Europe), or focussed on dated assemblages (as is the established tradition in North America). In either case these two traditions have most often worked independently of each other, they now need to be joined.

Initial attempts at solving the above problem have involved defining different types of site formation process, and associated transformations of the archaeological record, both cultural and natural. These 'solutions' suffer from a conceptual inadequacy: there being no simple relation between a deposit and a find derived from it. Hence defining a type of deposit does not indicate a single relationship with a find from it. Rather, there are a whole series of relations properties, each of which might define a different signature. The issues and problems raised above arise in many contexts, but are at their most extreme on sites with complex sequences comprising the most common types of site contexts (soil deposits) and the most common types of finds recovered in large numbers, both those easily datable (such as pottery) and much less so (such as animal bones). Sediments, pottery, and bones are all central in what follows. Sites containing information of all types have been of pivotal importance in developing this research.

In order to address the problem of deposit and assemblage we need to define different deposit types, checking the relationships between two analytical levels; basic soil descriptions (silt, sand, clay, plus inclusions), and higher order ones (dump, fill, occupation deposit). It will then be possible to analyse the complexity and consistency of moving between these levels. Without an understanding of the relationship between these two levels the construction of higher order interpretations become questionable. Similarly, we need to see how assemblage information can be quantified for fragmentation and formation history, and how this works within a single finds type. When particular quantification methods are shown to produce consistent characterisations of an assemblage type, it will then be possible to consider different finds types from the same deposits. Does the character of one assemblage type match that of another, or do the two diverge?

These similarities or differences in assemblage signatures then need to be compared with the deposit classifications, to see what correlations emerge. Are more 'integrated' signatures reflected by these analytical relationships, allowing us to determine what kinds of deposits and activities produce what types of assemblages? If we can find consistent relationships between fragmentation in assemblage types and the classification of deposit status, then deposits might be modelled in such terms. A refined understanding of deposit signatures will inform more integrated narratives of a site's history. If these outcomes can be justified, new and more consistent methods of recording, quantifying and analysing deposits and assemblages could be put forward for commercial contexts, to ensure that existing investment is fully exploited.

Finally, the results will reflect cultural processes more fully than is presently possible, and so serve as a foundation for more wide ranging interpretations. More insightful ways of grouping archaeological data should allow us to tell a different story of each site, based on a more sophisticated understanding of the relationship between deposit and assemblage. In some cases, the resulting accounts may move from simple, chronological descriptions, to more sophisticated accounts of activity types on the site in question. On occasion, this may mean providing simply different accounts. Elsewhere, we would expect it to generate 'better', or at least more interesting and incisive reports.

The following thesis makes contributions to the discipline as a whole in various ways. The problem identified as the cause for this research recognized a difference between both elements of method, and a break between theory and practice. The thesis addresses this problem by developing a completely new method for interpreting deposits and assemblages. The method is directly informed by theoretical concepts, linking theories behind the recovery of finds and deposits, theories of time and chronology, theories regarding taphonomic and formation history, and theories regarding the status of deposits and finds. This represents an improvement upon the often criticized gap between archaeological theory and excavation practice (Andrews et al., 2000, Hodder, 1997, Roskams, 2001c). Regional and wider academic traditions can lead to assumptions regarding how to excavate and gather data, often acting to separate the theoretical grounding for accepted practice from excavation.

The method presented in this thesis describes new ways of organising our site data. The result is a new approach to how we think about that data, and how we use that data to construct our understanding of the past. The significance of different ways to re-organise archaeological data, so that deposit and assemblage can be reunited during interpretation, is great. This approach not only holds potential for how sites are interpreted but also for how those interpretations are presented through reports and journal articles. Different structures for organising the report, rather than separating stratigraphic evidence and artefact study into disparate sections, will result in more interesting publications.

This process, of regarding deposits and finds, and organising their related data, results in new narrative structures for site history. This thesis develops a new narrative approach that incorporates the independent deposit, often reflecting "in-the-ground" changes in landuse above other factors, such as documented legal changes in land ownership. Where previous forms of constructing narrative have often been informed by the historical sources, items such as land ownership records, which sought to explain a site's development in the context of changing legal ownership and family cycles, this work provides a means of telling a site's story in respect to the evolution in how a property is utilized.

Additionally, this thesis represents a method that joins the interests of academic and developer funded archaeology. The sites used in this study were primarily archive sources from developer funded contexts. The resulting use of "grey literature" and archive data has led to a method that is responsive and adaptable to developer funded archaeological work. Most of the archaeological work that takes place in Britain and North America is performed in a developer funded context. Ideas and methods developed to bridge the gap between theory and practice, like the ideas of post-processualists, cannot advance methods without being embraced by the commercial world of archaeology (Chadwick, 2003:98). The method presented here meets these requirements and could easily be implemented as an aspect of contractual archaeological practice. Advice is made for improving recording and analysis during the excavation and post-excavation phases. The relative costs of these improvements to practice are minimal, denying any arguments against this method on the grounds of prohibitive expense to the archaeologist. The archaeologist cannot deny these methods on the grounds of being too expensive. Nor can the developer or governing body deny the costs as wasted expenditure. This thesis results in a new approach to archaeological practice that can improve our ability to reconstruct an understanding of the past.

1.3 Chapter Structure Outline

The following chapters are concerned with examining the problem addressed, developing a technique to address the issue, and subsequent testing of the method. Chapter 2 discusses in greater detail the divergent histories of stratigraphic and material studies. Chapter 3 is a discussion of the theoretical foundations for examining archaeological deposits. This chapter focuses upon the methods, concepts and frameworks for envisioning deposits in archaeological study. The fourth chapter presents the methodology followed in this research. The rationale for selecting case studies and the specific techniques for integrating deposit data and material quantification are introduced there.

Chapters 5 through 8 present this methodology tested against specific case study examples. The methodology is applied to the archive record of distinctive excavations. In the following chapter the methodology is tested further in an experimental evaluation of the previous results. Chapters 10 and 11, the concluding chapters, summarise the results. This begins with Chapter 10, which attempts to synthesize the results of the case study analysis. Chapter 11 concludes the dissertation by presenting future areas of possible improvement of the method, the resulting impact upon archaeological practice and the improved ways of organising data.

The appendices, included in a separate volume, provide the raw data from each case study analysis as well as the related images. Appendix 1 presents the detailed primary data from each site in table format, ordered by the site stratigraphic sequence and by ceramic and faunal measures of formation history. Each data set in Appendix 1 is grouped first by site, and secondly by each level of analysis presented. Related data in the form graphs and tables are included Appendix 1 as necessary. Appendix 2 presents the collective figures and images referenced in the chapters. These include examples of the maps and plans that illuminate the understanding of each case study and any relevant site photographs. Appendix 3 provides the results of the statistical correlation analysis performed on each measure used in the method. The separate correlation analysis tables are organised by site and level of analysis, and are presented in digital format in the enclosed disc.

Chapter 2

Towards a Unification of Stratigraphic and Material Data

2.1 Introduction

On their own, new investigations of stratigraphic and material data may seem unnecessary. Through the primary pursuit of archaeology, that being change over time (O'Brien and Lyman, 1999:1), research focusing upon the manipulation of stratigraphic data, and that focusing upon the manipulation of artefactual and assemblage data has become standard practice. Stratigraphic study, as an aspect of methodology, is often deemed obvious and given little more than cursory treatment in most introductory archaeological volumes and text (Triggs, 1998:22). Joukowsky for example, introduces stratigraphy as "perhaps the single most important principle upon which proper excavation techniques are based" (Joukowsky, 1980:156), yet spends a mere seven pages discussing the topic (site photography, for example, receives 15 pages). It was also well noted by Harris that stratigraphy was the basis of only eight articles in a bibliographic collection of basic archaeological literature (Harris, 1989:xi). This movement towards regarding stratigraphy as basic may relate to the early foundation of archaeology as an academic discipline when stratigraphic investigation formed the basis for most of the early prehistoric discoveries. In the 20th century the realisation occurred that stratigraphy was perhaps not as straightforward as first thought. More recently some sectors of the discipline moved away from the early geological origins of the study based upon the realization that stratigraphy was not unlike theoretical physics; in that the closer you look at stratification the more complex it becomes (Adams, 1992:13).

At the same time artefactual studies, mainly through seriation, are the focus of great amounts of research and energy. The ubiquitous nature of artefactual and ecofactual assemblage studies is reflected in the number of articles treating the subject in the same volume cited by Harris; 376 articles based upon artefact typology and classification, ceramics and faunal remains categories. In the prevailing years since that publication, seriation and other statistical evaluation of assemblage data has advanced (see Orton, 1982, 1985, 1989, Moreno-Garcia et al., 1996). However, advancement overwhelmingly tends to focus upon refinement of the understanding of the corpus of materials in question. A viable synthesis of the two traditions of archaeological study has yet to have been fully reached. Furthermore, the integration of these methods with data concerning site evidence and formation processes remains incomplete (Roskams, 1992:28).

In practice, site evidence, formation processes and taphonomy are not often integrated into analysis. These factors are often regarded as elements to cloud interpretation and the true nature of deposits and are addressed only with regard to the descriptions of deposits. In some cases these factors are more closely investigated (Serjeantson, 1991, Kobylinski and Moszczynski, 1992, Bollong, 1994, Villa, 1982, Needham and Stig-Sorensen, 1988, Sullivan, 1989, Beck, 2006) but on the whole there is a failure to fully synthesize these sorts of data and determinations with the greater interpretation of the site sequence. Under current field practice the organisation of personnel and resources often results in a separation between specialist elements of analysis. This problem is often reported (for one example see Roskams, 1992:27) and can be easily encountered by a review of common excavation reports. In fact, a random selection of 50 reports from the University of York holdings found no sources that attempted a synthesis section to the report. All were divided by separate sections on deposits, finds and ecofactual data. It is also not uncommon to find these sections produced in stand alone volumes separated in publication date by years. This research aims to correct this trend, to construct a method for the unification of stratigraphic, material and site data. The unification of the above would have the efficacy to enhance methodology in practice and to capitalize on the potential of recent innovations in quantitative analysis to improve the interpretation of the character and sequence of deposits. But this methodological advancement can not be properly pursued without a review of the historical development of the subject and the issues surrounding the separate traditions of study. And so, the following will discuss the historical development of stratigraphic study both in Europe and North America, the contributions of Harris to this study and his lasting tradition, the development of the study of site formation processes, seriation and the analysis of material assemblages, and the problems of residual and infiltrated finds to this study.

2.2 Stratigraphic Study: The Development of Thoughts and Techniques

The development of archaeological stratigraphic study, and archaeological investigation as a discipline, has come via the science of geology. Early archaeologists, very conscious of their antiquarian roots, sought and achieved a level of acceptance and respect through an association with the principles and methods of geological science. The exact theoretical relationship between the elements of geological and archaeological stratigraphy will be discussed below, suffice to say for now that the history of the two is closely intertwined. This intertwined relationship includes the sometimes divergent development of stratigraphic study in Europe and North America. A discussion and bridging of the two regions will be made in the following.

While the first observations of the laws of stratigraphy came in the late 17th century, it was some time later that science began to build upon the theories of Nicholas Steno. Steno's work with glossopetrae or "tongue stones" of shark's teeth evolved into an appreciation for the formation of fossils and the stratigraphic record (Figure 2.1) (Cutler, 2003). Geological science as it is known today began in the early 19th century, largely based upon the individual pursuits of only a handful of men. This was, in part, a result of the Industrial Revolution, which led to an increased exposure to natural elements through the construction of canals, railroads and quarries (Hayes, 1993:14). The work of William Smith, Roderick Murchison, Adam Sedgwick, Henry De La Beche and of course Charles Lyell laid the foundation for many of the modern theories that exist among the public consciousness today. In 1792 "Strata" Smith observed the repeated rock layers at Mearns Pit noting the common fossil remains, succession of fossil assemblages and constant relationship between strata at different locations (Winchester, 2001:65). Sedgewick and Murchison systematised the identification of the different rock strata into the Silurian, Devonian and Cambrian periods. The work of Charles Lyell, with his publications of *Principles of Geology* (Lyell, 1875) and *Elements of Geology* (Lyell, 1885) truly established the young discipline of geology as an accepted science.

The work of these and other individuals to collect large sets of data, form logical assumptions and make observations based solely upon provable elements of the data set was to become the accepted means of evaluating the past; a direct departure from the romanticism of the antiquarian pursuit. This "revolution" (Daniel, 1975:52) in thought led to the developed acceptance of the law of superposition, the creation of geological concepts of time pushed back the concept of the antiquity of mankind which in turn led to the development of the *Three Age System* by Thomsen. Christian Jurgensen Thomsen, curator of the National Museum of Denmark, had the materials under his care organised into collections of Stone Age, Bronze Age, and Iron Age for an 1819 opening. By the 1840's Jens J.A. Worsaae, Thomsen's successor at the museum, found evidence supporting the existence of the three ages through the excavation of barrows and bogs. This linear progression of people, from savage to cultured, would later fit well into the Victorian ideal of class and order. All these influenced the creation of the concept of evolution, forever changing modern approaches to the past and development of humans.

The antiquarian tradition was well established before the advance of archaeological methodology. The tradition was largely centred upon the Mediterranean and Egypt, as many made the Grand Tour and returned to England and other parts north with antiquities and art. In the 18th century such important figures as painter James Stuart and architect Nicholas Revett set a standard that many of the young educated elite would follow (Daniel, 1981:15). Outside of the ancient world many antiquarian societies were established throughout the 18th and 19th centuries. The Society of Antiquaries was chartered in London in 1751, and the Society of Antiquaries of Scotland was founded in 1780. Similar societies were founded in France as well as America in 1814 and 1812 respectively. These societies were perhaps spurred by interest at home, as early research into the antiquities outside of the Old World appeared in the second half of the 18th century. In Britain a volume of the Antiquities of Cornwall was published in

1754 by William Borlase (Daniel, 1981:25) and in America future President Thomas Jefferson published *Notes on the State of Virginia* in 1784, which linked stratigraphic layers to phases of ethnic origin.

Despite some public interest during this period, the practice of scientific geological investigation came slowly into acceptance. The development of geology allowed for more widespread acceptance and popularity. The work of Lyell and Darwin's subsequent developments on evolution drew the attention of the public across all lines of social class. The specialists themselves plodded a slow course away from catastrophism towards uniformitarianism, or actualism, as it is sometimes referred. Lyell himself, whom so many immediately link with uniformitarianism, held onto many catastrophist leanings throughout his career. The presumed negative effect that stratigraphic geology had upon religious beliefs and the history of Genesis led many to be slow in accepting it. Popular acceptance of these theories did not come suddenly, but within time stratigraphic geology was the standard respected method by which the antiquity of humans was investigated.

When compared to the antiquarian tradition, the earliest archaeologists had a much more fragile foundation upon which to build. It was not uncommon to have it reported that the finds so coveted by the antiquarian collectors were discovered by chance by lay people in locations without esteem, such as in the fields or manure piles or in a river while someone was fishing (Carver, 2006:10). The written record of the antiquarians could have easily supplied a source of some additional embarrassment as many statements about the abilities of the ancients or the biblical link to finds or sites (the apparent lost powers of alchemy or the Canaanites construction of mounds in America are only two such examples) became more and more obviously silly. Perhaps in part because of its own past, and due to the shadow of stratigraphic geology, archaeology developed such that geology was the narrative framework into which historians tried to fit it, one that was established, *a priori* (Carver, 2006:3).

The acceptance of the antiquity of human culture led directly to the establishment of archaeology as a serious academic discipline. If human culture had indeed developed over great depths of time then that time could, and in fact should, be separated and segmented into phases. This idea led to the realisation that the phases of development could be discerned through the recovery and analysis of individual finds in their original context. It was at this point that, it could be argued, archaeology first became a "legitimate academic pursuit" (Triggs, 1998:23). However, the subsequent devotion to artefacts and assemblages resulted in typologies receiving the greater focus over that of stratigraphic sequences. Stratigraphic interpretation was hindered by a rather simplistic notion that deeper meant older (Carver, 2006:7). Despite this fact, advances in stratigraphic thought were made during the antiquarian period. The Reverend Dr. William Stukeley established a relative chronological order of events when he noted that a Roman road turned abruptly to avoid the pre-dating Silbury Hill (Figure 2.2), as well as noting that Roman roads cut through Bronze Age disc barrows (Trigger, 1989:64). In North America a long standing colloquial note is that Thomas Jefferson practiced controlled excavation some 100 years ahead of his time. Jefferson's work on the mounds found within his Virginia estate in 1784 revealed a sense for strata and their chronological component well before this became the standard in archaeological work, describing sequences of earth and bone layers and their significance for interpretation. The work of Stukeley, Jefferson and their contemporaries were too inconsistent to represent an organized effort of prehistoric and stratigraphic archaeology. Stukeley's own observations about Silbury Hill ended in the confounding conclusion that it was constructed as a tomb for the British king Chyndonax (Trigger, 1989:70).

Once established as an academic discipline, European excavation practice was mostly conducted with little respect for the relationship between items and their locations. General Pitt-Rivers adapted and took on the ideas of his contemporaries when he was the first to employ the practice of assigning distinct coordinates to artefacts (Bowden, 1991:154). This remains a lasting contribution to the practice, along with his other well noted adherence to strict recording procedures. Sir Mortimer Wheeler, and his pupil Kenyon, adhered to a grid based excavation system relying on baulks maintained so that all structures or disturbances were related back to them (Kenyon et al., 1964:77). The baulks were kept between areas to detect stratigraphic variables that were believed to be difficult to determine over large scale excavations. This reliance on the vertical section was a new approach, introducing a greater sophistication and respect for the stratigraphic sequence and the material assemblages. Yet it still failed to fully coordinate finds to specific layers.

An understanding of the importance of relating finds to context was a result of the influence of palaeontological and geological practice. This even led to the concept of *fossils directeurs*, a term not unlike the index fossil of palaeontology (Triggs, 1998:25). This concept, that the finds within a context are an indication of its date, was developed in the late 19th century but exists down to today. These origins linked archaeological stratigraphic theory in Europe with geological stratigraphy and it was accepted that one could speak for the other. This was acted out in practice in the many excavations of deeply stratified cave deposits throughout Europe and the Near East during the early 20th century. Dorothy Garrod's work at Tabun Cave, for example, revealed 25 meters of stratification from the earliest Lower Palaeolithic period onwards.

Excavations at Castillo Cave in Spain utilized the practice of arbitrary excavation in "spits". While this development was an important step, it certainly fell short of excavation by true natural layers. If the purpose of excavation by archaeological strata is to reconstruct individual actions by representing action and event, then spit excavation fails in this regard by creating false units which are non-representative of particular events. Despite this fact, spit excavation still has its place in certain situations (for a review of proper applications of spit excavation see Roskams, 2001c). It was at this stage of development that the practice of stratigraphic excavation was imported to North America.

Despite the received wisdom from some, American archaeologists did not suddenly and without foundation simply start excavating stratigraphically (O'Brien and Lyman, 1999:145). Depending on the definition, it can be stated that stratigraphic excavation has had a long tradition within Americanist archaeology. O'Brien and Lyman's worryingly simplified definition of stratigraphic excavation (one that divulges their focus upon chronology and seriation above all else) states that the practice is only removing strata in vertically discrete units and keeping the associated assemblages within in sets for the aim of measuring time (O'Brien and Lyman, 1999:150). While this research seeks a more complex practice of stratigraphic definition, one involving true archaeological strata, the history of American methodology in many ways reflects this definition. The methods and approaches developed by Americanist archaeology was in many ways built upon the belief that *any* vertically discrete unit was sufficient for assemblage studies, independent of the unit as a representation of actual events, as true stratigraphic units should be. Following Jefferson, some early excavation work in America was performed by Richard Wetherill at Grand Gulch in the mid 1890s, and Max Uhle's excavation of a shell mound at the San Francisco Bay shoreline in 1902-03. Uhle's work recognised different layer deposits and divided the strata by the natural agents that caused their deposition (Figure 2.3) (Rowe, 1955).

It is noted that Nels C. Nelson was the first to perform organised arbitrary stratigraphic excavation in America. Nelson had been to European sites and said his "chief inspiration to search for chronological evidence came from reading about European cave finds; from visiting several of the caves, seeing the levels marked off on the walls and in taking part in the Castillo Cave in Spain for several weeks in 1913" (Woodbury, 1960:98). Other reports state that it appears that Manuel Gamio was the first to introduce the method in 1911 (Adams, 1960:99). Gamio was working with Franz Boas who sought a means to confirm his ceramic sequence gathered from surface collection in Mexico. Boas then suggested that the answer be found in stratigraphic excavation to compare to the assemblage. Gamio undertook the excavation of test pits at Atzcapotsalco, working in 25 centimetre levels. He was eventually able to confirm the sequence and establish one of the earliest cultural assemblages for the Valley of Mexico. Gamio's method was inspired by the pursuit of true stratigraphic sequence but in practice was less so, as he used preset unit thicknesses. Nelson also divided the sequences into arbitrary levels despite the earlier examples by Uhle in San Francisco Bay. However, the practice influenced many others and the method spread to the excavations of Hawkes and Linton (Willey and Phillips, 1955:743), and Charles Peabody among others. Arbitrary excavation was the foundation of the chronological approach that was the focus of American archaeology. Since seriation was seen as a valid means of reconstructing the chronology of a site, and arbitrary layers could easily be ordered chronologically by seriation methods, this excavation method continued in use. Recently, there have been calls to end this needless destruction of assemblage data; it was regarded by Praetzellis as a misappropriation of a method developed for one set of goals to a different context (Praetzellis, 1993:84).

It was Alfred Kidder who introduced the method of excavation by natural stratigraphic contour layers at the Pecos ruins in New Mexico, yet the naïve association between depth and age continued, despite the effects of vertical strata or possible intrusions. Kidder began his work at the beginning of the "classificatory-historical" period of American Archaeology (Daniel, 1981:175). As mentioned above, the focus throughout most of the early excavations in America, especially in the Southwestern states, was the formation of cultural chronologies. His publication of *Introduction to the Study of Southwestern Archaeology* (Kidder, 1924) was arguably the world's first attempt at a regional culture history synthesis, predating V. Gordon Childe's *The Dawn of European Civilization* (1925) by a year. Kidder himself was trained at Harvard by renowned Egyptologist George Reisner, who may have influenced his own desire to relate finds to history, emulating the complex history of pharaohs known in Egypt. Kidder's emphasis upon stratigraphic excavation of natural strata was mainly to focus upon what the levels showed in relation to history (Daniel, 1981:177). The focus upon chronology lent itself more to theoretical questions of typology and seriation rather than dealing with the stratigraphy. The sequence of materials was often deemed a more simplified aspect of the search to construct sound chronologies and the relationship between materials and contexts remained largely separated from the analysis of stratigraphy. This was despite the fact that once it was accepted that culture change was visible in the stratigraphic record, stratigraphic excavation, albeit often by arbitrary levels, became the norm in Americanist archaeology (O'Brien and Lyman, 1999:173).

The connection with geological principles implied that while still important, the methodological issues of stratigraphy are settled, and require no further investment of energy or resources. However, the ability of geological principles to address the many contexts that are found archaeologically have been in question for some time and the role that cultural material plays in soil contexts, whether it be sediment or fossil, have been subject to a necessary review. The "problematic nature" of artefacts and strata (O'Brien and Lyman, 1999:173) can lead to confusion between aspects of chronology and the nature of deposits, which require a new conception for stratigraphic interpretation.

The advocates for a new concept of archaeological stratigraphy were led by the work of Edward Harris (1975, 1979). Harris's research began a debate and subsequent divide between geological and archaeological stratigraphy. The debate would rage at times, and was the fodder for many caustic exchanges between the supporters of each approach. It was previously noted that the geological principles of Lyell, Smith and others was a foundation upon which archaeological study legitimised itself. The geological principles of stratigraphy, mainly that of superposition and 'strata identified by fossils' (Harris, 1979:111), were the operational manual from which archaeologists investigated their strata. Although into the 1970s the Law of Superposition was the most often regarded rule (Brown III and Harris, 1993:8).

Geoarchaeology's main concern is soils and sediments. As a sub-set of archaeological investigation the work of geoarchaeologists was mostly constrained to studies of environmental change over time. The direct effects on excavation method was limited, except within the USA at cave and rock shelter sites, where the study of *in situ* sediments had a greater influence on practice (Lucas, 2001:152). With regard to cultural finds the Geoarchaeological approach is based on the idea that archaeological strata are natural occurrences and that deposits, and the artefacts contained within, are essentially sediments. All sediments react in the same manner and are subject to the same forces as silt or stone particles (see Stein, 1985, Gasche and Tunca, 1983). Some make the argument that human action is *only* one agent involved in deposition. Viewing humans, especially in urban deposits, as only one agent involved in deposition is naïve. In archaeological stratigraphy from urban sites, human action is an *overwhelming* agent for change. This approach is not unlike stating that the earth shaking is *only* one factor causing damage during an earthquake. While this in actuality may be true, there are residual factors, such as flood and fire, but the actual major force cannot be overlooked or lumped in with the others involved.

The geoarchaeological approach, based upon the principles of geological and earth science, adheres to the concepts of the natural formation of beds of strata. A focus upon the study of the formation of sites through geological processes places an emphasis upon soil and sediments. Since all deposits are viewed as sediments, artefact material is interpreted as an aspect of clastic deposition formed mechanically from the weathering of rocks (Stein, 1985:340). This betrays the perhaps obvious but overlooked fact that the geoarchaeological approach operates on a different time scale from archaeological stratigraphy. The focus upon extreme durations of time which encompass the development of static type fossils is in contrast to deposits formed over decades or less. Fossil groups formed and deposited during a million plus year span are much less mobile than a short sequence of pits created during the occupation practices of a single season. In addition to issues of temporal scale, geoarchaeology operates over quite a different spatial scale from that of archaeological stratigraphy (Stein, 2005:244). Correlations of material culture are most often within the site or feature, and are not made across great distances, as in the large geological strata of a particular epoch.

Despite these inherent differences, geoarchaeology as the basis of analysing sequences led to attempts to standardize descriptions of archaeological deposits. Gasche and Tunca's guide divided lithologic units by the terms chronostratigraphy and ethnostratigraphy (Gasche and Tunca, 1983:327). The standardized descriptions are heavily rooted in soils science, as one would expect. The drive for a universal descriptive system of deposits, promoted by Stein (1985) and Farrand (1984) and proposed by Gasche and Tunca (1983), was criticised based on the fact that universal systems are unworkable. There would simply be an unmanageable number of factors and processes involved to describe them all. Harris's work suggested that the layer and interface are the only aspects universal to all archaeological sites. Additionally, it is interesting to note that the guide largely rejects the theory of the living floor, or occupation surface. The surfaces are rejected mainly because they are deemed difficult, "if not impossible", to define (Gasche and Tunca, 1983:330). They instead choose to have surfaces lumped together for the time period from which they originate. This practice negates the importance of the relationship between different surface levels and other stratigraphic features of a site (walls, etc.) as they relate to the chronological sequence. If performed in practice, this would result in the unnecessary loss of a large amount of valuable data.

Where the geoarchaeological school had its foundations in earlier periods, Harris and his contemporaries were operating under a new imperative. The technological and financial boom of the post-war decades' rapid development led to the creation of rescue movements in England in order to preserve the existing archaeological resources. Government took a larger role in planning and organisation, and professional circuit diggers arose (Roskams, 2001c:25). In addition to the New Archaeology developed in this period, the constant pressure of too many sites and too little money saw many resourceful means of dealing with data. It was during this period that Harris argued against the practice of viewing strata as natural data, first through the development of the Harris matrix, and subsequently through his principles of archaeological stratigraphy based upon the matrix. The development of the matrix was, in its earliest phase, presented as a measure to speed up analysis and provide a "proper foundation for good and timely publications" (Harris, 1974).

The Harris matrix was first invented during 1973 excavations as a tool to reflect the sequence of strata for the analysis of sites in Winchester. It acts as a relative chronology of the sequence of deposition; literally "what came first" (Brown III and Harris, 1993:7). The method was developed over several seasons and not formalized as it is presently known until the 1975 season. During that year the New Road site in Winchester was the first completed site which used the matrix method during the full course of excavation (Harris and Ottaway, 1976). This tool established the theoretical grounding of the importance of the interface as an archaeological unit. Whereas geoarchaeology is concerned with deposit substance, Harris is concerned with the interface; the edge or physical boundary of deposits by which they are defined. The difference is defined by Lucas as "a distinction of form and content" (2001:153).

The main distinction between geological and archaeological stratigraphy principles is the identification and interpretation of negative features or events which have no content substance; this is Lucas' distinction of form and content.

By concentrating on the content of a deposit, the geoarchaeological approach would miss negative features, cuts etc, that have no content. The true sequence of events at a site is obviously of importance to archaeological investigation. By emphasising events, and their relative relationships, the Harris archaeological stratigraphy approach gives primacy to the full range of activities at a site. Content and its interpretation are deemed secondary to understanding the sequence of site history. Taken to its extreme, however, this leads to problems in understanding the full nature of deposits, as will be discussed in following sections.

While the differences between geoarchaeological and archaeological stratigraphy was the subject of debate during the 1970s and 80s, during the last decade most of the debate has been put to rest. As Harris indicated in 1984, the Harris matrix (and thus the approach to archaeological stratigraphy) defends itself by its continued use (1984:127). By his own account, geological notions should be the starting point for research into archaeological strata (Harris, 1989), and that has gained widespread acceptance today. The excavator has become more aware of geoarchaeological principles, both for defining and understanding deposit sequences as excavation can only be aided by the use of both methods. The acerbic nature of the first discussions has largely given way to conciliation and an effort to tackle the task at hand. But what of the results of the debate? The test of use in practice indicates who won out in the argument. How many archaeologists today utilize Gasche and Tunca's *Guide to Archaeostratigraphic Classification*? How many adhere to principles set out by Harris? Time has chosen a "winner" (if one can be declared that in a debate of methodology) and the study towards a better understanding of archaeological stratigraphy has continued.

2.3 Harris and Afterwards

In 1989 Harris released the second edition to his fundamental work *Principles of Archaeological Stratigraphy* (1989). This edition surpassed the first with the inclusion of sections to address criticisms and provided a wider selection of examples and methods. The principles, based upon the 'laws of archaeological stratigraphy', were a foundation for the new breed of field excavator. The laws represented the view of archaeological stratification, and are paraphrased as follow:

The Law of Superposition: In a series of layers the upper units are younger than the lower units below

The Law of Original Horizontality: A layer deposited in an unconsolidated form will tend towards a horizontal disposition.

The Law of Original Continuity: A deposit in its original form will be bounded by a basin of deposition. Any vertical edge will represent a removal disturbance.

The Law of Stratigraphical Succession: Any unit of stratification takes its place in the sequence from its position with the undermost of all units above it and the uppermost of all units below, all other relationships are redundant. (Harris, 1979)

This repackaged work, provided with an introduction by Michael Schiffer, advocated single context planning over arbitrary stratigraphy and presented wider uses of the matrix system (Roskams, 1990). With the theoretical grounding for an archaeological stratigraphy in place, many archaeologists embraced, adapted, re-worked and developed research based upon the concepts of archaeological stratigraphy. For this fact alone, the amount of thought that his work promoted, Harris is to be congratulated. However, questions continued to be asked of the flexibility of the matrix to address all the situations and interpretive frameworks that archaeologists demand, specifically with regard to consolidated strata. Roskams questioned the far reaching effects of the work: was the practice truly more sound, or had Harris simply created a neat way to illustrate stratigraphic relationships (Roskams, 1990:972)? The Law of Superposition is the main focus of concern for its inability to account for stratigraphic units in standing structures: in effect, in these circumstances which way is up? Harris is certainly aware that consolidated strata do not work like unconsolidated strata, and would likely argue that the archaeologist would know which way is up. In essence this boils the Law of Superposition down into a basic truism; known later layers are younger than known older ones (Roskams, 1990:972). Others pointed out certain failings to the method before offering their own improvements (Brown and Harris, 1993:16). The decade following the publication of *Principles*, and the accompanying *Practices* volume, saw many advances in the way that archaeologists used and thought of archaeological stratigraphy. All adaptations to the matrix and other related methods remained based upon the concepts of archaeological stratigraphy, such as interfaces and features, such that all subsequent work has built itself upon the principles of stratigraphy set out by Harris.

One of the first adaptations of the Harris matrix was presented by Magnar Dalland, and named the diagram of chronological configurations (Dalland, 1984). This approach was based on the belief, later echoed by Carver (1990), that a complete Harris matrix could be too large and unwieldy, and ultimately too complicated to allow for easy interpretation of a site. Dalland's method was an attempt to simplify the production of the matrix. The focus of the display is upon the physical relationships between each stratigraphic unit, the results being a diagram of all possible relative chronological configurations that exist in the sequence. It is a method of overtly stating the temporal relationships by focusing on 'over' and 'under' relationships. A list of all possible permutations of "over" and "under" relationships is created moving first from the lowest deposit and upward with every sequential "over" relationship. This process is repeated from the uppermost layer down to list all "under" relationships. These two lists are amalgamated to construct the diagram of chronological configurations built around the key sequence of direct physical relations and the secondary sequences of deposits not directly linked. Dalland's method is different from Harris's matrix in that it views deposits as part of two separate moments on a time scale; when the formation commences and when it finishes. Because the exact time of each cannot be fixed (for one deposit let alone the relationship between two related deposits) within the sequence, the diagram is not fixed, but viewed as an elastic series of moments which are stretched and compressed at any point in the sequence (Dalland, 1984:123). This approach could be problematic in practice. However, as the combination of temporal and physical characteristics in the same diagram prove difficult if not "almost impossible" (Harris, 1984:133) for large sequences; a step away from the original goal of simplifying stratigraphic analysis. The number of permutations possible for even the moderate number of deposits takes the construction of such a diagram away from the lone archaeologist and into the realm of computerised analysis. Barber suggested (1984:49) that the difficulty of simplistically organising secondary sequences into the primary or key sequence is a failure of the data and not of any one method, as had been suggested by Harris as a problem with Dalland's approach. Perhaps the overlooked issue with Dalland's method is that of his approach to stratigraphic latitude. It should be noted that problems of "elastic" time are not caused by any one layer's period of use or deposition, but can also be affected by truncation or any other obstructions to our observation of the "event" that is the stratigraphic unit.

Another proposed development to the Harris matrix was published by M.O.H. Carver (1990). The Carver matrix, although developed before the Harris matrix (see Carver, 1979, 1980), was later adapted to be built upon the Harris matrix, and operates on the assumption that the Harris matrix is already in place (1990:97). The Carver approach focuses on contexts, features and structures over that of contexts alone. The diagram presents the sequence of strata with vertical arrows included to display the "life" or duration of any given deposit or feature (see Figure 2.4 for an example diagram from Durham). The sequence diagram is intended to be an interpretive tool building upon the Harris sequence. It is intended to present a fuller picture of what happened through time, rather than the direct order of events presented in Harris's method. A better understanding of the landuse history of a site is to be gleaned from the presentation of the Carver matrix, in much the same manner as Landuse Diagrams present a visible description of contemporary events on a site (Steane, 1992a:13). Harris saw fit to respond directly to the Carver matrix in his *Practices* volume. He argued against Carver's description of the Harris matrix as a direct statement of the physical relationships of stratigraphic units (Carver, 1990:97). Harris instead stated that Carver's description of the Harris matrix best fits the section drawing of a sequence. He believes that matrix diagrams are representations of relative chronology. Harris's main opposition to the Carver matrix is that he views it as a subjective method, based upon the judgment of the individual archaeologist and thus not a universal application like the Harris matrix (Brown III and Harris, 1993:18). The most problematic aspect of the Carver Matrix is that the archaeological analyst must decide what deposits are happening during what time spans. When dealing with complex site sequences the probability of interpretive error of time spans, or existence of deposits that can "slide" up or down a sequence, are quite likely. Any error can greatly influence the interpretive value of using such a matrix format.

Harris's response to the Carver matrix was part of his collection of 17 essays demonstrating the advances of the many archaeologists who shared his concern with archaeological stratigraphy (1993). This was the first such collection solely dedicated to archaeological stratigraphy. The contributions represented an international collection of the many applications of the Harris matrix which included applications from Catalonia, Poland, York UK, Germany, Mexico and Colonial Williamsburg. The topics of the essays included methods of on site analysis during excavations, as promoted by Harris, as well as above ground archaeology and new methods for post-excavation analysis. The latter group demonstrated new trends towards investigating artefact assemblages in relation to the stratigraphic sequence (Gerrard, 1993, Triggs, 1993). Gerrard's research introduced methods of statistical analysis towards assessing assemblage diversity, using this measure to understand disturbance activities and indicate movement of material between deposits. Triggs' essay examined seriation as a method of better understanding the nature of deposit sequences, work which was later expanded as part of his PhD dissertation research (Triggs, 1998).

While Harris's *Practices of Archaeological Stratigraphy* volume was published and began distribution around the world, a diverse group of archaeologists and other contributors equally interested in issues of archaeological stratigraphy was founded in England. Beginning as the "brainchild" of Kate Steane, the Interpreting Stratigraphy Group was formed in 1992 to hold regular informal conferences and meetings as a platform to spread research and encourage the discussion of issues of stratigraphic concern. The group describes its original concerns as: context/soil deposit descriptions, definition of features and interfaces or other truncations, storage of stratigraphic data in Harris matrices and other forms, data manipulation during post-excavation, phasing work, and integration of stratigraphic and finds work to tackle residuality and establish dated chronologies. These interests expanded into site formation processes and micromorphology, site reconnaissance and evaluation, standing building and burial recording, and archival issues and dissemination mechanisms.

The first conference of the Interpreting Stratigraphy Group was held in Lincoln in 1992. It featured ten papers covering many issues. The research included the investigation of aspects of site formation data (Hutcheson, 1992) and the issues facing reinterpretation of site data from backlog archives (Steane, 1992b). Max Adams presented a paper discussing the future of stratigraphic theory beyond the work of Harris (Adams, 1992). This presented several interesting ideas concerning the nature of the matrix, arguing that many of its surrounding principles remain under-defined. Adams suggests that subjective elements of recording, those concerning the physical relationships of deposits swept aside by the new approach, should be denoted and be included in analysis to attain a better appreciation of the "dynamic past we are confronting" (Adams, 1992:15). Adams feared analysis methods leading to a caricature of the past. Steve Roskams also presented a paper at the 1992 conference addressing theoretical issues facing stratigraphic analysis, and the way that they affect practice (Roskams, 1992). Roskams was concerned with the separation of finds and field data and how that was reflected in the definition of the status of deposits. The divisions of "primary" and "secondary" were argued to be far too simplistic, and did not reflect the true relationship between deposit and assemblage. Roskams suggested more elaborate and representative descriptions of deposit status for use in practice by field archaeologists (as will be discussed in section 3.5).

Subsequent conferences developed upon these themes and explored new areas related to issues of analysis and publication. The 1993 conference of the Interpreting Stratigraphy Group, held in Edinburgh, Scotland, featured a paper on database analysis of stratigraphy (Lowe, 1992). The conference the following year in Norwich featured nine papers, including issues of residuality (Brown, 1994, Vince, 1994). In 2000 a collection of the conference papers presented from 1993 to 1997 was published, edited by Steve Roskams. This large collection of 31 essays details a broad range of topics in the recent development of stratigraphic research in Britain. Topics include buildings and upright stratigraphy (Clark, 2001a, Westman, 2001, Jones, 2001), a host of field excavation and recording methods (Bates et al., 2001, Roskams, 2001a, Adams, 2001, Clark, 2001b, Smith, 2001) and new post-excavation analysis methods (Watson, 2001, Clark, 2001c, Hammer, 2001a, Hammer, 2001b, Cox, 2001, Rauxloh, 2001).

A review of the publications from the Interpreting Stratigraphy Group indicates that the range of research regarding archaeological stratigraphy has advanced greatly since the early 1990s. A strong tradition has developed in Britain, answering questions not addressed by Harris and responding to the myriad of demands that archaeologists are now asking of their data. Stratigraphic analysis has moved beyond questions of interfaces, deposits and chronological groupings into detailed examinations of finds assemblages and the formation processes involved in shaping the nature of deposits and the sequences that we recover. At present, methods of recording and organising stratigraphic data are very advanced but further steps are required to establish consistent methods of bridging these data with understandings of the nature of deposits.

2.4 Excavation and Recovery Methods

Archaeologists in the post-matrix era, such as those in the Interpreting Stratigraphy Group, pursued themes of interest, and developed and disseminated methods as their sites dictated. An interesting side effect of the post-Rescue archaeology era, one that is largely directed by the demands of business and cost efficiency, is that a myriad of different methods are used in order to address the threats to sites and to answer the interesting questions that they pose. However, the many different methods can often lead to problems of integrating data from larger areas excavated under different circumstances in order to address different research questions. Therefore, Carver argues for the importance of deciding recovery levels before one enters the field in relation to the research aims (1990:47).

Carver describes total excavation as a mode of recovery "where the rationale for selection is unspecific, or concealed" (Carver, 1990:48). He views the process of excavation as a mode of observation that results in data. To Carver the acquisition of data is dependant upon how data is defined and the techniques applied to see them (Carver, 1990:66). In light of this view he advocated the definition of different recovery levels, which operate on the definitions of data to set the appropriate method of excavation and recording for the particular situation. This definition outlines 6 grades of "data acquisition levels" (designated A through F) ranging from the collection of surface finds to careful micro-sieving of excavated pit fills (Carver, 1990:79). It is important to note that, in practice, differing recovery levels persist and the need to make interpretations and comparisons of data across this divide continues. This is not the most ideal situation. Carver has argued that a clearly defined research design at the outset would guide the post-excavation analysis "in a perfect world" (Carver, 1990:110). Yet undeniably this is not a perfect world. The reality of contract unit archaeology and subsequent economic stress, staffing, and in few cases poor design choices and methods creates data that is still valuable and useful but exists at varying levels. The great archive of data that has resulted from contract excavation is a useful source for many future archaeologists to revisit. However, some of these records lack any clear definition of recovery levels; these must be inferred later by the investigator. It is important that a method be sought for ways to use deposits from both identified and explicitly stated as well as from unidentified but inferred recovery levels in the comparison and interpretation of site data.

The introduction of formal excavation recovery levels based upon defined theoretical approaches to excavation principles helped archaeologists to clearly verbalize excavation practices. The principles of the recovery levels are not, however, a new development. The methods and approaches synthesised into six levels were in existence before their presentation as a means of organising the excavation recording at one site. What Carver's approach offers is a standard ordering of the methods used and more importantly, an explicit means of communicating to others what practices were used to gather archaeological data. This leads to the question "to what extent different levels of method are used in practice?" particularly in contract or unit archaeology applications, and how these methods are theoretically supported.

Many of today's most common practices are influenced by the development of rescue and contract driven archaeology. With resources and funding limited in most regions, the existence of pure research excavation is now mainly carried out by university departments as training operations. Other sources of funding include local trusts and museums. These types of training research excavations are usually limited in scope and while some are extensive and carried out over many years, such as the community research projects recently created in Britain by Heritage Lottery Fund initiatives, community archaeology does not usually account for the majority of work done. Developer funded excavation, termed contract, cultural resource management (CRM) or rescue archaeology depending on the region, is the major source of excavation conducted. Any new development in methodology that fails to account for an application in a contract setting has not delivered significant results.

In Britain the rescue movement began in the 1960s when the full scale of the danger created by rampant development was recognised. By the 1970s a council, committee and patrons were in place and excavation was conducted in most cases through good-faith negotiations with developers, as no legal requirements were yet in place (Hammer, 1993). This led to the development of a large pool of professional excavators. Many excavators began this period undertrained and inexperienced and simply developed skills and methods while on the job. A pool of archaeologists came to communicate and exchange methods based upon the varied situations and experiences (Hammer, 1993). The rapid changes in theoretical and practical approaches to recovery practices created a boon for the refinement of methods. The self-made archaeologist's methods combined with the existing academic and theory induced methods to grow and develop as situations demanded.

Perhaps the most important development of this period was in the methods of recording and how they dealt with deposits and recovery. Following the influence of Harris's stratigraphic principles in 1975, single-context planning was developed by the Department of Urban Archaeology (DUA) at the London Museum (later the Museum of London Archaeological Service) (Chadwick, 1997). This method introduced the pro-forma sheet to archaeological recording, where each archaeological unit was given a separate form for identification. During this time similar methods regarding stratigraphy were being formulated and organised by Andrew Boddington, who had formerly been with the (DUA), at the Northampton County Council (1978). The basis for this approach was greatly influenced by the arrangement of archaeological work at this time. Large urban sites requiring massive amounts of recording were excavated by large crews of young archaeologists. The practice of individual unit identification and recording, done by the excavator, released the upper management of the excavations from the burden of a great deal of the recording as was previously part of their responsibilities. This allowed crew numbers to expand as systems became more and more streamlined.

The single-context recording system, as mentioned, was based upon theories and principles of archaeological stratigraphy, but was also based on other implicit assumptions. Most context forms were built around two sections, one for the physical description of the context attributes, the other for interpretation of the context function. This struck a balance between the context as an observable object or record and the context as interpreted actively by archaeologists. Though certainly information is lost by inexperienced excavators and the use of terms by rote during recording, more specialized forms for situational features and other methods have proven successful for most. So successful in fact, that up to the 1990s only three types of formats were in use in Britain (Hammer, 1993).

More recent standards adopted by archaeologists have changed the field methods in use. The first such standard was the Management of Archaeological Practices (MAP 2) created in 1991 for projects by English Heritage. As envisioned during the creation of MAP 2, recently the standard was revised in light of changing practices and experiences. The new package, entitled Management of Research Projects in the Historic Environment (MoRPHE) was unveiled in 2006. These developments in recovery method and application have resulted in arguably good and bad points. While large amounts of research are undertaken, most has been conducted under the umbrella of consultants and has come to reflect the dry style of similarly contracted engineer's reports. The defect of the context forms is that they lead to mechanistic documentation without insights into evaluation of the material. An advantage of such frameworks for archaeology is that, following Carver's calls for clear research design (Carver, 1990), planning and objectives are more than ever part of the aims of excavation from the beginning.

In some regions the structure of the cultural resource management system is such that research plans are a built-in aspect of archaeological work. In Ontario, Canada, cultural heritage, which under Canadian law falls under the jurisdiction of the province, is governed by a four stage assessment system outlined clearly in a standards and guidelines document. Professional archaeologists, who must be licensed, work progressively from the assessment and background study stage, to initial test-pit survey, to advanced site specific assessment, to full excavation stages. At each stage the recovery aims of the archaeologist are dictated by the work. If a site is surveyed and finds indicate a longhouse structure necessitating a stage 3 investigation then the primary aim of further investigation is assessing the limits of this structure. The standards and guidelines that excavation is also based upon clearly indicate that *in situ* preservation is always the first choice, but where necessary total excavation is sought in order to minimize the loss of contextual information. Intensive trowelled excavation and sieving are standards under this system to recover enough material remains to ensure an understanding of the feature of interest and the patterns of distribution that surround it.

It is clear that at present, and probably in the future, a large part of archaeological work will be done in professional contract contexts. While there are certainly disadvantages to this professionalisation, such as the uninterested reporting and archiving of material, it is important to note that theoretical considerations are part of this work as much as research excavation. While perhaps understated in nature, the relatively young tradition of resource management and rescue archaeology have contributed to theory and in turn have used theoretical considerations to further field measures. Specifically, contract archaeology has added to the consideration of the recovery of material and how this relates to interpretations of materials.

2.5 Site Formation Processes

The previous sections (2.2, 2.3, and 2.4) were built primarily as a description and review of the issues. The following sections will aim to present a more analytical approach to the issues that affect a unification of stratigraphic and material investigation. This will begin by considering site formation processes, as these have a large effect upon the interpretation of both forms of data. As mentioned previously, Michael Schiffer produced the authoritative volume on site formation processes. First published in 1984, and now in many subsequent editions (1996), he outlined a myriad of factors effecting the formation of deposits as well as introducing many new elements to this area of interest. Schiffer underscored the importance of understanding formation processes due to their close relationship to virtually every inference made in archaeology (1996:8). He added a new dimension to earlier concepts that directly related past human activity to patterns and distributions of artefacts (Wood and Johnson, 1978:315), with a new appreciation of the changes that effect the patterns recovered. Archaeologists could no longer interpret finds at face value.

The entropic view of the archaeological record, discussed by Ascher (1968), holds that time will progressively reduce the amount of evidence surviving in archaeological contexts. Schiffer believed that the entropy theory alone was too simplistic; it did not take into account the many individual cases that opposed it nor the fact that information can be gathered by the addition of materials. Schiffer discussed two forms of formation processes: the first being cultural and the second being environmental or natural. He investigated the identification of each and the form of the effect each makes. He termed them n-transforms and c-transforms respectively and chose to use the definition of each to develop "laws" for use to understand archaeological finds and the environment of their recovery. Schiffer's approach is not unlike the aim of the geoarchaeologists, such as Gasche and Tunca (1983: see section 2.2 above), who advocated a universal descriptive system of stratigraphy not unlike Schiffer's search for universal laws that understand formation processes.

The concept of site formation processes is built upon certain assumptions. The main assumption, seemingly obvious due to the name, is related to the concept of the "site", which is formed by various factors. The site, or the density of human occupation in certain locations over that of the surrounding landscape (Dunnell, 1992), has different meanings in different branches of archaeological study. Whatever ones understanding of the concept of site, the congruence of cultural interaction and environmental factors results in a complex mix of factors to be interpreted and understood (Barton et al., 2002:166). Because of this fact Schiffer has been criticised for his law-like axioms (Butzer, 1982). This led Schiffer to a contradiction of sorts, when he recognised the fact that current knowledge made it very difficult to completely understand all factors involved in forming the archaeological record (Triggs, 1998:101). Despite this fact the conceptual tools introduced by Schiffer have proven useful over time in guiding the understanding of the archaeological record and have led to greater links between behaviour and finds (Barton et al., 2002:106).

Many pre-depositional factors can affect the body of material. Pre-burial dispersal factors from natural elements such as water and frost can move surface items. Also, cultural factors such as abandonment, often covering items Schiffer termed as *de facto* refuse (1972:160), can affect patterns of recovered material depending on whether abandonment was planned or sudden and catastrophic. For planned abandonment high value items are curated and removed while items normally designated for disposal, or Schiffer's secondary refuse (1972:161), are left behind. Catastrophic abandonment can result in a near complete pattern of material depending on the factors surrounding the abandonment. The most extreme case being Pompeii, which in its destruction has been suggested to be representative of that society frozen in time. This of course is an erroneous notion, if only for the fact that the eruption took place over three days (Webb, 1995).

Post-depositional disturbance factors involve a large body of factors caused by animals, plants and weather. Faunalturbation, that is disturbance by animals, is a term generally referring to the mixing of soils by animal action. This is most commonly caused by burrowing rodents but also by crayfish, insects and earthworms (Wood and Johnson, 1978:318). The quantity of burrowing mammals that operate in most environments is high. Mice, voles, gophers, rabbits, and squirrels can all create complex burrow systems that churn up and displace large volumes of soil. The remains of burrows, called krotovina (Schiffer, 1996:208), are often filled with other materials and soils, such that when viewed in profile they are often quite visible and can be easily accounted for. The effects of earthworm action upon archaeological soils can be often overlooked and perhaps disregarded by some; it is absurd to think that the lowly earthworm can move so much material and even undermine structures. In fact the action of earthworms, to ingest or push aside the soil as they move, extruding material behind them, can churn up large amounts of soil and blur the interfaces between archaeological strata. These facts led to observations by Darwin of the considerable impact of earthworms upon the earth (see Darwin, 1881). Darwin recognised the effect on archaeological finds that remain upon the surface of the ground. The principal area where worms have an effect can be the surface area where they work to cover and envelope materials in the ground.

The affects of floralturbation are another major disturbance factor. The mixing of soils by plant action, notable roots structures, can displace large amounts of material. Uprooted trees move a great deal of soil and create a specific disturbance pattern in the ground, in addition to adding a large amount of material to the surface environment through leaf fall, etc. The mounds of earth created by tree falls, called cradle–knolls, are at least easily identified and understanding of this form of micro-topography can aid the archaeologist.

The effects of weather extremes upon soil conditions have a great ability to affect archaeological deposits. The most commonly noted cause is cryoturbation, or the disturbance of material uprooted through freeze-thaw activity. Cryoturbation can dislodge large amounts of material, especially in built structures. Water that enters into cracks can freeze acting to separate and crack stones and bricks, breaking down a building in a surprisingly small amount of time. In soil conditions this depends largely on the depth of frost penetration into the ground in that particular area. The frost-heave effect, which acts to move materials upward, results in residual finds and displace materials well outside of their original context. Factors such as soil texture, moisture, thermal conductivity of artefact materials, and the shape of the material in question can all result in varying amounts of frost-heave (Wood and Johnson, 1978:341). A similar effect to cryoturbation is created by argilliturbation, that is the swelling and shrinking of clay based soils as a result of seasonal changes in moisture content (Schiffer, 1996:216). The common shrinking and formation of large vertical cracks in the clay soils results in moving large objects upward due to soil pressure and allows small objects to erode out of the sides and transport downward into the soil.

All the preceding disturbance factors examined by Schiffer and others demonstrate the importance of understanding the various factors involved in shaping the archaeological record. While the existence of universal laws governing these factors has been the subject of some debate (Binford, 1981a, Butzer, 1982), the concepts have led researchers to follow in the tradition of Schiffer and attempt to quantify the formation process around us. Charles Baker (1978), writing around the same time as Schiffer, recognised that natural formation processes such as sedimentation and erosion often resulted in an unusual occurrence of larger artefacts closer to the surface. This "size effect" was supported by available data but lacked a full assessment of the impacts of other factors accelerating the movement of material, such as freeze-thaw or faunalturbation.

Schiffer and Skibo (1989) turned towards formation indicators on the archaeological objects themselves in a study of ceramic abrasion. The mechanisms for abrasion are examined as well as some aspects for interpretation of causes. The different factors creating variability in the compositions of ceramic collections were also explored by Sullivan (1989). Sullivan examined the causes and results of ceramic reuse by examining patterns of ceramic joins between vessels. Three competing theories were examined and eliminated, demonstrating the value of incorporating formation processes and specific material data into interpretation frameworks. It has been more recently followed up (Hutcheson, 1992, Pollard, 2001) and likely represents a major future direction of such forms of research.

The preceding section dealt with studies of natural processes and finds. When assemblage data are investigated to understand formation processes the most common sources are non-natural ceramic finds. Yet this form of research in many ways mirrors the study of taphonomic factors that act upon organic materials, mainly faunal remains. In its strictest definition, taphonomy is the study of post-mortem processes affecting organic remains (Gifford, 1981:367). A concern with taphonomic processes and their practical effects upon finds has existed for some time. Like many other paradigms used by archaeologists it was borrowed from a sister discipline, having first been a feature of paleontological study of the formation of fossil assemblages. The term taphonomy was coined by I.A. Efremov in 1940 (Gifford, 1981:366). In the same way that taphonomic processes might have obscured fossil assemblage formation and preservation, archaeologists found the study of natural effects upon biological remains was a valid means of understanding correlations and forming better interpretations of finds. Taphonomy has been of special interest to zooarchaeologists and paleoethnobotanists, who focus upon organic remains recovered in archaeological collections with a traditional focus upon the inherent bias that is found within organic collections.

Taphonomy developed as an aspect of palaeontology rather than an independent study and has been closely linked with paleoecological study. Most efforts within this area, from its earliest days forward, were directed towards practical assessments rather than the development of an internal dialogue of theoretical implications (Gifford, 1981:382). In archaeology taphonomic study has a long tradition of development. Elements are found within the works of Steno (Lyman, 1994b:17) and other early research attributed to the archaeological tradition. Taphonomic issues became important to archaeological interpretation by the sheer number of organic and natural remains that exist as part of the archaeological record. The close relationship between humans and their environment, their exploitation of organic resources and interconnected relationship with animals make this area of study a vital part of archaeological investigation. So connected is the relationship that it has been suggested that an examination of faunal material alone as a reflection of economic or environmental data is a spurious distinction (O'Connor, 1996:213).

The factors that lead to the breakdown and change of faunal materials, be they chemical change, flora or fauna, are in many ways comparable and related to the formation process that effect artefact assemblages. Additionally, they are subject to cultural factors affecting archaeological contexts, identified as Schiffer's c-transforms (1972:161); although cultural formation factors that affect archaeological contexts are often local and non-universal. One recent taphonomic study has utilized statistical methods to determine attritional damage (Rogers, 2000). This method of investigation can be equally applied to ceramic and other material finds, in order to better integrate with the formation data of the deposit from where they were recovered.

2.6 Material Assemblages

The analysis of material assemblages serves as a primary source of information concerning past cultures. This fact is as true today as it was in the earliest days of archaeological analysis. Our expectations of assemblages are high (Carver, 1990:100), and, with the passage of time, have only increased. Due to this, we address material assemblages in many different ways: chronologically, spatially, and functionally among others. Ideally, the recovered assemblage of artefacts to be studied are homogeneous, and deposited over a short period of time (Spaulding, 1960:61). This of course is influenced by excavation methodology, as different methods of stratigraphic recovery and control can affect the amount of material from different periods getting mixed together. While descriptions of assemblages based upon stylistic elements is common, and has its place in archaeological investigation, it is not the subject of review here. The quantification of material assemblages is an important aspect of analysis and requires a review based upon its role in this research.

For many years statistical analysis has served as a major tool for the analysis of collections of artefacts. The invention of statistical archaeology can perhaps best be ascribed not to a mathematician, but to Flinders Petrie (Kendall, 1969b:68). Petrie established and formalized a method for examining the hundreds of graves, and subsequent find types in his excavations in Egypt (Petrie, 1899). While his seriation method was called sequence-dating by Petrie, it would become a basis for analytical work in the future, especially in the Americanist tradition of archaeology and beyond into the present. Seriation and statistical archaeology was an inevitability of modern archaeology. With the large number of artefacts that began to be recovered, and not just items of "value" for museums, inevitably it would be necessary to summarize the data in some logical manner (Banning, 2000:17). While describing the quantities, spreads, and densities of material among other aspects is of importance, determining a relative chronological sequence of material finds via seriation has become a standard tool in the archaeologist kit.

Seriation is the subject of extensive amounts of research and epistemological writing, but is a deceptively simple technique (Marquardt, 1978:257). Following Petrie's work, seriation is an attempt to order data units along a dimension. In an archaeological context, the data units could be graves, excavation units, etc, whereas the dimension is along a relative timescale. In order to perform this task a matrix of the various relative abundances is created. This is based upon the assumption that separate types will come into use, peak in production, decline, and cease to be in use, as epitomised by the famous "battleship curve" or unimodal production curve (Ford, 1962). Additionally the seriation method is based upon the assumption that the type classes selected for ordering by relative abundance represent a distinct period of time (Fagan, 1983:63). In order for the type to be relevant for a relative chronology, the type classes must have been produced for a limited period of time. Furthermore, the method is based upon the assumption that the observed ordering of material represents temporal and not geographic differences or other factors (Orton, 1980:88). These temporal differences are helped if the deposit in question was deposited over a relatively short period of time, although the seriation of slow developed deposits (rubbish, etc.) is possible.

In North American archaeology the construction and application of seriation techniques has a long tradition. Beginning with the work of Brainerd (1951) and Robinson (1951), the construction of similarity matrixes based upon the indexes of agreement (1951:294) was established as a standard approach. The deposits are aligned along the matrix based upon the agreement coefficients to establish a descending order as would be expected by the stratigraphic sequence (Robinson, 1951:298). Following this research Spaulding contributed work towards defining types for use in seriation analysis (1953). Meighan introduced an adaptation to the seriation method, a graphical measure based upon "three-pole" graphs (1959). Another adaptation introduced by Dempsey and Baumhoff (1963) was a response to the Brainerd-Robinson method of frequency seriation, which was based upon results they felt were not impressive enough to be fully trusted. Their technique, called contextual analysis, was based upon the presence/absence of artefact patterns and not on counts or frequencies.

Demonstration of seriation in practice was most notably made by Dethlefsen and Deetz, who published their seriation on death's heads, cherubs and willow trees that appeared on seventeenth and eighteenth century gravestones in the Massachusetts (1966) (Figure 2.5). They related the change from death's heads to other motifs to local social changes among the early Puritan settlers and, while testing the method against established chronologies, demonstrated how seriation analysis can be useful not only for establishing chronologies but for making interpretations about cultural development. Kuzara, Mead and Dixon introduced one of the first computer seriation applications, a pre-cursor to the Bonn Seriation program (Scollar, 1990) which is still popular today.

Many other researchers introduced variations, adaptations or advances on the technique (Cowgill, 1968, Kendall, 1969a, Brown and Freeman, 1964, Hole and Shaw, 1967) such that Robert Dunnell compiled a historical review of the method (1970). He addressed seriations development, regarding the problems with the early work to refine itself. He states that the early work ignored assumptions and assumed seriation to be practical and useful rather than acting as an evaluation, as a method for finding and correcting deficiencies (Dunnell, 1970:306). Dunnell noted that previously many publications criticized the abilities of the individual who did the work rather than the work itself. Dunnell also discussed some important aspects of theory, stating that seriation was in effect "a pair of linked hypotheses" (Dunnell, 1970:310); it infers a chronology and is based upon underlying assumptions about the finds.

The tradition of Americanist seriation method continued well after the rise of the Processualists. Studies into the method continued (Leblanc, 1975, de Barros, 1982) as well as research into the interpretive value of seriation (Cannon, 1983). The basis for the application of seriation developed out of the early days of archaeological study that was rooted in chronological and culture studies, but still holds a place following the development of the Harris stratigraphic paradigm. Despite the fact that the original purpose of seriation was to bring chronological order to unstratified assemblages (Carver, 1990:105) an intuitive next step for seriation analysis was to use seriation as an interpretive tool for a better understanding of the deposits in question. Since material units are the basis of the practice of seriation, it is reasonable to turn the investigation inwards towards the assemblage and to use seriation to reflect not just the materials collected (or where they fit along a timeline), but the nature of the deposit from which they were recovered. The first such study of this was presented by M.O.H. Carver (1985) as a method for the seriation of urban pottery collections.

The urban pottery seriation diagram is a graphical tool used to define, phase and characterize the activities of a site (Carver, 1985:356). Placing ceramic fabric types along one axis, and the context sequence along another, quantities are indicated for each (in practice quantities by vessel number are used). The method is useful for sites where both the stratigraphy is well understood and where the order of fabric types is more certain. By placing one against the other a more secure sequence can be obtained; the stratigraphic sequence can be used to inform the proper order of fabrics, and the reverse. This method holds a great potential to obtain increased control over stratigraphic latitude in the sequence by arranging orders of stratigraphic and material groupings based upon available data. Carver introduced the use of "context trains" (Carver, 1985:359), whereby a directly recorded stratigraphic relationship can be used to provide the y-axis for comparison to the fabric types. The resulting graph reveals something of the deposition history of the deposit. Carver notes four shapes along the diagonal for interpretation of the character of the deposits: a slope indicates gradual deposition; a cliff indicates sets of contemporary contexts; a plateau indicates a sudden influx of material; and an indentation indicates a possible dump of material (1985:360-61). Another interesting aspect of the diagram is its usefulness for indicating residual material. It operates on the assumption that material has one period of use on a site (analogous to the assumption behind the unimodal curve of seriation), and that use will increase up to a "fade point" or peak. By noting the fade points within the sequence, interpretation about the residual nature of material in an assemblage can be made. This method reveals the powerful ability of careful seriation to reveal more than chronological order through the integration of material and stratigraphic data.

The line of seriation research introduced by Carver was unfortunately not followed up by himself nor widely followed in the wider archaeological community, and for several years, based upon my current understanding, no further major contributions to this line of work were offered. However, in 2004 Eleanor Breen produced a study in seriation analysis based upon excavations at George Washington's Virginia estate, Mount Vernon, using the method as a tool to ascertain the duration of the deposition of midden deposits (Breen, 2004:120). This analysis was used to relate ceramic changes within the midden to household change within the Washington household. Breen used frequency seriation of materials by ware type, material by general vessel form and materials by precise vessel form. This method of seriation, by increasing sensitivity, indicated separate peaks of deposition of materials interpreted as different household periods. This seriation added a better temporal understanding of what originally appeared a uniform midden. This study, and Carver's before it, demonstrates how seriation analysis of material assemblages can be used for a better understanding of excavated deposits when coupled with stratigraphic analysis.

While seriation was developed in many ways as a method for use in the absence of clear stratigraphy, the Harris matrix has provided a tool for integrating stratigraphic and material data. The most common of these is to use a matrix as a backdrop against which the seriation sequence is placed. This is useful to fix the seriation sequence along the stratigraphic sequence, as classically a seriation analysis will result in a battleship curve, the beginning and end of which is unknown. However, this "sliding" (Triggs, 1998:175) of the boxes of the matrix into proper order is in many ways dependent on the homogeneity of the assemblage collection. The natural and cultural formation processes involved in the deposition and post-depositional history of an assemblage lead to the optimal situation for easily matching the matrix to the seriation to be rare. The seriation of archaeological deposits, especially urban deposits, can be significantly hampered by residual material present in the collection (Crummy and Terry, 1979:49). This makes the first responsibility of the analyst to determine the residual and infiltrated finds within the assemblage that may result in skewing the sequence.

2.7 Assemblage Composition: Infiltrated and Residual Finds

When analysing material assemblages perhaps the greatest obstacle is the complication caused by residual or infiltrated finds. Assemblages are formed as a result of both ancient cultural activity and the formation processes which follow them (Carver, 1990:104). Although Schiffer (1996) examined at length the many formation processes involved in shaping the archaeological record, which was reviewed in the preceding section, he did not deal equally with the concepts and problems related to residual and infiltrated material. This warrants a discussion of the problem here. Residual and infiltrated finds were discussed by Harris who stated the commonly accepted definitions of the terms (Harris, 1979:93). That is respectively finds that significantly pre-date the context from which they were found and those that significantly post-date the retrieval context. Both factors have an individual effect upon the interpretation and analysis of materials.

Infiltrated or intrusive finds involve any material that has migrated downwards into deposits. Human action, that is the digging of pits etc, can be a common agent for introducing infiltrated finds into a deposit. Human factors are much easier to identify stratigraphically and account for logically. The movement of artefacts downward into deposits by more natural or benign means is just as likely, yet much more difficult to determine by stratigraphic analysis. Soft deposits, trampling and other formation processes can result in dislodging artefacts into deeper and earlier contexts. The determination of infiltrated material, just as with residual material, has often been by the professional judgment (Vince, 1994:9) of the investigating archaeologist. Decisions about whether or not material is out of place are often based upon historical understanding of the site and materials present, and the site narrative from which the archaeologists are investigating the material. While many archaeologists are just as or better suited to make these types of determinations than any other source, and it is never my intention to disregard the judgement of experienced field excavators, objective determinations can perhaps provide a more consistent form of analysis.

The problem of residual material in an assemblage is often regarded as the more general problem with materials analysis (Carver, 1990:104) and recognised as a major obstacle, especially in urban contexts (Evans and Millett, 1992:225). It is important to differentiate the existence of curated finds (family heirlooms etc) that are naturally deposited in contexts later in date than their original production from true residual assemblages of displaced finds. Curated material is a cultural process that exists to some degree in most deposit groups; the distance between acquisition, use and deposition of material is ever present. Determining the degree of curation is a question of the cultural use and importance of certain materials. A certain degree of curated material will always exist in any material assemblage as time lag is a natural factor in any consumer goods system. Curated material, which falls under Harris's definition of residual finds, are not, however, part of the process of re-digging, cutting or other physical acts of redistribution that are at the heart of our interest in residual finds. Residual material is intentionally or naturally displaced as a result of particular actions. Determining the residual component of an assemblage is a question of deposit formation and history. Residual material reveals the entire process of displacement, reuse and formation and tells a deeper story of the nature and development of a site's occupants and its assemblage rather than the personal mementos or special finds of curation.

The problems that residual finds pose for dating methods such as seriation are straightforward. A high number of residual finds will skew the date of material from a deposit upwards, away from the true date of use and deposition. This has the potential to incorrectly affect dating attempts more than issues of time lag or curation of finds (for a review of time lag problems see Adams, 2003). Modern quantitative study of material assemblages, mainly ceramic assemblages, has highlighted the high amount of residual material that can be found in virtually any urban collection. The high amount of residual ceramics identified in most collections implies problems for a variety of other areas of research. Pollen particles, insect remains, faunal material, slag and industrial remains all have just as much likelihood of being re-deposited as the ceramic material. It is painful to think of the number of expensive studies on material finds that may have inadvertently been performed on material that in no way dates or relates to the context from which it was recovered. Although if fault is to be laid, it lies not on the assemblages but on the research questions that analysts have posed against them.

Due to this problem, many methods for approaching residual material have been proposed. Carver discussed two main ways to confront residuality (1990:105). The first was to establish and identify patterns of behaviour resulting in different contexts, resulting in designations of "primary" and "secondary" for each deposit. As Carver points out this method can be very difficult, if not impossible, for complex sequences from urban areas. Also, as discussed earlier in Chapter 1, the problem of assigning status designations to whole contexts largely ignores the relationships between the material and the context of recovery, obscuring the true status. The second method discussed by Carver was to define what context types are likely to be characteristic of primary status (cess pits, floors, midden heaps, and graves) and focus investigation upon these over those of likely secondary nature. Residuality is then detected by analysing the vertical sequence of assemblages (Carver, 1990:105). Again status is incorrectly inferred by type only, and is in fact even more removed, with no consideration for the relationships of materials and contexts involved. Moorhouse (1986) discussed methods for identifying residual material. The presence of small abraded single sherds among groups of otherwise near complete vessels was recognised as an indicator. While this method is a useful rule of thumb, it fails to put the level of residuality in any quantified manner. Moorhouse went on in the same article to demonstrate a quantified mean of assessing residual finds. By creating a graph of the quantities of each ceramic type, ordered by the phase of the site, the occurrence of residual material, according to Moorhouse, becomes visible. This method in many ways resembles Carver's seriation diagrams, the latter in fact being more useful for displaying residual contexts in a clear manner.

What Moorhouse and later Evans and Millett (1992) indicate is that understanding residual material is not only a way to illuminate the indigenous finds within a context, but is also a way of better understanding the nature of deposits and the processes that led to their formation. Evans and Millett's work towards accurately assessing residuality is perhaps some of the most complex in the area to date. One of the only other empirical studies of residual finds was performed by Bradley and Fulford (1980) who recognised that the post-depositional formation processes that act upon pottery create a trend line towards increasingly smaller finds through time. Evans and Millett note that external factors such as contemporary supply, activity at the particular site and the physical aspects of the ceramic wares involved (1992:229) can all affect the results of residuality in different manners, changing the true assessment of the residual to indigenous components. They advocate that using measures of sherds-per-unit volume would be a better, more accurate quantitative measure of the residual material in a deposit, as this measure would provide a quantifiable understanding of the density of finds in the archaeological context.

While culturally related factors are commonly given a high degree of attention, when studies of naturally related processes have been performed the results can be staggering. In a study of conjoinable lithic pieces at Terra Amata researchers tried to determine the movement of conjoined pieces. The finds were spread over some distance and separations of 20 to 30 cm were "not exceptional" (Villa, 1982:282) and were found moving through different geological layers. The finds were theorised to have been moved by trampling, mixing of fauna and alternating wetting and drying of the sediments. The natural formation processes involved in moving the material demonstrate only a small selection of the many natural causes of artefact displacement. This fact can make the task of truly understanding a deposit a depressing goal, however, the careful study by many archaeologists have shed a great deal of light on the processes involved in forming the deposits and subsequent collections that form the basis of study.

2.8 Conclusions

The divergent historical development of stratigraphic and material data studies and the surrounding factors involved in these areas of research has led to two distinct traditions. The effects of time, the influence of greater paradigms of thought and world events and the separation between European and North American methods have all contributed to a schism between deposit and assemblage. By building upon an understanding of the differences between studies and embracing unifying factors of classifying deposits and assemblages common ground to proceed can be found. The unification of the separate traditions discussed in the preceding pages requires some care and consideration of the many underlying (and sometimes competing) assumptions. However, where careful synthesis has been attempted, the results are very promising. The untapped potential of gaining a better, consistent understanding of deposits and their associated collections urges further research. A review of available literature, especially "grey" literature reports produced by contract units, makes painfully obvious the dearth of work utilising quantitative methods for integrating material and deposit data for a better understanding of the nature of deposits. With a strong historical foundation in place, and the spur of present practice, the next logical step towards defining and investigating a useful method is outlining the theoretical assumptions from which this work should proceed.

Chapter 3

Theorizing Depositional History

3.1 Introduction

Theoretical approaches to deposits, their formation and history have existed as long as methods have in general practice. Since the New Archaeology of the 1960s, an ambitious practice of contributing to archaeological theoretical models has existed (Trigger, 1989:1). The application of this to the realm of archaeological deposits, though perhaps less pronounced than other areas of archaeological interest, is equally important. Recognising and making explicit the theoretical foundation upon which methods are built is an important step in responsible method development. The influence of theory upon practice, an intertwined relationship, is undeniable. Everything that archaeologists do is infused by theoretical foundations (Schiffer, 1988:461). The theoretical frameworks relating to deposits, their formation and development, how we recover them and classify them for analysis can often be overlooked. Recent calls to correct this lapse in critical thinking about what field archaeologists do (Lucas, 2001:2) have been made (Tilley, 1989, Hodder, 1989). In regard to this, the following will detail the varied theories regarding deposits that apply to this research and aim to explain the background that the method to be developed is built upon. This is based upon a review of theories of interpreting and approaching time, theories supporting recovery levels and practices, approaches to taphonomy and concepts of status in the deposit record.

Many factors affect the development of methods and techniques of analysis. Many innovations of thought and practice are influenced, or dictated, by innovations in the related fields of science (Trigger, 1989:385) as well as by regionally specific needs. Others have argued that the development of techniques and methods is caused by the types of questions being asked and not technology (Collis, 2004). In this regard the theoretical causes for what questions to ask are very important. Archaeologists are famous borrowers of methods and many developments within the profession have come from developments outside the subject (Roskams, 2001c:19). When borrowing methods, the importance of understanding the relationship between method and theory in application is even more important.

Early concepts of deposits and theory were built on the belief of the secondary importance of theory as it relates to data. The era of Pitt-Rivers saw complete recovery of all data, whether applicable or not, based on the belief that archaeologists were involved in the recovery of facts; letting the pots speak for themselves (Hodder, 1991:15). Later developments saw the understanding that data are recovered under the umbrella of a particular theory, that all observational data are collected within a theory. While the solution to the problem that all data are biased by observational theory has been suggested to be middle range theory, Post-Processualists led by Hodder have claimed that there can be no true middle range theory (Hodder, 1991:17); that no independent instruments of measurement exist that are free of personal bias. This can be argued by some elements within archaeology, members of archaeological wings of biological science, etc. Understanding the limitations of data and the paradigms within which they are analysed and interpreted will be an important strength of the methodology to be developed in the following, and not a weakness. Building an understanding of theories and methods of depositional history begins with an understanding of the aims of archaeological excavation followed by the frameworks of time within which we place the history of a deposit.

3.2 Recovery: Methods, Levels and Practices

The previous chapter involved a discussion of the history of field excavation methods as they relate to stratigraphic definition. What a review of stratigraphic methods in a historical setting can fail to outline is the many greater theoretical determinations that lead to direct changes in practice. Of equal importance to stratigraphic developments is the story of developments to excavation practice in theory. What are we asking of the ground and how do these questions effect our approach? Beneath the issues of developments over time and across geographic regions is the fundamental debate about past and present relationships. As stated by Roskams, does the past speak for itself through its material remains, or do we as excavators impose perspectives as we excavate (2001c:30)?

Those from the tradition of viewing sites as deposits created a demand for "total excavation". Those following this tradition saw the site as a deposit, a "repository of facts" (Carver, 1990). The world was viewed as a great system, which was shaped by time and nature, and ultimately recoverable in its fossilized form. Beginning with Pitt-Rivers, the theory was developed that a site was a collection of data or facts. Excavators had only one chance to recover all these facts; therefore a highly involved process of recording every fact, every detail was engaged. This also required excavators to make every effort to remove themselves as an influential aspect of the recovery. Complete objective recovery was needed. Following this tradition Barker refined his approach to excavation methods to reflect the empiricists' stance. Barker's now famous comment that the only valid question to ask of a site is "What is there?" (1977:42) reflects the core of this excavation technique. If the entirety of a site's contents are exposed and treated with the necessary care, all of the answers concerning the whole sequence of occupation will be revealed to us.

The opposition to the "total excavation" approach exists on several grounds. Most are based upon whether our own present day perspectives are imposed upon the past during excavation. The argument is raised that data is not gathered but is produced by the archaeologist. Field excavators do not excavate data, but recover earth and stones; it is our observations of these earth and stones that turns them into data (Roskams, 2001c:35). In this lies the problem of present perspectives. Excavators construct interpretations based upon observation of appearances and formations of finds. These interpretations are argued to be subject to our modern paradigms and cultural backgrounds. Put simply, what one sees to be a line of stones may not have appeared as such in the mind of the Neolithic hunter. In the search of archaeological data to inform about the past, we as archaeologists make determinations about what constitutes data and what will answer the questions we seek. The selection of what constitutes data, or what aspect to measure, can often be at the expense of another aspect.

Carver took this to the next logical step by acknowledging that empirical aims are to be applauded but fail in that true “total excavation” is impossible (Carver, 1990:48). An incomprehensible archive of data can be constructed but some data will always be missed, and worse yet, no manageable interpretations encompassing all possibilities could be made of such a collection. This comes as a result of research design and definitions of data and not as a result of excavation practice. It is not a case of if archaeologists only were better at what they do then total excavation would be possible. Many believe that to understand the deposit one only needs a representative sample of ceramics and other finds to account for the full distribution trends within the assemblage. The recovery of biological remains has been an important concern in that area of study, for example in the recovery of pollen samples and bone. The loss of vital information in bone recovery methods has been investigated by many (Casteel, 1972, Ward, 1984). However, an equal argument has been made that representative sampling and maximal recovery from chosen samples is a more vital aim (O'Connor, 1996:9). None the less, be it a maximal or a representative sample, how and what is collected remains an aspect of the greater research design. Making the proper research decisions at the outset, which includes choosing to observe and record the right kinds of data, will result in a more fruitful excavation experience. One of the outcomes of this research will be to define observable data that has the potential to provide a greater understanding of the nature of deposits and their assemblages.

3.3 Theories of Time

Modern archaeology has expended a considerable amount of time and energy upon the consideration of time. Most of this has focused upon developing scales of time and fixing sequences of material. Typological classification, seriation, and modern radiocarbon dating are all examples of the sequencing and dating of material. Many archaeologists operate under the belief that dates are the keys to history and its re-construction (Levi Strauss, 1966:258). Even more believe that dating is fundamental to all archaeological endeavours (Hodder, 1993:268). However, outside of viewing time as a collection of dates, there exists a field of study concerned with developing archaeology's different concepts of time. Theoretical contributions to conceptions of time have not only added new viewpoints but made the different approaches more evident and explicit.

Time, in its modern construct, is a relatively new conception. It is an often overlooked fact that our present thoughts about time were developed in the late nineteenth century with the capitalistic industrialisation of the world. Modern large-scale production, transportation and communication required regularized time to function better, and it became standardized and global (Murray, 1993:175). The advent of a global time introduced a new way of measuring and thinking about time in space. We were now complete masters of time; we compartmentalized it, broke it down and built it back up again to suit our own needs. This control of time, along with developments in the physical and natural sciences led to other innovations of time. Measures of time expanded in both directions; into minute segments as well as vast stretches of time. The precision of time, dividing units by seconds and milliseconds, grew ever greater. The advances of Lyell and his contemporaries created depths of time that were previously not contemplated or conceived of. Once the practitioners of physics, geology, biology and archaeology began to understand the great depth of the age of the world a new framework for looking at time was created along with the human experiential one. They "recreated the context within which ageless debate about human nature…would take place" (Murray, 1993:175-176) as people became more concerned with our place in such a great void of terrestrial time.

Shanks and Tilley saw the differences in modern concepts of time as between human or substantial time and chronological time (1987). They believe that substantial time is marked by human experiences and that chronological is a strict measurement. Ultimately the social context is perhaps the most important determinant of "right" or "wrong" conceptions of time. A myriad of different views could exist about any given passage of time or event. The industrial age of train transport can be used as an example. A train set to arrive at a station at 12:00, pulls in as the hour approaches. An impartial observer may conclude that the train was on time. The physicist might say no, that the train was delayed by milliseconds. The philosopher may believe that the train could never be on time, that as time is divided infinitely smaller, the train can never be at the right place and time. Most of the above unfortunately misses the point. To the people waiting on the platform the train is certainly on time. What is important is how time suits *their* purposes, and not any other belief.

The difference between scales of time led to scholars devising different ways to perceive time. Fernand Braudel suggested that time could be viewed on three separated levels, each reflecting a different kind of history (1969). The first was the *longue duree*, or geographic time (Bradley, 1991:210), which changes on the scale of the environment. Mountains are built and destroyed within the *longue duree* scale of time. Social time is a scale that measures the actions of groups of people, for example the building projects during the Yuan dynasty. The last scale is that of personal time, a scale that measures events as experienced by individuals. While Braudel's theories of time scales were intended for the historian, they are also applicable to the archaeologist. As pointed out by Bradley (1991:210), in application archaeologists are naturally hampered by the resolution of the data we collect which limits are abilities to jump between theses scales. We cannot always choose the scale of interpretation we work in; the resolution of the data will often dictate the scale to be used. For example, finds from within the personal scale, say the time it took to chip a projectile point, may only be placed by their deposits to within a wider period of thousands of years.

Conceptual frameworks for investigating aspects of time are important, but often overlooked, understated or disregarded. The unsymmetrical nature of time is the basis for many frameworks. The concept of Time's Arrow, which has made various contributions to studies of physics and other natural sciences, defines this nature. The term was coined in 1927 by Arthur Eddington in his 1928 astronomical study . The basic concept of Time's Arrow is that time is not symmetrical, it extends along a linear path whether one is conscious of this or not. Eddington argued that the arrow is demonstrated by our own reasoning faculties;

we realise that viewing an activity in reverse would be irrational. If you saw a film of smoke moving backwards into a flame, this would appear wrong and against nature. If time was symmetrical then nothing would be wrong with this scene, it would appear perfectly logical and likely whether viewed backwards or forwards. Despite the long existence of this concept, it has been common for time to be treated as a dimension of space (Bailey, 1983:167). This is most easily reflected in the common practice of referring to distance in measurements of time ("How far is it to the store?" "It's only ten minutes away"). The problem with this approach is the difference between the natures of the two concepts. As mentioned time is one-dimensional or linear in nature, it flows irreversibly from past to future (Bailey, 1983:168). Space on the other hand is three-dimensional and symmetrical.

Time's unique linear characteristics are a result of various factors. As dictated by the concept of Time's Arrow, time exists on path from past to present towards future regardless of ourselves. However, time is also very often viewed as cyclical in nature. Agriculturally based societies often develop a cyclical sense of time based upon the passage of seasons, animal husbandry and other natural cycles. This can hardly be surprising given the number of natural processes that operate on recurring cycles of time. Even the passage of the moon would appear to reflect the cyclical nature of time to some cultures. Evans-Pritchard documented this belief among the Nuer of East Africa, where this form of time reckoning extended to beliefs of generational cycles and the relationship to ancestors (1940).

Time is also shaped by our own conception of events and how we represent them to ourselves and others. These differences lead to different "times" and have been the cause of aligning opposing debates and schools of thought. The difference between larger spans of time outside of ourselves and shorter time as experienced (which mirrors Braudel's long time and personal time) has come to reflect the environmentalist conceptions of time and the internalists concepts (Bailey, 1983:166). The former concept reflects geological scales of time and the interpretations that follow this line of thought. The latter concept reflects personal scales and interpretive frameworks based upon the social sciences approach.

While this has led to some vociferous opposition from different camps, it is largely unnecessary as there are no inherent aspects of archaeological data that force the two concepts to be mutually exclusive.

Despite some differing opinions on conceptions of time, on the whole archaeology has devoted very little attention to thinking about concepts of time. Some recent work towards new insights into the theoretical conceptions of time has contributed to bridging gaps between approaches to time and interpretation (Gosden, 1994, Thomas, 1996). However, it is Gavin Lucas who has published what may be the first complete book concerned entirely with this theme (2005), despite the fact that dating is such a primary aspect of archaeological investigation. One reason for the general dearth of publications on this topic is, like stratigraphic investigation, it is regarded as simple, and on the whole dealt with. We have our chronologies in place; unless a groundbreaking means of acquiring dates is invented there is nothing further to discuss. This assumption operates in opposition to the fact that all archaeological investigation is linked to chronology and limited by the temporal resolution by which we can approach our data. Put simply, the problems we can tackle archaeologically are related to the resolution of our dates. The theoretical paradigms we construct are a reflection of the temporal scales of our material. It is also not out of the question that field investigators are hesitant to approach the theory of time because it is viewed as an unnecessarily complex abstraction that only obscures real archaeology from happening.

Lucas also makes a distinction between two types of time. For Lucas the distinction lies between chronological time and real time. Chronological time is the modern conception as created by modern industrialisation. This is time as equal compartments, a series of events flowing in order towards the future. This conception is behind most archaeological frameworks and demonstrates the influence of Eddington's Time's Arrow upon archaeological theory. The groupings of dynasties and the technological ages of cultures are both examples of this approach, creating successions or periods of time. This progression from ancient to modern, primitive to advanced, narrows our abilities to interpret actions and intentions in past cultures. It is also in many ways a pre-determined examination of the past. Cultures develop along a linear line towards the present with no allowance for data that falls outside this paradigm. This is contrasted with his definition of real time, that being time built around narratives. Lucas sees this as an emphasis upon time as duration, as we experience it within our own subjective views. This approach, to time as duration, reflects in many ways, as discussed to some extent by Lucas, the work of McTaggart (1908). McTaggart used the terms A series and B series to reflect time as a duration that flows from the far past through the near past to the present and into the future (real time) and time as a succession of events arranged in earlier to later or before/after relationships (chronological time). This relationship can be taken to reflect archaeological practice in relation to stratigraphic ordering. The Harris matrix, a sequence of event related contexts reflects the chronological time concept. Carver's stratigraphic matrix, which represents durations of time, can be argued to represent Lucas's real time.

Lucas's book includes a review of the time theories of Geoff Bailey, or time perspectivism, and often aligns itself in opposition to them (2005:43). Bailey has been a long contributor to the question of time concepts, which began over 20 years ago and continues to the present in many forums (1981, 1983, 1987, 2005). Over these years, time perspectivism has been subject to many attacks from different sources (see Shanks and Tilley, 1987), mainly based upon the idea that Bailey had proposed a temporal approach too rooted in environmental factors. Time perspectivism however shares an appreciation of the importance of experienced time, the problem with separating past from present and the many temporalities that can be represented by material objects. The same object can reflect many activities over different periods of time. Time perspectivism also observes the value in recognising the importance of time to those who used it. Bailey's main point lies in presenting the importance of differing perspectives that are created by the different scales of observation. Time perspectivism is based upon the belief that archaeologists encounter different resolutions of time from anthropologists, or more specifically ethnologists. This difference leads to different observable levels of phenomena; what are at issue are the different scales of observation available. Archaeologists have the ability to operate on a significantly longer scale of observation than an ethnologist. The ability to observe different phenomena are argued to be subject to the effects of the archaeological palimpsests that are recovered.

Both Lucas and Bailey use the idea of the palimpsest; however, the slight differences in definition and application display the differences at the core of each approach. To Lucas, palimpsests are "traces of multiple, overlapping activities over variable periods of time and the variable erasing of earlier traces" (2005:37). This reflects the many temporalities that exist over all forms of time and in all things. A public monument is not an aspect solely of its period of creation (an Iron Age building, Roman road) but is an aspect of all subsequent periods. That Roman road is also a medieval trade route during the medieval period, and is a modern tourist site within the current landscape. In this approach no object can be defined by its contemporaneity alone, but must be an aspect of all time over that of separate moments in time. This idea, expressed in practice, can be seen in Carver's matrix, which groups contexts by feature "life" in order to represent time on the macro or site scale. The full range of contexts and their temporal interaction with the rest of the site are expressed by Carver's method.

To Bailey palimpsests are "mixtures or aggregations of events or phenomena, in which much of the original information has been removed" (2005:269). Time perspectivism places an emphasis upon the effects of different durations of time and the history of different phenomena that comprise the present. It does not, however, fail to acknowledge the aims of many archaeological investigations, which is to understand what items meant to their creators. By keeping this grounding for interpretation, as well as understanding that as items live on, different meanings in different periods is formed. This plays a role in the interpretation of reuse and the formation of deposits and assemblages therein.

It is with this approach in mind that much of the following analysis will proceed. Focusing and understanding time scale, duration and resolution in analysis and interpretation will inform methods to be developed. However, aspects of the following methodology differ from time perspectivism in design and theoretical approach. The chronological placement of strata, as representations of actions and events, cannot be avoided in ordering stratigraphic sequences. Also, by Bailey's own definition, the concept of palimpsests operates on an understated belief in the loss or blurring of understanding by overlapping histories and events. This research approach embraces the concept of the palimpsest but, as will be discussed later, takes a different tack on the approach to taphonomy and the loss of information to the ravages of time. The overlaid remains of activities may result in losses of earlier traces of activity or meaning, but much can be gained by this same process.

3.4 Taphonomic Theory and Practice

An implicit statement of recovery levels and methods (as discussed in section 3.2 above) are one measure of controlling the finds we interpret. However, understanding and accounting for the ways in which finds are changed and altered by their environment is another step in ensuring a better understanding of the nature of deposits. As demonstrated in section 2.5, site formation processes have a significant effect upon the interpretation of stratigraphic and material data. These cultural and natural processes lead to taphonomic effects, the results of which shape the ways that archaeologists approach and interpret assemblages. Due to their important role in effecting archaeological practice, issues of taphonomic theory warrant a consideration in the discussion.

The development of taphonomic study within archaeological investigation can be seen to relate to the issue of data quality. The potential value of assemblage data has two linked aspects: the integrity of the assemblage and the quality of data capture (O'Connor, 1996:6). While data capture is concerned with the quantitative and investigative suite of methods that are applicable to an assemblage, data integrity is a function of two circumstances. The context of the data collection is the first, which relates to the issues covered in the preceding section. The second is the circumstance of the deposition and diagenesis, aspects of taphonomy. Studies of taphonomic effects, specifically diagenesis, have gained greater focus during the last ten to twenty years. Some of this focus has appeared to shed light on the complexity of the issue; in much the same way that stratification becomes more complex the closer one looks at it, so taphonomy becomes increasingly complex. This has led to claims that the discipline understands less about the subject than appeared to be the case in earlier periods (O'Connor, 1996:8). However, taphonomic studies conducted with an aim for understanding the different agents of deposition are very useful, and more importantly, more interesting than assessing levels of attrition (Rogers, 2000:721). The theoretical model within which taphonomic study first developed was largely uniformitarian in nature, and built around ideas of actualism. Uniformitarianism, most widely attributed to Charles Lyell, is built upon a belief that rates of change and processes of development are the same today as in the distant past and that the earth, while dynamic in nature, is cyclical in change (Lyman, 1994b:47). Based upon this, most taphonomic research has constructed modern controlled circumstances where an outside process could be created. This process is then measured and the effects applied to reasoning of findings within the archaeological record. This is defined as actualism; the methodology of inferring the nature of processing from the past by analogy with observable actions in the present (Lyman, 1994b:503). The most common application of this method today is ethnographic studies into existing human cultural groups.

Actualism and uniformitarian approaches have been subject to criticisms, mainly due to the inherent assumptions of the methods. The main critiques are based upon the fact that processes may not be the same in the past as today, and that assumptions cannot be tested that would take into account *every* influential factor. Other criticisms are based upon the fact that when errors or omissions are observed using uniformitarian methods the assumption of the analyst is most often that present knowledge must be incomplete, thereby invoking ad hoc determinations that weaken the method in general (Lyman, 1994b:53). Despite these arguments uniformitarian methods remain a theoretical and methodological aspect of most historical investigation.

The methods of actualism were promoted by Binford as a part of middle-range theory as a means of establishing causal relations between results and processes. Binford defined useful causal relationships as those that are constant and unique (Binford, 1981b). These formed the basis of Binford's search for temporally unchanged laws through his middle-range research. Opposition to this position has come from various places, the strongest of which was presented by Gould (1980), who opposed actualism in general. Gould advocated disposing of the actualist methods based upon several key failings he saw in the method. He mainly saw actualism as limited because one assumes what one is looking to find out. The other main criticisms were that the similarity between the modern world and the past was assumed and that when answers are offered they do not necessarily provide complete explanations. As suggested earlier, this notion is most often combated by the belief that not enough understanding of current processes exists.

The application of actualism in taphonomic study is most commonly based upon experimentation and observation of effects upon faunal remains. In essence, a possible cause for effects observed in the archaeological record is offered and these conditions are created as closely as possible to identify if a similar outcome occurs. The approach of taphonomic actualism, based firstly upon uniformitarianism, is built secondly upon a belief that distinctive aspects of an effect can only be considered diagnostic of that effect (Lyman, 1994b:60). If an effect is to be fully understood it must be demonstrated to be diagnostically different from other similar effects. A failure to do so results in processes of equifinality, which are not useful from a practical approach and fail from a theoretical standpoint. It can be argued that cases of observed equifinality are not the fault of the data but of the research methods employed. This highlights perhaps the major possible failing of taphonomic actualism study, the uncontrollable nature of effects. Observations of causes and effects can be concluded scientifically and in a responsible manner, yet not account for every variable in play. Aspects of the recreated causes may not properly reflect the ancient actions they intend to. The same prehistoric contexts do not exist or cannot be fully recreated, or extinct factors cannot be observed today, let alone recreated for testing. Also, the equifinality of different processes resulting in the same end are perhaps less problematic than the possibility of observing different results of the same process. In essence, the complex web of factors that leads to observed effects are extremely hard to recreate in full while accounting for every subtlety and change in variables.

Moving from considerations of the theoretical application of taphonomic research to a consideration of the theories surrounding the data that is interpreted, some important distinctions can be made. The earliest approach to taphonomic study was made based upon the belief that the biased nature of faunal assemblages needed to be understood before true interpretations could be made. This was not unlike the common view of formation processes that the potential of assemblage collections for cultural interpretation are influenced by alterations or loss of the original position, composition, association, and mutual relations of artefacts (Hassan, 1987:2). Symbolic model representations of the development of the collected archaeological assemblage demonstrate vividly the standard approach by many researchers (Clark and Kietzke, 1967, Meadow, 1981, Hesse and Wapnish, 1985). This linear movement from full collection to fragmentary modern collection of archaeological faunal material implied that the quality of data at any given time was subject to when it was removed from the archaeological context. Theoretically, this is no different from arguing that material excavated 100 years ago was in one way more reliable than some today because it had at least avoided an extra 100 years of attrition.

More recent study has shifted concern from the biased nature of faunal material to a consideration of what can be learned from the different taphonomic processes. At the 1984 annual meeting of the Geological Society of America, a symposium focusing upon the positive aspects of taphonomy, new working definitions of taphonomy to consider the total affect upon the information in the fossil record were proposed (Lyman, 1994b:27). Whilst this shift in taphonomic thought took place, no model representations symbolizing the positive addition of data through taphonomic process were made. However, the move from considering the supposed bias as a negative to being relative in nature is an important development in taphonomic thought. It is a transition from one approach to another. The first is a consideration of taphonomy as a tool to reveal effects upon collections of data. The second is viewing taphonomy as a tool to reveal the nature of the deposit from where it was derived. It is important to note that regardless of the approach, care should be taken in any taphonomic study of material deposition. The great complexity of factors involved in shaping taphonomy should never be underestimated (Wilson, 1996) whatever the particular approach to conceptualizing taphonomy.

On the surface the examination of taphonomic elements of faunal data in order to understand the nature of deposits may seem a theoretical dead end. One might ask, why bone fragmentation data? Is this not a context specific observation? Does this type of data not reflect more of the cultural setting, husbandry practices, distribution and supply in an urban setting, the entire *chaine operatoire*, and not in fact the nature of deposits and sequences? While it has been demonstrated that close regional studies of taphonomy and formation processes are important (Torben et al., 2006), in actuality these types of data and this approach can offer more than site or regional specific information.

> There are more stages of incorporation, redeposition and diagenis that lie between the butchering of a carcass and the study of the resulting bones. At a context-by-context level, the bone fragment might be indicative of the formation and subsequent transformation of the deposit, and therefore a contribution to the interpretation of that deposit (O'Connor, 2003:87)

To take the view that bone data is too clouded by cultural patterns to be useful as a measure of deposit formation patterns overlooks the many stages/life-history of finds. It does not jump from use and deposition stages to archaeological find stage. All aspects of finds, even diagenesis and issues of decomposition and effects of soils, are part of the fingerprint of that material and contribute to interpretation of deposit sequence formation and any subsequent interpretation. Taphonomy and taphonomic history is more akin to a ball of soft clay. Each person to handle it leaves an impression of themselves and at the same time adjusts, smudges or erases the impression left before them. Furthermore, we should resist equating the taphonomic history of bone with the formation processes or attrition of ceramics; one cannot necessarily speak for the other. This assumes they have the same taphonomic pathway. A close contrast and comparison must instead be the basis of using fragmentation and condition data as a useful source.

As demonstrated earlier, taphonomic data is most commonly viewed as a reductive process, materials are deposited following their life-use stage in an original location. From that point onward selective aspects of this original nature are degraded, removed, altered or completely lost. In effect, once an item is deposited "it's all downhill from there". In much the same way that temporal theories of palimpsests seek to utilize the fragmentary nature of time and the archaeological record to their advantage (Bailey, 2005:269), I would advocate choosing to use the fragmentary state of taphonomic history as an advantageous situation to embrace the palimpsest of materials that are collected (Schreve, 2006:555). This is achieved by viewing taphonomy as an additive process, imprinting all the collective actions that have affected the item since its deposition. Following this, faunal material represents perhaps the most versatile representation of these actions; it is both ubiquitous on sites of most periods and very sensitive to environmental changes. A review of the collective faunal collection for taphonomic data can reflect the history of the nature and transformation of the deposit from which it was recovered. Faunal remains have the potential to act as a "keystone" to reveal all that has affected a deposit and therefore its very nature.

3.5 Concepts of Status

Very few terms in archaeology are used so often and given so little consideration than those that regard concepts of status. As excavation methods became a more and more formalized means of assessing deposits and associated finds to aid interpretation it took a larger role in practice. Some *pro forma* context sheets for deposits, as a standard, require a prompt for the excavator to assign impressions of deposit status. While some may be a simple space to describe impressions, others will include check boxes listing the options; primary, secondary, *de facto*. One example of a *pro forma* with the checkbox option is the standard context sheet used on historical sites by Parks Canada Archaeologists, Ontario Service Centre. These determinations are followed up by specific specialist analysis towards further interpretations. Most archaeologists highly value this information on deposit status and would even advocate an increased input of this data in the field in standard practice (Hammer, 1993). The theoretical grounding for terminology used, frameworks of analysis and what this means for interpretation in practice are important considerations.

Some early archaeological approaches to the archaeological record regarded the site as a petrified reflection of the past. Finds were thought to directly reflect past activity with no intermediary factors to blur the lines between find and behaviour. It was working in the face of this situation that prompted Michael Schiffer to pose criticisms of present practice. Schiffer (1972) advocated a consideration of formation processes as factors in affecting finds locations and behavioural aspects that result in the archaeological record. He asked questions such as why there is an archaeological record, how remains are produced and what variables determine what is recovered. Schiffer believed that formation processes were not a factor in interpretations and assumptions of most archaeologists (Schiffer, 1972:156). In response to this he offered a model for viewing material finds as moving through various systemic contexts towards the archaeological context and recovery. Systemic context, more widely understood as the "life" history of an object, is defined as the processes that a durable object participates in during its life: procurement, manufacture, use, maintenance, and discard (Schiffer, 1972:158). More specifically Schiffer was concerned with spatial aspects of finds within the systemic context.

In reaction to Schiffer's concern with spatial patterns and behavioural activity displayed in the archaeological record, he designed terms with which to define the status of finds in a deposit and assert the value of such finds for interpretation. These terms have become almost standard terminology on archaeological sites; "*de facto* refuse", "primary refuse", "secondary refuse". Based within an investigation of abandonment practices as cultural factors for patterns of disposal, the first term was proposed. Schiffer defined *de facto* refuse finds as those that reach archaeological contexts without the performance of discard activities (1972:160). Essentially these are finds which are lost or abandoned. In addition to finds that retain some use value within a society Schiffer proposed terms that recognized the recovery of finds that are stored; he introduced the term "provisional refuse" for reference to stored refuse having a perceived value for future re-use (Schiffer, 1996). The following terminology defined by Schiffer was constructed with an aim to know some of the determinants of variability in patterns of refuse transport and disposal. Schiffer proposed to distinguish refuse as primary or secondary. Both forms are intentionally discarded cultural material, their difference lying in the location of discard; primary material is discarded in its location of use, and secondary material is discarded in a location other than the location of use (Schiffer, 1972:161). The difference is found between finds left on a workshop floor and those that are collected and removed to a midden dump.

The definition of these terms for deposit status creates certain implications for further use. The first such implication is the relative lack of true primary deposits. Schiffer advocated an approach whereby even minimal removal of finds to an area adjacent rendered a find secondary in nature (1996:58). Due to this the vast majority of finds are secondary since increasing density of site occupation creates greater pressures for removal and a decreasing relationship between find location and original use location (Schiffer, 1972:162). To some extent this fact limits the value of the insight, if the aim is a definition of find and deposit status that is as refined as possible. In fact, it was suggested not long after Schiffer's original work that the pigeonholing of finds into three type categories tends to obscure the great diversity of site building processes that impact deposits and assemblages (Sullivan, 1989). Further implications of these terms are a result of the language itself. The use of primary and secondary as terms are loaded with their myriad of applications. This fact, compounded with the multiple uses of status terminology in archaeological literature (be it social status or otherwise), surely leads to some confusion. Furthermore, the use of the term primary (greater) and secondary (lesser) carries with them an implied value. This value-laden approach is transported to common practice. Whole deposits are disregarded, machined off, or removed based upon their value ("it's just a secondary fill, get rid of it"), choosing to ignore the range of additional information that can be gathered from any deposit regardless of defined secondary status. In the modern context of contract archaeology this value driven approach to deposits can be dangerous as developers push for less expense and greater turn around time on excavation sites. There is in fact no lesser or greater value, only different values. depending on the aims of the archaeologist and the questions being asked.

It is important to distinguish between different conceptions of status that employ the same primary/secondary terminology. Despite the widespread use of these terms there is a variance in the exact meaning of each, and in the ways to deal with the investigation of material from these designated contexts. Schiffer, most well known for his advocacy of the primary/secondary status groupings, approached the investigation of status through the construction of preconceptions of behaviour. The cultural behaviour of leaving metal debitage upon a metalsmith's shop floor or sweeping up a courtyard led to separation of primary or secondary contexts. This approach is countered by Carver's approach to status. While Carver used the primary/secondary classes, his investigation of status was built on observation and measurement of the recovered assemblage. This was done through the analysis of diversity statistics and seriation, which provides a measure of the degree of mixing. This approach, while rooted in the primary/secondary approach, moves beyond hard designations between two options to cover a spectrum of disturbance.

The modern pressures of contract archaeology, since the development of CRM or rescue excavation, have created other practices that prompt concern over the use of definitions of status. Roskams (1992) suggested that the modern excavation team, with separate specialists operating exclusive of each other, has led to a break down in interpretation and integration between data on find and context. As a result contexts are assigned a certain status so that specialists can focus upon sections of an assemblage that is "important" and disregard the rest or simply archive it for some unknown future archaeologist's interest. Worse yet, as Roskams points out, is the tendency to define the status of a deposit solely in terms of its physical properties, lumping together all such finds in association. This follows a noted propensity of archaeologists to conceptualize our surroundings and interpretations around the physical nature of an object. Despite the fact that stratigraphic contexts have been well accepted as the "material results of events in time" (Fedele, 1984), in the field contexts are routinely investigated with a focus upon the spatial extent and regarded as a pit, etc: therefore treated as an object (Lucas, 2001:157).

It has been previously noted that problems existed with assumptions regarding status. In reviewing Whallon's spatial analysis at Guila Naquitz, Schiffer warned that it was not enough to assume that materials on an occupation floor were primary products of processing activities; he pushed for a more convincing argument (1974). Roskams clarified the problems with assumptions of material status by defining clearly the proper aim of deposit status. He advocated that status be defined not upon physical properties but by the relationship between find and stratigraphic context (Roskams, 1992:28). In each case the basis for determining this relationship is devised by an understanding of the functional, chronological and spatial characteristics of the finds and its associated contexts. Using these three factors Roskams proposed four initial type categories for a more representational deposit status (1992:28-29):

- Type A – Finds contemporary with, and functionally connected to, the stratigraphic unit from which they were derived.
- Type B – Finds broadly contemporary with, yet functionally and perhaps spatially distant from, the context in which they were found.
- Type C – Finds functionally and chronologically unrelated to the context in which they were found, but derived locally.
- Type D – Finds unrelated to the context in which they were found, imported to the place of deposition, and earlier in date than that context.

By using the above definitions rather than primary and secondary assemblages could be investigated more deeply to infer past actions. Also, with reference to modern funding and organisational concerns, the use of more refined definitions could help in organisation of assemblages and perhaps make it more clear to developers or other funding sources what exactly the aim of investigation is.

The type categories suggested by Roskams were presented in the context of a conference paper intended to share ideas and concepts that were admittedly at an initial stage. It was widely acknowledged that greater refinement of such terms and their application could come from further thought and subsequent testing with real life material. There are two approaches that may be attempted at the outset. The first is by refining and splitting the terms already presented. The second is by theorising additional terms and definitions to compliment the four already accepted.

If one starts by reviewing the four types already presented in order to split into finer categories there are several possible ways forward. These adaptations are to be found in the use of terminology in the definitions of each concept, that through refining certain vagaries, finer definitions could result in new useful types. Taking Type C material as a start, a slight refinement of terminology could be useful. This status type, which incorporates material that is both functionally and chronologically unconnected but derived locally, is only slightly problematic due to the term "derived". In certain scenarios it would not be uncommon to encounter material that meets the spirit of the definition of Type C. Yet this material cannot be defined as specifically manufactured locally, during previous periods, as the term may suggest. For example, consider Chinese Export Porcelain recovered at a Historic period military site. That porcelain was certainly not manufactured locally, nor was it traded, bought nor distributed locally. It was, however, introduced into the site by a travelling regiment as part of the Officers Mess collection. This material is therefore certainly an aspect of the site's life history, and due proper consideration, yet may be seen to not meet the present definition of Type C status. To avoid confusion perhaps "utilized" could be more applicable in order to avoid confusion and allow the term to be applicable to all archaeological deposits and sites.

Turning next to Type B a true refinement could be made. Type B refers to items that though chronologically synchronized, are functionally and spatially *distant* from their context of recovery. Herein lies a problem; how distant is distant? Are finds considered functionally and spatially connected if found within the same building? What if the archaeologist is not dealing with bounded structures but instead production areas outside an encampment? In that case, is the lithic debitage that remains at the location, material that was created by one individual sitting around a hearth, Type A? How far around the same hearth area do those microliths need be scuffed before they transfer to Type B status? The original use of a somewhat vague spatially based term requires some adjustment to the definition. Schiffer struggled with similar problems around the application of his primary status term on material found adjacent to use areas. He advocated an episodic policy of broadening the primary status concept to include discard at activity related locations but not at locations of use (Schiffer, 1996:58). While it would be absurd to create hard definitions of "distant" (10 meter separation is distant, 9.99 meters is close), separate definitions of Type B could be presented; perhaps Type B1 and Type B2. Examples of such could be by separating intra-site and extra-site definitions. However the term "site" carries with it its own series of definitions and conceptions and may be equally as prone to debate.

The next step in the refinement of deposit status types is to theorize new terms and definitions to add to the four already accepted. Two additional types could possibly be added that incorporate other permutations of the three forms of data (functional, chronological and spatial) that constitute the definitions. The first, here termed Type X, would be for finds that are functionally unrelated but spatially (broadly so), and more importantly, temporally related to the strata from which they were recovered. An example of this would be a cooking pot in a smelting workshop; this is interpreted as functionally unrelated but originating from within the same building complex at the same time period of occupation. Type X finds would have obvious comparisons to Schiffer's *de facto* refuse, the pot forgotten in the corner. In this case the term "function" may require a closer examination. How we choose to define function could have a great effect upon our interpretations of different status deposits. Is the function of a building always implicit? Can a space only have one function? These issues will have to be faced while testing status definitions against real site data, and will be revisited in later chapters.

The second new type, termed Type Y, would cover finds that are functionally related, but spatially and temporally unrelated to the deposit from which they were derived. An example of this type would be the re-application of plaster contents removed from an earlier wall but deposited separate from the wall structure. Later applications of plaster are removed from the wall, mixed with original plaster and deposited away from the wall. This example may be far fetched, which reflects the rarity such a status type find would be, not only due to the difficulty in making such a determination, but mainly due to the close relationship between function and space. Both are in many ways inter-related; functional activities exist within a specific space, and therefore to determine a type that separates the two would be rarer that any of the original four types. This status type is presented as a matter of completeness. Based upon the three factors affecting status (functional, chronological and spatial) this is a possible permutation of the three factors. However, it is a highly unlikely form, and would largely represent a coincidental event. From an archaeological standpoint this would only be interesting if a large number of such finds existed. In the example of the wall plaster presented above, this would only be interesting if large amounts of re-deposited plaster were recovered. Perhaps the re-deposition represents a deliberate cultural action by the inhabitants of the site.

These adjustments and refinements only exist in theory, and as previously stated, the examination of the case studies to follow and the development of the methodology will most likely be the proving ground for the usefulness of deposit status type divisions. However, a more finely tuned theoretical sense of status types will certainly help in creating sound status definitions in practice. The introduction of status designations that focus upon find and context is certainly a more strenuous and demanding procedure than those before it. Determining the status of precise finds among the thousands that are recovered on site may be difficult. It is important to demand new levels of precision to push practice forward. In the thirty years since the development of primary/secondary status designations the practice of archaeology has advanced greatly. Surely the present state of archaeological practice is up to the demands of more exacting status types. The use of status types to create deeper, more integrated interpretive frameworks is the ultimate aim. This is a goal of the present research, which will benefit all who utilize these sorts of archaeological data.

3.6 Conclusions

The preceding review of theoretical positions and arguments concerning archaeological deposits has answered the call for an explicit statement of the foundations of this investigation. Before the methodological exercise in the following chapters could proceed a clear understanding of the theoretical foundations of practices was needed. The areas of review were chosen and grouped in order to expose the background and critical thoughts that support the development of methods in practice. Chapter 2 exposed the history and background of study in the areas of concern as well as certain gaps in methods, and more importantly, possible directions to follow for new and better outcomes. Chapter 3 has presented a review of the reasoning that supports these links. The chapter began with a discussion of the greater aims of excavation practice via its theoretical foundations. Efforts towards "total excavation" are applauded, but are recognised as impossible due to the constraints of research design and the nature of archaeological data.

This research will investigate the best data types to select for during excavation that represents more of the complete nature of a deposit's history and formation. Time was considered based upon its role in archaeological thought. A summary was constructed of the extensive history of temporal thought aimed around fundamental themes. The concept of the palimpsest was advocated, as this encourages a consideration of the multiple levels of temporal history that any item holds. As demonstrated by Carver's matrix, a practical consideration of time scale, duration and resolution in the investigation of context history is a positive approach. Future methods of analysis developed in the following chapter will bear this aim in mind. A review of taphonomic theory and practice was next considered. A summary was constructed of the development of taphonomic thought that shaped practice and will feature in the development of this research approach.

This research advocates an additive view of the taphonomic process. A view wherein all the actions of the taphonomic process that have shaped an item since its deposition are to be embraced as indicative of the complete nature of that deposit. Future analysis methods will aim to quantitatively capture the complete understanding that taphonomy has the potential to contribute. The following section considered the effects of definitions of status upon analysis. The present paradigm of status constructed around terms such as primary, secondary and de facto, was examined. This concept, built largely around the physical properties of deposits, is rejected. Instead it is advocated that a concept of deposit status where definition comes by the relationship between find and stratigraphic unit be used. Future analysis will use this paradigm of deposit status to investigate classifications of deposits and use comparative statistical analysis to make insights into the nature of contexts. These combined areas of theoretical grounding all point towards a responsive, informed approach to methodological practice, utilizing all aspects of archaeological data, grouped towards a more positive outcome of interpretation.

In light of the above review, deposit history is best viewed as a multi-faceted concept. Deposits and their associated finds are constantly evolving and adapting entities. The taphonomic history of materials and contexts shape the archaeological record, imprinting upon, as well as erasing the contextual data. This creates a complex relationship between deposit status and finds which also reflects the complex history of context adaptation. Deposits are best viewed in light of their collective development over their entire range of time within the available chronological resolution. By utilizing specific, unbiased methods of analysis, such as statistics and visual matrices, the status of finds and deposits can be used to reveal the full nature of archaeological deposits. This should lead to better interpretations of human behaviour within contextual situations, helping archaeology in practice in both research and contract environments. The chapters to follow, presenting methodological research in specific case study situations, will build upon this foundation aiming to provide a useful and efficient addition to methodological practice.

The topics examined throughout Chapters 2 and 3 draw together a wide range of subject disciplines and developmental histories. The complicated subjects of material, stratigraphic study, and formation processes that are at the heart of this research are made more complicated by the wide range of terminology used within each area. The widespread use of jargon to apply to varied, and sometimes overlapping, concepts can lead to confusion. In order to avoid this confusion and the use of undefined jargon a glossary of terminology will be presented. In order to understand what terms have been used and what will be used in the future, a review of all known terms discussed in the preceding text will be listed. In most cases in the preceding sections, especially in Chapter 2, terms were used within the context of a discussion of their origin or subject area and every attempt was made to use terms as intended by the *original* authors. In order to move forward however, it is necessary to define the terminology that *this* study will use for all future occurrences of each item.

Some terms used in reference to stratification are illogical despite widespread appearance. Terms such as *natural strata*, which are not natural and *arbitrary strata*, which are not strata, will be eliminated from general use in this study.
Natural Strata. This is often referred to an independent unit of stratification or a "major episode of cultural deposition" (Schiffer, 1976:133). This term is incorrect when used as a universal statement because the strata that are defined and excavated by archaeologists are rarely "natural", that is formed by geologic or other natural processes. Archaeological strata, by definition of the pursuit of archaeology, are created by human action or event. Some deposits of natural formation may or may not contain cultural remains, such as hill wash. This term incorrectly combines both types of strata and is therefore avoided.
Arbitrary Strata. This is a reference to the excavation practice of removing pre-designed thicknesses of soil from an archaeological context, often termed "spits". This may be done by standard design or in response to the lack of divisible stratification at a site. This terminology is incorrectly used though because the "strata" being removed are not strata at all but random sections of the soil.

The terminology to be used in this research is built upon the archaeological process of study, in order to understand finds and their places of discovery. This process begins with the mobilization of *stratigraphic excavation* at a specific *site*, resulting in the recovery and identification of *stratigraphic unit*s and associated *assemblage*s which form a *context* for closer study.
Stratigraphic Excavation. Often defined by less precise terms (see page 8), when used here it refers to the practice of removing individual archaeological strata and keeping all associated finds. As the archaeological strata are representations of individual actions or events, the associated finds are reflections of that event.

Site. When used alone or in the definition of other terms a "site" is termed as a distinct spatial clustering within a landscape of human cultural remains, represented through artefacts, ecofacts, features, architectural remains and all other residues of human life and activity.

Stratigraphic Unit. A myriad of terms have been employed to refer to a unit of strata or independent archaeological location. This most basic unit of archaeological collection is the central focus of all analysis. For the purposes of this research when a unit of stratigraphy is referred to it will align to the following definition: an independent collection of unconsolidated or consolidated material defined by its physical properties, separated for consideration within a sequence of other like units.

Assemblage. For all future reference, the assemblage is a collection of material (artefacts, ecofacts, etc.) created by a cultural group through human activity, recovered in association with a specific stratigraphic unit, and maintained in that association for the purposes of analysis. The focus of this research upon the relationship between archaeological deposits and their finds is built upon the assemblage.

Context. Despite the many meanings and uses to this term, this research will use a single definition. An archaeological context is defined by the association between an assemblage and its parent stratigraphic unit. Stratigraphic units and assemblages are analysed in regard to their shared context.

Much of the proceeding methodological discussion and analysis will involve the definition of deposit classification. Throughout this process the use of terms related to deposit status classification will be required and therefore will be defined now for future discussion. It should be noted that the very term "deposit status" is in error and reflects the common misuse of the term. The mistake lies in the fact that the deposit is not being classified, but the relationship between the find and stratigraphic unit. This current definition will be re-examined in later chapters based upon the findings of the analysis and may be reorganised, redefined or expanded based upon the results. A close review of the basis for the current definition of status, as provided in previous sections, reveals that there are several deciding factors that dictate the exact relationship between find and context. Each of the three factors, (chronology, function and space) led to additional subdivisions. For considerations of temporal factors there are three variations for the relationship between a find and its derived stratigraphic unit: a find directly linked with a point in time, having occurred in that period, and not being contemporary. For considerations of functional factors there are two variations for the relationship between a find and its derived stratigraphic unit: a find functionally related, and a find not related in function. For considerations of spatial factors there are three variations for the relationship between a find and its derived stratigraphic unit: a find having "happened" at that location, a find happening in the vicinity, and a find that did not happen in that spatial location. For reasons of completeness these variations and the resulting permutations of each can be tabulated for review:

Permutations	Temporal	Functional	Spatial
1	Point	Related	Happened
2	Point	Related	Vicinity
3	Point	Related	Didn't Happen
4	Point	Not Related	Happened
5	Point	Not Related	Vicinity
6	Point	Not Related	Didn't Happen
7	Period	Related	Happened
8	Period	Related	Vicinity
9	Period	Related	Didn't Happen
10	Period	Not Related	Happened
11	Period	Not Related	Vicinity
12	Period	Not Related	Didn't Happen
13	Not Contemporary	Related	Happened
14	Not Contemporary	Related	Vicinity
15	Not Contemporary	Related	Didn't Happen
16	Not Contemporary	Not Related	Happened
17	Not Contemporary	Not Related	Vicinity
18	Not Contemporary	Not Related	Didn't Happen

These permutations result in various useful and interesting types and various types that are not useful for analysis. Permutations 13 and 14 are virtual non-starters as non-contemporary finds that are functional or spatially related are purely coincidence. Permutations 3-6 and 9-10 are not widely useful as the close relationship between function and space make them difficult to separate. In the first instance these types do not seem to offer useful insights into a find or its stratigraphic unit. The remaining status types are useful for various reasons and are listed below in the order that they will be recognised and used.

Deposit Status Classification.

Type A – Finds contemporary with, and functionally connected to, the stratigraphic unit from which they were derived.

Type B – Finds broadly contemporary with, yet functionally and/or spatially disconnected from, the stratigraphic unit in which they were found.

Type C – Finds functionally and chronologically unrelated to the stratigraphic unit in which they were found, but utilized locally.

Type D – Finds unrelated to the stratigraphic unit in which they were found, imported to the place of deposition, and earlier in date than that unit.

Type E - Finds functionally unrelated, but spatially (broadly so) and temporally related to the stratigraphic unit from which they were recovered.

Type F - Finds functionally related, but spatially and temporally unrelated to the stratigraphic unit from which they were derived

Chapter 4

Methodology

4.1 Introduction

In this chapter the procedures developed in order to understand a more complete nature of a deposit's history and formation is presented. As shown in the previous chapters, the history of thought and practice surrounding stratigraphic and material analysis demonstrates a need for greater integration. In order to fulfil this need a methodology is required to facilitate the functional integration of stratigraphic and material data. A methodology must be suggested and subjected to testing, and if necessary subsequent modification. Also, in order to be applicable upon a wider setting, it will need to be applied to a range of sites and adapted or adjusted accordingly.

In response to these needs, the following chapter outlines a proposed methodology for integrating stratigraphic and material data. It is firstly demonstrated that using specific case studies different measures of formation history can be reasonably compared quantitatively. Secondly, it will be shown that the organisation of a suite of such measures can expose the relationships within the stratigraphic sequence between the interpreted characteristics of stratigraphic units, the ceramic assemblage, and the faunal remains. The chapter is divided into eight sections. Section 4.2 outlines the rationale used to choose case studies for this analysis and the requirements that each case study needs to meet. Section 4.3 reviews the approach devised to define and classify deposits that are used during analysis. Section 4.4 details a method that deals with the issue of deposit status and related assemblage composition. Section 4.5 details the quantitative measures that will be used to assess the ceramic assemblages investigated. Section 4.6 details similar quantitative measures, dealing with the faunal assemblages. Section 4.7 addresses the collective procedure of this research, which uses the different measures outlined in previous sections. Section 4.8 will summarise this approach and draw together some general conclusions.

The method presented in this chapter, while informed by the development of methods in a theoretical setting, was first formulated with data from the Mount Vernon, Virginia site of The House for Families. Specifically, stratigraphic and material data from this site comprising ceramic and faunal types were used to test the method. The methodology presented here was developed following the aims and interests of this research project as outlined in previous chapters; the House for Families data served as an initial framework for this method. Excerpts of this study will be presented in this chapter in order to explain the application. The full discussion and analysis of the House for Families case study will follow in a later chapter. Due to the inherent gaps in this and other datasets, and the need to test the findings from variant site types and locations, many additional site assemblages will be used to demonstrate the effectiveness of the method. As a result it will be demonstrated how the compilation of a suite of formation related statistics can reflect the assemblage composition and the nature of context.

As cited in Chapter 3, a new approach to the definition of deposit status will feature highly in the methodology. This definition, based upon the relationship between find and parent stratigraphic unit, leads to the creation of six types. These are repeated below, as follows:

Type A – Finds contemporary with, and functionally connected to, the stratigraphic unit from which they were derived.

Type B – Finds broadly contemporary with, yet functionally and/or spatially disconnected from, the stratigraphic unit in which they were found.

Type C – Finds functionally and chronologically unrelated to the stratigraphic unit in which they were found, but utilized locally.

Type D – Finds unrelated to the stratigraphic unit in which they were found, imported to the place of deposition, and earlier in date than that unit.

Type E - Finds functionally unrelated, but spatially (broadly so) and temporally related to the stratigraphic unit from which they were recovered.

Type F - Finds functionally related, but spatially and temporally unrelated to the stratigraphic unit from which they were derived

Determination of these types is dependent upon a definition of the deposit type. This must be defined before a functional relationship can be determined. The various excavator approaches to defining deposits will be organized into a precise approach as discussed below in Section 4.3. It is first necessary to define the rationale for selecting case study groups.

4.2 Selection Rationale for Case Studies

The decision to use certain site assemblage data sets as case studies is dependent upon many factors. The case studies selected must fulfil specific requirements in order to further the research agenda and positively inform the development of the method. These requirements are that a significant stratigraphic depth is present, that the necessary finds are present, and that a transparent interpretive framework has been used that can be subsequently disentangled. The type of site, both temporal era and geographical location, are important considerations in choosing data groups for study. In an effort to create a more universal examination, drawing upon a wide range of data, the choices will vary in geographic location to provide a representative sample of different types of sites. A focus upon sites from both North America and Europe will be made. Temporally, the first choice sites will be towards those of Roman or post-medieval (Historical archaeology in North America) and high medieval (UK) origins as these sites most often provide a strong temporal resolution.

The types of archaeological contexts to be examined will firstly aim for truly stratified sites rather than "horizontal stratigraphy", as the stratigraphic information is generally less certain on horizontal sites. Therefore the focus will primarily be upon urban sequences, as these more commonly contain deep stratigraphy. The feature types sought will be those which represent the mix of urban living processes. This will include collections from the disposal of rubbish or other deposits normally classified as refuse, living surfaces, and fills. Thereby representing the most basic range of activities that people perform no matter what the location or period; people produce and dispose of waste, dig holes, and disperse soil. An examination of features classed as middens or rubbish pits will allow for a review of interpretive determinations of excavators as well as provide a great wealth and range of material as is common to disposal deposits. With a focus upon urban contexts, this research will also naturally focus upon collections recovered in relation to structural remains.

The range of finds collections to evaluate are great considering the wealth of materials that can provide the necessary insights. The material chosen will be based upon the criteria outlined below that each must meet in order to serve this research. The first is that the material is recovered from a tightly dated sequence of stratigraphic units or itself be of an easily dateable nature in order to provide a tight temporal sequence and good temporal resolution. Secondly, the material must be readily available and exist in the necessary volume and quantity to make analysis viable. Finally, the material must demonstrate a resonance for site formation processes, for example fragmentation of ceramic and bone, as this is the key aspect of the research design. Materials such as glass, which largely lacks an ability to indicate the effects of site formation processes, will be avoided. Based upon these criteria this research will focus primarily upon collections of ceramic finds and faunal remains. These choices collectively provide the necessary chronological resolution, collection size and reflection of formation processes. It is important to note that faunal material, while not necessarily dateable by itself, is most relevant due to its reflection of past formation processes and general abundance. The faunal material must be associated with a ceramic assemblage or other well dated component from the sequence.

The impact of post-excavation grouping of stratigraphic data upon analysis is a point of focus in this research. Insufficient quantities of material within specific strata are often reasons suggested for grouping related strata before statistical analysis such as seriation. In order to examine the effect of grouping, this research will seek to examine a combination of collections that have been "lumped" or grouped by phase based upon observed relationships between layers or other related criteria, as well as those that exist 'as they came out of the field'. The selection of both will provide an opportunity to review the choices behind grouping as well as to examine the effects that are a product of this post-excavation analysis process. For this review to take place it is necessary that the methods applied by the excavators are explicit and can be clearly reviewed and disentangled. If a stratigraphic unit is the definition of certain attributes, then the results of the definitions made will effect the formation and nature of the contexts examined and interpretations based upon them.

The culmination of the above criteria should result in collections that will allow for the kinds of insights that are sought. Based upon these selection criteria, the case study group from which to build this research and analysis will exhibit the following characteristics:

- A site of Roman period origins and later
- A well stratified site within an urban context
- Containing large amounts of ceramic and faunal remains
- Featuring data collection methods that identify contextual and qualitative/quantitative information such as fragmentation and cross-context joins.
- Feature sequences of strata that are both lumped into larger higher order groups, and exist in lower order assemblage groups.

4.3 Rationale for Defining Deposits

The definition of deposits has become a standard tool within archaeological field practice. Different practices and methodologies exist as a result of various regional differences or excavation traditions. Taken as a whole however, these combined methods take two forms: the first defining the physical properties of the deposit, the second defining the interpretive meaning or supposed archaeological value. In order to proceed with the method developed here, a standardized approach to defining deposits must be examined and stated clearly. An inductive approach will be followed to move from the excavators observed details to grouped types of definitions. This rationale with inform the future analysis of stratigraphic units and their sequences, and their relationship to associated assemblages.

The physical attributes of a deposit have been described and organised in a myriad of ways. Commonly methods develop in order to address the regional peculiarities of local soil conditions. The standardized Archaeological Site Manual of the Museum of London Archaeology Services, which is widely used and accepted, defines a rationale for describing the physical deposits. The stated reason for this standard method is in order to form a permanent record of the nature of the deposit, and to allow for informed interpretation of the sequence (Westman, 1994:3.1.2). Additionally this method was devised in order to elucidate formation processes and allow for comparisons between deposits. The MoLAS method describes the physical nature of the deposit, its compaction, colour and thickness, as well as the soil contents of the stratigraphic unit (see an example context sheet developed by MoLAS. Figure 4.1). Terminology is developed to describe the composition of soil, such as sandy silt and clayey sand, through the use of a chart (Westman, 1994: Figure 14). Methods for the description of any inclusionary elements are developed as well.

Despite the widespread acceptance of the MoLAS method for defining deposits, many other methods are employed around the world. A common alternative to the description of deposit composition is to state the component aspects reflected as a percentage of the deposit whole (ex. 60% clay loam, 30% fine sand, 8% sub-rounded pebbles, 2% charcoal flecks). This is opposed to the MoLAS method which, following the example given, would describe a deposit as clayey sand with moderate sub-rounded pebble inclusions and charcoal flecks. However, examples of the percentage based method of deposit description are seen within the MoLAS manual (Westman, 1994: Figure 9), which suggests the widespread use of this method. Due to the varied methods of description of physical properties that will be encountered during this research, it is necessary to develop a method to summarise and organise deposits based upon the varied provided descriptions. This method will be used towards an intra-site approach to analysis. It will be used to build up a comparison between the excavator's interpretations and the definitions used in this research. Using the descriptions provided, a stratigraphic unit will be inductively defined by its primary soil component, and common inclusion groups. In this way the definitions will move from the greater level of detail recorded by the excavator, to a type category that draws together other like deposit types. These will be further summarised into categories of common primary soil composition. While similarities may exist between deposits at adjoining ends of each category, it is necessary to divide the deposits and this is an unavoidable result of nominal data groupings.

The soil descriptions for the site of the House for Families can be presented as an example of this process. Descriptions were provided by the excavators in the following common format: Stratigraphic Unit 47B "98% black (2.5YR 5/0) carbon mottled with 2% very dark brown (10YR 2/2) silty clay with very frequent bits of coal and other unidentifiable burned material and frequent brick flecks", or Stratigraphic Unit 47C "95% dark yellowish brown (10 YR 3/4) silty loam mixed with 3% yellowish red (5 YR 5/8) clay and 2% grayish brown (10 YR 5/2) silty clay with occasional carbon fragments and occasional brick flecks" These were first summarized as "Carbon, silty clay, coal, brick flecks" and "Silty loam, clay, silty clay, carbon, brick". Other examples of summarised description types are as follows: "Ash, charcoal, slag, rubble" or "Mottled clay, coal ash, cinder, slag and brick rubble". These summarised descriptions are further organised along a set of simple guidelines. Deposits can be described by content frequencies into three categories. These are primary content with other content, equal parts contents, and primary content with some smaller content amount. These can be separated from each other by the frequency range for primary amount of 75% to 90%, 55% to 75% and 45% to 55%. For example a deposit of 80% clay with 20% silt would be defined as "clay with some silt", a deposit of 60% clay and 40% silt would be defined as "clay with silt", and a deposit of 50% clay and 50% silt would be defined as "equal parts clay and silt". Following this format the first example provided, stratigraphic unit 47B would be summarised as "carbon with some silty clay".

Following the construction of a complete list of the summarised deposit descriptions a summary grouping was possible. Each unit was treated first by its majority composition, that is the greatest soil type present, and secondly by the common inclusion types. In the case of the House for Families a list of five physical description types could be generated. The collected list from this site of each stratigraphic unit's physical description was reduced into the following categories:

Ash based - charcoal/slag/brick inclusions
Silty loam based - carbon/charcoal/brick/mortar inclusions
Clayey loam based - charcoal/brick inclusions
Carbon/organic based - coal/brick inclusions
Clay based - cinder/slag/brick inclusions

These types will feature in the analysis of the stratigraphic units and are organised under the category of Physical Deposit Type in the analysis section to be described in proceeding sections. The construction of such a list will be specific to each case study site examined but will follow the format set out above.

The physical descriptions that are compiled as part of any site archive are often used to guide the interpretation of deposit types (ex. a compact clay deposit is interpreted as a floor surface). As with the physical descriptions a variety of interpreted types will be comprised and established depending upon the location and type of site. Also, as with the physical descriptions, the interpreted types that are created can be reduced into like groupings based upon the common functional histories of each stratigraphic unit. At the site of the House for Families a range of interpreted types were provided, ranging from hot water pipe trench fill, ash and rubble fill, to House for Families occupation waste fill. Based upon the interpreted function associated with each deposit a list of five categories could be constructed drawing together like interpreted functional groups. Each deposit is then classed under one of the interpreted categories. These interpretations were reduced into the following list:

Occupational waste deposit
Displaced waste deposit
Destruction related deposit
Intrusionary fill deposit
Capping waste deposit

Within each case study analysis this form of defining deposits will be used. The results of this rationale will be used in determining deposit status types and other aspects of the analysis methodology. What will be of importance for this research will be to determine that a clearly defined methodology was developed by the excavators and applied consistently. This relates to an interest in the relationship between the content of each deposit and its interpretation. It may serve as a tool to enlighten excavator practice and assumption to correlate the occurrence of each description category with each interpreted category; if for example, a high degree of clean clay deposits are associated with occupational surface deposits. The occurrence of patterns or lack of correlation between content and interpretation may demonstrate interesting aspects of the nature of deposits and their relationship to excavation practice.

4.4 Status Sequence Graphs

The completed methodological procedure to be developed in this chapter, as will be explained in section 4.8, will feature a suite of statistical measures with which to build a fuller description of the nature of context. Towards this end, statistical measures will need to be developed in addition to the use of existing measures. The first of these statistical measures to be developed are status sequence graphs. This tool is based upon the previously stated approach to deposit status. This approach, as mentioned in the conclusion of Chapter 3, is in logical opposition to the very term "deposit status". This is because, as all status designations are a result of the relationship between finds and assemblage context, and since all status is a relational property, every find is subject to different definitions depending on their relationships. In effect, there are no assemblage wide status labels such as primary/secondary but a collected range of status designations. Adopting this approach will help to disconnect the deposit from its origins within the realm of human activity, as is often the case with determining "deposit type" (house floors, hearths, etc) (O'Connor, 1996:6). Viewed as a whole, this will exhibit a range of frequencies of each type. The frequencies of each status type present among individual artefact categories in a single stratigraphic unit will reflect the nature and type of deposit formation. For example if a high number of Type A ceramics (>70%) is present, then a deposit can be considered to be largely undisturbed. These ratios could be exhibited in graphical format to provide a view of the general nature of an individual stratigraphic unit and the relationship between the frequencies of each status type present. It is important to note that, like the Carver Seriation Diagram, such a graph is not intended to be a statement of fact (Carver, 1985:359). It is a basis for interpretation, a more involved method than a look at isolated finds archives and deposit descriptions can offer.

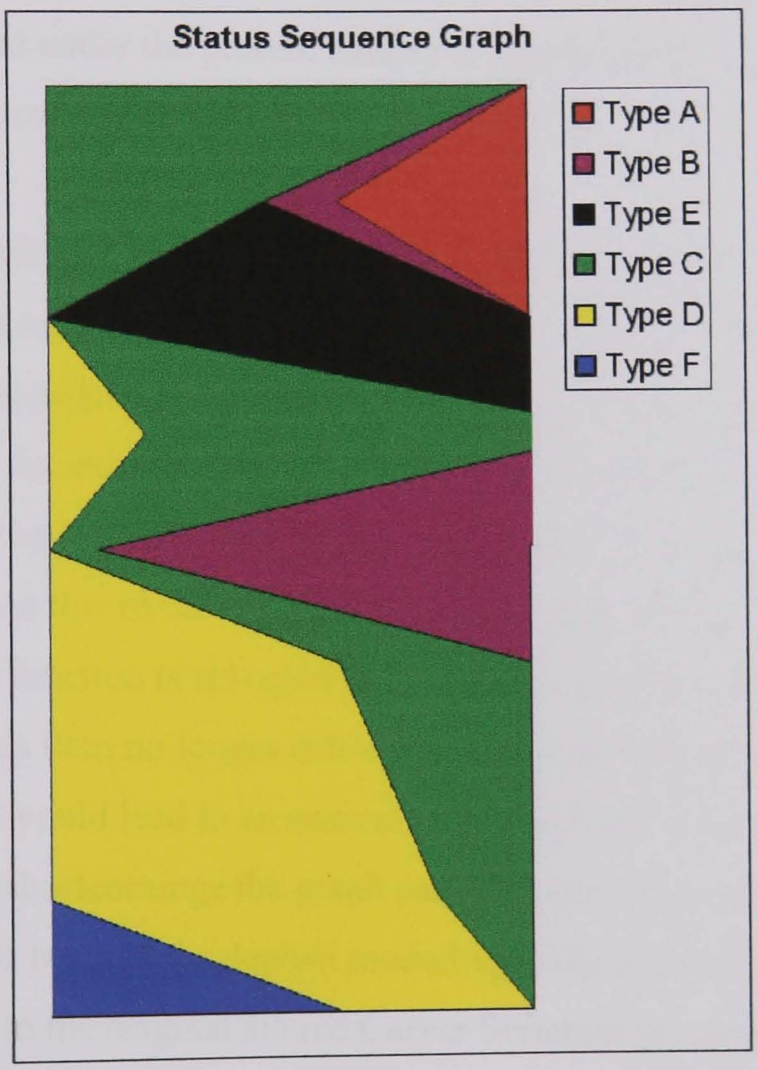
With the above in mind, the aims of the Status Sequence Graph are rather simple. That is, to divide all finds within an artefact class into individual contexts by their known status type. When contexts are listed in order of stratification a bar graph representation of each quantity of status type can be constructed to indicate the trends of deposit type change. This aim is only limited in practice by determining a reliable and consistent method to divide assemblages into separate status type groupings. It would be inconsistent and unacceptable to simply divide an assemblage based upon individual interpretation or excavator intuition.

In order to facilitate a more consistent method of dividing an assemblage into type categories, a Carver Seriation Diagram is constructed for all the ceramic finds within a site area or feature (see Figure 4.2 for an example from Saddler Street, Durham). When using ceramic quantification data with sequence data, both are ordered by general chronological sequence as known: ceramics by known chronology and the contexts by observed stratigraphic relationships. The Carver Seriation Diagram provides the first stage of the analysis process. The diagram acts to divide the collection between Types A, B and E, and Types C, D, and F based upon time factor (as explained in section 4.1). Types A and B are closely associated due to their higher order context. These status types by definition cover finds that share a temporal connection with the stratigraphic unit that they were recovered from, yet differ in functional and spatial relationships. Type E finds belong in this first group due to their definition as being broadly contemporary with the stratigraphic unit they were found in. These finds, however, are less likely to occur and are more interesting as coincidental finds than as expressing actual practice. The "fade points" separation is assumed to be material out of temporal context, which are all remaining status types. This is led by the belief that the total number of any fabric type should rise and then decrease along the sequence. This creates fade points, after which all material recovered can be considered residual. Thus dividing the assemblage into two groups, those on one side within the fade points (Types A, B and E) and those outside of the fade points (Types C, D, and F).

The division of the ABE group and CDF group into component parts is the next stage of the process. This stage recognises certain assumptions: although objective methods are employed in this application, a truly objective technique is by definition not possible as information about function, chronology and space is collected for finds and context to form the definitions/determinations. This data, collected and compiled in the field, is subjective by nature and open to determinations by the archaeologist. Examining the functional/spatial aspect of the finds separates the Type ABE group. Ceramic types used in the seriation diagram are compared to deposit function descriptions (pit, tile dump, etc.) to determine the spatial relationship between an items intended function and its proximity to areas with an intended function. All separated ceramic types are Type BE, all remaining types aligned with the function are Type A. The remaining group of Type BE finds require another filtering process in order to identify the role of the spatial relationship that separate these two types. Type B finds are spatially disconnected while Type E finds are broadly spatially connected. By a close review of the spatial relationship between the interpreted context location and its function the two types can be separated. This may be done in some cases with a consideration of evidence in plan and section.

The Type CDF group is separated by examining the spatial aspect of the finds data. Again, ceramic types are compared to deposit function descriptions to determine the imported finds that were not utilized locally. This will in the first instance separate the Type CF and D finds which are differentiated by Type C being locally utilized, Type F retaining a functional relationship and Type D being imported. The remaining group can be closely re-examined for evidence supporting a Type C or F designation. This latter type is highly irregular and is designated based upon a close review of the interpretation of the stratigraphic unit and the individual find. An example of this type was discussed in section 3.5, which is the re-application of plaster contents removed from an earlier wall but deposited separately from the wall structure. Later applications of plaster are removed from the wall, mixed with original plaster and deposited away from the wall. The likelihood of material that has become separated temporally and spatially from its deposit while retaining a functional connection is low.

The determined quantities of each status type category are converted to frequencies based upon vessel quantities (10 vessels out of 100 vessels recovered in Context A for Type B status = 10% Type B status). Frequencies are used to construct an area graph of any order of status types present. An example graph is presented below. Contexts are ordered along the vertical in stratigraphic order, the earliest deposit at the bottom of the graph. The frequencies can also be represented by separate lists, ordered by type. This will be seen later during the examination of the analysis procedure.



The method described above acknowledges certain limits. This method is used despite the possible biasing effects of varying supply rates at the site level. The Carver seriation method is based upon the assumption of the unimodal curve, that is finds will diminish along a linear creating "fade points" of residuality (Carver, 1985: 362). As observed by Evans and Millett (Evans and Millett, 1992), the assumption of the unimodal curve can be in error if material is introduced to a site sporadically and at uneven rates over time. To correct for this factor measures of ceramic density relative to soil quantities excavated might best be used. However, as soil quantity measured at the stratigraphic unit level continues to be done erratically by excavators, measures of ceramic density cannot be used in all situations. Fade points may also be biased by supply rates and could as well be corrected for if ceramic density figures can be calculated. If this is the case then perhaps a seriation diagram based upon ranges of density would be more informative. However, given the present scenario of excavation recording practice this is regularly not possible and the method of investigation presented above must proceed under the present conditions while acknowledging the possible pitfalls in certain situations.

Another natural limitation of the method is its susceptibility to bias as it relates to vessel function and recycling of materials. Type status is determined at the second stage (separating from ABE and CDF groups) based upon perceived vessel functions. That is, for example, tablewares are determined to relate to household function, etc. This approach is open to bias if items are re-used and take on a different function via this re-use. For example a blacking bottle, once serving a utilitarian/cleaning function is salvaged by an individual and re-used for food related storage. This item no longer exhibits its original function as assumed by the vessel type and would lead to an error in assigning type status. However, despite its possible shortcomings the graph can offer additional insights. The finished graph could be used for deposit modelling. The finished status graph could be compared to the original source Carver Seriation Diagram, specifically comparing ratio relationships. Where the Carver diagram diagonal identifies deposit types such as cliffs or indentations it would be interesting to compare to the status graph for the frequency of different deposit types within that same sequence. For example, Carver indicates that an indentation along the diagonal may represent a dump or back-filled ditch (Carver, 1985:361). Intuitively it would be assumed that such a deposit type would have a higher frequency of Type C or D material. By examining the frequencies present in the specific sequence of deposits that form the indentation the relationship between the two diagrams modelling capabilities can be investigated. If consistent relationships are identified it could go a long way towards using the diagrams to identify and interpret different deposit types.

4.5 Quantitative Methods: Ceramic Statistics as Measures of Site Formation History

The aim of evaluating the cumulative effects of formation processes in shaping the nature of deposits requires the use of standardized quantitative methods. Pottery and faunal material will be the main focus of these quantitative methods. As in Tipper's study of Grubenhaus fills, the material culture is studied in terms of events and behaviour that create and form deposits, with part of the focus given to methods that identify variables relating to the condition of deposition (Tipper, 2004:112). Post-depositional history, as previously discussed, is the other area of focus. Each measure is described below for its intentions and mode of use. The full extent of the relationships between these measures and the full methodology are to be outlined in the proceeding section. The statistical measures relating to ceramic and faunal remains are treated in separate groups.

Ceramic finds are used in this study due to their especially sensitive indication of formation processes (Tipper, 2004:113). Measures of general quantification are combined to formulate measures of fragmentation and other indicators of the complete history of a stratigraphic unit's assemblage. Generally the measures used can be seen to be firstly built upon basic quantification, and secondly upon the combination of two other measures into a derived measure. In this study the basic measures are sherd count, sherd weight and EVEs. The derived measures are Mean Sherd Weight, Average Sherds per Vessel, Completeness, Brokenness, and Units per Volume. Other measures are included that are based upon observation such as Percentage Burnt, Status Sequence Graph Frequencies A through F, and Farthest Migrant Matrix Score. Due to the varied use of terms and application of practices each measure is described below to clearly demonstrate the approach used here. It is important to note that the adoption or rejection of certain methods is in part related to the need to evaluate material from a recorded archive, where access for new analysis is not available. The methods described are applicable to situations were the original assemblage is extremely remote from the analysis, such as in the use of internet or other public data archives.

Sherd Count – Total counts are used of each distinguishable ceramic sherd, separated by each stratigraphic unit. This is the simplest and most common form of ceramic measurement (Millett, 1979).

Sherd Weight – Sherd weight is used measured in grams, preferably to the nearest 0.1 g, as is commonly the case (Tipper, 2004:114, Aultman et al., 2003).

Rim EVEs Total – This measure of vessel representation is used towards several related calculations. In this, each sherd is treated as a fraction of the vessel it originated from, these fractions being summed to represent the total fraction of ceramics present (Orton, 1982:2). As the exact fraction of the whole is unknown, an estimate is used: estimated vessel equivalents (*EVEs*) (Orton, 1989:96, 1975). For the purposes of this study rims will serve as the basis for estimation of the complete vessel as this is a widely available form of the measure with a long history of use (Egloff, 1973). A standard radius template on a cataloguing mat will serve for the measurement of rim diameter using millimetres; the rim exterior is used as a general rule for thicker sherds.

Mean Sherd Weight – The measure of sherd weight is divided by sherd count to produce a measure of the average weight of each sherd in each stratigraphic unit. This measure may be susceptible to bias based upon ware types present in specific stratigraphic units but has been demonstrated to be an effective measure of pre-depositional processes that form the archaeological record (Bradley and Fulford, 1980).

Average Sherds per Vessel – This measure represents the average number of sherds in each stratigraphic unit to account for each recognised vessel. This measure is formed by using the sherd count and analyst counts of numbers of recognised vessels per stratigraphic unit. The sherd count is divided by the vessel count to arrive at the final number. The vessel count is best described as the *estimated vessels represented.* As demonstrated by Orton and Tyers (Orton and Tyers, 1990:82-83) this measure can be any estimate of the proportions of vessels represented in an assemblage. While a direct review of the sherds may be sought, this is in most cases too timely or labour intensive. In most cases this measure will be arrived at by assessing distinguishing characteristics of form and decoration to determine sherd families that indicate a quick count of vessels represented. While the terminology of *evrep* (Orton and Tyers, 1990:83) is largely unused, in certain areas it is the responsibility of the investigator to tease out the exact method of arriving at the vessel count. The *evrep* count will be used in other quantification methods utilized in this research.

Completeness – The *Completeness* of an assemblage is a measure fully intended to equate with the post-depositional history of that assemblage (Orton and Tyers, 1990:86). It is defined as the ratio of vessel equivalents (*EVEs*) to vessels represented (*evreps*) (Orton, 1985:114). This logically relates to the average numbers of each vessel that is still present in the recovered assemblage, decreasing from a whole of 1 with each successive event of breakage, redeposition etc. to a lower limit of visibility. *Completeness* only remains unchanged or decreases over time, suggesting that a relatively unaffected stratigraphic unit with Type A status assemblage should have a higher *Completeness* value than a predominately Type D assemblage.

Brokenness – This second measure of post-depositional history was developed in conjunction with the Completeness figure (Orton, 1985). Unlike *Completeness*, which is effected only by post-depositional forces, *Brokenness* is a function of both post-deposition and ceramic type (Orton and Tyers, 1990:86). *Brokenness* is calculated by dividing sherd count by the estimated vessel equivalent (*EVEs*), the value of which begins with 1, or a complete ceramic vessel, and increases upwards with each successive breakage. A stratigraphic unit with related assemblage of largely Type A status should exhibit a lower *Brokenness* value than a similar assemblage of mostly Type D status.

Units per Volume – This measure is intended to serve as a representation of the density of ceramic material present in each stratigraphic unit. The sum weight of ceramic material in the stratigraphic unit is measured in grams. This measure is divided by the estimated volume of soil in that particular stratigraphic unit (Vince, 1977). Volume is measured in cubic metres of soil and is based upon estimated measurements made in the field of the general length, width and depth of each successive stratigraphic unit. This is presented as an estimate because in most cases the irregular nature of stratigraphic units cannot be exactly recorded. Additionally, the volume may be estimated at a later time based upon profile and plan drawings generated in the field. The density of ceramic material in a stratigraphic unit is assumed to form a relationship with other factors of formation process that are measured here. The exact nature of that relationship will be drawn out in the analysis of the case studies and the method at determining this will be examined in the proceeding section.

Percentage Burnt – This measure is calculated as the ratio between the number of identified ceramic sherds with burning present and the total ceramic assemblage of a stratigraphic unit. The identification of burnt ceramic is a simple yes/no indication that is standard in many recording procedures. This measure is included due to the assumed likelihood that frequencies of burnt material may be influential upon fragmentation and may also share a relationship with the status types of assemblages. By that, there may be a relationship between spatially displaced material (of the B, D or F Types) and the occurrence of burning (fire fills deposited in a second location).

Status Sequence Graph Frequencies – As described in Section 4.4, the construction of a Status Sequence Graph could be used to elucidate an impression of the nature of a stratigraphic unit's assemblage by listing the relative frequencies of each status type designation. Following the methodology set out in Section 4.4 a Status Sequence Graph is constructed which indicates the number of each status type present in each stratigraphic unit. The determined quantities of each status type category are converted to frequencies based upon vessel quantities (10 vessels out of 100 vessels recovered in Context A for Type B status = 10% Type B status). For the purposes of this part of the analysis the frequencies are represented by separate lists, ordered by type. Therefore an ordered list of a complete sequence of stratigraphic units can be built for Type A, Type B, etc. This list will be related to other measures described here, to represent the history of the formation of a stratigraphic sequence.

Farthest Migrant Matrix Score – A tool called a Farthest Migrant Matrix can be used to form a scoring system for a sequence of stratigraphic units. This is constructed by using a site's Harris matrix to provide a display of known ceramic cross-context mends to show the farthest migrant from any single context from its original location or likewise the general cycle of refuse disposal within a site context. This charts the movement of material, be it between deep sealed layers or surface deposits. In a chain of stratigraphic units, 1 atop of 2 atop of 3, if unit 1 has conjoins found in both units 2 and 3 only a connection between unit 1 and 3 will be included in the matrix.

This derived measure is based upon several assumptions. Firstly, that a relationship of mends between two stratigraphic units represents a history of displacement, recycling, or other post depositional factor. Furthermore, the further away that a mend exists stratigraphically, the more disturbance may be represented. Using these assumptions, a score system can be devised to rate a stratigraphic sequence. For each unit away that a mend is documented a score of one will be given. Using the same example as above, a chain of 1 over 2 over 3, stratigraphic unit 1 would receive an FMM score of 2. For relationships that are found between unrelated chains of stratigraphic units, that is stratigraphically horizontal relationships, a standard score of 1 will be applied. A list of the successive scores for a sequence will be taken to represent the degree of interaction between each stratigraphic unit. This policy to normalise out of sequence mends may result in obscuring the full extent of lateral movement across a site; a short movement between small pits would receive the same score as a movement 100 metres across a site. Additionally, this method doesn't take account of the quantities of mended material in each stratigraphic unit. No standard procedure could fully take into account the spatial elements involved in mend movement so the present method will be accepted with an understanding of its failings. Using this scoring system a sequence can be ordered and ranked, to give an impression of the trend of material movement within the sequence. This measure will combine with the status sequence graphs and other measures to be explained below, to represent the collective nature of a stratigraphic sequence.

4.6 Quantitative Methods: Faunal Statistics as Measures of Site Formation History

Faunal material, like ceramics, are important indicators of formation process and taphonomic history. They are treated here because of their potential for information and due to the previously stated aims of aligning artefactual and ecofactual datasets. The quantitative methods used will be applied separately to each class of species examined in this research methodology. The faunal analysis will focus upon collections of domesticated livestock over that of hunted, fished or scavenged species, and in turn firstly on collections of cow remains, secondly on that of pig, and thirdly on sheep bones. Analysis will be performed where substantial numbers of each species exist and may be omitted where not. For example, in the examination of the House for Families dataset, analysis was performed on cow and pig bones. Sheep bones were omitted due to generally low numbers.

The intense variety of terms and practices used to analyse faunal assemblages requires a clear explanation of terms and the approaches to each selected. A history of terminological ambiguity and vague application of methods exists in zooarchaeology (Lyman, 1994b:36). This history further necessitates a transparent discussion of each quantitative method used in this research. As discussed above, particular methods are adopted or excused in part because of the aim to create a methodology for using archived datasets. The lack of access to the actual faunal assemblages will influence which quantitative measures are used; for example, the use of minimum number of individuals (MNI) at the exclusion of the minimum number of skeletal elements (MNE). This is due to the manner in which MNE is determined, most commonly from dividing bone samples into zones in order to estimate the total number of elements present in an assemblage.

This measure requires the direct investigating of the bone specimens. As this method of quantification is not entirely used in the various case studies that will be used, this method will be avoided unless necessary. The following measures will instead be favoured during analysis.

NISP – This is the most basic quantitative unit, or observational unit, of faunal analysis. It is defined as the ***number of identified specimens per taxon*** (Lyman, 1994b:100). It is a count of the number of bone fragments identified of each species. As a measure the *NISP* is generally the most agreed upon in meaning and is widely understood for the units it intends to measure.

MNI – Like *NISP*, *MNI* is one of the most commonly encountered measurements in zooarchaeological literature (Lyman, 1994b:100). It is defined as the ***minimum number of individuals***, or animals, necessary to account for all the identified specimens, or as defined by Hesse, the smallest number of animals necessary to produce the sample of bones (of a taxon) observed (Lyman, 1994a:43). For the purposes of this research, this is based solely upon skeletal elements represented and not upon age, sex or measurements as has been suggested (Reitz and Wing, 1999:195). This is due again, to the use of archive material and the prevalence of sex or other attributes not being part of the analysis process.

NISP:MNI – The ratio of *NISP* to *MNI* is a derived measurement of the fragmentation of an assemblage. It has been described as the estimation of skeletal completeness or degree of fragmentation of a faunal assemblage (Lyman, 1994a:44). For the purposes of this research the ratio is presented using the total number of specimens in each stratigraphic unit. This differs from the approach advocated by Klein and Cruz-Uribe that the ratio be presented separated by skeletal part (Klein and Cruz-Uribe, 1984:71). This measure is taken to represent the degree to which post-depositional disturbance has taken place. This measure is used despite the knowledge that problems can exist in its calculation. For example, the NISP:MNI score could be high for a complete skeleton, or for a few highly-fragmented bones

Percentage Whole – The proportion of whole specimens is a measurement of the degree to which individual specimens within an assemblage have been fragmented or broken. It is calculated by the percentage of whole and intact bones relative to the *NISP* of each stratigraphic unit. This is a quick and easy measurement of post-depositional disturbance of each stratigraphic unit assemblage.

Teeth:Mandibles – The proportion of teeth to mandibles present in an assemblage is another indicator of the extent of fragmentation of that assemblage. This is taken as a representation of post-depositional disturbance, creating a greater quantity of loose teeth present in the assemblage with each disturbance episode. However this is not taken as a clear relationship between high ratio numbers and numerous episodes of disturbance, as intense singular episodes of disturbance can create similar results to multiple low intensity disturbances. Assemblages with no mandibles present but with loose teeth are utilised as well as those with mandibles present.

Percentage Small – This measure is another indication of the extent of fragmentation of an assemblage. The measure is calculated by the frequency of carpals, tarsals, sesamoids, and phalanges to the total *NISP* of a stratigraphic unit's assemblage. A higher number of small bone specimens surviving in an assemblage are taken as an indication of disturbance, as small dense bones are more likely to survive compression, treading, or other process that act to break up bones.

4.7 Material Quantification and Seriation

The previous two sections stated and explained the statistical measures that will be used to infer formation processes of stratigraphic units and related assemblages. This section will explain their integration and the proposed methods attempts to arrive at conclusions about the complete nature of deposits. In order to more clearly elucidate the aims and procedures undertaken examples from the

House for Families Site case study will be presented. The full presentation and analysis of that particular study will follow in later chapters.

The collection and analysis of the case study data has been managed by simple spreadsheet computation. This format, while scaled back from the use of Microsoft Access or other database tools, has been demonstrated to be the most efficient and intuitive means to organise the datasets. The analysis process takes place in several stages and will be termed below as Level 1 through Level 3 analysis. At each level we will consider the stratigraphic sequence, the ceramic assemblage and the faunal assemblage. The case studies to follow are all largely based upon existing analysis data supplied by other parties. This data is used with the knowledge that errors and/or omissions may exist. This potential exists in any dataset and is accepted as a by-product of using archival data.

Level 1- This process of analysis begins with the organisation of the stratigraphic sequence of stratigraphic units to be investigated. The basis for all subsequent analysis begins with the organisation of the sequence into a clear order of succession. This is ordered in descending order from the latest stratigraphic unit to the earliest. At Level 1 analysis this ordered set will include all the individual stratigraphic units in the sequence, free from any post-excavation grouping or organisation into phases. The presentation of the data can be viewed as grouped sets added to each other, the stratigraphic sequence serving as the first such set. The following is an example, selected from the House for Families.

Strat. Unit
40K
40A
40X
40B
40F
40U
40D
40H
47B
40C

The next set to be organised is the deposit related categories. As described in Section 4.3 this begins with the category of Physical Deposit Type, the designations of which are ordered with the sequence by the categories determined during the initial investigation of deposits described earlier. The next category within this set is the Interpreted Deposit Type. This is ordered in the same manner as above and following the practice described in Section 4.3. Below is another example selected from the site of the House of Families.

Strat. Unit	Physical Deposit Type	Interpreted Deposit Type
40K	Clay based - cinder/slag/brick inclusions	Intrusionary fill deposit
40A	Clay based - cinder/slag/brick inclusions	Intrusionary fill deposit
40X	Silty loam based - carbon/charcoal/brick/mortar inclusions	Destruction related deposit
40B	Ash based - charcoal/slag/brick inclusions	Destruction related deposit
40F	Ash based - charcoal/slag/brick inclusions	Destruction related deposit
40U	Clayey loam based - charcoal/brick inclusions	Destruction related deposit
40D	Ash based - charcoal/slag/brick inclusions	Displaced waste deposit
40H	Ash based - charcoal/slag/brick inclusions	Displaced waste deposit
47B	Carbon/organic based - coal/brick inclusions	Displaced waste deposit
40C	Ash based - charcoal/slag/brick inclusions	Displaced waste deposit

The next set in the order are the ceramic related measures outlined in Section 4.6. Each of the successive statistics act as measurements of the formations processes that may have acted to shape the stratigraphic unit and its recovered assemblage. The relationship between each measure and the parent stratigraphic sequence will be determined by a statistical evaluation. This will be performed on the basis of ranking and correlation both within the sets and, more importantly, across the sets. This process begins with the ceramic measures which are presented in the order described above with their corresponding ranks. The ranking process has been performed following the procedure for Spearman's Rank Correlation. That is, where common ties occur, rank is assigned by the mean of the tied ranks. For example, should two stratigraphic units share a ranking for order 1 and 2, a rank order of 1.5 will be applied to each because there is no basis for putting one above the other (Drennan, 1996:228). A selected example of this is presented below from the House for Families.

Strat. Unit	Mean Sherd Weight (gm)	Rank Order
40K	2.75	9.00
40A	0.9	19.5
40X	0.3	29
40B	9.82	4
40F	2.45	10
40U	1.86	13
40D	0.74	22.5
40H	0.32	28
47B	0.7	24
40C	6.3	5

The measures used for ceramic material, and their associated ranks are organised in a specific manner. The first of which involves the rank orders. As a general rule rank order is always presented ascending from most intact or undisturbed to most broken or disturbed. More specific details are best described for each category. The first ceramic category is *Mean Sherd Weight*. This is ranked from largest sherd weight to lowest sherd weight. *Average Sherds per Vessel* is ranked from highest number to lowest, representing most intact vessels to least intact vessels recovered. *Completeness* is ordered from highest number, or the most complete, to lowest number, or the most incomplete assemblage. *Brokenness* is ordered from highest number to lowest. This represents the average number of sherds into which each pot has been broken, the largest number representing a greater degree of brokenness. Both the *Completeness* and *Brokenness* (and therefore the EVEs) have null entries (n/a) where no measurable rims exist in a stratigraphic unit. *Units per Volume* of ceramic material is ranked from highest number to lowest, representing the densest assemblages to least dense assemblages in relation to stratigraphic unit. No rank is assigned where no volume measurements exist for a stratigraphic unit. *Percentage Burnt* is ranked from the lowest percentage of burnt material to the highest percentage. No rank is assigned where no burnt material exists in a stratigraphic unit. The Status Sequence Graph Frequencies are ordered from highest frequency to lowest frequency present for each status type. In this case the decision was made to include entries of zero in the ranking (as opposed to n/a). This was done as to explore the effects of a full spectrum of status types in a stratigraphic unit. The

Farthest Migrant Matrix Score for each stratigraphic unit is ordered from highest score to lowest score, representing the most degree of movement to the least.

The final set in the order is the faunal related measures outlined in Section 4.6. As with the ceramic material the different measures are ordered and ranks are derived for each. Again, these orders follow a general rule of the least disturbed to the most disturbed. The *NISP:MNI* ratio is ranked from lowest to highest, representing the least fragmented assemblage to the most fragmented. No rank is assigned where an absence of faunal material exists in a stratigraphic unit. The *Percentage Whole* is ordered from the least whole assemblage to the most whole of intact assemblage. *Teeth:Mandible* ratio is ordered from lowest to highest, representing the least amount of loose teeth to the largest number of loose teeth. No rank is assigned where an absence of loose teeth and/or mandibles exists in a stratigraphic unit. *Percentage Small* ratio is ordered from lowest to highest, representing the lowest frequency of small bones to the highest frequency. No rank is assigned where an absence of small bones exists in a stratigraphic unit.

Following the construction of the rank orders for each set of data the process of correlation and investigation can begin. The most widely known method for examining ordinal scale data is Spearman's rank order coefficient. This will be used to generate an understanding of the correlations between each measurement as well as to test for the strength of the correlation. Spearman's rank order analysis will be calculated using the online Wessa.net free statistics software package (Wessa, 2007). This tool computes the rank correlation coefficient for two data series. Statements of confidence are also derived using the Wessa.net package, based upon the calculation of a t-test. This method provides a statistical statement of confidence in the judgments resulting from small samples. In Appendix 3 the results are presented by positive and negative correlations. Positive correlations are highlighted blue, whereas negative are highlighted purple. All correlations that fall within the upper third of the range are outlined. This arbitrary demarcation is intended to highlight distinctly positive or negative relationships.

The process of correlation follows two steps. The first step is an investigation of the intra-set correlation, which is to ensure that a certain degree of correspondence between measurements of each material exists. The next step is an investigation of the extra-set correlations between the material types and the deposit related information. These two forms of investigation should reveal relationships between the deposit descriptions and interpretations, the ceramic assemblages and the faunal assemblages, by determining what relationships occur, and more importantly what assumed relationships don't occur.

Level 2 - Once this first Level analysis is complete, the next can proceed. This centres on the effects of lumping or grouping of stratigraphic units during post-excavation. As stated previously, the impact of grouping stratigraphic data is a focus of this research. Level 2 analysis proceeds following the same procedures outlined as in Level 1 but are completed with the stratigraphic sequence grouped and ordered following the post-excavation interpretations of the excavators. The statistical measures introduced are calculated by summing the totals for each stratigraphic unit included in a particular grouping. In the few cases where zero entries exist for a higher order group a rank is still assigned. This was done to increase the number of observations in the correlation analysis. The results of Level 2 analysis will be compared against the findings of Level 1 in order to indicate the effects of the grouping. The disappearance of relationships identified in Level 1, or the appearance of different relationships will shed light on the effects of the interpreted stratigraphic grouping.

Level 3 – This level of analysis, like that of Level 2, follows the same procedures used in Level 1 but with another correction introduced into the dataset. For this level of analysis all material identified as residual is removed before the calculations and correlations are completed. This will follow the process outlined in the design of Status Sequence Graphs (Section 4.4) by using the Carver Seriation diagram to inform which aspect of each stratigraphic units assemblage are residual. The results of Level 3 analysis will be compared against the findings of Levels 1 and 2 in order to determine the effects of residual material within the site assemblage. The investigation of residual material will indicate whether or not biasing effects are created by their presence and the extent of the possible bias.

4.8 Conclusions

The collective results of the above methodology will result in a better understanding of the nature of deposit history and that history's reflection in site data. This will be reflected in the observed relationships between each measurement and set of data. Following the completion of successive case study analysis, comparisons between each case study results will elucidate patterns in these relationships. Drawing conclusions from these identified relationships will present a suite of measurements and should inform better practice both for the excavator and the post-excavation analyst.

The above methodology utilises Urban Seriation (Carver, 1985) methods as well as exhibiting a seriation quality of its own. This is true in the sense that, as defined by Dunnell, any seriation is essentially a pair of linked hypothesis (Dunnell, 1970:310). The approach used here is also built upon a pair of linked hypotheses, exhibiting itself through the inferred sequence. These hypotheses are firstly, that the collection of statistical measures reflects formation history, taphonomy and the like, and secondly that once ordered, these measures will reflect the observed or inferred chronology of sequence. It is the relationship between the ordered suite of statistics and the observed sequence data that will inform which measures are best suited for the job and which assumptions relating to the collection of data are misplaced. The following chapters, dealing with specific case studies, will demonstrate the results of this methodology in practice and lead to the final assessments and conclusions.

There are many possible outcomes of the three levels of analysis proposed here. A comparison of the findings between each level may reveal biasing or obscuring effects of the decisions made in post-excavation analysis. Grouping of stratigraphic units, as explored by Level 2, may be found to hinder the insightfulness of formation statistics as units of varying extremes in fragmentation are grouped, thus creating an averaging of the measurable effects of post depositional history. The removal of residual materials from the equation, as in Level 3 analysis, may result in vast difference in the results, demonstrating the biasing element. It may in fact demonstrate little difference between the levels of analysis, demonstrating that removing residual material is not necessary or as biasing as sometimes thought. The results of the three levels of analysis will produce finds comparable both within the site and across the different case studies. The results from vastly different excavation contexts will be most interesting as common indicators of contextual history are sought. The following chapters will look to draw conclusions from the separate case study analysis and then to draw out any common trends.

Chapter 5

Case Study: Mount Vernon, House for Families

5.1 Introduction

In the previous chapter the research methodology for the analysis of finds and deposits was presented. In this chapter I examine the results of the first application of this methodology to a case study dataset. The historical context of the study is discussed, as is the research history of the site. The material culture assemblages and parent deposits are analysed and the findings presented. Finally, previous interpretations of this material are reconsidered and possible patterns in the dataset are discussed.

The first case study is the House for Families site, Mount Vernon, Virginia. As outlined in section 4.2, any site chosen for analysis must fit certain criteria. The House for Families was chosen as the pilot case study site because it fit well within the site selection rationale. Firstly, the site is located within the wider regional focus of study and dated to the historic period. The House for Families provided a particularly strong temporal resolution and the site was occupied for a relatively short period of time, which limits the likelihood of residual material. Secondly, the deposit type was also well suited, as the House for Families deposits are midden based, and associated with an occupational structure. This allows for a review of interpretive determinations by excavators. The deposit sequence at the House for Families is well stratified but lacks the complexity of some urban sequences. Finally, the site assemblage at the House for Families is well suited to study. There are sufficient amounts of well analysed ceramics and faunal material in manageable quantities to make for fruitful analysis. This fact, coupled with the chronological sequence and deposit related reasons mentioned above makes the House for Families a prime candidate for the initial case study. The House for Families site is simple enough to make this first study operational but is complex enough to make for interesting interpretation.

The following sections build upon the first to present the findings of the House for Families analysis. Section 5.2 provides the *Site Background and Research History*, setting the context of study. Section 5.3 explains the process of *Data Construction*. Section 5.4 presents the findings of the *Analysis* of the site data. Section 5.5 presents a *Review and Reinterpretation* of the analysis results, highlighting the key findings and results as well as re-visited the excavators interpretations. Finally, section 5.6 summarises the above and provided some *Conclusions*.

5.2 Site Background and Research History

The House for Families (44 Fx 762/40-47) (hereafter HfF) is located at Mount Vernon, near the city of Alexandria, Fairfax County, Virginia. Historically, this was a thriving plantation within Virginia's Chesapeake region, a region that was built upon tobacco and other agricultural production. Mount Vernon was the ancestral home of the Washington family, first purchased by John Washington in 1674. The estate and grounds grew and developed over many years. Structural changes to the main estate quarters reflect the growing status of the Washington family and its most famous inhabitant, George Washington.

During George Washington's life Mount Vernon grew steadily into the form seen today. The main house was rebuilt twice and doubled in size over the original structure. Washington's careful and meticulous approach to agriculture saw many gains in output. In addition to the agricultural estate, Washington opened a highly successful distillery, becoming a major producer of whiskey. The landscaping of the estate was also carefully attended to and through its form and structure represents a prime example of the wealth of many large property owners of the period.

Currently the Mount Vernon Ladies' Association (MVLA) operates the site. The MVLA, led by founder Ann Cunningham, purchased the site from descendants of George Washington on February 22, 1860, rescuing it from disrepair (MVLA, 1903:24). Mount Vernon is operated as a major tourist attraction in a completely restored condition and was designated a National Historical Landmark in 1960. The site serves a particular historical interest not only as the home of a former President and General, but as a typical plantation that profited under the south's slave economy. Archaeological and historical studies into the nature and structure of the slave system, as well as investigation into the lifestyle of the slave population have found Mount Vernon a valuable cultural asset.

Mount Vernon is a large plantation and estate covering nearly 8000 acres (Pogue, 2003: Mount Vernon History, June 2, 2007.). The site is most famous as the residence of George Washington from 1754 to 1799. The plantation was divided into a central residence and farm, and four outlying farms and production centres. At the time of Washington's death 316 slaves were recorded to be living and working at the estate. These slaves lived on the outlying farms, named Union, Muddy Hole, Dogue Run, and River or at the main residence, Mansion House Farm. In 1786, 67 of the 216 slaves at Mount Vernon were housed at the Mansion House Farm (Pogue, 1991:1). The slaves tied to outlying farms mainly worked as field hands whereas the slaves at the Mansion House Farm were primarily house servants or skilled craftsmen (Pogue, 2003: Background, June 2, 2007). These skilled trades included blacksmiths, carpenters, spinners and weavers (Pogue, 1991:1).

The HfF was a slave residence situated close to the Mansion House Farm and was apparently constructed to house most of the slaves working at the farm and residence (Figure 5.1). The quarters appear on a 1787 map of the plantation. Archival evidence suggests the building was of wood frame construction, built atop a brick foundation. It was a large structure, two stories high, six bays in length with chimneys found along each gable (see Figure 5.2 for a depiction of the building while in use) (Pogue, 2003: Background, June 2, 2007). The quarters are referenced in George Washington's notes as early as 1761. Based upon archival sources it is believed that the residence was constructed around 1760 and was abandoned as a residence by 1793. It was demolished around the fall of 1792 or winter of 1793 (Pogue, 2003: Background. June 2, 2007).

The excavation of the HfF took place in two parts. The MVLA contracted the Virginia Research Center for Archaeology to excavate the site in 1984-1985. This work was completed as part of a testing phase during a comprehensive survey of the estates cultural resources. This work was finished by the MVLA Archaeology Department in 1989-1990 and was reported on by Pogue (1991). The only surviving portion of the structure is a small brick-lined cellar remnant (Figure 5.3). The cellar was intruded by the modern construction of a boiler room and related utility and service lines. As a result, only a six foot square portion survived at approximately 4 feet deep. Three walls form the surviving section. This area was first excavated in 1984 by bisecting the feature, removing the north portion of fills up to a 1 foot baulk against the south wall (Pogue, 1991:10). The cellar was subsequently backfilled and capped with brick paving stones. The remaining south portion was the subject of excavation in 1989 following removal of the backfill and expansion of the excavation area up to the south wall.

The excavation by two separate organisations leads to some difficulties with aligning methodologies between the two. The 1984 material was identified by deposit as operation 40 and the 1989 material was identified as 47. The finds removed in1984 were screened through1/4 inch mesh and were organised by their deposit assemblage. The 1989 excavation allowed the re-investigation of the stratigraphic sequence produced earlier. All this material was waterscreened and floated. Unfortunately a large portion of the intact baulk was lost to collapse in 1989. The associated finds were organised under the designation 47DELTA and processed by flotation (Pogue, 2003:Background, June 2, 2007). The remaining section was found to have significantly more distinct deposits than first recognised. Specifically, five deposits found in 1984 were found to be 16 separate deposits (Pogue, 1991:10). The two drawn sections show the differences between the stratigraphic sequences (Figure 5.4). This separation makes spatial comparisons between the two operations difficult as well as affecting the arrangement of the stratigraphic matrix.

The finds recovered from the HfF were used to construct a depositional history. Four phases of deposition were defined by the seriation of the artefact assemblage. This was based upon the 1984 data set as there were insufficient finds within the 1989 assemblage to do anything more than inform the first seriation. The relative dates suggested by the seriation are not definitive due to the *terminus post quem* dating (deposits are only dated to after a set date), as well as the high likelihood of time lag in deposition. This is based upon the interpretation that the material used in the HfF were most likely handed down from the main house following removal due to changing styles, periodic replacement, etc. This lag between the initial purchase and use in the main house, and the later use and deposition in the HfF could affect the dating phases. Despite these known problems the excavators defined the following phases: Phase I post-1759, Phase II probably post 1769, Phase III post-1769, Phase IV post-1779 (Pogue, 2003:11).

5.3 Data Construction

Construction of the Sequence -

The method of analysis to be applied to the HfF data, as outlined in Chapter 4, begins with the establishment of the stratigraphic sequence. With the establishment of the set sequence of deposits all the related data can be organised and analyzed towards the Level 1 research ends. The nature of the excavation history at the HfF, taking place in two separate excavations, is such that the construction of the sequence is more difficult than was first thought. The chain of interrelating deposits within the HfF forms a unilinear sequence. Ideally, this is the desired result of stratigraphic excavation. However, the task of integrating the two excavated sequences is a challenge due to the aforementioned splitting of multiple deposits. The excavators of the HfF resolved some of these problems by assigning the deposits to separate stratigraphic groups, effectively lumping like deposits. These groups were organized within the four phases of depositional history. Following the stratigraphic matrix provided by the excavators, which was separated by stratigraphic group, a redrawn matrix (Figure 5.5) and subsequent stratigraphic sequence, was developed. This sequence, presented in Tables 5.1 to 5.10, will serve as the basis for organising all the subsequent data. Additionally, a table presenting the different stratigraphic groups and their constituent deposits is provided (Table 5.23).

Deposit Definition –

The process of defining deposits was previously outlined in section 4.3. That section presented the process by which two categories of analysis will be defined for each site. That is Physical Deposit Type and Interpreted Deposit Type. By examining the soil description provided by the excavators and their subsequent interpretations of the form of the deposits, an investigation of these two analytical levels will be possible. It is an important aspect of this research to examine the complexity and consistency of our ability to move between these different levels of analysis.

The soil descriptions that accompanied each deposit were given in the format of colour and percentage of each main soil component, with inclusion elements described using key words "occasional" and "frequent", modified by "very" when deemed applicable. These descriptions were organised into summary lists of component parts listed from most prevalent part to least. From this list a further summary grouping was possible based upon the major common elements of each deposit. Each unit was treated first by its majority composition, that is the greatest soil type present, and secondly by the common inclusion types. In the case of the House for Families a list of five physical description types could be generated:

Ash based - charcoal/slag/brick inclusions
Silty loam based - carbon/charcoal/brick/mortar inclusions
Clayey loam based - charcoal/brick inclusions
Carbon/organic based - coal/brick inclusions
Clay based - cinder/slag/brick inclusions

These description categories are provided in Tables 5.1 to 5.10 ordered by the stratigraphic sequence.

The construction of the Interpreted Deposit Type categories follows a similar method, using the interpretations provided by the excavators. As with the physical descriptions above, a variety of interpreted types will be established.

Also, as with the physical descriptions, the interpreted types can be reduced into like category groupings based upon common functional histories of each stratigraphic unit. A variety of interpreted types were found at the HfF. These ranged from occupational related deposits to ash and rubble fill to modern disturbance related fills associated with the installation of gas and hot water services. Based upon the interpreted function associated with each deposit a list of five categories was constructed, drawing together like interpreted functional groups. Each deposit is then classed under one of the interpreted categories. These interpretations were reduced into the following list:

Capping waste deposit
Displaced waste deposit
Destruction related deposit
Intrusionary fill deposit
Occupational waste deposit

These interpretive categories were supported by the excavators in various ways. The Capping waste deposit category was interpreted as such due to the clean clay content and its very compact nature with a decrease in artefact density (Pogue, 2003:Contect Query 3, January 3, 2007). The Displaced waste deposit category was interpreted based upon the apparent similarities to material from the nearby North Grove blacksmith's shop. The inclusion of coal, slag, ash, iron waste as well as the small, fragmentary and heavily worn nature of the domestic finds suggested to the excavators a "secondary deposition" (Pogue, 1991: 8). The Destruction Waste deposit category was interpreted based upon the inclusion of brick, mortar rubble, nails, and plaster; resulting in the conclusion that these deposits appeared "to derive from the destruction of the building" (Pogue, 1991: 8). The Intrusionary fill deposit category was assigned as deposits were identified relating to the repeated modern disturbance for construction of a boiler room and other modern service lines (Pogue, 1991: 3). The Occupational waste deposit was determined based upon their discrete nature, interpreted during the occupation of the structure above. The intact nature of finds, including whole fish bones led the excavators to define these deposits as primary deposition (Pogue, 1991: 8). The description categories are also provided in Tables 5.1 to 5.10, in conjunction with the physical deposit types, ordered by the stratigraphic sequence.

Status Sequence Graph-

As described in section 4.4 the Status Sequence Graph will serve as a main statistical tool towards building a more complete description of the nature of context. This tool utilizes the definitions of deposit status presented earlier for the purposes of viewing a whole site sequence assemblage as a changing and evolving spectrum of status. The aim of this tool is to organize all finds within an artefact class by their individual contexts according to their assigned status type. This is used to create a bar graph of each relative frequency of status types, indicating the trends of deposit type change.

To create a consistent method of constructing the status graph, a Seriation Diagram is constructed to order the ceramic types against the known stratigraphic sequence. At the HfF the ceramic assemblage is organised by type according to those defined in the calculation of mean ceramic date (MCD). Calculating MCD for interpretive needs is a common practice in North American archaeology as this provides a good quick estimation of an assemblages chronological position (South, 1977). At the HfF the mean ceramic date types are organised following the DAACS methods (DAACS, 2004:About the Database, MDC-Type List, June 2, 2007). These date types are based upon manufacturing spans narrowed by decorative technique and applied colours. The exact dates followed are those set down in Miller *et. al.* (2000) based upon extensive archival research. Specifically, 22 ware types were present at the HfF and used in the construction of the seriation. They are ordered based upon the median date of the MCD date range (Table 5.24).

The seriation diagram is constructed by compiling data on the quantity of ceramic materials (vessel numbers) and is organised by ordering pottery types along the x-axis and contexts along the y-axis. For the purposes of this research some of the design elements of the seriation diagram will differ from those created by Carver (as presented in section 4.4). The main difference is found in the presentation of quantities. The example seen in Carver's review of the diagram (1985) used pictorial representations of sherd quantities, grouped by ranges of the quantities of sherds (ex. 2-5 sherds, 6-20 sherds, etc.). The approach here will be to use estimated vessel numbers, presenting the numbers in the display rather than a range. Another minor difference is the method of indicating the line of fade points. The purpose of the seriation diagram is to serve as a tool to divide the entire site assemblage by temporal placement utilizing the diagrams' ability to demonstrate fade points in the sequence. The fade points, or peaks in quantities of material arriving at a site, are the barriers between material that is associated temporally and those that are residual in nature. In the seriation diagram a shaded line represents the fade point range (Table 5.25).

Following the method outlined in section 4.4, the next stage of the process is dividing the assemblage, now in two groups, into individual groups. One easily made observation of the seriation graph is that a relatively small group of material lies above the fade points, which is residual in nature and thus part of the CDF group. This may be expected from an assemblage deposited over a relatively short period of time (1760-1793). The much larger group of ceramics, located below the fade point line, is part of the Type ABE group. Figure 5.6 outlines the basic process that is followed to divide the remaining assemblages. This begins by examining the functional/spatial aspect of the finds. The ceramic types used in the seriation diagram are compared to deposit function descriptions to determine the spatial relationship between an intended function of an item and its proximity to areas with an intended function. For example, in this case the HfF is interpreted as primarily living quarters and all ware types and vessel forms from deposits related to that occupation were examined with an expected functional connection to a living area. All ceramic types found not to correspond spatially to the parent deposit are Type BE; all remaining types aligned with the function were classed Type A. The remaining group of Type BE finds require another filtering process in order to identify the role of the spatial relationship that separate these two types. Type B finds are spatially disconnected, while Type E finds are broadly spatially connected. By a close review of the spatial relationship between the interpreted context location and its function the two types were separated.

Following Figure 5.6, next the Type CDF group of finds was examined for its spatial aspect. As before, ceramic types are compared to deposit function descriptions to determine finds that were not utilized locally. This will, in the first instance, separate Type C finds from the DF group. Type C finds are locally utilized, whereas Type D and Type F are unrelated spatially. The remaining group was closely re-examined for evidence supporting a Type D or F designation based upon the determination of function. Type F finds are functionally related while Type D finds are functionally unrelated. This process resulted in a finished group of finds, which are separated by status type according to context. This list is reduced into the status sequence graph presentation in Figure 5.8. The result is a detailed outline of the development of the site assemblage as each phase of deposition occurred.

Ceramic measures of site formation history-

As outlined in section 4.5, ceramic finds are used in this study to reflect the formation history of the whole site assemblage. Basic quantification and derived measures are used to compile a statistical representation of the formation history of the deposits that finds originated from. The measures described in section 4.5 were made for the assemblage from the HfF. The results and any associated peculiarities of the measures and/or source data are presented below.

The sherd count, sherd weight and EVEs were organized by stratigraphic unit using the quantities supplied by the DAACS database for the HfF (Tables 5.1 and 5.2) (Pogue, 2003: Artifact Query 4, February 12, 2007). Sherd counts and weights were directly taken from the DAACS database, whereas EVEs were calculated from the rim and other sherd measurements provided by the ceramic analysts. The Evreps were calculated using the aforementioned ceramic database, in many cases the format of this database made the estimation of individual vessels difficult. In the case of the HfF case study sherds are assumed to belong to the same vessel unless they can be shown to belong to different ones, resulting in a minimum vessel count (see Orton, 1989:94). In cases where the sherd weight was less than 0.10 gm the weight was recorded as 0. All measurements were taken following the DAACS Cataloguing Manual for ceramics, available via the DAACS website (Pogue, 2003: DAACS Cataloging Manual, February 15, 2007). Rim EVEs were only calculable for certain stratigraphic units as the assemblage as a whole contained a general paucity of rim sherds. The derived measures of Mean Sherd Weight, Average Sherds per Vessel, Completeness, Brokenness, and

Units per Volume were all constructed following the methods outlined in section 4.5 (Tables 5.2 and 5.3).

The remaining ceramic measures used in the analysis of the HfF are the Percentage Burnt and the Status Sequence Graph Frequencies. The measure of Percentage Burnt (Table 5.4) was possible with the HfF assemblage as observations of burning were made for each ceramic entry in the database (Pogue, 2003: Artifact Query 4, February 15, 2007). The scores attributed for the Farthest Migrant Matrix were also ordered by stratigraphic unit and used in the analysis of the HfF. The method of deriving a FMM score was previously presented in section 4.5. Finally, the status type frequencies generated in order to complete the Status Sequence Graph (Tables 5.4 to 5.6) are, for the purposes of this analysis, organised into columns according to the sequence list of stratigraphic unit's. The complete list of status type frequencies are presented in Appendix 1.

Faunal measures of site formation history-

As with the ceramic measures, faunal material was used at the HfF to elucidate the formation history of the site. As above, the measures used are both basic counts and more involved derived measures. All measures were constructed following the methods presented in section 4.6. At the HfF faunal data was compiled from both cow and pig bones. Sheep bones were not used in the analysis due to the low number of finds across the entire assemblage.

The NISP and MNI counts were the basic quantification measures of the assemblage. The NISP data was taken from the faunal object counts supplied by the DAACS database (Pogue, 2003: Faunal Artifact Query 2A, February 15, 2007). The MNI counts were calculated using the database information on bone elements and bone symmetry which provided an understanding of the type of bone and side. These figures were combined to determine the first derived measure of NISP:MNI ratio. The quantities of Percentage Whole were calculated using information provided on complete or incomplete bones. The Teeth:Mandible and Percentage Small measures were calculated using the data on bone elements. The complete lists of these measures for both cow and pig are provided in Tables 5.7 to 5.10.

Quantification and Seriation Levels 1 to 3-

The data presented above was calculated following those methods outlined in Chapter 4. Additionally, these data are organised following the Level 1 seriation method presented in section 4.6. This level is based upon the stratigraphic sequence in an ordered set that includes all the individual stratigraphic units in the sequence. The data in Level 1, without any grouping of stratigraphic units, is evaluated for rank order agreement between each category. The findings of this analysis will be presented in the following section (5.4).

Once Level 1 is completed, the assemblage data can be organised into Level 2 order. This is done by grouping the stratigraphic sequence into the excavators' phasing or other form of higher order interpretive level. At the HfF the Level 2 grouping was based upon the eight Stratigraphic Groups defined by the excavators (Tables 5.11 to 5.19). Once organised in order from latest to earliest group the Level 2 group appears as follows.

Stratigraphic Unit
Modern
SG08
SG07
SG06
SG05
SG04
SG03
SG02
SG01

The individual statistical measures used in Level 1 are combined for each stratigraphic unit within the group to form the output used in analysis. For example, Mean Sherd Weight is calculated by adding all the ceramic totals within the group and dividing by the new combined weight of the ceramics within the group. The combined totals are made for both the ceramic and faunal collection for calculation of the associated correlations.

Level 3 is based upon the removal of all known residual material within the assemblage before calculation of each statistical measure. This was performed with the HfF dataset by removing all finds that were above the fade points (Table

5.26). The establishment of the fade point line, while informed solely by the data provided, is to some degree a subjective exercise. Two different excavators may not draw the exact same line, however, this is a necessary task and part of the interpretive process. All finds in this level of analysis should be regarded as being assigned residual, rather than a statement of fact. As it is impossible to determine which faunal finds belong with this group no changes were made to the faunal dataset for this level. Rank order correlations were thus made only for the recalculated ceramic measures. No status type frequencies were used in the calculation of Level 3. Due to the removal of residual finds at this level of analysis three types would be eliminated (Types CDF), whereas three would remain unchanged, rendering these calculations meaningless. The following section will detail the process of analysis for correlating these three levels of seriation and the subsequent findings.

5.4 Analysis

As discussed above, the analysis of the HfF begins with examining the relationship between each measure and the parent stratigraphic sequence. This will be determined by a statistical evaluation. This was performed on the basis of ranking and correlation within both the sets of ceramic and faunal data as well as across the sets. The rank order correlation of the Level 1 dataset was the preliminary focus of the analysis. The full data are presented in Appendix 1 Tables 5.1 to 5.10, listing each measure and the associated ranks ordered following the stratigraphic sequence. The ranking process was performed following the procedure for Spearman's Rank Correlation. That is, where common ties occur, rank is assigned by the mean of the tied ranks. Rank order is always presented ascending from most intact or undisturbed to most broken or disturbed.

Spearman's rank order analysis was calculated using the online Wessa.net free statistics software package (Wessa, 2007). This tool computes the rank correlation coefficient for two data series. Some series that were compared featured a full list of entries as data was available for every stratigraphic unit within the sequence (ex. Mean Sherd Weight vs Average Sherd Weight). Other data series had fewer entries due to a lack of available data for every stratigraphic unit (ex. Mean Sherd Weight vs Completeness). In some cases this resulted in a correlation output with a lower probability than desired as the small number of 'samples' resulted in a low probability once a t-test was performed. All the correlation analysis is presented in Appendix 3 within the worksheets entitled "HfF".

Level 1 -

The completed ceramic correlation results were organised with the aim to identify trends within the dataset. They are presented in Appendix 3 worksheet "HfF Sum", coordinated by positive and negative correlations. Positive correlations are highlighted blue, whereas negative are highlighted purple. All correlations that fall within the upper third of the range are outlined, indicating specifically positive or negative relationships.

Several interesting correlations are visible within the House for Families group. There is a strong correlation between Completeness and Brokenness ($r_s = 0.97$, $p = 0.05$). This is expected based upon the close relationship between these two measures. Additionally both Completeness and Brokenness demonstrate a strong positive correlation with Type E status ceramics (respectively $r_s = 0.71$, $p = 0.13$ and $r_s = 0.89$, $p = 0.07$). Both measures also demonstrate a strong negative correlation with Type B status ceramics (respectively $r_s = -0.71$, $p = 0.36$ and $r_s = -0.67$, $p = 0.31$). However, the relationship with Type B is less significant with 64% and 69% confidence respectively. Additionally, brokenness demonstrated strong relationships with Type C and Type F ceramics. Type C a positive correlation ($r_s = 0.71$, $p = 0.61$) and Type F a negative one ($r_s = -0.71$, $p = 0.61$). However, these are both not given much regard due to the very low confidence levels for both.

Following the same format as with the ceramic analysis, the faunal correlation coefficients are presented in Table 5.13. The dominant characteristic of the faunal measures is a generally negative correlation between each. Only Teeth:Mandible vs Percentage Small demonstrated a positive correlation for the cow bones (r_s = 0.56, p = 0.24). For the pig sample the only positive correlation was between NISP:MNI vs Percentage Whole (r_s = 0.37, p = 0.12). Several measures demonstrated a strong negative correlation, namely Percentage Whole (Cow) vs Teeth:Mandible (Cow) (r_s = -0.89, p = 0.08) and Percentage Whole (Pig) vs Percentage Small (Pig) (r_s = -0.88, p = 0.004). This relationship is explained by the opposing nature of each measure. Percentage Small presents a ratio of carpals, tarsals, sesamoids and phalanges to the rest of the assemblage. These types of small, dense bones naturally tend towards remaining intact as compared to, for example, rib bones, which are easily shattered. As such, this measure is interpreted as increasing as the assemblage becomes more disturbed. The Percentage Whole measure is interpreted as decreasing as the assemblage becomes more disturbed, representing an assemblage that is being broken and shattered via formation processes. Therefore, there exists the chance that as Percentage Whole increases, Percentage Small will decrease, creating a mutually exclusive relationship. The remaining negative relationships are peculiar however, given the expectation that all reflect similar formation processes.

The calculation of the Level 1 extra-set correlations provided a comparison of the ceramic and faunal measures. These correlations were predominately positive with only 39% of the relationships negative. NISP:MNI (Cow) demonstrated a generally strong correlation to the ceramic measures, the strongest correlation with Completeness (r_s = 0.62, p = 0.20). Additionally, Percentage Whole (Pig) and Teeth:Mandible (Pig) both demonstrated strong trends towards positive correlation with the ceramic measures. The strongest correlation was between Units Per Volume and Percentage Small (Cow) (r_s = 0.89, p = 0.11). This indicates that as density of ceramics increased within a stratigraphic unit, so did the number of small cow bones.

Several notable negative relationships are demonstrated within the extra-set analysis. Mean Sherd Weight vs Teeth:Mandible (Cow) is a strong negative relationship (r_s = -0.82, p = 0.10) as is FMM score vs Percentage Small (Cow) (r_s = -0.87, p = 0.37). The FMM score category generally correlates negatively with the faunal measures, only demonstrating a notable positive correlation with

Percentage Small (Pig) ($r_s = 0.20$, $p = 0.49$), however this relationship suffers from a high probability of potential sample bias.

The next stage in the analysis of Level 1 HfF is an investigation of the correlations between the material types and the deposit related information. There are two levels which separate the deposit definitions: first is the basic soil descriptions (silt, sand, clay, plus inclusions), and secondly, higher order ones (dump, fill, occupation deposit). Looking at these two levels for the HfF assemblage some interesting relationships appear. Generally there is little common agreement between the interpreted designations and the physical descriptions (See Figure 5.7). Only the Intrusionary Fill Deposit category has common physical descriptions. Based upon the derived categories for the HfF, there seems to be little reason to link specific physical deposit types with a particular interpreted function.

The relationships between interpreted deposit types and the ceramic measures are varied. The Intrusionary Fill Deposit category demonstrates many common correlations with the ceramic measures. The only deviation with this category lies in the Mean Sherd Weight measure with two ranks of 9 and 19.5 respectively (Table 5.1). The remaining statistical measures demonstrate a close agreement between the ranks of the two stratigraphic units within the category. This ceramic signature is one of relatively small in size, low density finds of Type C status. No faunal finds exist in this category to correlate with this signature.

The Destruction Related Deposit category demonstrates far less correlation amongst the ceramic measures. However, a general signature can be distilled from the data. The ceramics within this category are relatively large in size, primarily intact, from a lower density deposit, unburnt and of a primarily Type E status. The cow and pig bone assemblages reflects this signature of a largely intact assemblage. The Displaced Waste deposit has a distinctive ceramic signature, demonstrating a pattern of small size, relatively broken finds, subjected to a higher occurrence of burning. The Displaced Waste deposits are mainly Types B and D status ceramics. The faunal assemblage indicates a slightly more intact collection; however, the bones recovered are mainly small, corresponding with the small size of ceramic finds.

The interpretive deposit category of Capping Waste Deposit represents a singular stratigraphic unit. This deposit's assemblage, designated a Type B status, demonstrates a consistent signature. The ceramic assemblage ranked low in most categories indicating a generally broken, small and incomplete yet unaffected by burning assemblage. The faunal remains are equally disturbed, composed primarily of small, complete bones. It is more difficult to determine a definitive signature for the Occupational Waste Deposit category, perhaps in part due to the large number of stratigraphic unit's within this category. Comprising two thirds of the entire sequence, this category contains a full spectrum of rankings for each statistical measure. This interpreted category is comprised mainly of Type A status ceramics. At this level of analysis it seems impossible to distil a single distinct signature representative of this entire category of interpreted deposit type. This may be possible at the next level with a combined group of stratigraphic units. Alternatively, this may not be possible, which would suggest a problem with the interpreted category of Occupational Waste. This category may in fact be too vague and fail to encapsulate all the varying depositional practices related to these stratigraphic units. A review of the effectiveness of assigned categories will be addressed in the following section.

Level 2 –

The Level 2 analysis introduced a higher order grouping of the stratigraphic units at the HfF. The stratigraphic sequence organised into stratigraphic groups 1 through 8, as well as a grouping termed "Modern". The correlation analysis is presented in Appendix 3 and the analysis results in Tables 5.11 to 5.19. Again, several interesting correlations are noticeable, as well as interesting comparisons to the Level 1 correlations. The same strong positive relationship exists between Completeness and Brokenness ($r_s = 0.97$, $p = 0.05$) and Average Sherds Per Vessel and Completeness ($r_s = 0.87$, $p = 0.07$). A strong correlation exists between Units Per Volume and Percentage Burnt ($r_s = 0.84$, $p = 0.01$). Brokenness demonstrated a strong relationship with Type E ceramics ($r_s = 0.71$, $p = 0.13$).

Looking comparatively with the Level 1 analysis, several trends appear. The strong relationship between Completeness and Brokenness and Type E ceramics remains. However, the lumping of stratigraphic units appears to have introduced an obscuring effect upon the relationships. A focus upon the derived statistics only, excluding the status related measures, reveals that many more negative relationships exist at Level 2 than at Level 1. Generally, the Level 2 calculations involved fewer observations within the sample series (9 compared to a possible 36 at Level 1), which may have led to these results. The status frequency measures are not without some differences between Levels 1 and 2. Most noticeably, Type A ceramics demonstrate a very strong positive correlation with Average Sherds Per Vessel, Completeness, Brokenness, Units Per Volume and to a lesser degree Percentage Burnt.

The faunal correlation analysis demonstrates a continued negative correlation amongst the measures used. Whilst an additional positive correlation exists in the cow bone analysis, the measures demonstrate a general disagreement, as was the case at the first level of analysis. The most interesting comparison between Levels 1 and 2 is at the correlation of NISP:MNI to Percentage Whole for pig bones. At Level 1 this was a positive correlation, however at Level 2 this is a strong negative correlation (r_s = -0.96, p = 0.01).

The Level 2 extra-set correlations, as noted above, are primarily positive with a slight increase from Level 1 to 43% negative. The sorting of stratigraphic data at Level 2 appears to have acted to polarize the results of the analysis. A quick look at Appendix 3 (Worksheet "HfF Sum") reveals that more numbers, both positive and negative, lie within the upper third of their range (as denoted by the outlined entries). Strong positive correlations exist between NISP:MNI (Pig) and Type C ceramics (r_s = 0.81, p = 0.04). The Teeth:Mandible measure for pigs also demonstrated a number of strong positive correlations with status frequencies D and E. The most notable negative correlation at the Level 2 ceramic extra-set is between Completeness and Percentage Whole (Cow) (r_s = -.088, p = 0.04). Also, a strong negative correlation was found between Percentage Whole (Cow) and

NISP:MNI (Cow) (r_s = -0.92, p = 0.04). The faunal extra-set correlations were split evenly between positive and negative correlations.

The analysis of Level 2 HfF correlations between the material types and the deposit related information begins with an assessment of the two levels of description. The combined stratigraphic groups at Level 2 were given Physical Deposit Type categories drawn from those used at Level 1. Their designation was made following the group descriptions provided by the excavators. For example, Stratigraphic Group 1 was described by the excavators as "Grayish-brown ash with charcoal flecks and brick bits" (Table 5.23), this led to the designation "Ash based - charcoal/slag/brick inclusions" from the list of Physical Deposit Types. The Interpreted Deposit Type designations were made based upon the main interpretation used in relation to the stratigraphic units within that stratigraphic group. The full list of designations is provided in Appendix 1. As noted at Level 1, little clear relation between both deposit categories exists. The "ash based" physical description category is the most predominant physical description but is not associated with a singular functional interpretation. The Occupational Waste Deposit category is exclusively associated with the "ash based" category; similarly the Intrusionary Fill Deposit is exclusively a "clay based" group.

Correlations between the Level 2 deposit and assemblage data provides interesting comparisons with the Level 1 observations. The Intrusionary Fill Deposit category, as noted above, has a strong common signature based upon the ceramic measures. The deposit signature presents an assemblage of relatively small size, with low density finds of Type C status. The Destruction Related Deposit category has a ceramic signature of relatively large size, primarily intact, from a lower density deposit, unburnt and of a primarily Type E status. The combination of stratigraphic units into a collective group appears to have strengthened the signature observed at Level 1. The faunal assemblage again reflects an undisturbed, largely intact collection.

The Displaced Waste deposit has a ceramic signature of relatively small size, broken finds, and mainly Types B status. The high frequency of burning noted at Level 1 is confined to stratigraphic group 6, interestingly the most disturbed of the two groups. The faunal assemblage shares the same disturbed nature as the ceramic, it is statistically more disturbed than noticed at Level 1, and again composed of mainly smaller bones. As cited above, the deposit category "Capping Waste Deposit" represents a singular stratigraphic unit and therefore, no changes occur between Levels 1 and 2. The Occupational Waste Deposit category remains difficult to classify into a singular signature. The category is primarily associated with Type A status ceramics. The ceramics are mainly intact and demonstrate an undisturbed signature relative to other deposit types, only surpassed by the Destruction Related Deposit in such categories as Completeness and Brokenness. This category is more generally the most dense with ceramic remains and least exposed to burning, in addition to having moved the least amount vertically (FMM score). The faunal remains are generally more disturbed. The NISP:MNI ratios are generally lower in rank, as is the Percentage Small (Cow) ranking. The Percentage Whole measures consistently ranked higher in the Occupational Waste Deposit category, perhaps as an indication of the disposal of waste in a Type A status manner.

Level 3 –

Level 3 analysis introduced an additional filtering process to the dataset. This involves the identification and removal of all residual material before the calculations and correlations are completed. This will be performed with the use of the Carver Seriation diagram to inform which aspects of each stratigraphic unit assemblage are residual. All material outside the fade points of the seriation curve are removed from the assemblage before any calculations are completed. The aim is to compare Level 1 and 2 to determine the biasing effects of residual finds. The correlation analysis is presented in Appendix 3 with the corresponding analysis results in Tables 5.20 to 5.22. The faunal assemblage is omitted as there is no clear means of separating residual bone material from the same stratigraphic unit assemblage. The status related frequency measures are also omitted because as residual finds are removed, Types CDF are excluded and Types ABE remain the same as at Level 1.

The initial comparison to Level 1 intra-set analysis reveals an interesting lack of change despite the removal of residual finds. Most correlations are unchanged or reinforced as slightly stronger than first observed. For example, Mean Sherd Weight vs Units Per Volume increased from a correlation of $r_s = 0.48$, $p = 0.04$ to a correlation of $r_s = 0.64$, $p = 0.01$. At Level 2 the most noticeable differences lie in the relationship between Average Sherds Per Vessel and Completeness/Brokenness. At Level 3 these are positive relationships whereas at Level 2 they are negative.

The Level 3 extra-set correlations continue the similar trend noted above between Levels 1 and 3. The correlations are mainly unchanged between these two sets. The general trend differs from Level 2 in that polarised results are not found and very few strong correlations are noted. Based upon these results it appears that the residual element within the whole site assemblage does little to bias the overall nature of the finds. However, some differences are identifiable. Specific signatures of unaffected deposit categories are noted. The Destruction Related Deposit category ceramic signature is much less intact, is of mixed size and suffers from more exposure to burning than the Level 1 signature. This signature demonstrates an increase in statistically observed disturbance with the removal of residual material. The Displaced Waste deposit ceramic signature is relatively small in size with broken finds, generally the same signature noted at Level 1. In all, the effects of residual finds are less than at first expected. This may be in part due to the relatively low residuality at the HfF. The site was occupied over a short period of time with little disturbance compared to, for example, most urban deposits. As additional case studies are processed the effects of Level 3 analysis will be interesting to compare to the HfF.

5.5 Review and Summary of Trends

In the previous section of analysis, as the results were produced and presented, some important and interesting relationships became apparent. These results are the focus of the following review and reinterpretation. The results of our ability to define different deposit types and move between them, our ability to quantify assemblage data, and our ability to correlate differences in assemblage signatures and deposit classifications is the ultimate aim of this research. As such, the following will discuss the quantification and deposit data in a *Review of the Levels of Analysis*, and then examine the *Key Relationships and Signatures,* relating these to identifiable functions or activities.

A *Review of the Levels of Analysis* begins with quantification methods used. The ceramic intra-set correlations provided the first look at the quantification methods. Observations at each level of analysis revealed interesting results. The ceramic intra-set demonstrated a generally positive relationship amongst the separate measures. Amongst the derived measures, ignoring the status related frequencies, the relationships are generally quite strong. At Level 1 the Average Sherds Per Vessel and Percentage Burnt measures are the only ones to relate poorly with the other statistics. This is the same at Level 2, with the addition of Units Per Volume as a slightly problematic measure. At Level 3 these same trends are repeated. The results suggest that the ceramic measures selected generally relate well to each other and are accounting for the same processes. Making a clear determination of this will need to be based upon the completion of further case studies; however the initial results are promising.

The faunal measures in the intra-set analysis are much less promising than the ceramics. The correlation amongst the measures at both Levels 1 and 2 are mostly negative. The only consistent positive moving between Level 1 and 2 is between Teeth:Mandible and Percentage Small for Cow. The viability of the faunal measures is supported by the determination of specific signatures and at the extra-set levels, as common agreement with many ceramic measures is achieved.

The correlations between the deposit related information and the materials data demonstrated the difficulty in assigning specific interpretive designations to deposits. There was little common agreement or trends between the two levels of deposit data; the Physical Deposit Type descriptions and the Interpreted Deposit Types. This was true at all levels of analysis. As mentioned earlier, only the Intrusionary Fill Deposit category had common physical descriptions amongst the deposits. While often mixed with coal, ash and other seemingly displaced destruction debris, the fills used in the deposition of modern services are commonly clay based. This may be a site-specific trend to Mount Vernon, but is an interesting trend for consideration of any other work in the area. This may also be an interesting reflection of modern work habits compared to historic activity and will be looked out for in future case studies that deal with modern truncation deposits.

The identification of *Key Relationships and Signatures* at all levels of analysis was an important part of the analysis section. Identifying signatures, how they change between levels and ultimately, how they relate to function is an important step in this research. The Capping Waste Deposit category, as discussed above, was represented by only one deposit, which restricts the ability to make comparisons. However, a clear signature is presented by this category. The category ranked low in most ceramic measures, indicating a small and broken up assemblage of pottery. This assemblage was not subject to much burning, and was entirely of Type B status. The faunal assemblage reflected the same signature. Consistently ranking low in NISP:MNI and other measures, indicating a small, fractured assemblage of bone. Interpretively, this signature would appear to support the applied designation. Being uniformly disturbed, it stands to reason that this deposit type was brought in from another location during the period of occupation, in order to serve a function other than that reflecting the daily residue of living within the household.

The Displaced Waste Deposit category Level 1 signature is one of ceramics that are small in size, broken and highly burnt, bone finds that are less broken but small in size, and finds of primarily Types B and D. This signature does not change very dramatically at other Levels. Ceramic material remains small and highly fractured with Type B status, the faunal material is not demonstrated to be much fractured, but is generally comprised of small bones. The interpretation of this category is logically supported by the statistical findings. The fractured ceramics and small bones would support a determination of material that has been displaced from other waste deposit locations. Specifically the faunal material, with its small size but not small NISP:MNI ratios, suggests a displacement activity rather than a deposition of material in its first location, that was later subject to stamping or other activities to break up the assemblage.

The Destruction Waste Deposit category Level 1 signature reflects a ceramic collection that is somewhat large in size, intact, from low density deposits, unburnt and of Type E and C status. The bone remains are relatively intact and mostly whole. At Level 2 the ceramic signature is strongly reinforced with large size and low density deposition. The combination of stratigraphic unit's results in strengthening results that may have been more dispersed at the individual stratigraphic unit. The Level 3 findings are largely unchanged from those at Level 1. Interpretively these results suggest a particular form of destruction related activity. Rather than smashed and mixed up material, these finds are large and intact enough to suggest deposition of whole waste into the destroyed and disused building foundation, which are subsequently mixed with structural debris.

The Intrusionary Fill Deposit category signature is consistent between levels of analysis. Consisting only of ceramic material, they are small, relatively broken, from low density deposits and of Type C status. These findings fit the interpretation, suggesting that displaced and well weathered material in small quantities have made their way into the redeposited fills of modern service work.

The Occupational Waste Deposit category, as cited above, was difficult to distil distinct signatures for. At Level 2 the signature was defined as mainly intact ceramics, from dense deposits with low FMM scores, and with disturbed faunal remains of whole bones. As discussed in the previous section, the difficulty in determining a distinct signature (more so at Level 1than at Level 2) may be due to the interpretive designation rather than the size of the assemblage components. The vagueness of the designation, placed upon deposits that are representative of more activities than Occupational Waste, may be the root of the problem. The nature of the HfF would suggest a single signature result. Due to the short time span of occupation, single function structure, and shared history of formation processes, one would assume the result to be a single uniform signature. This not being the case suggests that the interpretive category fails to take into account the different functional activities behind separate multiple discrete episodes within the occupational fills (Pogue, 1991: 8). More exacting interpretive designations are necessary if they are to allow us to determine what kinds of deposits and activities produce what types of assemblages or for targeting of assemblages in research agendas. Further case studies will hopefully elicit trends that can be used to better pull apart the Occupational Waste deposits at the HfF.

5.6 Conclusions

In summarising the first case study of this research process several factors need to be examined. The performance of the statistical measures in assessing formation history and sketching a deposit signature was varied. In general the ceramic measures were quite successful. The faunal measures were less convincing in agreement with each other, but provided a useful corollary with the ceramics. A final judgment on the abilities of the faunal measures will have to be assessed following the completion of additional case studies. Certain measures may become less useful following further analysis. The Farthest Migrant Matrix scoring was a less reliable measure than at first expected and, may be used less in further analysis. This may especially be the case if mends analysis is not part of the processing of ceramics from the following case studies. Most ceramicists do not commonly complete this form of analysis. With future case study analysis more consistent methods of recording, quantifying and analysing deposits and assemblages will be achieved. The potential of use for commercial contexts is high, in order to ensure that existing investment is fully exploited.

The investigation of each level of analysis proved interesting. The first and second levels compared well with each other. It appeared as though the organisation of the stratigraphic units into higher order groups resulted in extreme relationships between measures. The stratigraphic groups became defined by the outliers within the group rather than becoming averaged by the grouping. At this first investigation it appears as though the grouping of stratigraphic units is not harmful for analysis and developing the site picture. The third level of analysis had little real effect on the results first observed at Level 1. These sorts of assumptions will be necessarily tested against later case studies with greater numbers of assessed residual finds.

Looking now to other additions or reinterpretations building on the work of the excavators, different options are open. The reinterpretation will begin by returning to the status sequence graph produced above (Table 5.27). Using this graph as a guide, a different way of grouping and organising the HfF site data is possible. Rather than using the seriation based stratigraphic groups for organising the excavated data, more intuitive divisions are possible with the status sequence graph. This organisation provides an order that is more representational of the nature of the deposits. For example, stratigraphic unit 40U was originally grouped within stratigraphic group 8. This deposit is interpreted as representing the destruction episode of the HfF (1792-1793). The resulting status type that this deposit has separates it from its surrounding stratigraphic units. This potentially important destruction level deposit is recognised by the status sequence graph based grouping as an independent event, where it would have been otherwise obscured by the chronological grouping. This serves as a good example of the interpretive and sampling potential that a status based grouping of stratigraphic (and subsequent material) data provides. Using the status sequence graph to interpret site data not only results in new or different stories about the history of a site but, perhaps more importantly, the methodology provided the tool for future means of retelling the stories of sites.

This case study of the HfF has provided a different means of viewing the site data. Perhaps most of all this is found with regard to the approach or theme of the interpretation. The excavators took a specific approach to the excavation of the HfF. Beginning with the historical record, and the foundation of the knowledge of the structure as a house for slave populations, the investigation focused upon the diet of the slave inhabitants and their material wealth. Based upon earlier assumptions about the austerity of slave lifestyles the excavators were surprised to find a rich assemblage of faunal remains and ceramic material. The examination of the site record was based first upon historical records and second upon the whole site assemblage. This outward-in, perhaps particularistic and culture historically driven, approach is not uncommon. The above examination of the

HfF presents an opposing theme or approach. This is inward-out. By beginning with the finds data, viewed at the most basic discrete levels and building them together, a different picture of the site can be assembled.

This picture unfolds as follows. Occupation of the structure was represented by a complex series of deposits representational of different use and disposal activities. These deposits at one point were purposely capped by material containing finds dating to that time and place, but from an unrelated location. This indicates a distinct effort to cover the material within the structure's cellar, perhaps for hygienic reasons. Following the primary life use of the structure the cellar was used for the disposal of waste imported from other areas. This material included well broken and burnt ceramics with intact but small bone remains and was mixed between presently used material and those from earlier periods. These displaced deposits were later covered by material from the destruction of the structure. These deposits were used by the occupants as a place to dispose of small amounts of large, intact and unharmed ceramics and whole pieces of bone, both from that period and some material from earlier periods of use on the site. Later, modern activities left behind a few traces of small, broken ceramics mostly from earlier periods of use on the site. This initial picture of the HfF will become more elaborate as the research methodology is refined through further application.

The completion of this first case study analysis has provided valuable results towards the ultimate aims of this research. Among the hopeful outcomes is the aim to find consistent relationships between descriptive/derived statistics and the classification of deposit status. This is in order to allow deposits to be modelled in such terms. The results of the HfF have provided a first step towards this outcome. As reliable and consistent signatures are developed it will be possible to use these results to identify status and function at future excavations. For example, if a particular statistic signature for Type A status materials is refined, this signature can then be looked for in assemblages where determining the specific status is difficult (identifying specific functional or chronological relationships for example may be difficult in certain circumstances). Future case studies will aim to strengthen our understanding of these signatures and to bridge the gap with results assumed to be localised.

The HfF also provided a good first step towards defining better understandings of deposit types. The potential for better use in the future is high. More specifically, the ability to define sampling strategies which target site assemblages from specified deposit types for detailed and integrated analysis has a strong potential. Future case studies will aim to build upon the foundation of the HfF by broadening the complexity of the factors that shape our understanding of deposits and assemblages. By looking at sites with greater stratigraphic complexity, and greater potential for residuality amongst the collection of finds, our understanding will be enhanced.

Chapter 6

Carlisle Millennium Project, The City Ditch (MIL 3 & 4)

6.1 Introduction

This chapter presents the results of the second case study analysis. As was presented in the first case study, the historical context of the site, the research history, the assemblages and deposits, and the analysis results will all discussed. The results of previous interpretations are also reconsidered as new narratives and patterns in the data are sought.

The Carlisle Millennium Project, The City Ditch (hereafter CMP) was chosen as a case study due to its fit into the pre-defined criteria. The first case study was chosen in part because of its short period of use, and well-stratified but not overly complex sequence. The CMP case study builds upon this initial site in interpretive potential with a step up in relative complexity. The CMP site had an extensive and well stratified sequence located within a deep ditch feature. This sequence was subject to re-cutting, disturbance and movement of soils, presenting a greater potential for residual material and an intense taphonomic history. The site was occupied and filled over a period of over four centuries. This greater length of deposition strengthens the taphonomic potential. Also, the larger finds assemblage provides for fruitful analysis potential. Overall, the CMP site offers a good opportunity to further test the analysis methodology with an interesting urban excavation. The data to follow was all provided by Oxford Archaeology North and will be among the archive holdings of the Tullie House Museum, Carlisle.

This chapter follows a similar format as in Chapter 5, in order to build up the understanding of the site, analyse the data, and present the interpretive results. Section 6.2 provides the *Site Background and Research History*, setting the context of study. Section 6.3 explains the process of *Data Construction*. Section 6.4 presents the findings of the *Analysis* of the site data. Section 6.5 presents a *Review and Reinterpretation* of the analysis results, highlighting the key findings and results as well as re-visiting the excavator's interpretations. Finally, section 6.6 summarises the above and provides some *Conclusions*.

6.2 Site Background and Research History

The CMP project began in 1996 with a proposal by Carlisle City Council for funding from the Millennium Commission for the city's Gateway City Millennium Project. Focused around the centre of the historic city, the project was approved in February 1997. The full project was a joint partnership between the Carlisle City Council, the Millennium Commission and the local business sector. The archaeological elements were driven by two specific mitigation elements.

- The Millennium Gallery – a new exhibition gallery beneath the Castle Way ring-road, incorporating a pedestrian subway giving access from Tullie House Museum south of the road to the castle on the north;
- The Castle Way (Irish Gate) footbridge, providing additional pedestrian access across the Castle Way ring-road approximately 100m west of the gallery (OA, 2004).

The history of Carlisle begins with Iron Age Brython settlements and the later local Carvettii tribe. However, the city is best known for its Roman settlement as the provincial town of Luguvalium. Roman settlement in the first century AD began with several phases of fort construction expanding into a sizeable settlement with administrative, industrial and religious construction. In later periods Carlisle continued to be of strategic importance based upon its location on the English-Scottish border, and at varying times was either the last English town before the border or the last Scottish town. Due to this importance the medieval castle was built. The first castle is commonly attributed to construction by William Rufus around 1092, the present structure dates to the 12th century. English Heritage operates the modern site. Later the town expanded to the areas of the standing walls and addition suburbs were occupied.

The excavated history of Carlisle was, until recently, relatively unknown. However, several excavations have shed light on the development of the city. Excavations at the Blackfriars street site from 1977 to 1979 revealed the Dominican Friary, and the Lanes excavations from 1978-1982 revealed medieval tenements. Other work at Rickergate 1997-1999, Castle Street 1981-1982, Annetwell Street 1973-1990 and Botchergate 1998-2001 have all added to the collective archaeological understanding of Carlisle (Figure 6.1). These sites have also informed the development of a Carlisle ceramic type series. The medieval ceramic record in Carlisle and the North-West of England has traditionally been difficult to study. Absences of secure stratigraphic sequences for comparison and a mix of local traditions combined with regional, national and international import items introduced at various points in time have all led to an insufficient understanding of the Cumbrian medieval pottery. The Carlisle ceramic sequence was greatly advanced by the excavations at Rickergate 1998-99 and again at CMP via association with dendrochronology and leather dating (OA, 2004). The waterlogged conditions at these two sites created the situation for a large assemblage of well-dated leather finds. Additionally, the excavated sequence from the Carlisle site of Blackfriars street resulted in the Carlisle type-series, which informed the fabrics organised at CMP (McCarthy, 1990).

The CMP archaeological excavation took place between November 1998 and March 2001. The CMP excavations were situated on or adjacent to the modern Castle Way in what was the northern portion of the medieval walled town. The site is directly south of the medieval castle, which sits atop a natural bluff over the flood plain of the River Eden. In total 5 excavation trenches were placed at the CMP site. Two of which were on the present day Castle Green, one was situated to the south beside the present site of the Tullie House Museum. The remaining two, the focus of this case study, were situated within the Castle Way road itself. The Castle Green, a large grassed area in front of the castle, was originally part of the greater castle complex separated from the medieval town by the City Ditch. The focus of CMP trenches MIL 3 and MIL 4 was the City Ditch (Figure 6.2). These two trenches are analysed in this case study. These were selected due to their characteristics that matched the case study aims as outlined in section 4.2. These trenches featured rubbish related fills as well as structural deposits and had a continuous sequence of Medieval deposits with a large assemblage of ceramic and faunal finds.

Trenches MIL 3 and 4 crossed the Castle Way carriageway separated by a 2.5 to 3 m baulk. The trenches were excavated in separate operations in order to facilitate continued traffic flow along the road (OA, 2004). This resulted in two separate stratigraphic sequences with some correspondence between them. The defensive ditch was several metres deep with well preserved organic remains within. The upper deposits were unfortunately disturbed as the modern construction of the road lead to the mechanical removal of up to 2 m with gravel backfilling. Within the ditch, deposits normally classed as primary fills and rubbish were found within the early phases. During later phases the building of tenement structures took place within the ditch, as the defensive necessities had passed. In this way the MIL 3 and MIL 4 trenches had a mixture of deposits that would classically be termed secondary fills, and primary occupation debris.

The excavators of the CMP site divided the post-Roman remains into three periods (defined as 7-9). The period 7 levels were dated to the early medieval period, the medieval levels were period 8, and the post-medieval levels were assigned to period 9. Subsequent analysis led to the need to divide the periods into sub-periods. Specific to the MIL 3 and 4 excavations, the period 8 contexts were divided into 8i the late 12th century (see Figure 6.3 for period 8i features), periods 8ii and 8iii the 13th to 14th centuries, and period 8iv the early 15th century.

6.3 Data Construction

Construction of the Sequence –

The stratigraphic sequence for the CMP is difficult to construct due to the excavation history of the site. The excavation of MIL 3 and 4, which took place in two separate operations, resulted in the two separate sequences. While some stratigraphic connections are observed, the organisation of the two separate sequences must be constructed based largely upon the dating of the stratigraphic units by finds. The use of ceramics and the well preserved leather remains have helped inform the dating of each stratigraphic unit. The finished sequence from the CMP site was organised based upon the site phasing, which grouped stratigraphic units from MIL 3 and MIL 4 into like periods and sub-periods. The stratigraphic matrices for MIL 3 and 4 were organised by the excavators according to the site phasing. This allowed for the final determination of the sequence for analysis. The final sequence could be subject to some minor revisions based upon the small number of stratigraphic units that could "slide" up or down (as indicated by the matrices). However, the analysis must move ahead and the final sequence is confidently accepted. All further analysis is based upon the ordered stratigraphic sequence (Tables 6.1 to 6.12).

Deposit Definition –

The two categories of deposit data, Physical Deposit Type and Interpreted Deposit Type, are defined by examining the soil description and their related interpretations. At CMP the deposit descriptions did not follow a specific regime for definition. The varied descriptions, such as dark-mid grey silt or mid-dark brown silty clay, lacked mention of the inclusionary elements. These descriptions were reduced into the following groups based upon the primary soil element. These are as follows:

Sand
Silt
Clayey Silt
Silty Clay
Clay
Stone Gravel
Red Sandstone Rubble

The Interpreted Deposit Type categories are produced following the same manner. The separate interpretations are provided by the excavators in the site archive and in some cases are informed by the CMP phase narrative discussion text. While a wide range of interpretations are provided, these can be summarised into seven basic groups as follows:

Intrusionary fill deposit
Property/Structural Preparation

Internal Layer
External Layer
Ditch Fill
Linear Feature Fills
Circular Feature Fills

These interpretive categories are based upon both the activities that took place on site as well as the nature of the features recovered archaeologically. The Intrusionary fill deposit was defined by the excavators as material from the Period 9 upper levels; contexts that were subject to modern contamination during the mechanical construction of the roadway. The Property/Structural Preparation category is stratigraphic units that are associated with the division of land and other property maintenance such as the construction of fences and buildings. Internal layers are those from within a building or structure. External layers are those outside of the structures, including those at the edges of the ditch cut. Ditch fill deposits are those deposited within the initial cut and use of the city ditch. Linear feature fills and Circular Feature fills are deposits found within the many small cut features within the original base of the city ditch (see Figure 6.3 for examples of Linear and Circular Features as well as Ditch Fills within the earliest period of CMP). The categories assigned to each stratigraphic unit are provided in Table 6.1 to 6.12.

Status Sequence Graph-

The Status Sequence Graph began with the construction of the Seriation Diagram. This was built upon the previously presented stratigraphic sequence and by using the Carlisle ceramic type series (McCarthy, 1990). Following the Carlisle type-series, there are four main fabric types identified at the CMP. These are Gritty wares (Red Gritty Ware, White/Buff Gritty Ware), Lightly Gritted wares, Partially-Reduced wares (Partially Reduced Grey Ware), and Fully Reduced wares (Late Medieval Reduced Grey Ware) (Bradley, forthcoming). The individual wares were numbered in general order of date based upon the progression from early gritty wares, to partially reduced wares, to fully reduced wares (Table 6.27). A series of wares were recognised as foreign imports and numbered beginning from 500 (Brown Glazed Oxidised Ware, Green Glazed Buff Ware, Gritty ware, Sandy Reduced Brownish-Buff Ware, Gritty Whitish-Buff

Ware). Two other wares, numbers 110 and 115, were later and Post-Medieval in origin (Post Medieval Blackware, Brown Glazed Red Earthenware).

The seriation diagram was constructed using estimated vessel number counts from the CMP ceramic record. As before with the HfF data, vessel numbers are used in the graph and the area within the fade points are highlighted by shading (Table 6.28). With the seriation graph completed the remaining steps outlined in Figure 5.6 were followed in order to define the frequencies of each status type present at CMP. The final product is the ceramic assemblage separated by status type according to context. This list produced the status sequence graph presented in Figure 6.5. The resulting detailed outline of the development of the site allows for new interpretations and grouping of the site data. The results of which will be discussed in further sections.

Ceramic measures of site formation history-

Following the methodology, basic quantification and derived measures were used to compile a statistical representation of the formation history of the deposits from the CMP. These are ultimately used to develop deposit signatures in the analysis. All measures were organised by stratigraphic unit in the established sequence. Oxford Archaeology North supplied the sherd count, sherd weight, EVEs and Evreps (Howard-Davis, forthcoming). These measures were then used to compile the derived measures of formation history (Mean Sherd Weight, Average Sherds per Vessel, Completeness and Brokenness). Observational data such as burning present and cross mends were used to formulate the Percentage Burnt and FMM score measures. The accuracy of these two measures is questionable due to the apparent inconsistency of each observational category during post excavation processing. Burning was recorded as observed soot only sporadically under the "decoration" category of the ceramic archive and cross-joins were recorded where found in the comments section of the ceramic archive. Each category is more coincidental than representative of a consistent program of study. Unfortunately full dimensions for stratigraphic units were not available in all cases such that the Units per Volume measure could not be calculated for the CMP archive.

Faunal measures of site formation history-

The faunal material was processed in the same manner as previously set out, using basic counts and derived measures. At CMP the assemblage of sheep bones, while relatively small, was determined to be large enough to warrant inclusion in the analysis joining the cow and pig bones.

The NISP and MNI counts were determined using the faunal database supplied by Oxford Archaeology North. NISP values were taken from the basic counts and the MNI values were calculated using the database counts on bone elements and side. Observed data on elements, zones present and proximal and distal portions were used to construct the Percentage Whole measure. Bone elements data from the archive allowed for the remaining measures, Teeth:Mandible and Percentage Small, to be calculated.

Quantification and Seriation Levels 1 to 3-

The Level 1 organisation of the CMP data is based upon the previously presented stratigraphic sequence. This exists free of any grouping, higher level organisation or filters. Further analysis in the following sections will take place looking at the data at Level 2, which is organised by the chronological based grouping defined by the excavators. At the CMP this was based upon the Periods and Sub-Periods mentioned in section 6.2. As in the first case study the individual statistical measures used in Level 1 are combined for each stratigraphic unit within the group at Level 2. These combined totals are used for calculation of the associated correlations at the analysis level. Ordered from latest to earliest the five groupings for Level 2 at CMP are as follows:

- Period 9
- Period 8iv
- Period 8iii
- Period 8ii
- Period 8i

Level 3 analysis is performed with a filter applied to remove any residual material within the Level 1 assemblage. This is determined via the seriation diagram

(Table 6.29) using the defined fade line. At CMP this group of material included infiltrated finds, which appeared below the fade line. This level of analysis proceeds with all the previously acknowledged possibilities of interpretive variation that may exist. The fade points defined in this analysis may be different to those assigned by another investigator. As in the first case study, faunal material is excluded from the analysis, as is the determination of status type frequencies.

6.4 Analysis

The analysis of the CMP data begins by exploring the statistical relationship between the selective measures and the sequence of stratigraphic units. Spearman's Rank Correlation analysis is used to test the veracity of the observed nature of each deposit; the deposit signature that supports the next stage of interpretation. Once again, the Spearman's rank order analysis was calculated using the online Wessa.net free statistics software package (Wessa, 2007). The sample size or number of variables tested by the procedure varied depending on the measure involved and the number of observations available for each stratigraphic unit. The resulting correlation output was therefore at times lower than desired as the small number of 'samples' resulted in a low t-test probability. Each level of analysis is presented in Tables 6.1 to 6.26, which lists each measure and the associated ranks ordered according to the stratigraphic sequence.

Level 1 –

The results of the Level 1 correlation analysis are summarised into table form in order to identify any themes or trends in the dataset. The results are presented in Appendix 3 (worksheets entitled "CMP") coordinated by positive and negative correlations. Positive correlations are highlighted blue, and negatives are highlighted purple. All correlations that fall within the upper third of the range are outlined, indicating specifically positive or negative relationships.

A strong correlation is observed between Completeness and Brokenness (r_s = 0.71, p = 0.0002). The close relationship between these two measures is recognised and expected. A similar strong correlation was observed at this level in the first case study (5.4). Brokenness and Percentage Burnt demonstrated a strong positive correlation (r_s = 1.00, p = 0.0818). What is notable about the Level 1 ceramic intra-set correlations is the general lack of strong correlations, both positive and negative. Additionally, the status related frequencies are generally negative, the Type B and D Frequencies for example register no positive correlation with any measure.

The faunal correlation coefficients indicate a similar trend towards generally weak correlations. The cow bone correlation between NISP:MNI and Percentage Small indicates one of the stronger correlations with a higher confidence level (r_s = -0.59, p = 0.0004). A number of 0.00 correlations exist among the pig and sheep bones. These are due to a low number of observations in the sample group and, as expected, are not significant. As observed in the HfF case study, a generally negative relationship exists between the Percentage Small and Percentage Whole measures. This was previously suggested to be due to the opposing nature of each measure (Percentage Whole increases, Percentage Small will decrease) (5.4). The cow bone assemblage produced the majority of positive correlations, mainly the Teeth:Mandible measure demonstrated a positive correlation with the other indices of formation history.

The Level 1 extra-set correlations compared the ceramic and faunal measures. These correlations were spread almost evenly between positives and negatives. Unfortunately a large number of the measures could not be compared, or were not statistically viable, due to the low number of samples in the group. This mainly occurred with the bone samples; the Percentage Small measure for pigs and the Teeth:Mandible ratios for sheep were the worst measures in this regard. Some strong positive correlations were observed between the pig and sheep measures. Teeth:Mandible pig vs NISP:MNI sheep (r_s = 0.87, p = 0.215) and Percentage Whole pig vs Percentage Small pig (r_s = 0.92, p = 0.06) were both strong examples. The problem of small sample size effecting the probability is again observed with the Teeth:Mandible pig vs NISP:MNI sheep correlation.

The link between the material data and the deposit related data offers some interesting insights into the deposit signatures. Beginning at the level of the deposit data there are some correlations between the interpreted designations and the physical descriptions. A summary of the frequency of each physical description category at each interpreted type reveals some common trends amongst the interpreted descriptions (see Figure 6.4). The Intrusionary Fill deposits, located only within the upper Period 9 post-medieval phase (see Tables 6.1 to 6.12), is only associated with stone gravel. This is a result of the modern roadwork in front of the Castle Green. The stone gravel was backfilled as support for the modern asphalt roadway; any materials recovered in these layers are redeposited from other areas. There are several noticeable trends within the Internal and External Layer categories. Both of these deposit types are primarily composed of silt stratigraphic units and those described as clayey silts. Both the Circular and Linear Feature Fills are almost evenly associated with clayey silt and silty clay deposits. The Property/Structural deposit types generally demonstrate no common agreement with a physical description. This is largely the same with the Ditch Fill category. This may be a reflection of the diverse nature of activity over time.

There are many observable relationships between interpreted deposit types and the ceramic measures. The External Layer deposit category demonstrates a wide range of ranks at the Mean Sherd Weight category. These ranks range from the highest to one of the lowest, the average rank settles at the second highest, indicating a relatively large average sherd. This category also ranks highly at the Sherds Per Vessel category, indicating ceramics of a generally large nature (based upon a small sample group). In contrast, the Completeness and Brokenness measures indicate low ranks. Additionally, these ceramics are not subject to much observed burning or vertical movement. These two measures are less consistent measures of transformation history due to the inconsistent manner of their recording and observation. A range of status types is observed amongst the stratigraphic contexts in this category. The trend indicates a transformation from primarily Type C ceramics to Type B ceramics. The faunal assemblage consistently trends towards low ranks across each animal type indicating a highly fragmented or disturbed assemblage. The NISP:MNI ratio in particular is ranked lowest or second lowest in each cow, sheep and pig category. This represents a notably broken or dispersed assemblage of bones.

The Internal Layer category has few examples and therefore it be difficult to get a full picture of the nature of the deposit signature. However, several aspects are clear and common agreement within many measures is observed. The ceramics tend to be quite small in size and have few sherds per vessel, suggesting a broken nature. The finds are mainly Type A with a few examples of Type C residual sherds. There are few examples of faunal material recovered in the Internal Layer stratigraphic units making the faunal signature difficult to determine. What is clear is that the stratigraphic units that contain entirely Type A status ceramics mainly contain complete and whole bones. Many small bones are found within the assemblages however, which could indicate finds pre-disposed to movement and disturbance.

The Property/Structural Preparation category suffers from a general lack of corresponding ceramic measures with which to build a signature. What is observable is that the ceramics are generally average in sherd size with very dispersed or broken up vessels. A few deposits of Type A ceramics are found, but the category contains mainly Type E ceramics. The faunal remains demonstrate a generally broken and incomplete signature with notably low Teeth:Mandible ratios. One notable outlier within the faunal assemblage is the highest average ranked NISP:MNI ratio for cow bones. The reason for this unusual find is that the generally few individual cow bone finds (two and three bones per stratigraphic unit) can only be associated to one cow in each instance. This is likely more a reflection of the small cow sample in this category rather than a true trend towards a highly broken assemblage.

The Circular Feature Fill category demonstrates a strong common agreement and deposit signature. The ceramics in this category are relatively large, and complete. The ceramics are unexposed to burning and are primarily of Type B status (except two examples of Type E status ceramics, found in a pit in the base of the ditch that is related in an unknown fashion to any function). The bones are also intact. Based upon the cow bone finds the bone assemblage is unbroken, whole and undisturbed.

The Linear Feature Fill category also demonstrated a common agreement in its deposit signature, interestingly opposite to the Circular Feature Fills. The Linear Feature Fill ceramics were generally small and of a dispersed nature, despite relatively high completeness scores. The ceramics were predominately Type B with some Type C status ceramics, representing residual finds. No vertical links to other stratigraphic units were observed. The faunal assemblage was consistently broken and composed of incomplete bones representing a generally disturbed nature.

The Ditch Fill category had the largest sample of stratigraphic units amongst the interpretive level of contextual data. As stated above, the layers identified as Ditch Fill were evenly composed of silty clays, silts and clayey silts. The large number of samples tends to obscure common agreement in some areas of the deposit signature; however certain consistent trends are identifiable. The ceramics consistently trended towards smaller sizes and few examples per vessel, indicating a disturbed nature. The Completeness and Brokenness scores also tended to be lower, indicated an incomplete assemblage. The ceramics had a mix of Type B, D and E status and demonstrated a series of peaks and changes throughout the stratigraphic sequence. The cow bones were the best indicator of the faunal assemblage signature, which was difficult to determine. The mix of scores and related ranks for each faunal measure category demonstrated little agreement on a common signature. Individually the cow bones tended to be broken and incomplete based upon the NISP:MNI and Percentage Whole results. The Teeth:Mandible and Percentage Small measures were in opposition and ranked higher in score, indicating a relatively undisturbed character. Overall, it is more difficult to distil a common deposit signature based upon the artefactual and ecofactual remains. This is interpreted as representing the diverse nature of the activities that resulted in the accumulation of the ditch fills. It suggests that the deposition of the ditch fills took place over time due to a number of dumping and accumulation activities rather than a single activity type such as the dumping of rubbish from a specific location.

The Intrusionary Fill Deposit category suffers from a lack of examples, but the two measurable entries in this category do offer some comparisons. A range of values is observed in the Mean Sherd Weight category (ranks of 79 and 30 respectively). The remaining measures are in common agreement resulting in a ceramic signature of relatively average size, few sherds per vessel but largely incomplete, broken finds of Type C status. Unfortunately, as with the HfF case study, no faunal finds exist in this category to correlate with this signature.

Level 2 –

At Level 2 the data is organised into its higher order groupings based upon the phasing of CMP. These are grouped by Period and Sub-Period. Periods 8 and 9 were the focus of this analysis with Period 8 divided into Sub-Periods 8i, 8ii, 8iii, and 8iv. These two periods supplied a sequence of medieval and post medieval deposits. These broad based periods covered a range in time from the 12th century to the early 15th. The correlation analysis is grouped in the same format in order to clearly view the trends and compare with Level 1 results (Tables 6.13 to 6.22).

Similar positive correlations are again observed at Level 2. The Completeness and Brokenness measures have strong correlation (r_s = 0.67, p = 0.17). Interestingly, the Completeness measure has a strong negative correlation with Type A ceramics (r_s = -0.92, p = 0.17). This indicates that as Completeness increases Type A ceramics are found to decrease. This trend will be revisited later as it has a relation to the deposit signatures observed. Unlike the Level 1 correlations, a greater number of strong relationships are observed, both negative and positive. The Level 2 status related measures had more positive relationships than those observed at Level 1. Type D ceramics for example, which had no positive relations at Level 1, is seen to strongly correlate with Brokenness (r_s = 0.72, p = 0.14). Once again, this type of relationship between a measure of fragmentation and a specific status type has importance for later stages of interpretation.

The faunal correlation coefficients indicate a movement towards more strong positive and negative relationships. However, many of these correlations are based upon a small sample group and therefore do not have a strong statistical significance. The negative relationship between most measures of Percentage Whole and Percentage Small continues at this level of analysis. The pig bone assemblage at Level 2 exhibits the most statistically viable series of relationships with which to further the interpretation that will follow later.

The Level 2 extra-set correlations continue the trend towards an increase in strong correlations with many more positive and negative relations observed. As observed at the HfF, the grouping of stratigraphic data at Level 2 appears to have acted to polarize the results of the analysis. Once again, strong relationships tend to surround the pig bone measures and the various ceramic measures but once again these are a result of small sample groups and are not statistically significant.

The analysis of CMP Level 2 relationships between the levels of deposit related information begins with an exercise in grouping the physical and interpretive categories found within each phase. The designations of each category were made based upon the most frequently occurring descriptions used in the stratigraphic units within that stratigraphic group. For example, the Intrusionary fill Deposit category was associated with the stone gravel physical description in Period 9 as this was the only description type made in connection with those categories. This task is much harder in the other cases as a mix of interpretive and physical types are associated with the other phases. Preference was given to a particular category based upon the most common designation and in some cases this was only by one or two examples. For example, due to these factors it should be accepted that Period 8ii is *primarily* a phase of clay based ditch fill layers. In the case of Periods 8iii and 8iv the interpretive category was combined as significant examples of two interpretive types existed to give them consideration. Despite these factors specific deposit signatures could be easily determined for each phase.

Period 9, as stated earlier, was associated with stone gravel deposits interpreted as Intrusionary Fills. As observed at Level 1, the Intrusionary Fill category has ceramics of few sherds per vessel associated with Type C status. The Intrusionary

Fill category is strongly associated with ceramics that have not suffered repeated breakage or other forms of pre/post depositional damage.

Period 8iv was associated with silt-based deposits and External and Property/Structural Layers. The ceramics within this phase demonstrate an agreement with the signature identified with External Layers at Level 1. These are relatively large sherds, and non-dispersed with low Completeness. The bones in Period 8iv are fragmented and those recovered tend to be small. This signature demonstrates that the External Layer signature is dominant enough to erase the independent signature of the Property/Structural Layers, indicating the importance of identifying these signatures at the level of the individual stratigraphic unit.

Period 8iii was associated with silt based deposits and External and Linear Feature Fill Layers. The Period 8iii ceramics were of average size and number of sherds per vessel, with low Completeness and mainly Type B status. The bones are fragmented and generally small. This signature, despite the lowering of the Average Sherd Weight, reflects the signature observed earlier for External Layers. This once again largely masks the signature previously noted for the Linear Feature Fills category. This is another signature that would be overlooked if analysis remained at the phase or group level.

Period's 8ii and 8i were both associated with clay based deposits and primarily Ditch Fill layers. As noted earlier, the association with a particular physical deposit type is tentative as many different deposit types (expect for stone gravel) were associated with Ditch Fills. The ceramics are small and have few examples per vessel, but unlike what was observed at Level 1, the Ditch fill ceramics have high scores for Completeness and Brokenness, suggesting an intact assemblage. The ceramics in this phase are predominately associated with Type B status. The faunal assemblage in Periods 8ii and 8i are both generally quite intact, scoring high in most measures at each animal type. This differs from the Level 1 signature, where the faunal assemblage tended towards a broken and incomplete nature. The bones at Level 1 were notably inconsistent in their ranks and it appears that the grouping of these stratigraphic units has strengthened the trend towards a consistent character.

Level 3 –

Level 3 analysis introduces a filtering process to the dataset to remove the residual material. Once again, the Seriation Diagram is used for this purpose, with any material that lies outside the shaded curve being removed before analysis took place for Level 3. The faunal material was not considered at this level nor were the status related frequencies (see Tables 6.23 to 6.26).

When compared to Level 1, the Level 3 correlation analysis remains relatively unchanged. The ceramic measures express the same relationships as seen in the first analysis. The general trend of Level 3 diverges from that seen at Level 2 as an increase in strong relationships is not found. Very few strong correlations are noted, as was the case at Level 1. Once again the results indicate that the residual element within the whole site assemblage does not bias the overall nature of the finds as much as may be often thought.

The deposit signatures observed at Level 3 offer some very interesting comparisons and insights into the effects of the removal of residual material. Each signature at Level 3 remains almost completely unchanged from Level 1. The ranks of each measure remain largely the same relative to each other, for example when looking at the average ranks the Internal Layer category at Level 3 averages 50.5 for Mean Sherd Weight: this is a significant change from Level 1. However, the Internal Layer category remains the lowest average rank for Mean Sherd Weight in relation to the other interpretive categories. The only notable changes to a signature observed at Level 3 are within the Circular Feature Fills and Linear Feature Fills categories. For the Circular Feature Fills category, once the residual material is removed the average rank for Average Sherds Per Vessel becomes the highest rank by a far margin. This indicates that the residual component of that assemblage accounted for the majority of the single sherds recovered. Overall the effects of residual finds are once again less than at first expected. At the HfF this was attributed to the relatively low residuality within the assemblage. At the CMP site there are significantly more residual finds, yet the effect is quite similar. The results of the Level 3 analysis will continue to serve as an interesting insight into the lack of effects that residual finds have upon the signatures of deposit assemblages.

6.5 Review and Summary of Trends

Due to the complexity of the combined various levels of analysis, correlations and other site data involved in this research it is important to summarise the previous sections to provide some clarity. The previously stated aims - to test our ability to define different deposit types and move between them, our ability to quantify assemblage data, and our ability to correlate differences in assemblage signatures and deposit classifications - will all be addressed in the following sections. These are organised first by a *Review of the Levels of Analysis*, and then by the *Key Relationships and Signatures*.

To produce a *Review of the Levels of Analysis* we will begin by examining the quantification methods and their ability to produce consistent characterizations of assemblage types. The ceramic measures demonstrated a generally positive relationship with each other, reassuring their value in determining true signatures and allowing analysis to be carried out. If only the derived measures are focused upon, beginning at Level 1, it is clear that the relationship is mostly positive. Only the Percentage Burnt measure demonstrates a generally negative relationship with the other measures. This may be largely due to the way in which this measure was determined. Unlike at other sites where burning was directly observed and recorded during the post excavation process, at CMP the burning was only noted sparsely and in relation to the decorations observed during the ceramic analysis. In some cases this burning was observed in relation to a vessel's function as a possible cooking pot, and in this way was more a comment on the life history of an object as opposed to the post depositional transformation. The thoroughness of this measure may be suspect and a cause for its inability to consistently observe the transformation history of an assemblage. However, the Percentage Burnt measure exhibited a poor ability to agree with the other quantification methods at the first case study site and therefore may be a general trend for this method. This likely has more to do with the process by which things become burnt, which differs depending on a many factors.

The ceramic measures at Level 2 exhibited a much more negative trend than at Level 1 or 3. This seems to be part of the recurring pattern seen at the HfF and CMP, that the grouping of results acts to magnify the observed nature of the finds. This suggests that the transition from Levels 1 to 2 is a meaningful and consistent process. Further case study will need to observe if this trend continues to be consistent. Overall the results suggest that the ceramic measures selected are relating well to each other and are accounting for the same processes.

The faunal measures, as at the HfF, are once again not as consistent in their agreement and relationship to one another. The relationships observed statistically are a mix of negative and positive and generally appear to be neither strong one way nor the other. The true value of the faunal measures appears to be in their connection with determining specific deposit signatures, as the trends observed at this level are much more consistent than the totality of the faunal measures when examined statistically for their corollary value.

Several interesting trends and observations appear when correlating the two levels of deposit data; the Physical Deposit Type descriptions and the Interpreted Deposit Types. The ability to move between each level of deposit data is questionable based upon the CMP findings. Common connections between the physical contents and interpretation are observed in the Internal and External Layer categories. Both exhibit a connection between silt and clayey silt deposits. Other categories, like the Ditch Fill category, exhibit no common correlation to any one physical content and are notable for how evenly dispersed the types of contents are.

The identification of *Key Relationships and Signatures* at each level of analysis and determining how these change and relate to function is an important point at this stage of the research. As noted, many clear and consistent signatures exist within the CMP dataset. These signatures, summarised during the Level 1 discussion, remain consistent at Level 3. The strong trends do not appear to be effected by the removal of the residual component within each assemblage. At Level 2 the effects of the period based grouping of the stratigraphic sequence affected the ability to define clear signatures. Several signatures, such as the Property/Structural Layers and Linear Feature Fills categories were clear and consistent at Level 1, but were obscured by the Level 2 grouping. These would have gone unnoticed if the CMP interpretation remained at the phase level. The importance of building the site interpretation from the point of the stratigraphic unit upwards is only reinforced by the results of the Level 2 analysis. In essence, this comes as a result of the choice to abandon the transformation history visible at Level 1, for the structure of a chronological based story constructed by Level 2.

As an interpretive tool the key signatures offer some very interesting results. The Internal Layer category has ceramics that are quite small in size and have few sherds per vessel and a small difficult to define faunal assemblage. This signature, while not fully supported by a range of data, indicates an agreement with the expectation of highly trod on and disturbed finds within these high traffic areas of the site. As identified in the Level 2 review of the measures, the negative relationship between Completeness and Type A ceramics suggests that these classically termed "primary" deposits become much more broken when recovered in association with occupation surfaces.

The External Layer deposit category has ceramics of a generally large and non-dispersed nature but a notably broken or dispersed assemblage of bones. This factor, coupled with the movement from Type C ceramics to Type B ceramics results in a difficult signature to interpret. The different trends in the ceramic and faunal material do suggest that the manner in which the ceramic material is entering the archaeological record is distinctively different than how the faunal material is entering. The movement from Type C to Type B ceramics once again demonstrates that deposit status is a relational property, which changes as finds of different date, function and spatial relationships are introduced into the record.

The Property/Structural Preparation category indicates an agreement with the interpretation of material deposited in construction related contexts. This is based upon the very dispersed or broken up vessels and broken and incomplete faunal material. One would expect that material that has become associated with construction fills etc. would be subject to a range of transformational forces that would fragment and distribute the finds.

The Circular Feature Fill category and the Linear Feature Fill category demonstrate one of the most interesting related signatures at the CMP. These features are commonly found in connection with each other, for example in the base of the ditch in the Period 8i phase of MIL 4 and throughout the sequence of Period 8iii deposits. While these deposits appear to have related functions and construction histories, they demonstrate distinctively different and opposing signatures. The Circular Feature Fills, comprised mainly of pits, have large and complete ceramics with unbroken, whole and undisturbed bones. The Linear Feature Fills comprise slots and shallow trenches perhaps utilised as drains. These features have ceramics that are small and of a dispersed nature coupled with consistently broken and incomplete bones. The opposing nature of these two deposit categories is quite interesting and offers, in the first instance, a means of modelling future deposits within this area and indicates very specific functional differences between each category.

The Ditch Fill category has a markedly mixed signature indicating that this designation is quite vague and is not accounting for the full range of functionally related deposits that are accumulating in the City Ditch. As suggested above, this is likely due to a range of varying activities that resulted in the dumping of the ditch fill material, and is interestingly not a single activity or functionally related action. This is likely representative of the nature of civic authority in medieval Carlisle, as organised civil collection of refuse was not in place at the City Ditch. In the future more exacting interpretive designations may be necessary to better account for this important class of deposit found within the ditch.

Finally, the Intrusionary Fill category, with Type C ceramics, few sherds per vessel and incomplete finds is indicative of a disturbed assemblage deposited from another location. This is expected due to the redeposited nature of this category. The nature of the disturbance in this category is likely a reflection of scale with regard to disturbance. Other categories were subject to repeated small-scale disturbance. The Intrusionary Fill category was subject to a single large-scale disturbance.

6.6 Conclusions

A series of conclusions can be reached at the end of the CMP case study review. The quantitative measures used in the case study are re-examined. The effectiveness of each level of analysis is summarised, and the site narratives are re-visited to provide alternatives to what the excavators found in their own research. Thus, in what follows I will consider new recording approaches, organise the site data in more interesting ways encouraging targeted analysis, and finally, offer up new site narratives for this location.

Once again the performance of the statistical measures in assessing formation history and sketching a deposit signature was varied. Generally the ceramic measures demonstrated an ability to consistently determine a deposit signature. The Mean Sherd Weight and Average Sherds Per Vessel performed strongly and were together key indicators of deposit signatures. The faunal measures were again somewhat indecisive, and did not express a strong agreement with each other. In several cases this was more a result of the small sample group being tested rather than the measures themselves. It may also be the case that species-specific diversity is accounting for some of the non-agreement. For example, cow bones may be entering the archaeological record after being subject to a different range of transformation pressures from pig bones. Further statistical testing against a more sizeable sample group will need to follow in the next case studies.

Several interesting comparisons can be made when examining each level of analysis. The same relationship between Levels 1 and 2 observed at the HfF was observed at CMP. The grouping of the stratigraphic units into higher order groups resulted in the expression of more extreme relationships between measures: significantly stronger negative and positive correlations were seen at Level 2. Perhaps more interesting, with the additionally complex site of CMP, is the observation that the phase based analysis would have obscured any detection of several of the deposit signatures that existed at Level 1. This supports the assumption at the outset of this research that examination from the site level, or similar higher order positions, are of little heuristic value.

The ability to define specific signatures for deposits based upon the quantitative measures as well as on the definition of deposit status would greatly enhance the effectiveness of deposit models. The interpretive value of these tools would allow site details to be better aligned with specific research agendas for focused output. At CMP many signatures could prove valuable as the basis for a model for future work at Carlisle. Specifically the recognised relationship between the Circular and Linear Feature Fills has potential to impact further work. The distinctive signatures of each feature type are indicative of functional differences. Both features share an affinity with Type B ceramics, yet the Linear Feature Fills have a residual component that is not observed with any of the Circular Feature Fills. The connection between descriptive/derived statistics and the classification of deposit status is a valuable one for the more involved modelling that is sought here.

Based upon the results of the CMP analysis, many suggested notes on recording, quantifying and analysing deposits and assemblages can be made. The specific quantitative measures, as discussed earlier, will require further analysis before final conclusions can be made. However, certain points are clear from CMP that suggest a need for both more consistent data gathering, and more data gathering, both of which help support the creation of more or different stories of site narrative.

To begin, there are several areas where the consistency of recording could be improved. The method of recording burning was inconsistent at CMP as it was only part of the noted observations relating to decoration on vessels, and more likely related to a vessels function in cooking than its post life-use history. Instituting a fuller observation at the analysis stage could add to the development of deposit signatures and could simply be introduced at a stage of analysis where several other observations are already made. This would not add any considerable time or cost to the analysis process and it should be noted that post depositional attributes such as burning, abrasion, and leaching are all recommended aspects of the minimum record for ceramic assemblages from the Medieval Pottery Research Group. These guidelines also advise that the exclusion of these attributes must be justified within the research agenda (Slowikowski et al., 2001:11).

The gathering of more data could have implications for more insightful future analysis, at CMP this is related to the recording of conjoined sherds. While it may be more costly than observing post-depositional patterns, a greater observation of conjoined sherds may have supported the analysis. This may be less important than the first point based upon the initial results at the HfF, but it would be useful to have further investigation of this method at a later stage.

In terms of the analysis of deposits, there are other possibilities for better/more data gathering. It seems clear from the determination of signatures that the Ditch Fill category was vague and seemingly failed to fully account for what may be several different signatures. More refined observational categories, that indicate specific activities, may help to determine better interpretive categories rather than using terms like "ditch fill" to account for a range of deposits. Determining specific signature patterns for the range of Ditch Fill activities may allow for deposit modelling with the status sequence graph.

In the first case study, some interesting ways to organise the site data and produce new related site narratives are possible. The status sequence graph (Table 6.29) allows for a more intuitive organisation as several groups of alike stratigraphic units are observed. These groups, unlike the phase grouping based upon the primary dates of ceramics and, in the case of CMP, leatherwear, are based upon temporal, functional and spatial relationships. The groupings provide a more fluid narrative to the site data, as the progressive change of each group into another suggests a timeline or narrative of occupation within the City Ditch. These groups often divide a Period or phase into multiple groups, yet another example of how phases fail to account for the dynamic nature of a site's development (Papaconstantinou, 2006:8). This form of narrative offers a sort of half step forward, away from chronological narrative towards a full respect for transformation history and a non-chronological, landuse based account.

Another source for constructing a site narrative comes from organising the transformation data in a different fashion. If the faunal data is used as the main guide for examining CMP, we can isolate a series of major "events" based upon the data. If the faunal measures are presented as a line graph, with the majority of non-entry fields removed, a clear trend line representing a series of happenings is expressed (Figure 6.6). This has several implications. Firstly, it demonstrates the faunal measures ability to express the same process of events. Secondly, it exposes the Percentage Whole measures' as the main dissenter among the four measures (as reflected in Figure 6.7). Upon close inspection of the trend line produced by the Percentage Whole measure we can see that the same series of events are expressed, however they are out of phase with the others, appearing at different times in the sequence (Figure 6.7). The other measures all express the same events at relatively the same point in the sequence. In its sequence the Percentage Whole measure expresses these events either before or after. This measure is acting as a sort of "echo" of the events demonstrated in the NISP:MNI line. It may be that this measure is too coarse a representation of formation history. If the majority of the assemblage is made of broken or fragmented bones then this measure may not be able to pick up the delicate differences in taphonomy. When some of the ceramic measures are organised in the same line graph as the faunal measures, we can see that the ceramic material corroborates these events (Figure 6.8). This interesting and insightful way of presenting the contextual data reinforces the agreement between the ceramic and faunal data and the value in integrating this information.

The different means of viewing the site data developed here leads naturally to evaluating the interpretive approach and constructing additional ones. The excavators at CMP adopted a specific research agenda and approach to the post excavation organisation. The evaluation of the site is based upon a phase narrative structure, which discusses the structural developments and findings within each phase of use in the City Ditch. Working between and around the specific temporal phases at CMP, an adapted narrative can be constructed based upon the status sequence graph groups. This narrative is both interesting and different, and it should be noted, is based on only a portion of the site's material finds. Among the future directions of this research may be advocating the fuller integration of other forms of material data.

For now. the following narrative can be distilled from the results of the status sequence graph (Figure 6.5) and deposit signatures. In the base of the ditch circular pit features were cut in relation to the disposal of waste, with large undisturbed faunal and ceramic finds. These features were cut in close relation to linear features of a specifically different function. Above the initial deposits was a build-up of soft fill layers following the disuse of the ditch as an element of the castle defences. These layers expressed a mixed nature both with their transformation history and the deposit status. The trend expressed is one of a movement from mainly re-deposited waste fill from other locations (Type D ceramics), to specifically designed fill layers (predominately composed of displaced Type E status ceramics), towards layers of re-deposited material more closely related to the life use of the ditch (contemporary with, although spatially disconnected Type B ceramics). Above the fill layers were the remains of the occupation of the area of the city ditch. The occupational element within the City Ditch was a group of medieval tenements and the definition of Property/Structural areas. These featured disturbed and fragmented faunal and ceramic finds indicating the potential repeated movement related to construction activities. Related to these were external layers postdating a small selection of deposits located within the structures and related to their occupation. These had small and fragmented ceramics with many whole bone finds, indicating high activity areas with perhaps specific butchery and consumption related waste. Overlying the medieval deposits were a small series of modern and historic deposits with contaminated material. These deposits featured undisturbed ceramics with fragmented bones. The ceramics were residual in the latest layers but likely re-deposited in the earliest group. The different nature of the modern materials and deposits suggests something about the processes of deposition in the modern period. The way in which, as well as the scale at which, fills are produced and dispersed in the urban setting changes from the medieval period to the modern period.

As explained, another narrative source comes as a result of organising mostly the faunal data in a new manner. As the previous status-based narrative was a half step forward, the narrative that these events inform represents a full step forward towards using the transformation history to inform a story of Carlisle's City Ditch. The main implication of the line graph discussed above is that 5 major events took place at CMP. The events can be characterised as follows. Before the latest layers were laid at CMP there was a large deposition of fragmented and disturbed faunal material (point 1 Figure 6.7). This event was followed closely by the deposition of a largely intact and unfragmented faunal assemblage (point 2 Figure 6.7). Point 3 demonstrates a second event of fragmented remains. This event is separated from another event of fragmented material (point 5 Figure 6.7) by a significant peak representing a largely intact faunal assemblage "happening" (point 4 Figure 6.7). It is interesting to note that despite the fact that these events are presented synchronically and are not linked by a narrative, that the final three events all occur during the same period (8ii) and within the same interpretive category (Ditch Fill). This clearly shows that as the data at CMP is organised in a new way that different interpretations are possible for previously grouped material and that the idea of "ditch fill" as a catchall interpretation is insufficient.

The nature of the Ditch Fill signature indicates that civil authority in medieval Carlisle was not formally organised with regard to the deposition of refuse fills. Rather than a single functional deposition of fills, which we would expect to demonstrate a common signature, it appears that the filling of the ditch took place over time with small-scale episodes. This may be more connected to the surrounding tenements than with large-scale collection and dumping of material that is visible in other contexts (the London waterfront, for example). In effect the Ditch Fill category, as an interpretive approach, fails to account for the evolution of this feature as three separate entities. The Ditch was in the first instance a City Ditch, defensive in nature and likely kept quite clean. It later became a big hole, a place for large dumping of material. In time, it became a depression, surrounded by the life of the city. In this context, small scale dumping and movement of material took over. The interpretive category of "Ditch Fill" has obscured the multiple identities of the feature.

The CMP excavations have provided a strong foundation for evaluating the methods proposed and building upon the first case study results. The increased complexity of this site complemented the first case study and took the evaluation into new areas from the first case study. New site narrative options have been explored, indicating the interconnectivity of all forms of site data, and an interesting site-specific insight has been found with respect to Carlisle. In the case studies to follow we will aim to build upon this level of complexity with additional deep, well-stratified sites with which to test the ability of the quantitative measures and the effectiveness of the kinds of narratives that have been proposed. It is important to point out that, despite distinctly different excavation contexts, one an 18th century slave quarter remnant in North America and another a large defensive city ditch and related structures in medieval northwest England, more similar trends are visible within the data. With additional study, perhaps the idea of a site's setting as an over arching determinant of investigation results will be stretched and tested to its limits.

Chapter 7

12-18 Swinegate, York

7.1 Introduction

The third case study provides a further opportunity to apply the methodology and examine the themes identified in previous chapters. As in previous cases the background site data, excavation data and the results of analysis will all be examined in this chapter. The following pages present a review of previous interpretation and data organisation, and provide a platform to determine new narratives and means of viewing the excavation data.

The excavation record at 12-18 Swinegate (hereafter SG) is an interesting example of modern contract or rescue driven archaeology. The work was carried out in anticipation of construction activity within the urban core of York. The site sequence examined here (the Roman period deposits), features a series of deposits with relationships with structures, and in defined external areas. The series of construction deposits, domestic refuse, fills, and other layers provide a rich sequence with a great interpretive opportunity. The York Archaeological Trust (YAT), who kindly made all excavation data available for this analysis, excavated the SG site.

The format of this chapter enables an understanding of the site, presents the analysis of the data, and the correlating results. Section 7.2 provides the *Site Background and Research History*, setting the context of study. Section 7.3 explains the process of *Data Construction*. Section 7.4 presents the findings of the *Analysis* of the site data. Section 7.5 presents a *Review and Reinterpretation* of the analysis results, highlighting the key findings and results as well as re-visiting the excavator's interpretations. Section 7.6 summarises the above and provided some final *Conclusions*.

7.2 Site Background and Research History

The SG excavations were required due to the redevelopment of areas around the corners of Grape Lane, Swinegate, Little Stonegate, and Back Swinegate for the office space of a local insurance company. In total 15 trenches were excavated between the period of October 1989 and July 1990 (Bonner et al., 1991:8). The areas of excavation, located within the heart of the walled city of York, had the potential to impact deposits from many periods in the history of the city. The focus of this case study is the Roman period deposits from within a specific trench. The site lies centrally within the Roman Fortress, near the known locations of administrative buildings and a Bath and Sewer complex (Figure 7.1 and 7.2) (Bonner et al., 1991:8). The excavation aims for these period deposits were to identify further evidence for the Bath Complex as well as domestic structures for military personnel. It was also hoped that deposits from the period immediately following Roman occupation might be able to inform our knowledge of this little understood time.

There is a long and well-documented history of excavation of Roman period sites within York. The resulting analysis of these sites has established a strong understanding of the Roman period ceramic type series. A detailed publication by Jason Monaghan has outlined the Roman York type series, which ultimately was used in the analysis of the SG assemblage. The fabric concordance established by Monaghan was used to order the seriation diagram that will be presented in the following sections.

As mentioned above, 15 trenches were excavated during the SG project. Ten of these trenches were located directly along the north side of Swinegate (Figure 7.2). Of these, trench 3 (Figure 7.3) is the focus of this case study research. Trench 3 was the largest of the trenches at SG, measuring 3.20 m by 15.60 m aligned to Swinegate on a NW/SE axis. This trench was specifically placed with an aim to locate Roman and Post-Roman period deposits. Its location back from the street frontage was intended to avoid medieval disturbance, and the excavation of Trench 3 was informed by work that preceded it during excavation within Trench 2. The excavation of Trench 3 resulted in the identification of a period structure (Figure 7.4) and internal deposits, and later a conversion to an open yard area of some debated function. Many deposits interpreted as serving a function of surface repair, as well as dumping activities was encountered within the Area 3 sequence at SG. The exact nature of these deposits will likely be an interesting area of focus in the following case study. Previous work during the CMP case study revealed that blanket statements like "dump" or "fill" can be inexact.

The SG sequence was divided into 4 periods, named Period 2 through 5. Period 2 dates from the 3rd quarter of the 1st century and encompasses the initial use of the site, an early post structure, and eventual structural collapse and levelling. Period 3 dates to the first half of the 2nd century and saw the construction of an external wooded floor for an exercise yard or as a cock-fighting pit within a Bathhouse complex (Figure 7.4 for location of timber floor at right side of the trench), and later metalling of the open area. Period 4 dated to the second half of the 2nd century and accounted for the continued use of the Period 3 buildings with multiple repairs to the external surfaces. Period 5 dated to the Late 3rd and early 4th centuries and accounted for the final phase of use of the Period 3 structures and continued use of the exercise yard with the construction of new related structures of possible post-Roman use.

The archive report produced for the SG excavation is structured around the site stratigraphic matrix, this in turn was grouped into units termed "Context Sections". These context sections established the nature of the existing site narrative. They are defined as consisting of any number of deposits with a close proximity to each other that are reflective of a single activity type. The excavators then structured related context sections into groups that form their "discussion points" of the site narrative. Although intended to be reflective of activity, these context sections conform to a rigid chronological structure. As the current analysis unfolds the relationship between the excavator's narratives and those produced by my methodology will be an interesting point of comparison. The following case study should demonstrate an interesting examination of the nature of constructing site narratives.

7.3 Data Construction

Construction of the Sequence –

The SG case study is based upon the excavated sequence from Area 3 of the site. This sequence was subsequently ordered following the "Context Sections" system cited above. This format provided ordered sequences of interrelated deposits (as interpreted) from the earliest to the latest periods within Area 3. The sequence retrieved from the site report is the only available basis upon which to build ordered contexts at SG (listed in Tables 7.1 to 7.5). While there is always the possibility to move related deposits up or down within a sequence, the reported order is accepted as presented. As the accepted sequence, listed in Tables 7.1 to 7.5, reflects the "Context Sections" system the possibility of better organisation exists. This is due to the fact that this system introduces a level of interpretation to the sequence, by favouring the matrix, that may separate otherwise related stratigraphic units. This issue will be discussed further in following sections. This may again prove an interesting opportunity to evaluate different methods of constructing site narrative.

Deposit Definition –

The Physical Deposit Type and Interpreted Deposit Type categories of deposit data are determined by examining the soil descriptions and their related interpreted functions. The archived records from SG provided detailed soil descriptions and interpretations. The physical deposit soil descriptions were defined by percentage values of each component part (ex. 80 % clay, 20% silt). This allowed for a series of controlled deposit type categories. Based upon the range of soil components encountered at SG, and the frequency range of each within deposits the following four Physical Deposit Types were defined for use at SG.

Clay Based
Silt Based

Sand Based
Building Materials Based

The Building Materials Based category is a combination of stones (gravels, pebbles, cobbles, etc.), plaster, mortar and tiles. As these materials appeared as the primary component (>50%) within a deposit, that deposit was classified under the Building Materials Based category. This format was followed for all deposits in order to separate majority clay, silt and sand based deposit categories. In most cases this division was explicit due to the abundance of primary material (ex. 70% clay = Clay Based). In a few select cases the component parts did not represent a single majority greater than 50% (ex. sand/clay/silt/mortar, 40/30/20/10). In these situations a choice was made to associate the stratigraphic unit with the highest percentage part. It was considered not necessary to create separate Physical Deposit Type categories for the few examples where this occurred.

The Interpreted Deposit Type categories were constructed by combining the descriptions provided in the archived context sheets and the archive report. These categories were built up from firstly the original context sheet, and secondly from the interpretive terminology used in the archive report. Precedence is given to the archive report in most cases as the provided interpretations fill gaps where none is present on the context sheets, or provides the means of separating similar deposits. The choice to privilege the archive report interpretations will allow for an examination of the higher order interpretations of the SG stratigraphic units. This process resulted in a series of interpreted functions that could be summarised into a series of activities carried out at SG. These five categories are as follows:

Surface Preparation/Repair
Dump/Fills
Construction Related
Occupation Surface
Destruction Related

The Surface Preparation/Repair category includes deposits interpreted as levelling fills or other intentionally laid deposits to allow for the construction of occupational surfaces. In some cases these include deposits classified as "Dump/Levelling" in the context sheets. These are however, defined as levelling activities in the archive report. The Dump/Fills category includes all deposits interpreted as a primary dump deposition of waste materials. These are often termed as belonging to a series of associated dump deposits in the archive report. The Construction Related category includes all deposits interpreted as construction backfills, foundation fills, post holes, or other deposits that were a direct result of a building activity. The Occupation Surface category includes all deposits interpreted as floor surfaces, and importantly, metalled surfaces prepared solely as a walking surface. Finally, the Destruction Related category includes all deposits associated with destruction phase pits, refuse or backfills resulting from the destruction of a structure or occupation. The interpretive categories act to separate the sites deposits into periods of preparing surfaces, living on surfaces, constructing structures, destroying or replacing structures or disposing of waste. The categories assigned to each stratigraphic unit are provided in Table 7.1 to 7.5.

Status Sequence Graph-

The SG Status Sequence Graph is based upon the construction of a Seriation Diagram. This is built upon the stratigraphic sequence and the Roman York pottery type series, both discussed above. The pottery type series is based upon the series that appears in Monaghan (Monaghan, 1997:862) (Table 7.14). This was constructed using a range of materials recovered from excavation within urban York. These sites, which include SG, formed a pattern of ceramic types introduced into York during the first to fourth centuries.

The seriation diagram (Table 7.15) was constructed using estimated vessel number counts from the SG ceramic archives. The graph presents vessel numbers and encloses finds within fade points by shading. The final graph will be used to define status type frequencies following the methods outlined in section 5.5. This graph will be the basis of further analysis to be outlined in the following sections.

Ceramic measures of site formation history-

The quantification and derived statistics of the SG finds collection are used to compile deposit signatures and develop an understanding of the formation history of the site. The ceramic archive located at the YAT offices contained detailed analysis of the ceramic collection. This analysis provided fabric, form, count, weight and EVE measures within each stratigraphic unit. These measures were used to compile the derived measures Mean Sherd Weight, Average Sherds per Vessel, Completeness and Brokenness. Observational data for the amount of burning present and cross mends were not available, such that it was not possible to determine the FMM score or Percentage Burnt. These two measures are therefore not included in the SG ceramic analysis. Full dimensions for stratigraphic units were also not available, such that the Units per Volume measure could not be calculated for the SG site.

Faunal measures of site formation history-

The SG archive did not contain a record of faunal analysis. Therefore it was necessary to arrange for the analysis of the faunal material within Area 3. Terry O'Connor provided expert assistance with the SG bones. The faunal material was processed for basic counts of species (NISP), and bone type. The SG assemblage of cow and sheep bones was used in the analysis presented here. There were insufficient amounts of pig bones to make the inclusion of this or other animal material relevant.

The MNI counts were determined using the results of the faunal analysis performed by Terry O'Connor. Percentage Small was calculated using the lists of bone types present. The SG faunal collection contained very few numbers of complete bones, which lead to the decision to exclude the Percentage Whole measure, as this would not be statistically relevant. As the faunal collection was revisited following nearly 20 years there was no way to determine what level of disturbance had occurred during the original cleaning and bagging process. Due to this counts of loose teeth were not included in the recording process, as any results would likely be biased. Therefore the Teeth:Mandible was also excluded from the final analysis. With two measures excluded it was determined that a substitute faunal measure was necessary. After consultation from Terry O'Connor it was decided that the NISP:MNE ratio would serve to account for the formation history of the faunal assemblage. This measure was calculated by determining the MNE (Minimum Number of Elements) for each deposit. This is defined as the number of identifiable body parts within each deposit, excluding non-identifiable fragments and ribs.

Quantification and Seriation Levels 1 to 3-

The first level of analysis is based upon the initial stratigraphic sequence outlined in Tables 7.1-7.5. Level 2 is based upon an organisation of the stratigraphic units into higher order chronological groups as recognised by the excavators (Tables 7.6 to 7.11). The SG sequence, as discussed in section 7.2, is divided into four period groups based upon the "Context Sections" system. These periods are the basis of the Level 2 analysis, and ordered from latest to earliest are:

- Period 5
- Period 4
- Period 3
- Period 2

The completed seriation diagram will be used to determine what components of the ceramic collection are residual or infiltrated. These finds are removed from the ceramic assemblage for Level 3 analysis (Tables 7.12 and 7.13). As in other case studies, it is recognised that the placement of the determination of residual and infiltrated finds is an interpretive action and may be subject to some error. This is accepted as an unavoidable aspect of the research.

7.4 Analysis

The analysis stage of the SG case study begins with an examination of the statistical relationships between each measure. This is performed using the Wessa.net free statistics software package (Wessa, 2007). As discussed in section 6.4, the results at this stage are often subject to the number of finds present in the calculation, which affects the t-test probability. The statistical effectiveness of each measure is discussed relevant to each level of analysis (Levels 1-3). Following the statistical analysis the deposit related data is examined, again at each of the three levels of analysis first introduced above.

Level 1 –

The results of the Level 1 analysis is provided in Tables 7.1 to 7.5, the correlation results are presented in Appendix 3 (worksheets entitled "SG"). As in previous chapters this table presents colour coded positive and negative correlations as well as outlining the particularly positive and negative relations.

At Level 1 it is interesting to note the generally positive correlations that exist between the ceramic measures. Brokenness exhibited notably strong correlations with both Mean Sherd Weight ($r_s = 0.67$, p = 0.0006) and Completeness ($r_s = 0.69$, p = 0.0004).

The faunal correlation analysis reveals that the NISP:MNI and NISP:MNE measures once again demonstrate an agreement. The Percentage Small measure was consistently incongruous with the other measures. The nature of the Percentage Small measure renders it likely to be impacted by specific processes that surround bone consumption. If small bones at SG are distributed throughout the archaeological record due to specific processes, this may be affecting the measures ability to reflect the same formation history as the other measures.

The Level 1 extra-set correlations demonstrated a general pattern of greater disagreement between each measure. Mean Sherd Weight was consistently in disagreement with the faunal measures, except in the case of Percentage Small bones for cows ($r_s = 0.67$, p = 0.0562). The NISP:MNE measure for cow bones stood out as a measure with consistent disagreement with the set of ceramic measures. As with the ceramic intra-set correlations a large amount of the results from the status type analysis are meaningless due to the complete lack of Type A, D, E, and F ceramics.

The relationship between the physical component of each deposit and the interpreted nature of that deposit type is an interesting beginning to the investigation of each deposit signature. Presented in Figure 7.5 a graph demonstrates the frequency of each physical deposit type within each interpreted category. The Surface Preparation/Repair and Dump/Fills categories demonstrate a fairly even distribution of deposit components. However both categories are primarily clay based. Clay based deposits are additionally the major component within the Construction related category. The Destruction Related category is an even mixture of clays, silts and building materials. The only category which is exclusively associated with a particular soil type is the Occupation Surface category. This is due to the fact that the surfaces recovered at SG were mainly metalled exterior surfaces and were therefore composed of stone materials. Collectively the SG deposits follow a similar trend observed in previous case studies where there is little consistency between the physical elements and the interpreted function of a deposit. Our ability to consistently link deposit types with specific functions is questionable given the results of the SG case study and those that preceded it.

The deposit signatures present at SG are much better understood with the integration of the ceramic and faunal measures. Beginning with the Surface Preparation/Repair category, the ceramic measures provided a clearer picture of the nature of this interpreted type. The surfaces rank highly in average sherd weight and average sherds per vessel, indicating a generally large sized, well preserved assemblage. Contrary to these results the Completeness and Brokenness measures are both low ranked relative to the other deposit categories. The status of the ceramic material reveals a trend towards Types C and B. Specifically a trend is demonstrated of change to Type C in the later periods, from Type B in the earlier periods. The faunal material from the Surface Preparation/Repair category indicates a generally well preserved faunal assemblage. The bones ranked highest or second highest amongst the deposit categories for all measures except for NISP:MNI.

The Dump/Fill deposit category had one of the largest samples of stratigraphic units amongst the interpretive level categories. As discussed above, this deposit type was composed of a range of soil types, perhaps related to a range of different dumping related activities. The ceramic measures demonstrated an assemblage of averaged size and level of disturbance relative to the other deposit types. The Completeness and Brokenness measures ranked second highest relative to the other categories. The status types present demonstrated a similar pattern to the Surface Preparation/Repair category, in that the trend was a change from primarily Type C to Type B. The faunal remains within the dump category are primarily disturbed in nature and consistently ranked last relative to the other categories. The NISP:MNE ranks for both cow and sheep were the lowest of all deposit types, as was the Percentage Small rank for cow bones. Despite the consistent faunal signature observed for the Dump/Fill deposits the ceramic signature is inconclusive. With closer inspection it may be revealed that there are different activities resulting in the deposition of these dumps and/or fills.

The Occupation Related category offered other inconclusive results related to the ceramic signature. The Mean Sherd Weight measure overall ranked quite low, indicating a consistently small average sherd size. However, the Average Sherds Per Vessel measure was quite high, indicating a higher number of sherds present for each vessel. This presents a ceramic signature of small, perhaps disturbed sherds, with many examples to account for each vessel present. The Completeness and Brokenness measures were both quite average relative to the rest of the sequence; the rankings indicate neither a largely complete nor a broken assemblage. The surfaces were mainly composed of Type B ceramics. The faunal measures indicated a relatively undisturbed assemblage. The Percentage Small and NISP:MNE measures both ranked highly, indicating an intact assemblage with few small bones present. The NISP:MNI measure however ranked relatively low, perhaps indicating a pattern of specific disposal practices incorporated into these deposits.

The Construction Related category demonstrated a pattern of large sized sherds amongst the small sample of recovered sherds. The Mean Sherd Weight ranks were quite high, indicating large sized sherds. The Average Sherds Per Vessel measure was quite low, indicating few sherds per vessel. This is likely related to the small number of sherds recovered in each Construction Related deposit. The Completeness and Brokenness measures are not reliable due to the low number of samples. The status frequencies were primarily composed of Type B ceramics. Only one deposit within this category had measurable Completeness/Brokenness. Likewise, there were no faunal remains in these deposits to allow for the determination of an integrated signature.

Finally, the Destruction Related category demonstrated a different pattern of material disposal. The ceramic material within destruction layers were consistently broken and disturbed, ranking lowest amongst all deposit types in the Mean Sherd Weight and Average Sherds Per Vessel measures. As with the Construction Related deposits, the Completeness/Brokenness measures are unreliable due having only a single representative sample. Like the construction layers the status frequencies were primarily composed of Type B ceramics. Unlike the Construction Related category a small faunal assemblage was present within the Destruction Related layers. This assemblage was high in NISP:MNI but low in NISP:MNE rankings. As before, perhaps this indicates the deposition of specific butchery cuts amongst the destruction material.

Level 2 –

As discussed above, the SG site is organised temporally along the four periods (Periods 2,3,4,5) which range from the first century AD to the early fourth century. While these periods divide further into phases and subsequently smaller context series based upon related strings of stratigraphy, for the purposes of this study the effects of grouping the SG material into the four periods will be examined. The correlation analysis follows the same format as that presented with the Level 1 material. The analysis results are presented in Tables 7.6 to 7.11, the correlation results in Appendix 3.

The arrangement of stratigraphic units into higher order groupings has not affected the general relationships that exist between each ceramic measure. The greater number of positive trends that were observed at Level 1 are reflected at Level 2. As seen in previous examples these relationships are expressed statistically as stronger. The grouping of the stratigraphic data has once again resulted in more extreme relationships between each measure. The only significant change between Level 1 and Level 2 is between the Average Sherds Per Vessel and Brokenness. This relationship, which was negative at Level 1, is expressed as a strong positive relation at Level 2 ($r_s = 0.80$, $p = 0.1646$).

The grouping of stratigraphic data appears to have greatly affected the relationships between many of the faunal measures. The NISP:MNI to

NISP:MNE between both cow and sheep bone are negative at Level 2 where they were positive at the first level of analysis.

Throughout the ceramic and faunal intra-set correlations a similar pattern emerges as was seen with the ceramic results. The majority of the relationships remained the same; however, a much greater number of strong relationships existed at Level 2. This pattern has been observed at numerous case studies and clearly appears to reflect a consistent problem resulting from the phasing process.

The construction of signature types for the chronologically grouped deposits begins by determining the physical and interpreted classification of each period. As explained in previous chapters, this is based upon the most frequently occurring descriptions used in the stratigraphic units within each group. The following deposit signatures are derived from the collective assemblage within each period, described with some reference to the signatures identified at the first level of analysis.

Period 5 was associated with Silt Based deposits of a Dump/Fill function. The signature of this period's material is one of small, disturbed sherds of low completeness, associated with Type C status. The faunal material is equally of a disturbed nature, with measures ranking generally low in relation to the other periods. This signature differs from that which was identified in relation to the Dump/Fill deposits at Level 1.

Like Period 5, Period 4 demonstrated a trend towards small, disturbed and broken ceramics of Type C status despite its association with Surface Preparation/Repair deposits. The faunal remains followed this pattern, with the exception of the NISP:MNI measures for both cow and sheep. These measures were quite high in relation to the other periods. The trends observed within the last two periods at SG indicate a general trend towards more fragmented material in the later stages of the site's history regardless of the types of interpreted deposits within. This may reflect a higher degree of surface exposure before incorporation into the archaeological record.

Period 3 was again associated with deposits of a primarily Surface Preparation/Repair related function. These also differed from the signature identified at Level 1 in that the Period 3 ceramics were generally large and intact with an association with Type B status. The faunal material was also quite well preserved, interestingly with the same exception of the NISP:MNI measures for both cow and sheep, as these indicated a fragmented nature.

Period 2 followed the signature of the previous period with a clearly large and intact ceramic assemblage. This period was associated with primarily Dump/Fill deposits and had a well preserved faunal assemblage to match the ceramic remains. These results demonstrate that at SG the temporal groupings do not share a relationship with different deposit types and instead follow a temporal pattern. Our ability to distinguish and separate the story behind individual deposit types within each period of life at SG is obscured by the temporally derived trends. As interesting as these chronological trends may be, the contextual based understanding of the site is no longer apparent at the grouped level.

Level 3 –

The third level of analysis introduces a filter to remove all finds determined to be infiltrated or residual based upon the results of the Seriation Diagram. All material outside of the SG fade points are removed from the analysis stage. As in previous case studies, this stage chooses not to consider the faunal material, nor the status related frequencies. The analysis results are presented in Tables 7.12 and 7.13 and the correlation results in Appendix 3. .

The relationship between the ceramic measures used at Level 3 demonstrates that there was no significant effect upon results by the inclusion of potentially residual material at Level 1. Although two measures that were noted for the strength of the relationship at Level 1 (Mean Sherd Weight vs Brokenness and Completeness vs Brokenness) were no longer as strong at Level 3, the overall effects of residual material is not great. The only change in specific type of relationship between the two levels was observed between Average Sherds Per Vessel and Completeness. This relationship became negative ($r_s = -0.12$, $p = 0.5962$) once the residual component was identified and removed.

By comparing the deposit signatures identified at Levels 1 and 3 the effects of the residual component can be better determined. At SG it was quite clear from the Level 3 results that the identified signatures were not greatly affected by the presence of residual or infiltrated finds. The only significant change in a measure's rank with the removal of the residual finds was in the Average Sherds Per Vessel measure for Occupation Surfaces. At Level 1 this measure ranked quite highly, in fact it averaged the highest rank amongst the deposit categories. However, with the removal of the residual component the measure was near the bottom relative to other deposit types. This change indicates that in this example an amount of ceramic sherds with many examples per vessel was skewing the results. Perhaps this is an example of some specific re-deposition of material or other activity that resulted in the introduction of some well preserved sherds of material pre-dating the use of the surfaces in question. Overall it seems that our abilities to identify and use deposit signatures for the construction of site narratives is not greatly affected by residual finds. In the instance where residual finds do affect a signature this may be an interesting indication of specific activities or processes acting upon a site.

7.5 Review and Summary of Trends

In the following sections, entitled a *Review of the Levels of Analysis*, and the *Key Relationships and Signatures*, the results of the SG case study will be summarised and examined in light of the primary research aims. This summary will begin by examining the quantification and correlation results before examining the deposit related results. Finally, an examination of the results of developing and understanding a narrative for SG will be presented.

As we begin with *A Review of the Levels of Analysis* it appears from the SG correlations that the ceramic measures were consistent in reflecting a unified formation history. The Mean Sherd Weight and Average Sherds Per Vessel measures are relatively simple and easy to calculate but have demonstrated a consistency throughout the case study analysis. This suggests that the minimum effort of weighing sherds and calculating minimum vessel counts can go a long way towards understanding archaeological deposits. The faunal measures, as noted earlier, failed to agree with the Percentage Small measure. Interestingly this same measure demonstrated a consistent positive relationship with the ceramic measures. As was suggested earlier, this may be likely to the specific deposition process that surrounded cow bones.

The two levels of deposit related data provided some interesting trends and relationships. At a theoretical level the interpreted deposit types present three related groups. The Occupation Surface related deposit stands alone as a functional type. The Surface Preparation/Repair and Dump/Fill categories share, at least in their simplest form, a similar process in that both categories involve the re-deposition of intentional materials. Likewise, the Construction and Destruction related categories share a similar pathway in that both are related to building up or tearing down a structure. Our ability to isolate and understand signatures for each of these four deposit types is at the centre of results for the SG case study. Interestingly, both the Surface Preparation/Repair and Dump/Fill categories were composed of a mixture of physical materials, with little consistency in a relationship between physical and interpreted deposit types (see Table 7.14 for the deposit relationships).

Unlike the Surface Preparation/Repair and Dump/Fill types, the Construction and Destruction related categories demonstrated some notable differences in their relationships to physical component. The Construction Related category demonstrated a significantly greater relationship with Clay Based soils as opposed to the Destruction Related category, which was evenly composed of clays, silts and building materials. It is interesting to note that the underlying natural geology of the area is glacial boulder clays. The association between clays and construction activities may be a result of the building process of cutting into the natural soils for construction purposes. The destruction materials, on the other hand are a result of disturbance of standing structures and do not involve disturbing natural layers. Overall, there is reason to believe that we can consistently connect some functional deposit types with physical materials;

however the processes involved in forming these relationships remain sophisticated and difficult to define.

The *Key Relationships and Signatures* at SG exposed some trends with the established methods of determining deposit signatures. The signatures identified at Level 1, except for one noted exception, again remained clear at Level 3. If these results continue to appear it is likely to impact current perceptions of materials and deposits. When a cumulative review of all case studies is ultimately performed, if consistent trends are recognised during Level 3 analysis it will likely result in a re-examination of accepted thoughts on "out of date" materials.

The individual deposit signatures at SG provide interesting indications of activities and processes beyond the pattern. The Occupation Related category held material that was broken and well trodden on and as indicated by the prevalence of Type B ceramics was likely, due to the fact that these are external surfaces, distributed onto surfaces away from their original location of use. The nature of the faunal material indicates that it is possible that specific butchery or industrial processes resulting in the deposition of the animal remains.

The Construction Related category results indicate that specific large samples of a small number of vessels were deposited during the construction process. Although faunal data is lacking in these deposits, one interpretation of these results is that specific material consumed during the construction phases are being deposited following construction. Much like in modern settings, rubbish from workmen is often disregarded around a worksite. Perhaps in the SG setting ceramic materials were deposited bypassing the normal process of weathering or re-use. Unlike the Construction Related deposits the Destruction Related layers had faunal material present. These finds corresponded with the ceramics to present a signature of well broken and disturbed material. In future situations the clearly fragmented nature of the Destruction Related finds is a means of distinguishing and modelling these deposits.

The Surface Preparation/Repair category demonstrated a signature of relatively well preserved ceramic and faunal waste. It was interesting to observe such intact material within the intentional fill layers, indicating that perhaps specific waste material from undisturbed locations was being introduced as levelling fills, as opposed to using rubbish remains from other sources. Therefore the materials are not smashed in the process, just dumped as a whole.

The Dump/Fill deposit category provided what is ultimately the most interesting signature result at SG. The collective signature indicated an average level of ceramic fragmentation, with well fragmented faunal material. However, upon closer inspection of the stratigraphic relationships amongst the Dump/Fill deposits it becomes quite clear that two distinct signatures are present for these types of deposits. These two signatures reflect a chronological change between Dump/Fill deposits from the earliest periods (2/3) and those from the later periods (4/5). This trend is of distinctly smaller, fragmented remains in the last two periods (despite two notable deposits at the very end of the sequence) with large, intact material in the earlier periods (Table 7.1-7.5). The later material is so fragmented in fact that no Completeness or Brokenness data was available from Period 4/5 stratigraphic units. As noted above, the Level 2 grouping of deposits demonstrated that all the recognised signatures were obscured by the chronologically derived trend from intact early material towards disturbed later materials. This trend is likely a result of the strong effect of the Dump/Fill deposits mixed amongst the site sequence.

These signatures clearly indicate that the processes involved in the deposition of Dump/Fill materials changes over time as the landuse within SG evolves. The structural history of the site evolved from earlier wooden elements to a notable reworking of the area into an exterior surface, and a later structurally related building phase at the very end of the Period 5 sequence. It seems clear from these results that this change to an external area resulted in a shift in the processes that result in the deposition of waste materials. The physical component of the Dump/Fill deposits also reflected the temporal change. The Period 2/3 material was primarily Clay Based, whereas the Period 4/5 material was mainly Silt Based. Looking more closely at the data it appears that during the early period, in deposits related to a structural phase, that the disposal of waste material resulted in large, unfragmented ceramics. In later periods relating to the use of the site as an external exercise yard area, material is tracked in, trodden on, or some other process resulted in highly fragmented finds. The noted exception to this trend, cited above, is in the last two deposits which related to the brief construction of structures which may have post-dated the Roman use of the area. These two deposits contain distinctly larger and intact ceramic material than those previous. These results may initially be viewed as outliers to the previous trend, but more likely represent a final shift in the pattern of disposal in Area 3 at SG in light of the apparent relationship with a new building phase. It is not a viable interpretive approach to designate all dump material the same within the sequence when clearly the *processes* involved in the creation of these dumps is changing over time.

7.6 Conclusions

The following summary of the SG case study will examine the effects of the different quantitative measures used, the results of each level of analysis performed, and a review of the site narratives constructed as a result of the preceding sections of analysis. This summary will present the results of new and different site narratives that are now possible based upon the integrated analysis performed. The results of these new narratives will be examined in comparison to the form of analysis already in place. It will be possible to examine how the use of different methodologies can dictate the form of narrative constructed.

The SG statistical measures of formation history were varied. The Mean Sherd Weight and Average Sherds Per Vessel measures were specifically useful in determining clear deposit signatures. Based upon the overall success of the Average Sherds Per Vessel measure it is increasingly surprising that minimum vessel estimates are not more common in ceramic analysis. The faunal measures were again less reliable, specifically the Percentage Small measure. Despite some variances in the statistical correlation results, the relationship between the ceramic and faunal measures is consistent in other forms. The related SG events graph demonstrates that ceramic and faunal measures show that the data is able to tell the same story of a site's history.

The ability to define and understand deposit signatures at each of the three levels of analysis has again proved a challenging and important task. Many consistent signatures were identified at Level 1 with particular relationships to function and use of the site. The application of the groupings at Level 2 created a distinctive obscurity to the Level 1 signatures. The sequence wide trend towards progressively fragmented signatures shielded the results of Level 1 and rendered the signatures unidentifiable. This is another example of the possible problems of grouping material at the interpretation stage. If we continue to group finds on a higher order interpretive basis we render our interpretations susceptible to the influence of particular results over others. At SG this was demonstrated to the point where a single signature trend (Dump/Fill) imposed itself across the entire site. At Level 3 the results of the residual and infiltrated components removal demonstrated that clear signatures are again, not greatly affected. The usefulness of supposed residual or disturbed deposits in piecing together an understanding of a site seems a point which deserves reconsideration.

The deposit signatures from SG have provided different interpretive frameworks with which to examine the site. The connection between pattern and process, as is often the case, can prove illusive. Despite this fact interpretations of the results have been presented above which could prove useful for understanding the site in its context. The nature of Destruction and Construction related deposits appears to suggest that destruction processes involved the repeated smashing and mixing of cultural materials, whereas the construction processes involved the single use deposition of material used during the construction phase. Surfaces appear to be prepared for by the deposition of specifically designed fills using materials that were not subject to a great amount of fragmentation. Finally, dumps of waste materials followed a specific process related to the external/internal and functional changes to the area. It is possible that later dump fills were accumulating in external areas, based upon their silty nature as silts are more representative of natural, alluvial or other processes. Alternatively, earlier fills may be deliberately deposited waste (classically termed primary) based upon their clay based nature.

These results reveal details particular to the development of Roman York. Silty deposits were previously recovered above the early 4th century via principalis during excavation work for the repair of sewer lines in Low Petergate (see Figure 7.2 for the location of the Petergate excavations (Ottaway, 1997). During the same period the street was recreated in a new form by utilising recycled demolition materials. The finds from the area of Low Petergate, combined with similar finds from 9 Blake Street (Hall, 1997), and the results from SG indicate that perhaps large-scale demolition and rebuilding of fortress buildings in the present day Swinegate area took place during the latest Roman periods. At the very least these collective finds indicate that the landuse of this area of Roman York underwent significant changes during the 4th century.

The different site narratives that are possible at SG are in many ways dictated by the methodologies (and therefore the theoretical basis) employed. The previous work at SG was performed within the context of contractual archaeology. As a result the format of organising and presenting the results reflects that forum. The implications of this context of study will be discussed later, in the light of the new narrative presented here. The new narratives have previously used the status sequence graph to construct a fluid narrative around the site data. Unlike other case study sites, the nature of the SG site led to a status sequence graph without the usual full spectrum of relationships. The SG status sequence graph is confined to either Type B or Type C ceramics (Figure 7.6). This reflects the nature of the SG deposits/assemblages: all material was spatially and functionally displaced from the point of original, alternating between sharing or not sharing a temporal relationship with the parent deposit. Despite this fact, based upon the strong deposit signatures present at SG a new and detailed integrated narrative can be presented for SG.

The story of SG Area 3 reads as follows. In the earliest period of Roman occupation within Area 3 construction related deposits, related to wood structures, contained large and well preserved cultural material likely deposited directly by those responsible for the construction work. These were placed in relation to surface preparation fills composed of intact, large material remains, deposited immediately from a waste context and not imported from established midden contexts. In addition to the surface work large amounts of dump and fill deposits were laid featuring large sized primary waste. In the following period of occupation similar surfaces and dumps were deposited, in addition to highly trodden on occupation surfaces relating to newly established external areas. The following period of use saw new construction phases, as well as the destruction of previous structures. These destruction fills contained highly smashed and fragmented material. Waste material deposited in dumps and fill stratigraphic units contained fragmented and disturbed material, possibly accumulating around the external areas, as opposed to the process of intentional waste deposition from the previous period. The final period of distinctly Roman occupation within Area 3 saw a continuation of highly troden external surfaces, and the repair deposits associated with them. The dumping of fragmented waste continues under the same processes until the very last phase of occupation within the period. Within this phase a pattern of large and well preserved cultural material was deposited in relation to a final building process identified in the SG sequence.

The differences between the site narrative presented above and the one constructed as a result of the excavator's archive report reflects the different methodological approaches adopted. The intention of the Level 3 archive report, under which the SG material was contained, is to illustrate the stratigraphic and structural developments of the site (Frere, 1975:2.5). Advanced synthesis of site material was not the intention of these Level 3 reports. The excavators, operating within a contractual "rescue" context, presented their results within the Context Series format discussed above. This method is built upon the basis of the site matrix, which is then divided up into the individual context series, defined as any number of contexts sharing a close stratigraphic link representing a single activity (Bonner et al., 1991:9). A higher level organisation within the report then groups related context series to form related discussion points within the text (Bonner et al., 1991:9).

This method of organisation influences the method of interpretation as well as the method of presenting the site narrative. The privileging of the matrix, whatever its form, imposes the theoretical effects of this method upon the structure. The Harris matrix in its simplest form acts as a direct statement of the physical relationships of stratigraphic units, and is structured to reflect each unit as happening only once, and instantaneously (Carver, 1990:97). As a result, the basic matrix is an ordered model of how individual stratigraphic units were disposed of in the ground (Carver, 1990:97). By privileging the matrix above all other possible inputs the resulting narrative risks privileging the happenstance of how deposits ended up in the ground. This can ignore the physical and spatial relationships that occur, some of which may ultimately be more important. Using stratigraphic methods we, as excavators, may be unable to link two deposits. However, these two deposits may share important spatial proximity and/or role in a site process. With the site matrix as a guide, two otherwise linked or related deposits become separated in the site narrative, and thus, how we understand a site. The integrated narrative presented above incorporates site data that accounts for stratigraphic relations, chronological relations, physical components, interpretive frameworks, materials, and formation history. This integrated narrative is more complex, by taking into account all the above elements without privileging one over the other. At the same time, the integrated narrative is more comprehensible, as trends and differences between site processes become quite clear to see.

As was demonstrated in the previous case study, we can group the site data into a different visual format in order to present the story of the landuse within the area of study. At SG a mixture of ceramic and faunal data was combined following the method outline previously in section 6.6 in order to present a series of "events" that took place at the site. The Mean Sherd Weight and Completeness measures as well as the NISP:MNE ratios for both cow and sheep were included in the graphical presentation of the SG transformation history trends (Figure 7.7). The combination of these measures allows us to identify three key events as well as a major trend across the whole sequence. The trend line begins with a series of short peaks and troughs representing the final stages of Roman occupation at SG. This pattern is interrupted by a significant deposit of fragmented and incomplete material (Point 1 Figure 7.7) generally corresponding to a period of dumping at SG. Following this event a significant deposition of intact material (Point 2 Figure 7.7) takes place; interestingly this corresponds with a period of surface preparation. The earliest phases of landuse at SG are highlighted by a large deposition event of highly fragmented material (Point 3 Figure 7.7). This event is represented by each measure in the graph and aligns in the site sequence with the construction of the earliest occupation surface. The general trend observable across the line graph is one of low points within the latest half of the line with higher points within the earliest half. The landuse trends at SG reveals repeated periods of resurfacing and dumping which shape the history of the area.

The SG case study has importantly revealed the usefulness of the methodology to disentangle multiple processes and activities that can become obscured by our assumptions. It has also revealed the risks and implications of how our organisational methodologies can influence our interpretations. Throughout this study the integration of site data has been advocated. The SG case study has once again demonstrated the benefits of this approach. The following case study will continue to explore this belief while testing our accepted interpretive assumptions.

Chapter 8

The Barley Hall, 2 Coffee Yard, York

8.1 Introduction

This chapter, the fourth case study analysis, presents similar results and themes identified in previous case studies. The sites background information, excavation data and the results of analysis are all examined in the following pages. Although not subject to a great amount of publication and analysis, the excavation within number 2 Coffee Yard, today known as the Barley Hall, has an interesting research history that can be revisited in light of the new analysis contained here. Within this review new narratives and means of forming an integrated understanding of this site are found.

The site at number 2 Coffee Yard, the Barley Hall (hereafter BH) provided an opportunity to examine the results of an urban excavation within a medieval townhouse (Figure 8.1). This site was subject to extensive occupation and redevelopment over its history. The series of internal deposits within the structure reflects an intensive occupational history common to urban structures of this age. The selection of this site as case study provided an opportunity to examine household related deposits from within a busy urban location. The site was excavated, and subsequently purchased, by the York Archaeological Trust (YAT). As with the SG material from the previous case study, YAT made all excavation data available for this analysis.

As in previous chapters, this chapter follows a format that will establish an understanding of the site, analyse the data, and present the interpretive results. Section 8.2 provides the *Site Background and Research History*, setting the context of study. Section 8.3 explains the process of *Data Construction*. Section 8.4 presents the findings of the *Analysis* of the site data. Section 8.5 presents a *Review and Reinterpretation* of the analysis results, highlighting the key findings and results as well as re-visiting the excavator's interpretations. Finally, section 8.6 summarises the above and provides some *Conclusions*.

8.2 Site Background and Research History

The medieval building range at 2 Coffee Yard was known from previous study of the structural history of York in 1981 (See Figure 8.2) (1981). The BH excavation and restoration project began in 1985 with trial excavations as refurbishment plans were underway for the buildings conversion to office accommodation. In 1987 YAT began a complete excavation project (Brann, 1987). This work revealed the full medieval element of the structure, as it had previously been clad in modern surfaces with many additions and tenant fragmentations. The YAT, upon the realisation of the building's potential, ultimately purchased the property with the aim of returning it to its previous splendour. Extensive conservation plans were made, and today the BH serves as a heritage site, drawing many visitors to the medieval townhouse.

The history of the medieval structures in Coffee Yard began in the 1120's when the Yorkshire magnate Robert Fossard gave land to the Augustinian canons of St. Oswald at Nostell Priory (Michelmore, 1987). This included property in the Yorkshire village of Bramham and the block of land along Stonegate and extending east to Grape Lane (encompassing present day Coffee Yard). The Stonegate property was subsequently established as a prebendal house of St. Oswald's. It was not unusual for monasteries to keep town houses close to York Minster, and the Augustinian canons of Nostell would have especially required a property for themselves and their servants in close proximity to the archbishop's courts.

The earliest range within the BH is the 14th prebendal house. This range was unusual in its three-storey construction and appeared to represent a specialised building design that had been purpose built. The early house was added to in the 15th century with a new range at right angles to the earliest. The addition had a large ground-floor two bay hall and a two-storey service bay that incorporated a common passage (the public alleyway remains in use today). The high quality hall in the 15th century range was likely built for the use of the priory; it certainly replaced a previous hall wing along the same alignment (Michelmore, 1987). Not long after the construction of the hall the decline of the monastery's wealth resulted in the rental of the BH to secular tenants. The change from the canon hospice to secular tenants resulted in changes in the structure of the BH. The early prebendal house range was subdivided into smaller tenancies and a series of post-medieval alterations were made with extremely poor quality construction (See Figure 8.3 for an excavation plan of the BH structures).

The excavation at BH began on February 2nd 1987 and took 11 weeks to complete (Brann, 1987). The excavation focus was limited to locating the earliest levels associated with the prebendal house. The two ranges of BH divided the building into five rooms. These were labelled as Areas 1 through 5 during excavation (Figure 8.3). Areas 1, 2 and 5 were within the early range structure and Areas 3 and 4 were located within the later Hall range (see Figure 8.4). This case study will focus upon the stratigraphic sequence recovered from Areas 1 and 2. These were chosen because they provided the opportunity to investigate a sequence of deposits that stretched the full chronological history of the use of the medieval house. The sequence within Areas 1 and 2 begins with the construction and use of the prebendal house and moves into the addition of the new range. This resulted in subsequent changes to the design and function of the structure as well as the change from religious to secular domestic use. By evaluating this sequence it may be possible to investigate the nature of medieval domestic deposits and how these relate to social use and structure. A new narrative approach to the history of BH, one more reflective of the integrated data, may prove interesting and add to the existing site story.

The YAT excavators divided the BH sequence into four phases within Areas 1 and 2. These were defined as Phase 1, late 13th to early 14th century deposits related to the first building. Phase 2, 14th century deposits related to the last period of the sole use of the first building. Phase 4, late 14th to early 15th century deposits related to the period following the construction of the second building. Phase 5a, 15th to 16th century deposits related to the life-use of the connected second building. This phase was divided into three sub-phases based upon the chronological order of different flooring types. These are firstly, 5a; the earth and clay floors, 5b; the mortar floors, and 5c; the brick floors. For the purposes of this study we have focused on the 5a floors that form the earliest part of phase 5a from the post-medieval sequence. As in the SG case study, the BH site and report is structured according to the YAT "Context Sections" system. The context sections defined the existing site narrative and, as before, the following case study should demonstrate an interesting examination of the nature of constructing site narratives, as the chronological structure of the "discussion points" will be re-examined by the methodological approach used here.

8.3 Data Construction

Construction of the Sequence –

As a result of using two separate excavation areas in the BH case study, it was necessary to connect the stratigraphic sequence of the two areas. Area 1 and 2 were excavated and organised as separate operations. With the use of the site matrix organised by the excavators it was possible to order the BH sequence used here. The final sequence is grouped by the phasing defined by the excavators as outlined in the stratigraphic matrices. As in the CMP case study, it is accepted that within this final sequence there may be room for movement of separate deposits up or down the order, but it is necessary to decide on a final accepted order for analysis (Table 8.1 – 8.12).

Deposit Definition –

Following the methodology previously established the Physical Deposit Type and Interpreted Deposit Type categories of deposit data are defined by examining the soil descriptions and their related interpreted functions. The physical deposit soil descriptions were drawn from the archive report produced by the YAT. The report provided simple details of each deposit, mainly describing each layer by primary and secondary elements (ex. Silty clay). In a few cases this includes the description of deposits composed of decayed wood organic material. While this cannot be defined in the same manner as the soils types, this material was deserving of a separate descriptive category. The soil descriptions contained within this report were reduced into five categories of Physical Deposit Type. The five final categories are as follows:

Clay Based
Silt Based
Mortar and Debris Based
Sand Based
Organic Based

The Interpreted Deposit Type categories were produced using descriptions made in the Level III report. Unlike other case study sites, there was not a great range of interpretations of the BH deposits. Most deposits were identified as floors or fills, with a few other related functional interpretations. These are summarised into five basic groups as follows:

Construction Related
Dumps/Levelling Fills
Occupation Surfaces
Pit Fills
Linear Feature Fills

Construction Related deposits are those recovered in direct relation to the construction of walls or other building features. Dumps or Levelling Fills are deposits interpreted as serving a distinct purpose in the upkeep or construction of the floor surfaces. Occupation surfaces are applied to the varied floor surfaces that constituted the living space of the BH rooms. Linear Feature Fills and Pit Fills are deposits found within the many small cut features within the structure distinguished from each other by the occurrence of linear, or ditch like construction of some features. The interpreted categories essentially distinguish between layers created by construction, living debris and the upkeep and construction of living surfaces, and the disposal of garbage. The categories assigned to each stratigraphic unit are provided in Tables 8.1 to 8.12.

Status Sequence Graph-

The Status Sequence Graph is based upon the construction of the Seriation Diagram. This was built using the established stratigraphic sequence and by using the established medieval ceramic sequence identified in York. Previous excavation within York has informed a strong understanding of the medieval wares that circulated within the city. Excavations at Aldwark and other sites (Brooks, 1987:120) informed the construction of the basic pottery sequence at the BH. Personal communication with Ailsa Mainman, medieval pottery specialist at YAT, helped to establish a final order for the pottery recovered at the BH (Table 8.24).

As in previous case studies the seriation diagram was constructed using estimated vessel number counts from the BH ceramic record. Vessel numbers are used in the graph and the area within the fade points are highlighted by shading (Table 8.25). The completed seriation graph informed the remaining steps outlined in Figure 5.6, which were followed in order to define the frequencies of each status type present at the BH. The final product is the ceramic assemblage separated by status type according to context. This list produced the status sequence graph presented in Figure 8.6. The finished graph and related results of interpretation will be discussed in further sections.

Ceramic measures of site formation history-

Basic quantification and derived measures were used to compile a statistical representation of the formation history of the BH deposits and to develop deposit signatures. All measures were organised by stratigraphic unit in the established sequence. The site archive located at the YAT contained the initial ceramic analysis. These only contained simple lists of the ware types and sherd counts. Therefore it was necessary that I re-examined the ceramic material in order to determine the sherd weight, EVEs and Evreps. These measures were then used to compile the derived measures of formation history (Mean Sherd Weight, Average Sherds per Vessel, Completeness and Brokenness). Observational data such as burning present was also made during the re-examination of the ceramic archive, this data was used to formulate the Percentage Burnt measure. However, it was not possible to determine the occurrence of cross mends and the FMM score was not included in the BH analysis. As with the CMP excavations full dimensions for stratigraphic units were also not available, such that the Units per Volume measure could not be calculated for the BH.

Faunal measures of site formation history-

The BH archive did contain a record of complete faunal analysis. The faunal material was processed recording using basic counts of species, bone type and other details. The BH assemblage of cow, pig and sheep bones was used in the analysis.

The NISP and MNI counts were determined using the faunal record sheets supplied by the analyst's personal archive. NISP values were taken from the basic counts and the MNI values were calculated using the counts of simple bone elements. Percentage Small was calculated using the lists of bone types present. Data on the recovery of separate bone elements was not included, leading to the decision to exclude the Percentage Whole measure. Any attempt to construct this measure based upon only the identification of proximal or distal portions recovered would have rendered the results too biased to be useful. Counts of teeth were not recorded either, so the Teeth:Mandible was also excluded from analysis. As with the SG case study it was determined that a substitute faunal measure was necessary to complete the faunal analysis. Again it was decided that the NISP:MNE ratio would serve to account for the formation history of the faunal assemblage. This measure is calculated by determining the MNE (Minimum Number of Elements) for each deposit. This is defined as the number of identifiable body parts within each deposit, excluding non-identifiable fragments and ribs. The NISP:MNI and NISP:MNE ratios are intended to represent the degree to which an assemblage as been broken up or made unidentifiable by other processes.

Quantification and Seriation Levels 1 to 3-

Level 1 analysis will be based upon the stratigraphic sequence presented in Tables 8.1 to 8.12. Level 2 analysis is based upon a review of the sequence organised by the higher order chronological groupings recognised by the excavators. The BH sequence, as discussed in section 8.2, is divided into five phase groupings. These phases will be the basis of Level 2 analysis (Tables 8.13 to 8.19), and ordered from latest to earliest are:

- Phase 5A
- Phase 4
- Phase 2
- Phase 1

The seriation diagram will be used to determine the residual and infiltrated components within the BH sequence. These finds are removed from the site assemblage before Level 3 analysis takes place. As in other case studies the placement of the "fade points", by which residual and infiltrated finds are defined, is an interpretive action. This is acknowledged and accepted as an unavoidable aspect of analysis.

8.4 Analysis

Following previous chapters the analysis begins by examining the statistical relationships between each measure using the Wessa.net free statistics software package (Wessa, 2007). The relatively small number of faunal remains hindered the statistical veracity of the tests, however, certain conclusions could be made at teach level of analysis. Following the statistical analysis the deposit related data is examined at each level.

Level 1 –

A table presenting the results of the Level 1 analysis is presented in Tables 8.1 to 8.12. The correlation analysis is provided in Appendix 3 (worksheets entitled "BH"). As in previous chapters this table presents colour coded positive and negative correlations as well as outlining the particularly positive and negative relations.

Within the ceramic measures it is most interesting to note the lack of strong correlations. The only strong correlation is observed between Completeness and Brokenness (r_s = 0.92, p = 0.0). The close relationship between these two measures has been recognised in previous examples and was for the most part expected. In addition to the generally poor statistical relations between each measure is the prevalence of negative relations at Level 1. One notable trend is for high percentages of Type B ceramics to occur with positive results for Mean Sherd Weight, Average Sherds Per Vessel, Completeness and Percentage Burnt.

The faunal correlation coefficients indicate a similar trend towards generally weak correlations. The Percentage Small measure is exclusively negative in relation to the other measures. The only consistent statistical relationship was between NISP:MNI and NISP MNE, suggesting that these two measures are closely related, and furthermore that one could be a useful substitute for the other.

The Level 1 extra-set correlations provided a greater range of strong relations. Percentage Burnt expressed a strong correlation with Percentage Small cow bones ($r_s = 0.80$, $p = 0.1646$). Also, the NISP:MNE ratio for pig bones was shown to correlate strongly with Completeness and Brokenness. As other case studies many correlation results were not statistically viable, due to the low number of samples in the group. Overall, the strength of integrating each form of data is not expressed in purely statistical results. The benefits of integration will be demonstrated more fully in the analysis methods to follow.

The links between deposits and materials once again provides some interesting relations. The deposit data relationships between what exists physically and what is interpreted presents some interesting parity. A summary graph (Figure 8.5) of the frequency of each physical deposit type found in each interpreted category demonstrates the parity between each interpreted type. Each category is dominated by the frequency of clay based deposits. The predominance of clay deposits in stratigraphic units of all interpreted function perhaps indicates a site specific tendency towards clays, in any case it would seem to lessen the importance of the relationship between clays and any particular function in any individual category. There are no other clear relationships demonstrated in the summary graph. Perhaps as expected, mortar and debris related deposits have a connection with construction related deposits. Pit fills are almost evenly divided between deposits of clays and those of sand based contents. It appears from the deposit based data that at BH there is no consistent relationships between physical deposits and our interpretations of their functions.

The results of the ranking procedures from the ceramic and faunal related measures provided a much clearer picture of deposit signatures at BH. The Construction Related deposit category averaged low ranks in the Mean Sherd Weight, Average Sherds per Vessel, and Percentage Burnt categories indicated a ceramic assemblage of few, burnt and broken sherds per vessel. The Status Type frequencies demonstrated a transition from Type C to Type B ceramics, notably with Type B status ceramics in the earlier Phases 1-4. The faunal remains were generally nondescript with average ranks of high NISP:MNI ratios and low NISP:MNE ratios. The faunal assemblage fails to negate or reinforce the clear ceramic signature of a broken and disturbed deposit type.

The Occupation Surfaces category featured averaged ranks representing small sized sherds with few examples per vessel. There were low rankings associated with the Percentage Burnt measure indicating a signature of broken sherds not subject to life use or post-depositional burning. The status frequencies were a mixture of Types A and F ceramics. This was primarily Type A ceramics in Phase 2 and Type F in Phase 5. The faunal measures presented averaged rankings representing relatively intact cow bones with less distinct trends among the other species remains.

Linear feature fills and Pit Fills exhibited distinctly different signatures despite their close affinity to each other. The Linear feature fills had a generally disturbed signature with low rankings for Mean Sherd Weight and Average Sherds per Vessel, as well as very few examples of burnt ceramics. The Brokenness and Completeness measures are in opposition to this trend, however this is due to the fact that only one Brokenness/Completeness measure exists for this category, which was quite high. This individual measure is likely an outlier and not representative of the overall signature observed in the other ceramic measures. The Linear feature fills ceramics were mostly of Types B and C status. In opposition to this signature the Pit Fill category demonstrated a mostly intact signature with large average sherd size and many sherds per vessel, as well as being relatively unexposed to burning. Unfortunately the faunal record does not allow additional comparison of these opposing signatures, as there were no faunal remains in the Linear feature fills deposits. The Pit Fill faunal assemblage demonstrated a different trend than its ceramics with relatively fragmented bones but very few small bones, therefore ranking high in that measure category.

The final interpreted deposit category, Dumps/Levelling Fills, had an interestingly intact signature with relatively large sherd sizes, more sherds per vessel with little burning. The status types were an even mix of Types B and C ceramics. The faunal remains were intact and not highly fragmented when observed relative to the other interpretive categories.

Level 2 –

The higher order groupings at BH that Level 2 is based upon are structured on the four relevant phases of life-use in the hall structure (see Tables 8.13 to 8.19 for the Level 2 results). These phases (1, 2, 4, and 5a) range from the late 13th century to the 16th century and are organised along specific changes/alterations or other natural divisions in the life-use of the BH structure. Although the focus of this research, as stated above, is upon deposits located within the earliest structure (Areas 1 and 2) the 5 phases of the site extend chronologically across a period in time from the earliest construction and use of the prebendal house, through the addition of the second hall building. During these phases the overall use of the building transitions from a monastic related structure to its rental as a secular domestic dwelling.

As seen in other case studies, unlike the Level 1 correlations, a greater number of strong relationships are observed (Appendix 3). Throughout Level 2 a number of strong negative and positive correlations are observed. This is largely due to the small sample numbers used at Level 2. This, as observed at Level 1, results in a low probability of the results expressing a true relationship. It is interesting to note that the results of the correlation analysis of Type B status ceramics were distinctly negative at Level 2. This differs from the notable positive relations with the main ceramic measures at Level 1. The great increase in sample size affected results was observed among the faunal relations. At the Level 2 extra-set correlations this trend continued, with a range of completely positive or negative results (1 or -1). From a purely statistical point of view the results of the BH case study cannot shed light on the effects of higher order grouping of contextual data.

The Level 2 deposit related relationships are once again based upon a grouping of the most prevalent interpreted and physical categories in each phase of the site. This task can be difficult in cases were a genuine mixture of categories exist in each phase. As in previous chapters it is accepted that a particular phase is *primarily* a phase of a particular deposit contents and functional types. Specific deposit signatures could still be determined for each phase. The already cited quantity of clay based deposits results in this physical type being representative of each phase, except for phase 4 which is associated with the Construction Related interpreted category. This association is tenuous however, as there were only two deposits in Phase 4 so this phase could have also been attributed as well to the Clay Based category.

Phase 5 was associated with clay based deposits and was interpreted as primarily a phase of Dumps and Levelling Fills. As was observed at Level 1 with the Dumps/Levelling Fills, the signature for the Phase 5 material was one of large sherd size, higher sherds per vessel, high Completeness and exposure to burning. Again the status types present are evenly Types B and C. The faunal assemblage indicates an intact collection, although the NISP:MNI measure counters this trend. Like Phase 5, the Phase 4 signature is exactly the same as those observed for the Construction Related interpreted category at Level 1. This is due to the fact that this short phase is represented by only two deposits, both of which were Construction Related.

Phase 2 offers an interesting mixture of signatures observed at Level 1. This phase is attributed to the Occupation Surfaces interpreted category and like the signature observed for this category at Level 1, Phase 2 has few sherds per vessel that are unburnt. The sherd size however is noticeably larger and is likely due to the number of Dumps/Levelling Fill deposits within Phase 2, which are notably larger in average size. The Status of the ceramics within Phase 2 is primarily

Type A with a smaller frequency of Type F ceramics. The Phase 2 faunal assemblage is mainly composed of fragmented bones with few small bones.

Phase 1 has a notably mixed signature. Although this phase is associated with the Pit Fills interpretive category, there are a varied number of different deposit types within the phase resulting in a signature that fails to clearly reflect any of the single deposits types within. The ceramics in Phase 1 were composed of smaller sized sherds with many sherds per vessel and a relatively high number of burnt sherds. The status types present were overwhelmingly of Type B. The faunal assemblage was composed of relatively intact bones but with many small cow bones.

Level 3 –

Level 3 analyses filtered the dataset to remove the material ascribed as residual. As before, the Seriation Diagram is used for this purpose, as the material lying outside the shaded curve being removed before analysis took place at Level 3. Faunal material and the status related frequencies were not considered at this level. See Tables 8.20 to 8.23 for the Level 3 results. The correlation results are presented in Appendix 3.

When compared to Level 1, the Level 3 correlation analysis remains completely unchanged in terms of positive or negative results. The only changes occur in the strength or weakness of the observed relationships. A greater number of stronger relationships are observed at Level 3. Specifically with the Percentage Burnt measure stronger relationships are expressed between Average Sherds Per Vessel and Percentage Burnt (r_s = 0.76, p = 0.0086) and Completeness vs Percentage Burnt (r_s = -0.9, p = 0.0702).

Trends observed in earlier case studies are once again demonstrated with the removal of the residual material from BH. This result was all the more surprising given the large amount of residual material identified within the BH site assemblage. As was the case in the CMP case study, the ranks of each measure remain largely the same *relative* to each other. Despite changes in the average ranks of measures under each interpreted deposit type, the relationship between each type largely remains the same (ex. At Level 1 and 3 Pit Fills was the least burnt category). At Level 3 the Linear feature fills category was difficult to compare to the Level 1 results because, with the residual component removed, there was no measurable data for Completeness, Brokenness and Percentage Burnt. The Mean Sherd Weight and Average Sherds per Vessel results, however, remained virtually the same from Level 1. In previous case study examples the continuation of signature trends despite removal of material was attributed to small residual components (HfF), yet as residual amounts increased (CMP) this trend continued. With the results from BH analysed it now seems there is a clear trend with potential future effects for practice. Our ability to understand and classify deposits and assemblages is not greatly effected by residuality. The results of the Level 3 analysis will be followed closely in future case study examples.

8.5 Review and Summary of Trends

As in the previous case study chapters the results of the research aims - to test our ability to define different deposit types and move between them, our ability to quantify assemblage data, and our ability to correlate differences in assemblage signatures and deposit classifications - will be summarized in the following two sections. These are a *Review of the Levels of Analysis*, and the *Key Relationships and Signatures*. Additionally, our ability to use deposit, stratigraphic and material data towards constructing site narratives will be examined.

A Review of the Levels of Analysis must first assess the quantification results from BH. The ceramic measures indicated a generally greater negative relation with each other than in previous case studies. The Percentage Burnt measure demonstrated a generally negative relationship with the other measures. This measure was recorded directly by myself during the ceramic analysis, unlike at CMP where burning was only noted sparsely and in an inconsistent manner. The consistent negative results in some cases may be more closely tied to the processes that account for burning in ceramics. This measure may be more likely accounting for burning during the life history of the ceramic vessels and not an aspect of the post-depositional history of the finds. At BH the burnt finds were associated with cooking pots. These are generally large, bulky vessels which had subsequently larger sherd sizes once recovered. It appears that the percentage of burnt material present in an assemblage is more a reflection of particular processes that existed on that site, and less a reflection of particular post-depositional disturbance.

Another interesting aspect of the correlation analysis is that from a statistical point of view the Completeness and Brokenness measures were considerably less reliable at BH than in previous case studies. This fact put a greater importance upon the results of the Mean Sherd Weight and Average Sherds Per Vessel measures, which were consistent indicators of deposit signature throughout the BH study. It is interesting to note that reliable signatures were observable with a relatively small number of fragmentation measures.

The two levels of deposit related data provided a single consistent relationship. The prevalence of clay based deposits in all interpreted categories creates a situation where the ability to move between each level of deposit data with consistent results is not possible (see Figure 8.5). Our ability to define and understand deposits at BH based upon their physical contents is not possible based upon the presently used definitions. Perhaps with expanded, more exact categories, identifiable trends and relationships between physical and interpreted natures might be possible. This would likely come as a result of more integrated physical contents categories that take inclusions more into account.

The *Key Relationships and Signatures* at BH reveal our further understanding of each level of analysis. By determining how these change and relate to function, aspects of the research aims are addressed. As noted many clear and consistent signatures exist within the BH dataset. These strong identifiable signatures that were revealed at Level 1 once again remained clear at Level 3. This trend, visible throughout the case study analysis, reinforces our need to question our practices and perceptions of materials and deposits. Many assemblages and deposit sequences are disregarded during analysis due to the perception that a strong residual component renders them of a low interpretive value. The aim to link deposit signatures to activities and construct site narratives based upon them is achievable with even very strong residual assemblages, such as those found at BH.

The Level 2 grouping of deposits revealed some consistent signatures between the deposit and group levels and some obfuscation of the Level 1 findings. The results of phase 4 and 5 signatures is one that mainly remained the same and identifiable. The blending of otherwise distinctive signatures expressed in the deposits within phase 2 results in an averaged signature. This averaged signature lacks the extreme results expressed by the disturbed and undisturbed deposit types at Level 1. The main negative result of the grouping is that the key distinction between signatures of the Linear feature fills and Pit Fills were not identifiable during any phase. The key differences between these two types of deposits, and how they relate to activities on site, would not have been visible if analysis was only performed at the phase level.

Taken as interpretive reflections of activity the deposit signatures provide some interesting results. Perhaps as expected the Construction Related deposits consisted of fragmented ceramics, highly exposed to burning with equally disturbed faunal material (according to NISP:MNE scores). The materials transitioned from Type C to Type B status. This indicates a movement from material brought in from off site in later periods to those spatially related in the earliest phases. This may represent the changing nature of construction activities during the first and second ranges built in the 14th to 15th centuries.

The Occupation Surfaces category held finds indicating high fragmentation with low exposure to burning. The faunal material was relatively intact in relation to the other categories. This result is interesting, noting that fragmented material would be expected within a high traffic surface area, without evidence for burning. While the possibility exists that these intact bones were deposited at the end of the "life" of the surface, these results may indicate that burning related material was removed from within the occupation area of the structure or that cooking and heating processes were subject to much greater amount of control than might be normally assumed.

The Pit Fills and Linear feature fills categories demonstrated different signature from possibly related deposit types. The intact unburnt Pit Fill material is juxtaposed by the fragmented and burnt Linear feature fills finds. It appears that the Pit Fill features were created with for the removal of intact, fresh waste whereas the Linear features may have been exposed or in some way open to a completely different set of formation processes. These results mirror in some ways the Circular Feature Fill and Linear Feature Fill categories found at CMP. Unlike these deposits however, the BH Linear and Pit Fill categories do not appear to be related to each other consistently by spatial or temporal location. These deposit types were not found close to each other in a particular period of time. It appears that over the course of three centuries examined at BH, that these two deposit types existed to support their distinctive activities. It is interesting to note that both deposit types demonstrated a change from primarily type C ceramics at the latest phase to Type B status at the earliest. This may represent a common development over time, whereby waste is deposited in relation to its location in early periods, and moving over wider areas in later periods.

The Dumps/Levelling Fills category was quite intact with large sherd sizes, more sherds per vessel with little burning, with intact faunal remains. These results were unexpected as the nature of the fill deposits, mostly to level floor surfaces in anticipation of a re-flooring, suggested that broken material might have been recovered. The intact finds indicates that specific disposal of fresh waste into levelling layers may have been part of the practice of created levelling deposits.

8.6 Conclusions

To summarise the results of the BH case study the following will examine the quantitative measures used, the effectiveness of each level of analysis, and the possible site narratives constructed from the integrated analysis. Once again, a series of different site narratives can be offered for BH based upon the methods employed. These new narratives offer examples where different approaches can result in interesting interpretations of a site.

At BH the ability of the statistical measures to assess formation history and sketch a deposit signature was varied. Despite some of the statistical results the ceramic measures, specifically the Mean Sherd Weight and Average Sherds Per Vessel measures were useful in determining specific deposit signatures. The faunal measures were again less reliable. In several cases the results of the small sample group being tested affected the results more than the measures themselves. Overall, it seems that the correlation results are less important indicators of the usefulness of the measures than those expressed by overall integration of the data. As the events graphs show, the interaction between the ceramic and faunal measures demonstrates that the data is able to tell us about a sites history in interesting ways.

The three levels of analysis once again resulted in a range of clear signatures, obfuscations and challenges to existing beliefs. The Level 1 signatures, even those relying on simplistic measures, were consistent and specific to each interpreted deposit category. Several of these signatures were obscured by the combination of deposits at the phase based groupings of Level 2. Key signatures like the Linear feature fills and Pit Fills were not clearly divisible at the grouped level. At Level 3 it was clear, following earlier examples, that residual material is not as much an obstacle to interpretation as often thought. In fact, the measures employed at BH demonstrate that residual rich deposits can be understood and defined using simple approaches available to all archaeologists with minimal effort.

The relationship between the definition of deposit signatures and deposit modelling was discussed in previous case study sections (Section 6.6). At BH many of the recognised signatures may prove useful in future modelling of urban deposits. The relationship between different fill deposits, discussed above, is an obvious example whereby models might inform future work. Additionally, the nature of occupation surface deposits, their broken nature and rarity of burnt materials may prove an interesting model for future consideration of similar deposits. The surprisingly intact nature of levelling fills at BH is another signature that could prove useful in disentangling other urban deposits.

Beyond the correlation analysis observed at BH, there are interesting notes to be made about the nature of formation measures used in this study. The general absence of rim sherds rendered the Completeness/Brokenness measures less reliable than in previous studies. It is interesting to note that reasonably consistent relationships exist between the other ceramic measures. The simple measure of Mean Sherd Weight provided valuable insight into deposit signatures. While this measure may be regarded as dubious due to the consideration of different ware types in use during different periods, the fact that this was reinforced by the results of the Average Sherds per Vessel and Percentage Burnt measures reveals that these easily produced, and generally inexpensive to generate, methods can provide valuable insight into understanding and classifying deposit types.

The faunal measures used in the BH study may appear statistically unreliable, however, the results revealed trends towards useful and consistent classification of deposits. As discussed in previous sections (Section 8.3), the nature of the original analysis performed on the materials meant that certain measures employed in previous case studies were not possible. However, the results from BH demonstrate that the simple ratio of NISP:MNI and the newly introduced NISP:MNE measure could be valuable and consistent measures for understanding the nature of faunal assemblages. Their use in conjunction with the ceramic measures demonstrates that with the minimal investment into post-excavation analysis we can understand deposits in different ways, if we are open to new ways of grouping archaeological data.

The site narratives constructed at BH can be based upon several different means of grouping the site data. The original excavators of BH produced a temporally based, functionally driven narrative which worked in conjunction with the in-depth historical study of the locale. As the site was excavated within a redevelopment basis, the final site narrative was set in a Level 3 archive report, a report which by its nature only seeks to outline stratigraphic developments (Frere, 1975:2.5); this report intentionally lacks elaborate narrative. This provided the present evaluation of BH with generally a blank slate with which to define and understand the excavated material. With this in mind the status sequence graph (Table 8.27) can be used to construct a fluid narrative to the site data.

This narrative reads as the following. In the earliest phases of occupation within BH a series of construction and pit fill deposits related to the establishment of the property were laid down. These held mixed amounts of highly fragmented construction material, and intact occupational related waste. These deposits were primarily composed of Types B and C ceramics intermixed with Type A ceramic within the early floor surfaces. This range of alternating pits, dumps and occupation surfaces continues until a significant block of Type C finds are found in association with Dump/Levelling Fill deposits. Following this episode is another block of deposits that are dominated by Type F, and to a lesser extent Type A finds. These deposits correlate to a series of occupation surfaces and linear features within the new building range. It is interesting to note that at this time the nature of occupation surfaces appears to change from those that existed in the earliest building phases. Following the occupation deposits is a long chain of Dump/Levelling Fill deposits that are dominated by unfragmented Type B ceramics. The last period of occupation within BH is characterised by construction related deposits of Type C status. These deposits differ from their earlier like construction fills in that they contain large amounts of residual material derived from the area of the BH.

If we now organise the site data in a way that elicits a landuse based narrative, constructed independent of the site chronology, several interesting results appear. Following the procedure explain in section 6.6 a line graph is constructed using in this case a mixture of faunal and ceramic data. The results of the NISP:MNI and NISP:MNE ratios and the Mean Sherd Weight and Percentage Burnt measures are organised into a line graph with non-entry fields removed. This "events" based graph allows us to examine the life-use history of BH notable for the alignment of the ceramic and faunal measures and highlighted by four key events (Figure 8.7). Towards the end of the medieval use of BH a large deposition of fragmented and burnt materials took place (Point 1 Figure 8.7). This event interestingly corresponds with the appearance of a pit fill deposit in the middle of a chain of dumps and levelling fills. Following this event a series of peaks and valleys are clearly observed. It is interesting to note here that all these deposits correspond with the Dump/Levelling Fill category, perhaps indicating that this interpreted category represents multiple different forms of activity. Following these events a large deposition of intact and unfragmented material takes place (Point 2 Figure 8.7). This episode corresponds to an occupational surface. Following this a peak of unburnt and unfragmented finds a large deposition of highly fragmented and burnt materials characterising a construction related episode. Finally, another deposit of unfragmented material (Point 4 Table Figure 8.7) directly follows a smaller dump of disturbed and burnt finds. The event based narrative once used in conjunction with the deposit signatures indicated a clearly traceable landuse history of repeated build, dump, and occupation surface deposits. These events help to define the changing nature of life within BH and build a richer understanding of the history of this site to exist alongside the archival evidence.

The BH case study has provided key insights that build upon the trends and relationships that have been observed in the preceding studies. The BH case study has provided examples where common assumptions about deposits are supported by the results and examples where other assumptions are challenged. The "events" graph demonstrated that peaks and valleys corresponded with changes in the interpreted deposit types. These results correspond with common assumptions about deposits. However, the deposit signatures suggest several differences from common assumptions. The relationship between occupation surfaces and burnt material for example, suggests that burning material was intentionally deposited in other locations. This would be a clear challenge to the common interpretation that charcoal flecked surfaces are linked to occupational levels, as it is assumed that cooking and heating processes will result in charcoal that over time, is naturally distributed around an occupational surface. In either case the results of the BH case study has now provided a means of testing these assumptions, removing them from the level of supposition. In the next chapter our ability to identify and disentangle the different deposit signatures will be tested along with the varied applicability of different site formation measures. With the following case study the value of understanding a site based upon integrated data, free from highly structured chronology, will be explored within a different setting.

Chapter 9

109-113 George Street, Parramatta, NSW, Australia

9.1 Introduction

Previous case studies and their relevant analysis sections have identified core deposit signatures representative of activities. In particular cases these signatures were noted for their possible strength in modeling the local deposits (see Carver, 1990) and therefore informing types of activities and processes that would have otherwise gone unnoticed. With this assumption, that signatures can be constant indicators of site processes, goes a series of questions. The confined multiplicity of functions and activities performed within most urban contexts (houses, shops, etc.) is assumed to create such a varied texture of deposit types that modeling across any great area is unreliable. I have been assured that on urban sites you could identify completely different signatures from one meter to the next. The following case study is designed as an exercise to test these sorts of assumptions because it is simply not good enough to assert these notions as fact. The potential boon for urban archaeologists, especially those operating within developer funded contexts, warrants a controlled examination of the reliability of deposit signatures of understanding a site on a wider basis.

With this basis for this exercise established the site at 109-113 George Street, Parramatta, NSW, Australia was chosen to serve as the setting for this experiment (Figure 9.1). The site at 109-113 George Street (hereafter GS) was excavated within a developer funded setting by Casey and Lowe Pty. Ltd. under the direction of principle archaeologist Mary Casey, who has kindly made the GS data available for review. The GS site is located within the urban core of Parramatta, near the NSW capital of Sidney. The property was the location of a Roads and Traffic Authority local offices during the most recent modern period but was historically the property of the Hassall family, prominent in the area, and established by the patriarch Rev. Rowland Hassall. The lots of land that made up the GS site were subsequently the location of the family home, store, village

Sunday school, barns and outbuildings, and a dairy. The home and buildings were used not only as a family residence but as a printing press business, and for preaching and hosting religious services and other community activities.

The GS site is distinctly useful as the test case because of its range of deposits and level of analysis. This is due to the following factors:

- Based upon the history of GS it is expected that a range of deposit types will exist that reflect their corresponding processes. If deposit signatures could be identified that relate to different activities then we may then be able to test for their applicability across the whole site.
- Our ability to identify signatures will be strong due to the detailed amount of post excavation analysis that was performed upon the site's finds.
- The structure of the excavation, and therefore the organization of the site data, will naturally lend itself to the proposed experiment.

In order to test the assumptions discussed above, the following case study experiment is designed as a partial blind test. The GS site was divided into two areas during the excavation phase. These areas, designated Area A and Area B (Figure 9.2), coincided with the modern property boundaries designated to separate the George Street properties from those behind them (Union Street, Parramatta). This excavation division creates a natural means of separating the GS sequence for analysis. With this in mind it was decided to analyse the sequence from Area A as per the standard methodology. This analysis was performed at Level 1 with the aim to define and understand the site in terms of the deposit signatures within. With the data established the process was repeated with the sequence from Area B. However, the second sequence was examined as a blind test, without the deposit related information available, in order to test the effectiveness and consistency of the deposit signatures: to see if the form of each deposit signature is identifiable without the aid of the interpreted or physical deposit descriptions, based solely on the results of the formation measures.

In order to create a fair and reliable procedure it was necessary to enact certain measures. The order of the Area B sequence was defined, using the site's stratigraphic matrix, by an outside observer. The ordered sequence was delivered to me with the corresponding material database. With this established the analysis was performed again following the standard methodology. Individual context numbers were known during the analysis, but no idea of the interpretations of contexts was retained. Preceding the test summary, the following sections first present the SG site background (Section 9.2) and then presents the specifics of the analysis process (Section 9.3). With the blind test performed the final sections of this chapter reveal the excavators interpretations of each context and examine the results (Section 9.4).

9.2 Site Background and Research History

The archaeological investigation at GS began during a redevelopment of the property. The initial identification of archaeological potential arose during feasibility study for the project. A process of preliminary testing was undertaken in November of 2003 during the demolition of the previous structures owned by the Roads and Traffic Authority (RTA). Following initial study and subsequent removal of modern contaminated material from GS, full scale excavation began in 2004 by a team of Casey and Lowe archaeologists. Following the historic period excavation of the GS property, investigation of the indigenous archaeological remains was carried out in January of 2005.

The following background of the GS excavations is based upon the extensive archive report published by Casey and Lowe (Casey, 2006). The settlement at Parramatta, only the second established in Australia, was founded in 1788. Parramatta was initially an agricultural settlement worked by convict labour but soon became a town of growing importance (Casey, 2006:19). Despite the increase in civic organisation, when the lots at 109-113 George Street were occupied by the Hassall family, Parramatta was very much a rural outpost. On October 18 1799 a 14 year lease was issued to the Reverend Rowland Hassall for an acre of land at the price of 5/- per year (Casey, 2006:24). On 24 May 1803 Rev. Hassall purchased his neighbour's "4 acres 96 rods" for £30 (Casey, 2006:24). By 1805 Rowland Hassall had obtained all the land within the GS study area. The Hassall's house was constructed around this time.

The Reverend Rowland Hassall arrived in Australia after leaving a missionary post in Tahiti in 1798. Hassall acted as a government storekeeper, and later in 1814 as the superintendent of Government Stock. He and his wife, Elizabeth had four sons and five daughters. Throughout this period he continued to acquire land and preach from his home in Parramatta. The property at GS was outfitted with a barn, which served as the regular place for religious services. In addition the property housed a printing press and a children's Sunday school, separate kitchen building, dairy, and up to two other outbuildings. Following Rowland Hassall's death in 1820 the house and buildings were left to his wife and son. Following the death of Elizabeth Hassall in 1834 the property passed on to Thomas Hassall, who rented it out to tenants. During this period the property was the location of at least two schools: the Mills' Aldine House Commercial and Clerical School c1840 to 1846 and later on the Griffiths family's girls' school from 1859–1865 (Casey, 2006:36). Upon Thomas Hassall's death in 1868 the property passed on to other members of the Hassall family. In 1882 the family decided to sell the land, which went to auction in September of that year (Casey, 2006:31). In 1882 the Hassall family residence was demolished (see Figure 9.3 for a photo of the house just prior to demolition).

Following the sale of the Hassall families' extensive property holdings the allotments within the study area at GS passed through private ownership. The 1880's subdivision of the land into private lots saw individual houses constructed with George Street and Union Street frontages. The Commissioner for Main Roads arranged for the purchase of lots at the GS property in 1961, and built a two-storey office building at 113 George Street (Figure 9.4). This structure is referred to as the RTA buildings by the GS excavators. The RTA buildings stood until their removal and subsequent redevelop prompted the GS excavation.

Under the permit applications for the GS project a series of research aims were established (Casey, 2006:8). These included improving the understanding of the convict and free life in colonial Parramatta, the landscape of colonial Parramatta and, more specific to the property, understanding life in the Hassall household. The aims for the latter included elucidating:

- The nature of life in this household where the Hassall family lived for about 30 years.
- The nature of the material culture and consumption patterns of the Hassall family and their servants/staff over a period of about 30 years and how these remains related to the transformation of their environment from rural to urban place.
- Evidence for the nature of childhood and the way in which gender identities were constructed
- The way in which servants lived in this household.
- How religious life affected the way of life in the Hassall family. How was it different to convict lives or other settlers in early Parramatta?
- Evidence for customary patterns (buildings, food, religious practice, cultural artefacts)?
- Layout of the house and outbuildings and how this structured life in the Hassall household.

The study of GS followed an open plan stratigraphic excavation methodology. Initial surface deposits were stripped off by machine during the removal of the RTA structures and modern contaminants. The modern construction activities were found to have greatly impacted the remains of the Hassall period remains and related archaeological features (Figure 9.5). The site was divided into two areas, A and B, following the natural lot divisions of the civic property. Area A contained the northern half of the site along the George Street frontages, and Area B contained the southern half of the site along the Union Street frontages. The Area B features were organised into five spatially based groups. These were the features associated with the Dairy, the Central pit group and four Western pit groups (numbered Group 1-4). The excavators of the site divided the sequence within both areas into eight phases based upon the structural and land-use history of GS:

- Phase 1 is the natural and indigenous occupation of GS.
- Phase 2 the Pre-Hassall House Features.

- Phase 3 is divided into two sub-phases; 3.1 the Construction of Hassall House (1804 or c1814) and 3.2 the Occupation of Hassall House (c1814-1834).
- Phase 4 the Leasing of Hassall House (1834-1880).
- Phase 5 the Demolition of Hassall House (1884).
- Phase 6 the Twentieth-century housing.
- Phase 7 the Rubbish dump, site preparation and construction of RTA buildings (1960s).
- Phase 8 the Surface collection and demolition of RTA buildings (2003 and 2004).

9.3 Analysis

Control Sequence Signatures –

The control sequence, derived from Area A at GS was constructed following the methodology demonstrated in previous chapters. The stratigraphic sequence within Area A was constructed using the stratigraphic matrix. A greater number of deposits within the sequence are formed by horizontal stratigraphy. That is, they are not linked by long stratigraphic chains. Therefore, these deposits could only be arranged stratigraphically based upon the interpreted phasing for the area. This may result in some vertical movement within the higher order stratigraphic groupings, however, without alternative data it was necessary to proceed in this manner. The Area A sequence is divided internally by seven temporal phases (3.1, 3.2, 4, 5, 6, 7, and 8). Phases 1 and 2 are not included in this study due to the lack of finds. The phases associated with the Area A sequence follow the date ranges and occupational history described above. The following analysis is based upon the final sequence presented in Tables 9.1 – 9.7.

The two categories of deposit data used with the Area A sequence, Physical Deposit Type and Interpreted Deposit Type, were defined with the soil description and their related interpretations provided in the archive reports. The formal grouping was based on the inclusions within each stratigraphic unit. Due to the natural location of GS, which is situated upon a sandy alluvial terrace upon the bank of the Parramatta River (Casey, 2006:48), the majority of deposits are sand based. In order to separate each deposit into a series of categories, the predominant inclusions were used as the deciding factor. These elements were provided as simple descriptions in the site archive and were not based upon estimates of occasional, moderate, or frequent amounts. The inclusions appeared in easily definable groups leading to the following physical deposit categories:

Sand without inclusions
Sand with Charcoal
Sand with Brick and/or Stone
Sand with Brick and/or Coal

Additionally there were deposits based on a mixture of Clay mortar and Brick Fragments. See Tables 9.1 to 9.7 for the list of deposits and their associated categories.

The Interpreted Deposit Type categories were produced again with the aid of the archive reports found within an Appendix list of each deposit and associated descriptions. The range of deposit types that exist within the Area A sequence were reduced into the following category list based upon the type of activities or processes described in the archive. The categories are as follows:

Finds Assemblage
Posthole Fills
Construction Fills
Demolition Fills
Pit Fills
Linear Feature Fills
Gardening Related Fills

The Finds Assemblage category was finds recovered during the machine removal of the modern surface deposits. These finds were collected but could not be associated with a particular feature or deposit. The Posthole Fills and Construction Fills were deposits defined as independent postholes or foundation trenches used in the construction of both the RTA buildings and earlier structures dating to the Hassall household. The Demolition Fills were deposits defined as those related to the destruction of the Hassall family house. Pit Fills and Linear Feature Fills are categories defined as refuse pits, the linear features differing in shape (which includes features described as "rectilinear" by the excavators). The Gardening Related Fills are those interpreted as likely garden beds associated with the Hassall family household.

Following the established methodology a series of ceramic and faunal measures were used to define the deposit signatures within Area A. The data supplied by Casey and Lowe (the sherd count, sherd weight) was used to construct Mean Sherd Weight and Average Sherds per Vessel measures (Table 9.1). Although the total estimated rim diameters were recorded for the GS sherds, the exact length of each rim sherd, or the portion of the whole represented by each sherd was ultimately not available. This fact resulted in the exclusion of the Completeness and Brokenness measures. The observation of cross mends between ceramic sherds allowed for the construction of FMM scores for the Area A sequence (Table 9.2). Using the minimum vessel counts and the extensive ceramic typology (Table 9.14) a seriation diagram was constructed for Area A (Table 9.15). This diagram was used to determine the frequency of each status type within the sequence (Tables 9.2 and 9.3).

The faunal recording at GS was extensive, which allowed for the construction of a full range of faunal measures for both sheep (the most common species) and cow. The faunal database for GS provided the means to determine NISP, MNI and MNE counts (Tables 9.4 and 9.5). Furthermore, Percentage Whole, Teeth:Mandible and Percentage Small were all included in the faunal analysis (Tables 9.4 to 9.7).

Using the data described above a series of explicit deposit signature was identified for the control sequence. The *Finds Assemblage* category was in many ways what would be expected from a collection of disturbed finds. The ceramics ranked highest in Mean Sherd Weight but low in Average Sherds per Vessel, indicating well preserved ceramics with very few sherds per vessel. This fact, combined with the FMM score indicating a high degree of movement, demonstrates that the well preserved finds are originating from disturbed features around the site. The whole collection was derived of Type C ceramics, further indicating that the mostly residual material was from disturbed contexts. This is likely because both contexts were firstly disturbed by modern construction (RTA buildings), and secondly by the process of the mechanical removal of topsoil. The faunal measures corresponded with the ceramic results, reflecting a well preserved collection of bones.

The *Posthole Fills* and *Construction Fills* categories reflected similar deposit signatures. Both featured ceramics that ranked low in both Mean Sherd Weight and Average Sherds per Vessel as well as low FMM scores, indicating a higher degree of movement among vessel sherds. Posthole fills were comprised of Type C ceramics in all but the very earliest Phase 3.1 context, which was composed of Type B ceramics. The Construction fills were made up of a mixture of Type C ceramics in the latest contexts, moving to Type E and then Type B in the earliest deposits. The faunal signature for both was of well preserved but incomplete bones. Both categories ranked high in NISP:MNI and NISP:MNE but consistently low in Percentage Whole (and notably were absent of any small bones). One interesting trend within the Posthole fills is that the earliest deposit (5027, see Table 9.1), located within Phase 3.1 exhibited a distinctly different signature than the other posthole deposits dating to Phase 6 (contexts 4839 to 4921 inclusive, Table 9.1). The Phase 6 postholes averaged 1.08 sherds per vessel, as opposed to the 7.00 sherds per vessel exhibited by context 5027. The small mean sherd weight and large number of sherds per vessel in the early deposit differs completely from those that follow. This indicates that the nature of posthole construction from the period of the Hassall house changes over time to the construction of modern houses and fence lines. Most likely due to the practice of using clean fills in modern construction processes, rather than backfilling with locally derived soils in earlier periods.

The *Demolition Fills* deposit signature was one of relatively well preserved, large ceramics, with low degree of movement. The faunal signature was one of poorly preserved bones, ranking low in both NISP:MNI and NISP:MNE for sheep bones. Alternatively the bones within this category exhibited higher proportions of whole and low quantities of small bones relative to the other deposit types.

The *Pit Fills* and *Linear Feature Fills* categories also reflected similar deposit signatures. The relationship between signatures and the shape of pit features will be discussed in later chapters. At GS Area A the signatures of both pit feature types is of well preserved, large ceramics, with relatively low degrees of movement. The faunal signatures reflect processes of poorly preserved bones with high ratios of Teeth:Mandible, as well as low percentages of small bones.

The *Gardening related Fills* category is based upon displaced soil deposits interpreted as serving a distinct process. It was expected that this should present a distinct deposit signature, as was the case once analysis was completed. The ceramics from the gardening deposits were distinctively small in comparison to the other categories, ranking low in Mean Sherd Weight and Average Sherds per Vessel. Unlike in the Posthole and Construction related fill deposits, they demonstrated low amounts of movement between vessel sherds. The fills were composed exclusively of Type B ceramic sherds, dating to the use of the Hassall house. Unlike the other categories, they held no faunal material with which to form a signature. It appears from the signature that the garden beds around the Hassall house became points of deposition of highly fragmented ceramics, perhaps reflecting the use of composting or special use soils.

Test Sequence: Identifiable Signatures –

The test sequence was derived from Area B at GS. As with the control sequence, the stratigraphic order was derived from the site matrix taking into consideration that horizontal stratigraphy could affect the order of stratigraphic units within a phase. The test sequence falls into three temporal phases: 3.2 (c1814-1834), 4 (1834-1880), and 5 (1884). The complete sequence is presented in Tables 9.8 to 9.13.

Following the methodology used in the control sequence at GS, ceramic (Tables 9.8 and 9.9) and faunal measures (Tables 9.10 to 9.13) were applied to the Area B sequence. Using the same format of minimum vessel counts and the ceramic typology developed by Casey and Lowe, a seriation diagram was developed for the Area B ceramics (Table 9.16). The typology at GS reflects changes in both ceramic ware types (creamware, Chinese porcelain, etc), and decoration forms (transfer print, lead glazed, etc). The mean dates are derived from the established time ranges for the introduction and popular use of each type. Without any deposit related information, it was not possible to determine the frequency of each status type present. However, it was possible to group the ceramics items to either the same period as their parent deposit (Types A, B and E) or those that are residual or infiltrated (Types C, D and F).

Using the deposit signatures identified in the control sequence as a guide, similar signatures in the test sequence were identified. However, the closely related nature of many of the control sequence signatures made it difficult to separate the test sequence into individual signature associated with a deposit type. It was decided that the control sequence signatures could be divided into two primary signature types, to be then traced and identified in the test sequence. The signature types were divided by those that represented a process of *construction,* including the Posthole fills and Construction Fills categories, and those that represented a process of *disposal*, including the Demolition fills, Pit fills and Linear Feature fills categories. The construction related signature was one of small sherds, few sherds per vessel, high movement (FMM scores), progressing from Type CDF to Type ABE ceramics, with well preserved but incomplete bones. The disposal related signature was one of large sherds, many sherds per vessel, low movement (FMM scores), progressing from Type CDF to Type ABE ceramics, with poorly preserved bones but more percentage whole.

Using the two signatures as a guide, the stratigraphic units in the test sequence were designated either constructed related or disposal related. As would be expected not every deposit in the test sequence could be grouped into one of the two signature types. Two different signatures were identified that could not be associated with the main pairing. These signatures were designated independent signature A and independent signature B. The first independent signature (A) was one of small sherds, few sherds per vessel with low movement (FMM scores), entirely of Type CDF ceramics, with large well preserved bones. This signature may relate to that associated with the Gardening related fills, although no faunal material was recovered in association with the gardening deposits with which to make any comparison. The second independent signature (B) was one of small sherd size but with many sherds per vessel, with generally poorly preserved bones. The complete sequence from Area B indicating the designated signature types is presented in Table 9.8

The seriation diagram from the test sequence (Table 9.16) mirrored that of the control sequence. This pattern was one of a sizeable deposit of ceramics in the earliest phases, those associated with the first occupation of the Hassall household, with a second large group of material dating to Phase 5 and the demolition of the Hassall house. It is interesting to note in both cases that the latest group of material across GS is residual in nature, indicating that no material was recovered that dated to the modern housing structures (Phase 6) or the RTA buildings from the 1960's. All the material that was recovered from the later phases was re-deposited or disturbed ceramics that originated from the Hassall family ownership of the GS property.

With clear and independent signatures identified within the control sequence and a series of related and independent signatures identified in the test sequence, it now remains to reveal the deposit data for the test sequence and examine the results. It will be interesting to determine if the deposits designated as construction related or disposal related are in fact associated with those sorts of processes. It will also be interesting to determine if the independent signatures are associated with discrete deposit types or processes, or if outliers exist within the construction/disposal deposit types. The effectiveness of our ability to determine and trace deposit signatures, as well as those affects upon site specific interpretation will be examined in the following sections.

9.4 Summary and Analysis of Trends

The deposit related data for Area B, the test sequence, was derived from the archive report and context index provided by Casey and Lowe. The process of defining the interpreted deposit types for the test sequence was created following the same process as that for the control sequence. As much as was possible, it was attempted to follow the same analysis procedure in order to avoid any individual bias imposing upon the results. Five different deposit categories were identified in the test sequence:

Construction Fills
Demolition Fills
Pit Fills
Linear Feature Fills
Gardening Related fills

Once again the Construction Fills were deposits defined as foundation trenches used in the construction of the Hassall house and outbuildings. The Demolition Fills were deposits defined as those related to the destruction of the Hassall family house. Pit Fills were defined as any pit based feature. The Linear Feature Fills differed in shape and function based upon its use as a drain. The Gardening related fills are once again those interpreted as likely garden beds associated with the Hassall family household. Using the combined data available each stratigraphic unit in the test sequence was associated with one of the deposit categories above. These results are presented in Table 9.8.

A range of comparisons and results are due discussion. Beginning with the two primary signatures designed during the blind test (disposal and construction) one can see that a range of agreements and discrepancies exist. The majority of deposits within the test sequence were defined as Pit fills. This is because the majority of the finds in Area B were part of a series of pit groups in isolated clusters around the site, classified by the excavators as the Western pits, groups 1 through 4, and the central pits (see area plan Figure 9.2). Many of the features designated as fitting the disposal signature pattern belong to the Pit fills, Demolition Fills or Linear Feature Fills categories. The faunal signature of the disposal related features is likely a result of their relationship with household waste processes. The process of using low quality meats for stews or stocks results in small poorly preserved bones, but with more whole bones because small and poor cuts of meat were used (Casey, 2006:97). These results fit with the signature pattern expected to be associated with this type of deposit. However, a range of discrepancies exist between deposits that fit the construction signature pattern yet belonging to deposits of a disposal related process. A closer look at these deposits reveals that there are specific reasons for these results.

The first group of signatures that demonstrate a discrepancy between the identified pattern and the deposit type are found in Phase 5. Stratigraphic units 5059 and 5062 both had clear signatures associated with construction activities yet are defined as Pit fills (Table 9.8). These deposits are both located in the central pits group. This area featured two brick lined pits (Figure 9.6) and one with unevenly laid bricks and sandstone slab fragments (Casey, 2006:102). The brick and sandstone materials were the same as those recovered in the cellar feature from the main Hassall house. This material was likely left over from the construction phase of the house, or a result of some later repair or demolition. The excavators noted that these types of pits have not been encountered on any other Parramatta sites.

The nature of these features suggests a specific function at GS. The excavators theorised that these served a storage purpose or were related to gardening while in use. The basis of the interpretation of a storage function is that the brick base situated the pit, which was then covered over with wood planks. From time to time the inevitable slumpage of the soft sands would be dug out. The basis for interpreting these features as garden beds is that the brick based fixed the location of the garden bed. When the beds were dug out and turned over periodically the bricks located the proper location of the garden plot. The fills of these features were regarded as typical domestic refuse, due to the range of domestic tableware vessels. In fact, based upon an itemised list of the fill contents, the excavators stated that ceramic assemblage was consistent with those from rubbish pits found around the GS site (Casey, 2006:102). However, it seems clear from the signature of these deposits that these features served a distinctly different purpose than receiving common household waste. This function appears to be directly related to the location and distinctive construction of these pits, distinguishing them from other common rubbish pits recovered at GS.

The second group of signatures that demonstrate a discrepancy between the identified pattern and the deposit type are found in Phase 3.2. This group (4819, 4831, 5068, 4954) all date to the period of initial occupation by Rowland Hassall and his family. It is interesting to note that amongst this group is stratigraphic unit 5040 which, as the signature suggested, was indeed associated with construction processes, as the feature had several post-like depressions in it. Context number 5068 is located in the central pit group and like the others in that area is a brick lined pit feature of a particular function. The remaining pits (4831 and 4854) are both located within pit group 3 (see detail, Figure 9.7). This group was notable for the level of re-cutting and disturbance amongst the features. The two pits were both noted for being clearly re-cut for later features. The results of the repeated re-cutting of these features may have created the deposit signature that distinguished it from the other disposal features. Context number 4819 was a small sandy lens located within the base of a feature interpreted as a garden bed. This deposit only had a small amount of material within it (2 ceramic sherds) and due to this may represent a statistical skew. Overall, this group of deposits presented a different form of deposit signature than perhaps their interpretations might suggest, are likely so as a result of intensive cultural transformations and specific functional differences in their design.

As outlined in section 9.4, two independent signatures were visible within the test sequence. The first of these, designated independent signature A, was located within the latest part of the sequence. With the deposit data available it became clear that these two deposits are part of a series of grouped features interpreted as belonging to the dairy building at GS (Figure 9.8). A dairy building was among a list of buildings at GS in 1882. The remains of the dairy were previously disturbed by the modern excavation of a large sewer line. The wall of the structure was represented by a line of flat sandstock bricks (Casey, 2006:76), and a brick lined drain ran centrally through the structure. The drain was likely designed to draw liquid waste away from the interior of the building. The small size of the structure, only ever able to house two cows at one time, lead the excavators to theorise it was likely not a milking dairy but a place for milk to be processed into butter, cream and cheese (Casey, 2006:76). This process would surely have required proper drainage.

The two deposits previously classed as independent signature A belong to demolition fills from within the dairy structure. It is interesting to note that a third demolition deposit from the dairy was associated with a construction signature during the blind analysis (5049). These deposits stood out as clearly independent signatures, and correlate to an independent structure wherein small scale industrial production processes took place. These types of processes are unique at GS and would be expected to reflect independent signatures. The ability of the methodology, even under blind study, to distinguish important isolated signatures is an encouraging result.

The second independent signature, termed B, also demonstrated that individual deposition processes were at work in the test sequence. The deposit designated as independent signature B (4844) is associated with the interpretive category of Pit fills. However this form of pit fill was different from all others at GS. The pit feature was timber lined (Figures 9.9); a form of construction not encountered by the excavators at any previous site in the Parramatta area (Casey, 2006:89). The nature of the construction suggested that it was intended to be reused over period of time. Pollen analysis performed on the pit fill suggested that the pit was used for the disposal of some form of nutrient rich waste, although not faecal material. Based upon these results it was presumed that the pit was used to store kitchen waste, likely fats, for recycling purposes. The nature of the backfill deposit may suggest that the fill post-dated the functional use of the pit, as it held large fragments of sandstock bricks and charcoal. In either case, the timber-lined pit feature represents a distinctive feature type. The alignment with independent signature B and the timber lined pit feature again demonstrates the ability of this method to identify and begin to offer different interpretations for independent depositional processes.

By synthesising the trends summarised above, we can see that some definitive trends are revealed by this experiment. At the outset of this process the aim was to test assumptions related to the process of determining deposit signatures in urban contexts. The success in determining independent signatures and linking these with independent deposition processes is very encouraging. In both cases the methodology proved itself to be responsive to subtle differences in deposit signatures. The results of the deposit signature analysis provided valuable additions to the existing interpretations. Where, previously, fills within the central group were regarded as household rubbish, based upon the contents of materials discovered, the integrated deposit signatures indicates that this area represents a specific set of activities than in other rubbish pits. The fact that the deposit signature of the central pits matches that of the construction related deposits suggests that the fills within the brick lined central pits relate to some form of construction related activity. It is not assumed that the nature of the fills within the brick lined pits reflects the original function or use of these features. In fact they are just as likely, if not more likely, to be unrelated to the function of the features based upon the date of the materials within (see the seriation diagram 9.16).

As demonstrated by the signatures from the central pit group, differences between the expected signature (ex. construction related) and the assigned interpretive deposit categories (ex. Pit Fills) is likely related to the different spatial and functional feature groups. Each pit group demonstrated a distinctive pattern of activity related to that space. At the level of specific site based interpretation of GS the reburial and use of contained pits suggests long standing knowledge of the pit locations. The act of maintaining pits within clustered locals indicates that the inhabitants of GS had specific attitudes towards cleanliness, and landuse policy. The compartmentalising of rubbish disposal into a limited area was likely due to the other uses of GS property surrounding the house (Casey, 2006:98). These results demonstrate that specific actions at GS were related to the particular pit groups and structures in the property. Overall there was a trend of discrepancies to be associated with specific locations or structures. The nature of these results suggests that the application of the methodology to open area sites is highly successful.

The signatures observed during this exercise demonstrate that the narrative for GS does not closely align with the established phasing structure. As is common on historic period sites the phasing of GS is based upon the documentary or legal history of the property. The division of most chronological phases is based upon the changing ownership of the property from the Hassall family (Phase 3), to the occupation of leasers (Phase 4), to the modern division of the GS lots (Phases 6 and 7). These divisions are informed by the documentary history and not necessarily what lies in the ground at GS. If we look closely at the deposit signatures found at GS it is clear that the cultural processes do not significantly alter from Phase 3 to Phase 4. These trends once again demonstrate a need to incorporate the organisation of archaeological data based upon the archaeological deposits, and not upon other factors such as documentary history. The significance of grouping data in different ways, and basing site narrative on other factors will be expanded upon in the summary chapters to follow.

9.5 Conclusions

Our ability to trace a given signature across a site was scrutinized by this experiment process. In this case the designation given to each stratigraphic unit in the blind test sequence aligned with the interpreted deposit category in half of the cases. Although this is before specific individual reasons were taken into account, it seems that the accuracy rate is not enough to declare the experiment successful. While at face value the results do suggest that location of specific deposit signatures is an important aspect, the method retains applicability to use in confined urban contexts. The results only demonstrate that the approach to the application of the methodology needs to be thought through. This fact is true of any methodological approach. The use of the deposit signature approach is applicable to urban contexts in the same manner as keyhole excavation is used in these contexts. While greater information could be gained from a wider area of excavation, valuable insights are to be gained from the limited application of this approach. And in the same manner as keyhole excavation, conclusions and interpretations can be adjusted as new data becomes available.

The aim of this exercise was to test our ability to model deposits across a wider area because it was assumed that the complexity of archaeological deposits would make this too difficult. The results have demonstrated that the potential problems are often the source of the most interesting findings. As demonstrated by many of the Pit fills deposits, some signatures are identifiable and traceable across an area but, more importantly, the method is responsive enough to account for subtle changes in the archaeological record. The assumption surrounding this method was that in urban contexts great diversity of deposit signatures would be encountered, and that this would be a result of the background noise of intense urban deposition. In fact the diversity in deposit signatures indicates important differences in the archaeological record, which challenges our interpretations and warrant further investigation. The viability of using this methodology in developer funded urban excavations has been demonstrated. The GS site was a direct result of developer funded archaeology, and working within the confines of the existing analysis structure (with all the restrictions and additions that follow this format of archaeology) it has been shown that incorporating this approach can make valuable contributions to the work. Finally, no matter what the results of this exercise are, it was important to test the preceding underlying conclusions rather than to simply assume them to be true.

Chapter 10
Case Study Synthesis

10.1 Introduction

In the five case study chapters previously presented we have seen a range of important issues. Many interesting trends and results have been observed. The following chapter summarises and synthesises these results into a set of ordered themes. If we can begin to order and understand the specific level and type of result that has been achieved through the case study process, then we can begin to assess how the results can be used to further the practice of archaeology.

To these ends the following chapter aims first to construct a *Summary and Comparison* of each case study (10.2). This section looks at each case study and examines the results by each level of analysis performed. The following section assesses the *Statistical Trends and Interpretation* (10.3), examining the key results of the correlation analysis from each chapter with an aim to statistically establish if formation measures are telling the same "story" of cultural deposition processes. If we can match the results of each level of analysis, and each formation history measurement, to reliable trends then perhaps we can improve the utility of the site evaluation process and determine more consistent methods of recording, quantifying and analysing deposits and assemblages. A summary of the *Conclusions* (10.4) highlights the most important issues as we move forward with the development of this method of analysis.

The choice of case studies examined in Chapters 5-9 represent both a response to the rationale set out in section 4.2 as well as a reflection of the common state of archived archaeological sites. As previously outlined, this research sought case study sites that presented a well stratified site within an urban context, of Roman period origins or later and containing large amounts of ceramic and faunal remains. The most well suited case study sites would also have featured controlled data collection methods that identified contextual and qualitative/quantitative information, such as EVEs and individual sherd weights, and featured sequences of strata that were both ordered into higher order groups, and were accessible in their original lower order assemblage groups. In a best case scenario the case studies selected would have represented a balanced set of contexts both in Europe and beyond. However, a range of economic stresses upon developer funded archaeology, and regional traditions dictating "best practice" methods, have culminated in restrictions on what case study choices were truly available for this research. These problems have fallen within one of three basic areas:

- Problems with the Extent of Analysis
- Problems with the Manner of Analysis
- Problems with the Storage, Archiving and Accessibility of Materials

Beginning with the first point, many *Problems with the Extent of Analysis* performed both in the field and within the post-excavation environment have been encountered. These range from the lack of volume data for stratigraphic units, the lack of diameter measurements for ceramics, the lack of side identification for faunal materials, or the lack of basic faunal analysis (eg. many sites have only supplied rough counts of the number of bones recovered with only burning absence or presence observed). If the best practice methods employed at some of the sites examined were performed throughout the proposed study area, there would have been no problem selecting relevant case study sites.

The *Problems with the Manner of Analysis* has come as a result of specific research aims and agendas. Many sites have only had ceramics analysed but not the bone, or vice-versa. The problem is not that proper forms of analysis are unknown; the issue is that they are inconsistently applied both within and between assemblages. Other problems have revolved around the investigative agenda of the excavators, often only selected deposits or sequences are chosen for quantification, in many examples because these are regarded as the "good" ones. This circular logic only acts to repeat and enforce assumptions. Jonathan Last (2006:134) identified that preconceptions will determine what we find in the field. If we identify a deposit as a particular type, it will be analysed or sampled differently from other deposits. This will ensure that only certain materials are found on these deposit types, reinforcing our interpretations in a circular manner. In some cases this practice may be a result of the planning process employed under guidance notes such as The Management of Archaeological Projects (commonly known as MAP2) (EH, 1991), or similar management guidelines (discussed in section 2.4). These forms of guidance advise excavators and project managers to predetermine the type, quantity, condition and significance of archaeological data (EH, 1991:Section 4.8). As a result many features are predetermined for exclusion from study based upon their assessed quality. This is often determined during the evaluation process or as part of a research design. The identified danger of creating large backlogs of unpublished site data led to the notion that site assessment needed to be streamlined; that material not useful for interpretation needed to be quickly located and removed. While this was and is a real problem, the unexpected result of the deposit quality assessment process is the continued impediment of the wider integration of deposit data. This point should be considered in the future development of a "MAP3".

Problems with the Storage, Archiving and Accessibility of Materials has been an unexpected problem. The need for data at the stratigraphic unit level has often proved difficult to obtain in a collective, digital format. This often forced a return to the original context sheets, pottery sheets, or faunal record sheets stored in archive. Problems have been encountered where one section of a site archive is located in one place while another is located elsewhere. Alternatively context sheets or relevant section of the archive can be misplaced. The relevant excavators have often moved on and are unavailable to consult for guidance on how to best re-order the site data. As formats of digital storage of data become more and more important a danger arises in that the actual materials recovered might be given little consideration. As a result of the restrictions cited above, the case studies selected for this research are as much a result of availability as viability.

For the last case study there was a need to expand the case study selection to consider the developer funded site in Parramatta, NSW Australia (Chapter 9). Despite this fact, the site at GS, as well as each case study site that preceded it, directly responds to the needs of this research project. The varied range of contexts and types of sites used in this work offer a broad basis of comparison. The diversity of sites has enabled this work to develop an understanding of temporal, spatial, and functional elements that affect the formation of deposit signatures around the world.

10.2 Summary and Comparison

Each case study has generated fruitful results, both with regard to the relationships between physical and interpreted deposits, and at each specific level of study. Once these are viewed as a collective, we can begin to trace the trends and implications of this research for general practice. The following will first aim to summarise the results of each case study at the independent level of analysis and then to draw lines between each example. This will be performed at each specific level of study: that is Level 1, the basic sequence, Level 2, the sequence organised into higher order interpretive groups defined by the excavators, and Level 3, the basic sequence filtered to remove residual finds. Level 2 analysis was established as a means of testing the effects of grouping stratigraphic and assemblage data in higher order interpretive sets. The efficiency of moving between the basic and grouped levels during interpretation was at issue. Level 3 analysis was constructed as a means of testing the effects of residual and infiltrated finds upon archaeological assemblages.

As the main aim of this research was to develop deposit-based interpretation, it was necessary to address the issue of residual material. It has long been understood that residual material was a great obstacle to interpretation, especially within urban contexts (Brown, 1994, Evans and Millett, 1992, Rauxloh, 2001, Vince, 1994). Level 3 analysis sought to assess the impact of residual material on our ability to define and understand deposit signatures. As the residual and infiltrated finds were identified and removed via seriation methods, the comparisons with Level 1 could reveal any differences between deposit signatures. By assessing each level of analysis the following will treat the results within their specific context of interpretation citing specific examples from each case study. This approach allows the House for Families (HfF) (Chapter 5), the Carlisle Millennium Project (CMP) (Chapter 6), 12-18 Swinegate (SG) (Chapter 7), The Barley Hall (BH) (Chapter 8) and 109-113 George Street (GS) (Chapter 9) to add their individual results to our overall understanding of the methodology.

Each case study was approached as an extension of the previous one, towards developing the method proposed in Chapter 4. The HfF case study allowed the methodology to be tested and organised against real site data. This process enabled many of the potential problems to be determined and allowed many possible trends to be recognised. The following study of CMP provided a means of exercising the now established methodology against a more stratigraphically and contextually complicated site. This study allowed us to examine the potential of deposit related study at a deep urban site. The sites of SG and BH allowed the method to be fully explored in the context of intense urban excavations. The result of these studies was to demonstrate that interesting and distinctive results where clear in two sites that share very close spatial relationships. The final case study at GS was the culmination of this research, the examination of the consistency and meaningfulness of deposit signature analysis providing a summary view of the method in practice.

The use of deposit signature based interpretation has proven useful at both deeply stratified sites (CMP) and sites featuring more horizontal stratigraphy (GS). Using deposit signatures as a means of better understanding sequences is one result of this work. However, the method has demonstrated that it is also useful for developing an understanding of features not directly connected via stratigraphic links. By linking deposit signatures across a wider area we can understand how different areas are utilized and what different depositional processes are employed across a wider area.

Level 1 -

The aims of establishing integrated deposit signature investigation at Level 1 was to determine if untreated or ungrouped sequences of deposits could demonstrate consistent signatures with interpretive and physical classification. The exercise performed upon the sequences at GS clearly demonstrated that interesting and relevant signatures existed across both excavation areas. The Pit Fills and Linear Feature Fills categories presented very similar deposit signatures unlike previous examples of such feature types. The Posthole Fills and Construction Fills categories also presented aligned signatures reflective of their similar functional processes. The independent signatures identified during the test sequence analysis at GS demonstrated that specific cultural processes were linked with functionally and spatially localized feature groups.

The Level 1 sequence at SG provided another example of clear signatures which could be associated with specific cultural activities. Signatures such as the Occupation Related category and the Surface Preparation/Repair category indicated that specific cultural processes had shaped the nature of their assemblages. This was exhibited in fills independently connected to that process, as opposed to general source refuse fills. The BH case study also revealed interesting relationships between deposit signatures and our interpretation of on site activities. The Fills and Linear feature fills categories demonstrated distinct signatures, justifying their treatment as separate cultural processes based upon the construction of these feature types.

The five interpretive categories found within the HfF sequence each demonstrated clear and independent signatures. In many of these deposit types the signatures fit with the expected interpretation of that material. This result was also observed at the CMP site, which also demonstrated that clear and consistent deposit signatures can be identified and useful for informing interpretation. The first two case studies demonstrated the possibilities of the method, laying the foundation for the findings in later case studies.

Unlike the positive and expected results cited above, in some cases the deposit signatures discovered at Level 1 presented relationships inconsistent with our expectations. The most important of which could be classed as a result of varying terminology used during excavation and analysis. The key signature at CMP, the Ditch Fill category, followed this trend. The mixed signature suggested that this interpretive category was not consistently applied, nor did it elucidate the full range of processes that led to deposits within the ditch feature. Other inconsistencies were observed at the CMP site. The External Layer deposit category demonstrated a divergence between ceramic and faunal processes; generally large and non-dispersed ceramics with a dispersed assemblage of bones. This suggested that the manner in which the ceramic material had entered the archaeological record was distinctively different than from that of the faunal material.

At SG the dual nature of the Dump/Fill deposit category indicated that the interpretive terminology was not accounting for a consistent depositional process. Our ability to isolate specific signatures within separate sections of the SG site sequence led to the identification of deposition patterns linked to the landuse history of the site (closed structures vs open areas), and not dependent upon chronological changes such as Roman vs Post-Roman occupation. Another example of a result inconsistent with interpretive expectations was at BH. The relatively intact finds from the BH Dumps/Levelling Fills category indicated that well preserved household waste was used in these deposits. Contrary to what one might expect of levelling deposits within a structure.

Another interesting trend across the case studies is the relationship between the physical structure or shape of features and the nature of their contents. At CMP there were distinctive signatures, and deposition histories, between the Circular Feature Fill and Linear Feature Fill categories. At BH the Pit Fills and Linear feature fills categories demonstrated a similar form. The exception was at GS where the Pit Fills and Linear Feature Fills categories had shared signatures, and apparently formation process histories. I argue that, if we begin to refine our interpretive language and terminology to account for the varied forms or shapes of features, or perhaps more importantly be better aware of the relationship between what a feature is termed and what it constitutes, then our understanding will be improved.

The relationships between physical and interpretive categories were much harder to determine than the deposit signatures. At the HfF the physical descriptions were consistent in the interpreted category of Intrusionary Fill Deposits. This likely reflected a trend during modern construction work, where foreign soils are used for backfills rather than redistributing material from within the site. This reflects a change in the scale of movement of soils, as localized distribution of soils has given way to redistribution of materials over a wider range. At CMP there was some consistent agreement between physical and interpreted contents. This was seen in the Internal and External Layer categories relations with silt and clayey silt deposits. The relationships between the interpreted categories at SG and the physical components appeared to be related to the natural underlying soils. Cultural processes connected to construction were consistently connected to clays, which represents the disturbed natural soils at SG.

Within the control sequence at GS there were a few clear connections between the interpreted deposit types and any one physical component. The Demolition Fills category was independently associated with the Sand with Brick and/or Stone category, either a natural result of the process of demolition, or reflecting the excavator's commitment to linking this soil type with that interpretive category. The Pit Fills category was overwhelmingly associated with the Sand with Charcoal category. This may reflect specific practices where household-related burnt remains were deposited into pit features.

Overall the trend was towards inconsistent relationships between physical component and interpreted function. At CMP the Ditch Fill interpreted deposits were the clearest example of inconclusive relations to the physical categories. At SG interpretive categories such as Surface Preparation/Repair and Dump/Fills were composed of a mixture of physical materials with no consistency between physical and interpreted deposit types. The physical and interpretive categories at BH followed the established trend, as they demonstrated no consistent relationships with any group. The case studies have demonstrated that the relationship between physical and interpretive categories was rarely consistent. The trend suggests that in most contexts the association of particular deposit types with specific forms is not a reliable method for defining deposit elements.

Overall the results of the first level analysis have demonstrated that I have designed a functioning methodology that will aid in interpretation. The consistent nature of most signatures throughout each case study has shown that the integrated nature of the signature approach is a useful method. Where some notable divergences appear between interpretation and signature, such as with the Ditch Fills category at CMP or the Dump/Fill deposit category at SG, the problem appears to be connected with a lack of consistency in interpretive language used by excavators. Where we use vague terminology, generalised in our frameworks, we create the potential to overlook individual cultural practices.

Perhaps the most positive conclusion of the Level 1 analysis is the realisation that, even where results could be regarded as negative or unexpected, the end product in each case was interesting. The value of the deposit signature method, at least in part, is that all manner of results are useful for interpretation. The process never resulted in "bad" data, due to the reflexive nature of the methodology (for examples of the call for reflexive methods see Hodder, 1997, 2000, Berggren and Hodder, 2003, Chadwick, 2003). For example, at the CMP and GS sites the method demonstrated that it functioned circularly to reveal multiple signatures. Signatures linked to a particular interpreted deposit type (such as the CMP Ditch Fills and GS Dumps/Levelling Fills categories), and therefore expected to be the result of a single depositional process, where found to be connected to multiple signatures. These results were then reflected back onto the interpretive designations to reveal new categories for interpretation. This method creates a continuously ongoing process of reviewing interpretation results. As new interpretive categories are created in response to the appearance of multiple signatures they can in turn be subject to the test of the method; thus creating another cycle of interpretation and review.

Level 2 –

As was explained in section 4.7, the appearance or disappearance of Level 1 relationships during Level 2 was assumed to shed light on the effects of interpreted stratigraphic grouping. This investigation began with the HfF case study, where the two levels of analysis compared well with each other, without a great affect upon the identified signatures. This was also observed at the BH Level 2 analysis where the grouping of data into phases 4 and 5 mainly remained the same and identifiable.

Yet these results observed at HfF, and to a lesser extent at BH, did not continue throughout the other case studies. The prevalent trend observed elsewhere was that the creation of higher order groups acted to hide or obscure many of the deposit signature results observed at Level 1. At CMP the most interesting result was that many of the clearly identified individual deposit signatures seen at Level 1 were lost at Level 2. The Property/Structural Layers and Linear Feature Fills categories were not distinctive once data was grouped into phases. This demonstrates the dangers of performing analysis at the phase level. This was also clear at BH, where the signatures observed in Phase 2 were obscured by the blending of otherwise distinctive signatures expressed in the deposits. It appears that the distinction between signatures of Linear Feature Fills and Pit Fills at BH would not have been identifiable during any phase of Level 2. The results from the SG case study corroborated these results, the trend of Level 2 obscurity of the Level 1 signatures. During Level 1 at SG it became clear that a trend existed within the sequence towards progressively fragmented signatures. This trend likely shielded the results of Level 1 and rendered the signatures unidentifiable.

The result at SG was the first example of a single signature imposing, or perhaps more accurately imprinting, itself across an entire grouped set of data. A parallel result to a signature being imprinted across a group is the conclusion that, once organised by higher orders, one signature within a group was often strong enough to express itself across the entire set. If, for example, a series of distinctive deposit signatures within a sequence included one particularly fragmented assemblage, it would not be uncommon for that signature to be strong enough to be the main visible result. The danger of using grouped data in most contexts of study seem clearly established by the case study examples, thereby challenging us all to develop better methods of using site data.

Level 3 –

The examination of the effects of residual material within deposit signature interpretation developed within each case study, each one revealing key results associated with the residual component within an assemblage. These results built upon each other towards the final determination stated here. This process began at HfF where the removal of residual material provided an early indication that the residual component was not affecting the definition of deposit signatures. Even at that early stage of work, it appeared as though the grouping of stratigraphic units was not harmful for developing an integrated site picture. The relatively low amount of residual material at HfF meant that the results could have been misleading. However, the examination of CMP implied similar conclusions. Each signature at CMP Level 3 remained almost completely unchanged from that at Level 1. Perhaps more importantly, the relative ranking of each signature remained the same for most of the measures used. This proved that, although the particular results might have changed, the relationship between deposit signatures was the same, indicating that the residual element within the whole site assemblage was not biasing the signatures as much as had been expected.

The trend observed in the first two cases was also seen at SG - signatures were not greatly affected by the presence of residual or infiltrated finds. The greater amount of such material present here made the results even more interesting. Only the Occupation Surfaces signature saw significant changes, connected to the Average Sherds Per Vessel measure. The BH Level 3 analysis followed the established pattern, with signatures remaining completely unchanged from Level 1. The increased amount of residual and infiltrated finds at each progressive case study only strengthen the conclusion that this material was not a hindrance to understanding site formation processes.

Our ability to understand and classify deposits and assemblages is not greatly effected by residuality. In light of these findings the question of how we use, and fail to use, finds from urban contexts must be questioned. It appears clear that, if our understanding of a site is constructed from an integrated understanding of deposits, then we must better consider the way we incorporate residual finds. This must also extend to the way deposits are approached for investigation. The labelling of whole deposits as residual can no longer be a reason for its exclusion from analysis. Systems for ascribing residuality, such as those employed by the City of Lincoln Archaeology Unit (CLAU) (Dobney et al., 1997:83), risk discarding valuable context data based upon the judgment that they are not "useful". Dobney et. al. recognised that a degree of residuality will always exist;

this is the "background noise" of history (1997:84). However the result of analysis here indicates that the background noise is not as loud as first thought.

This study has demonstrated a method for extracting the valuable information embodied in residual data that Dobney and his co-writers called for (1997:87). It seems clear from each of the three levels of analysis that independent deposits, and each find within them, must be respected for their individual ability to contribute to a collective understanding of a site.

10.3 Statistical Trends and Interpretation

The aim of this summary of trends is to assess if reliable measures can be determined for use. I believe that these results can now be used to suggest that integrated deposit signatures are reflective of a true formation history, and not a result of random occurrences. Each case study is discussed in relation to identified trends, in order to decide what key elements were visible in the ceramic and faunal formation measures, and what these results mean for further interpretation. The use of certain measures over those of others can then be suggested with confidence that a true understanding of a site's development is expressed in the observed deposit signatures.

The statistical analysis that has been presented in this thesis has followed a clear research design. The correlation analysis has provided a means of assessing the relationship between any two variables included in the methodology and has provided insights into the tools for defining deposit signatures. This approach is however, only one possible means of testing the data. The group of measurements could have been treated as a series of variables and utilised multivariate analysis to assess the problem. Multivariate analysis would have assessed the observation of more than one variable at a time. Essentially treating each measurement as one point floating within a theoretical space, the clustering of multiple points has the potential to provide insights into the nature of the deposit signatures. Specifically, principal components analysis (pca) or cluster analysis could be utilised in future research. This work has the potentual to provide even richer interpretations.

Within the analysis performed in this work overall it appears from the ceramic formation measurements that several trends exist. Some negative or inconsistent results were observed. Measurements such as FMM score and Percentage Burnt proved inconsistent due to the labour intensive, and often inconsistent, nature of tracing crossmends and burning. They may not be useful in future deposit signature analysis unless the observation methods involved are improved. The Farthest Migrant Matrix (FMM) measure was generally poor at HfF, and it was questioned whether this measure would be useful in future examples. The Units Per Volume measure was only applied in the HfF case study due to the lack of relevant data at the other sites. This appears quite useful and it is unfortunate that further investigation was not possible at other sites. At CMP the general trend throughout the formation measures was one of weak statistical correlations. The Percentage Burnt ceramic measures at CMP were noted for the vagaries in their ability to link with other measures. This observed measure is dependant upon the consistency in which the data is gathered. At SG the results of the Completeness and Brokenness measures were again limited due to the small number of rim sherds. The ceramic measures as a whole comprised only of the Mean Sherd Weight and Average Sherds Per Vessel measures, as other ceramic data was unavailable.

Elsewhere positive results were observed with the ceramic measures. The case study at HfF had ceramic measures that were generally positive in their correspondence with each other, such as the Completeness and Brokenness measures. At CMP some of the ceramic measures, such as Completeness and Brokenness exhibited strong correlations. This was probably due to the small amount of rim sherds available for measurement. The low sample numbers of rims meant that these measures were limited in their ability to tell the story of a deposit signature. The other ceramic measures indicated an interesting trend; the ability to develop deposit signatures was not dependant upon labour intensive derived measurements. In fact in many cases the more involved Completeness and Brokenness measures proved to be poor indicators of deposit signatures. The simple measures, relating to sherd weight and basic vessel estimates, were the most consistent tools for understanding ceramic assemblages. At CMP we saw that the Mean Sherd Weight and Average Sherds Per Vessel measures demonstrated reliable indications of deposit formation history.

An unexpected implication of these results was the realisation that many important interpretations were derived from the most basic data sources available. The results at GS provided the opportunity to examine the trend of producing viable signatures from limited ceramic data. Once again a range of interesting and meaningful deposit signatures were identifiable, and traceable without the benefit of deposit related data. These were largely based upon the Mean Sherd Weight and Average Sherds Per Vessel measures. These results once again demonstrate that with the minimal investment of ceramic weighing and minimum vessel estimate procedures that a deposit based interpretation is possible. The implications of these results will be discussed further in section 11.3 to follow. The results from SG also indicated that, despite the statistical analysis, that interesting trends and deposit signatures were visible with a small pool of formation measures. This suggests that issues such as the expense of analysis and the availability of data are no reason to exclude a deposit-based interpretive framework. The BH results mirrored the SG trends in many ways. The Completeness and Brokenness measures were again limited in their applicability due to the low sample number of rim sherds. Also, the nature of the formation measures applied at BH was again one of limited resources.

Both the SG and BH case studies were retrieved from archive sources and had long ago been excavated and stored. The static nature of each site archive rendered many aspects of the normal measurement routine difficult or inaccessible. In the other case study examples the data was recently organised or published. Any questions and issues relating to the data were easily corrected by contacting those that had originally excavated the site. The archived material from SG and BH was more removed from the excavation phase and the original excavators and authors of the archive reports were unavailable to contact. However, interesting signature results were possible despite the lack of many different measurement types, suggesting that signature identification is possible at both research and contract levels as the analysis involved is not as strenuous as may be suggested.

The faunal measures of formation history also had successful and less successful results. The HfF data were notable for their lack of statistical correspondence. This was an early warning that individual measures were not "speaking the same language". CMP measures had many weak correlations, which was likely compounded due to the small sample sizes. It was notable here that they appeared to be less convincing statistically than in their overall ability to indicate trends of deposit signatures. Despite weak statistical relationships between measures, when the whole suite of results was examined, it was clear if a signature was one of fragmented or intact material. It became clear at this stage that the faunal material was a better indicator of signatures when measures were viewed relative to a series of deposit types, rather than lone indicators of transformation history.

The SG measures such as NISP:MNI and NISP:MNE were better indicators of deposit signatures, but the Percentage Small measure was less successful. This is likely very susceptible to different deposition processes. Differential processing and use of animal carcasses can result in the isolation of small parts. As an animal is portioned off one section, such as the ribs, may be sent to one location for consumption, while another section, such as the lower limbs, may be sent elsewhere for industrial processing. This will ultimately result in depositional processes that isolate certain bones. The GS data exhibited a range of positive results with each measure. Specifically the NISP, MNI and MNE measures provided useful indications of deposit signature from their ratios. Also the Percentage Whole measure was a strong tool in tracing the primary signatures here.

In each case study the faunal measures were useful indicators of specific deposit signatures despite the sometime low statistical results from the correlation analysis. This was previously suggested to relate to the nature of faunal material as an indicator of formation history. In some cases the species-specific diversity may be accounting for some of the non-agreement between particular faunal measures, in that different processes were involved in the production and deposition of animal related waste. Elements from a cow may be utilised for specific industrial process, whereas pig elements are used for completely different consumption and use. In either case it appears that the process by which animal remains became deposited was often different from the processes that governed ceramic deposition.

Whatever the results viewed in this work, the production of the events graphs and related narratives from the CMP, SG and BH sites demonstrate that faunal material is a key tool in understanding the development of use and process at a site. The key faunal related "events" identified during the events graph analysis, and subsequent narratives, were informed by the faunal transformation data, revealing key changes in the evolution of landuse at particular sites. The resulting narratives were interesting and, in most cases, were different from those previously offered. Despite some poor statistical correlations between faunal measures, the faunal data proved vital to an integrated understanding of archaeological deposits. Our ability to trace these sorts of changes, enhanced by the different forms of grouping site data, is dependant upon the integration of faunal data with other elements of material culture.

10.4 Conclusions

The wide range of case studies used in this work, both temporally and geographically, is a positive for the research. The methodology has been utilised in historic period North America, Medieval northern England, Roman and Medieval York, and finally, historic period Australia. We have seen that, despite a range of areas and the specific cultural practices of particular time periods, cultural and depositional process can lead to viable interpretations. If we begin to group archaeological data differently, and to think about deposits as a source of understanding a site's story, then integrated narratives are possible no matter where excavation is performed. The final chapter discusses the method in the context of greater archaeological practice, the ways in which it can be improved, and its potential for future impact on practice.

Chapter 11
Development of the Method

11.1 Introduction

This research has developed and tested an original methodology for evaluating sites from a deposit based perspective. The previous chapter discussed the important comparative elements and trends from the case studies to which it was applied. This chapter aims to provide an outline of the key aspects of the methodology and how it may aid in the future practice of urban archaeology by improving excavation and post-excavation practice around the world.

To do so, the following sections address the method used in this research in various ways. The first of these is to discuss the potential *Problems and Adaptations* (11.2) of the method for better use. The following section presents the *Future Directions and Impact on Practice* (11.3) that this methodology holds. This is followed by a discussion of the method's potential impact upon the *Structure and Use of Archaeological Data* (11.4). The closing section offers a final *Conclusion* (11.5) and discussion of the thesis as a whole. Overall, I demonstrate that the method presented in Chapter 4, examined in Chapters 5 to 9, and summarised in Chapter 10, has made a significant contribution to archaeological practice, both in the manner in which we view archaeological data, and the ways in which we use that data to understand a site.

11.2 Problems and Adaptations

The development of a new methodology for using integrated deposit and assemblage data necessarily required some refinement and adaptation during the process of case study analysis. As such, a list of what were potential problems for the method, as well as adaptations, was developed. It is useful to discuss these issues as they expose the potential weaknesses and definite strengths of the methodology. As we move forward with the established method, it will be important to be fully aware of the possible impediments to furthering this line of research. The following section discusses the aspects of formation history, and the consistency with which excavator language is applied and utilised. Some problems encountered during the integration of the case study data were, to some degree, expected. In some cases the analysis stage of this thesis required sorting through archived data not looked at for many years. The amount of time between excavation and this study, and subsequent issues of organisation and analysis that arise in developer funded archaeology, all contributed to an expectation of some hurdles appearing. However, this methodology has proven that it is flexible enough to respond to these problems.

Section 10.3 outlined the range of statistical results of the measures of formation history, showing that certain measures were either added to the collective method for determining deposit signature, or were omitted from use. The main obstacle in applying the methodology (Section 4.5 and 4.6) was the present state of analysis. In certain cases the necessary data was unavailable for use. For example, where rim sherd measurements were not available (GS), it was necessary to omit the use of Completeness and Brokenness measures.

The general lack of volume data for deposits and recording of crossmends between vessels led to the Units Per Volume measure and the FMM score to be under-investigated in this research. It was unfortunate that there was no viable means of adapting for this loss and it is hoped that, in the future, these be explored at greater length especially with regard to Units Per Volume. Recent work Doneus and Neubauer (2005) at the University of Vienna has demonstrated that, although not inexpensive, technological tools offer the potential to gather volumetric data in quick and easy ways. They have demonstrated that a combination of total station, 3D laser scanners, GIS and photo rectification software allows excavators to accurately record the upper and lower limits of a stratigraphic unit. These data can be used to easily generate soil volume measurements. Other digital methods, such as the use of photogrammetric software tools to construct measurable models of archaeological features, provide a means of quickly recording volume data. While it may be some time before these tools become common in developer funded contexts, what they propose is an exciting method for generating accurate volume data. In the meantime, my research would suggest that the method of counting the number of buckets of soil removed from a single stratigraphic unit would provide a level of accuracy that would allow for comparable measurements between deposits when constructing deposit signatures.

At SG it was necessary to omit the use of the Teeth:Mandible ratio due to the lack of recorded loose teeth data. The Percentage Whole measure was also excluded due to the lack of relevant whole bones. In these cases it was necessary to adapt the method with the introduction of a substitute measure, the NISP:MNE ratio measurement. Despite initial concerns over the use of the MNE measurement (see section 4.6), this ratio proved to be a sound addition to the method and was well suited to represent the relative fragmentation of the faunal assemblage.

The greatest challenge to fruitful interpretation revealed here was that of excavator language in interpretive frameworks. The case studies have demonstrated that it is not uncommon for inconsistent interpretive terminology to be used during the recording of deposits. At CMP we saw that the blanket application of the interpretive term “Ditch Fill” did not account for a range of disparate depositional processes at work in Medieval Carlisle. At SG it was clear that the reference to dumps or fills failed to describe evolving urban depositional practices. Finally, at GS, there was an inconsistent application of terms such as posthole, postpipe, and others referring to construction activities. If different terminology is employed in the field by excavators on primary records, it is necessary that this language is organised into consistent terminology during the summary interpretive stage. This might be achieved with a greater integration of spatial data with the written site record. The spatial relationships between features, and their physical extents, will be vital to deriving better descriptive terminology. By basing excavator terminology upon a more sensitive understanding of the individual shape, profile, depth or other physical elements of a feature, more intuitive and responsive interpretive terminology should be found.

Furthermore, the use of more consistent terminology can be achieved by determining accepted language for use in the field during the research design process. Explicitly understood language for use in context sheets and the primary record can be agreed to by all field technicians following the initial evaluation stage (following any trial excavation, test pits, etc.). Successful formats could then be included in site manuals or other standards guides. It will, of course, remain important that any language defined for use at the beginning of excavation will need to be responsive enough to account for what is encountered on site. Every site offers its own range of unique elements. In this regard it seems clear that a summary evaluation of the accepted meaning of terms used during interpretation will still be a necessary part of post-excavation analysis. In order to respond to all the developments that can occur while on site, the meaning of interpretive terms, and their successes or failures, will need to be considered following the excavation stage. During pre-excavation assessment, if we accept that the evaluation process is the ascription of value (Carver, 2003:50), we must more explicitly understand exactly what we have identified, before it can be assessed a value towards potential research output.

11.3 Future Directions and Impact on Practice

The future application of the method has the potential to inform different areas of study. This section will examine the potential impact upon the use of evaluation methods, measurements for understanding the signatures of ceramic and faunal assemblages, and the future directions resulting from the analysis performed at Levels 1 to 3. Beginning with evaluation methods, as outlined at CMP and other sites, it would be a significant contribution to urban archaeology if deposit based analysis was focused upon modelling and refining the understanding of a specific area. The exercise at GS demonstrated that the method is responsive enough to the vagaries of deposit signature in order to link deposits with processes. If one was to focus upon the urban core of a city and use the method to determine more refined deposit signatures across an area, it might be possible to more closely link deposit signature and status to specific cultural practices. At this stage the integration of more refined deposit descriptions and categories with signatures would prove useful. If we could link deposit signatures into a city-wide deposit model, we would have a great tool for linking research aims with deposits for more efficient evaluation resources and exploitation of investment. The value of archaeological material is defined by the intersection between the proposed research agenda and the existing deposit model (Carver, 2003:50). The method employed here has the potential in the future to first create better interpretation during post-excavation but also, as deposit signatures are better understood in an area, to improve deposit models and thereby the evaluation before excavation.

In section 10.3 we saw that the statistical trends associated with measures of formation history were queried with an aim to identify reliable methods, and thus improve the utility of the site evaluation process. The site evaluation process envisaged here follows a tradition first established by Carver (1987). Carver reasoned that modern planning processes should be developed through mitigation strategies designed around relationships to strong deposit models. A well informed deposit model can indicate the potential of the archaeological remains within a specifically defined spatial area. The key to the model was that it is constructed upon recording principles that are not only consistent, but quantitative, based upon four criteria: preservation, spacing, status, and environmental potential (Carver, 1987:125). While this approach is strongly advocated it is done so with an understanding that Carver's definition of status fails to serve better practice on two grounds: firstly, it makes statements about a whole deposit rather than individual finds, and secondly, it advocates the isolation of certain deposits in place of the assumed "good" ones (see Figure 11.1 for a representation of this approach).

Emery created a modification to Carver's four-fold evaluation of archaeological potential by introducing quantifiable methods for assessing stratigraphic spacing that were both diagnostic of data potential, and measurable. The key element of this addition to the process was the concept of stratigraphic complexity (Emery, 1992); a measure of the distribution and density of interacting strata within a sequence. Emery was able to demonstrate that contour plans of stratigraphic complexity are strong predictors of feature density. The deposit signature method advocated in my research follows the previous work in this area by focusing archaeological interpretation at the site level, as done by Carver, to the interaction of strata, as done by Emery, to the interaction of material culture within individual strata. This method places a focus, and value, upon each individual component that makes up a stratigraphic unit, mindful that "everything depends on everything else" (Hodder, 1997:694).

The method presented here builds upon the work of Carver and Emery by developing a means with which we can best expect to retrieve optimum information. The value of the method is that it is reactive to not only the level, but the type of research output that is sought; we can assess potential at the deposit level. The deposit signatures developed have the potential to reveal where the best preserved archaeological resources may be found, through the results of the assemblage measurements of formation history (ie. Mean Sherd Weight). They should also be able to link the range of possible outcomes of different features, based upon a sensitive understanding of deposit status.

The deposit signature method has the potential to act as a site evaluation tool because it can integrate excavation and test data; while testing is a form of excavation it is important to remember it is a separate, reconnaissance exercise (Carver, 1987:124). We have already seen at GS that the deposit signature method is responsive enough to be applicable across generalised space, despite the reservations of previous excavators (see Emery, 1992:50). This thesis demonstrates that a more sensitive understanding of individual deposits, their formation and composition, can be used to build up a broader understating of an urban area as even the smallest excavation is integrated into the collective model. This method can add to those created previously because it more sensitively considers deposit type, in order to be better matched against research objectives.

If the method presented here is allowed to influence field practice, the process of data gathering can be improved. If interpretive terminology is consistently applied during excavation and data gathering, a more explicit record will be produced. A sensitive regard for the physical nature of deposits, and how they relate to the assemblages within, will produce better interpretations. If deposits are more consistently recorded, including explicit contents descriptions and volumetric data, and a range of improved and consistent measures are applied to finds assemblages, a deposit signature based framework can be applied to our narrative structures.

If this method was focused upon a particular area it would also likely be possible to trace landuse and depositional processes over a period of time. The result, not unlike the findings at SG, would be to connect the evolution in the use of a site with the depositional processes. This would free interpretation of the confines of chronology such that cultural processes could be understood without the typical terminologies like Roman vs Post-Roman as would commonly be applied to a site like SG.

Looking next to the potential future use of measures of ceramic assemblages, it seems clear that certain measures can be distinguished above others. The future directions of this methodology will likely be shaped by the potential impact upon practice that this method proposes. As discussed previously, the use of certain measures in determining deposit signatures proved both successful and unsuccessful. The preceding case studies have demonstrated that certain measures are consistent identifiers of deposit signature and warrant their inclusion in excavation practice. The following ceramic measures should be included in future practice:

Mean Sherd Weight
Average Sherds per Vessel
Completeness
Brokenness
Percentage Burnt

The use of these measures necessitates the inclusion of certain recording procedures during analysis. Basic ceramic analysis should include weighing, estimating vessels represented, measuring rim diameter and percentage of which represented, and the presence or absence of burning. This observable data can be used towards the derived measures advocated in the case studies (Completeness, Brokenness, etc), and ultimately towards revealing many aspects of the formation history of a ceramic assemblage.

The observation of burning would best serve this method if burning was noted to extend over the break of a sherd, such that we could separate burning as a function of vessel use (ex. cooking pots) versus burning of sherds following the life-use of the vessel. It is clear that the process by which material becomes burnt is much more important than the observation itself. Measures that can link elements of formation history with those that follow the life history of a ceramic vessel are much more valuable in practice. The increased labour associated with noting burning, as compared to the other observations, would need to be weighed against the expected outcomes. Thus, if burning appeared to be an issue noted during excavation, then the added expense could be justified. Additionally, it may be possible to integrate observed levels of burning based upon an estimated degree (ex. No burning, moderate burning, high burning). Observing the amount of burning at this level should be able to provide a representative understanding of formation history within an assemblage.

The faunal analysis performed during the five case studies has demonstrated that a range of measurements are reliable indicators of fragmentation and formation history.

NISP:MNI
NISP:MNE
Percentage Whole
Teeth:Mandibles
Percentage Small

The use of these measures requires that species level faunal analysis should involve the identification of individual elements, including teeth, and the observation of whether a bone is complete or fragmented. Making this addition to standard practice would not require extensive changes or be prohibitive due to increased costs. In fact the process of case study sourcing and analysis indicates that the greatest obstacle to integrating faunal data with deposit and other materials is the tendency to exclude detailed faunal analysis altogether (e.g.Evans and Tomlinson, 1992).

The final point of consideration for future practice is related to the results of the three levels of analysis. The case studies have indicated that certain approaches to excavation and analysis need to be altered. The success of the method at Level 1 indicates that the analysis of individual stratigraphic units and their associated finds plays a vital role in interpreting a site. Finds analysis should obviously then be focused upon maintaining separation by individual stratigraphic units rather than grouping at a higher level. The Level 2 examination of the case study data has addressed assumptions about the grouping of data during analysis and interpretation. We have seen that once stratigraphic data is grouped, deposit signatures vital to the interpretation of the site can be lost (see CMP, SG, and BH).

Recent work has sought to identify "signatures" amongst archaeological data, yet this approach continues to be based upon groups of data. Recent work at Melbourne's "Little Lon" neighbourhood (Murray and Mayne, 2001) attempted to elucidate the real, multiple identities of the communities' residents. In this case the excavators sought to compare archaeological signatures (Murray and Mayne, 2001:103) derived from assemblages grouped by individual structures, linked to documentary records that distinguished family group inhabitants. While some groups were based upon individual rooms within the structures, none of the assemblage analysis reflected individual stratigraphic units. The resulting interpretations found homogeneity amongst assemblages, perhaps demonstrating that the aim to link people, materials and archaeological contexts at a site must be based upon a contextual and deposit based analysis. While the dangers of grouping data at the phase level has been previously stated (Miller, 1991), it is clear that structuring archaeological data to reflect interpreted chronologies carries a real possibility of lessening our ability to tell the story of the past performance of living. If we aim to develop interpretations upon our understanding of integrated deposit data, then such data must be inspected at the deposit level.

The results of Level 3 analysis have a great potential impact upon excavation practice and research design. The exclusion of whole deposits or features based upon the assumed residual or contaminated nature of the finds which they contain is no longer a sound research strategy. Despite the guidance of standards and guidelines, such as MAP2 (EH, 1991) and MoRPHE (Lee, 2006), excavators must rise above the institutionally cultivated tendency to view sites as a collection of disparate classes of material to pick and choose among. During the research design phase excavators must respect that all aspects of the archaeological record have the potential to add to our understanding of elements of a site. The previously described ability of this method to match material with the appropriate level of research sought, places an onus on the excavator to more intimately understand what they wish to get out of a site. If sections of the material record are to be excluded from analysis then, as part of the research design, the best scenario is that they should be avoided during excavation and recovery. As excavators we can no longer justify the exclusion of features based upon our assumptions of the contents. We cannot justifiably exclude deposits from analysis due to their perceived residual nature. It is perhaps a reflection of some of the failures of the developer funded system, or worse yet of the obstinacy of some practitioners, that this practice continues despite similar findings by other researchers (Triggs, 1998:327).

The implications for future practice resulting from the narrative structures, and the results of Level 2 analysis, are both points of discussion that fall within a broader issue that relates to the organisation, structure and use of archaeological data. The restructuring of accepted means of organising site data is perhaps the most important aspect of the method presented here.

11.4 The Structure and Use of Archaeological Data

At the root of the new methodology presented here is the idea that organising our site data in different ways has the potential to impact upon how we think about that data, and how we use it to construct our understanding of the past. The problem that was first identified, the schism between deposit and assemblage, has prompted a search for ways to re-organise archaeological data, so that the two can be reunited during interpretation. Two primary problems need to be addressed: the separation of finds and site data, and the chronological categories that inform site narratives.

The most common post-excavation organisational structure of archaeological data is to group stratigraphic evidence and artefact study into disparate sections (Bradley, 2006). The format is established as an industry standard under MAP2, the specialist reports being presented in separate sections to deal with various "classes of material" (Watson, 2001:152). This acts to isolate deposits and finds in an artificial and arbitrary way. As stated by Last (2006), the challenge of understanding deposits and assemblages crosses all specialist boundaries. If we follow this thought to its logical conclusion, the only fully responsive future for material studies is their dissolution as a discrete sub-discipline (Last, 2006:134); although certainly particular pottery or faunal lines of inquiry will remain an interest as well as the need in certain circumstances for large datasets (in order to ensure statistical reliability). Specialist classes of analysis are necessary; they provide a forum for specific lines of inquiry based upon all manner of archaeological data. The individual aims and contributions of specialists will remain relevant; it is at the stage where we begin to tell a collective story of human action in the past that we need to unite.

The format of publications often follows the pattern of isolated site elements. The publication of the YAT fascicule series or the Museum of London Archaeology Service (MoLAS) monograph series are two examples of the compartmentalised publication of site data (see Cool et al., 1995, Egan, 2005). The York fascicule series provided small reports on separate classes of data from York's sites (ie. the pottery, the small finds, the environmental evidence). Under these guidelines, the excavators and the audience continue to envision site data as independent classes of material. This is followed by the grouping of these separate parts into chronologically based compartments, with either the stratigraphy informing the grouping of the artefacts, or the artefacts informing the grouping of the stratigraphic units. The imposition of chronologically based groups upon site data introduces a higher level of interpretation; creating a separation between us and the data.

The chronological categories that we construct further the separation between the data and our interpretation. The alternative approach is to allow a unified deposit and assemblage to direct the grouping of data and the related narrative. At SG, for example, this analysis allowed the evolving nature of refuse disposal and landuse of that area of York to be revealed without a strict adherence to the chronological classification of the site occupants. For our purposes it was irrelevant whether the evolving use and deposition processes were connected to Roman or Post Roman activities. This form of narrative would not have been visible under conventional organising structures. A landuse based narrative is better suited to reveal processes that are not weighed down by interpreted chronological terms.

At BH the integrated organisation of data exposed that the nature of occupation surfaces appeared to evolve from the earliest building phases. This subtle change in the way materials were deposited on floors, and possibly to some degree how those floors were used, would not have been visible if the deposit and assemblage data had remained separated.

At GS the integrated organisation of the data allowed us to see a lack of depositional change between different phases of occupation. The documentary-based chronology derived for that site structured the data to reflect assumed differences. While the legal owners or occupier of a piece of property may change, what is important, from a deposit based view, is whether the use of the property, and therefore the materials recovered, changes. It was clear, from the methodology used here that the latter did not necessarily reflect the documentary history.

The impact of a new, integrated approach to grouping archaeological data was very clearly seen in the events graphs constructed at CMP, SG, and BH, leading to new ways of viewing it. The most obvious implication of adjusting our view of archaeological data is the way in which in alters the construction of site narratives.

Where an events graph was created, a fluid narrative could be created that respected the changes in landuse above all other factors, allowing us to "compare and contrast the rhythms of occupation" (Saunders, 2004:166). As the past methods of using ones surroundings changed, such as a place evolving from a location for digging pits and disposing of waste to becoming a public surface for gathering, we see a story developing. These narratives can function alongside conventional narrative structures and offer an equally important interpretation of the past. The differences and similarities between each, or the points at which the two intersect, can prove an interesting interpretive focus. The tension created when the two narrative structures cross is a great potential source of interest. What is important is that we give the deposits the opportunity to tell their story as well.

At sites where data is integrated with the intention to be more sympathetic to landuse history, we have the advantage of making our arguments open to a wider audience. However, as in the case of using landuse and sequence diagrams at Carthage, this should not come at the failure to explicitly provide original data (Roskams, 2001b:227). This method, and the resulting narratives, can serve as an addition to normal procedures while at the same time promoting a greater interest in the site details, providing readers with a means of engaging the site details more closely. By providing more stimulating narratives, via an informed process, we can include the public in ways that meets what they enjoy about archaeology (Carver, 1989:672). The challenge to the excavator is to incorporate this approach in creative ways, while meeting their publishing requirements, standards and expectations.

11.5 Conclusions

This dissertation began with a direct purpose. A problem was identified, with various contributing factors creating the divergent paths that isolated deposit and assemblage. This problem was addressed directly through the development of a unique methodology, integrating deposit and assemblage data. A series of important results were identified through case study analysis, leading to the affirmation of the current method, as well as identifying relevant avenues for future study.

In the introduction, the problem was portrayed not only as a break between different elements of archaeological method, but also as a failure to link theory and practice. At a theoretical level archaeologists often recognise the importance of space, and of its multiple nature: as being at the same time perceived, conceived and lived (Lefebvre, 1994). It is surprising then that the value of building interpreted interpretations that respect the most discrete level of space, the stratigraphic unit, is not observed. Surely the multifaceted use of space should result in an array of deposit signatures that will reflect activities in space and time. At a practical level, if we continue to group all finds and contexts or isolate them into separate sections of interpretation then we imply that, at a theoretical level, all spaces and activities are the same. This artificially created homogeneity does not further archaeological interpretation.

This research has followed the "Carverian" tradition of advocating research design as a method for transparent definition of relevant data (Carver, 1987, 1990). The deposit-based method advocated here has demonstrated that clearly-defined approaches to deposit and assemblage data are the best means of successfully linking research aims with output. Following the theoretical concepts of time developed in Section 3.3, it was also demonstrated that viable interpretation is possible through a concept of narrative time, rather than chronological time (Lucas, 2005). Additionally, the analysis has demonstrated that a theoretical conception of taphonomy, or the palimpsest, as a process of addition as well as subtraction of knowledge is a viable approach to integrating material data with contextual evidence. The deposit signatures at the centre of this method have recognised the active nature of deposit history. Finally, this research has attempted to correct the theoretical error linking find and deposit with regard to deposit status (begun by Roskams, 1992). The theoretically-inspired method of an active range of deposit signatures, truly reflecting the ever changing relationship between find and deposit, has proven a successful approach.

My research relied heavily upon "grey literature" and archive data in order to demonstrate that, in varying contexts, be it academic research projects or developer funded excavation, the creation of deposit based interpretive frameworks is a fruitful activity. These methods, developed to bridge the gap between theory and practice, meet the necessary standard of applicability to the commercial sphere of archaeology, and can therefore advance general methods and practice (see comments by Chadwick, 2003:98). This has lead to the development of some consistent methods of descriptive and derived statistics, and the related classification of deposit status and signatures. The results have suggested the need for more consistent methods of recording, quantifying and analysing deposits and assemblages for commercial and academic contexts, to ensure that investment sources are used to their fullest potential. I would encourage excavators and finds analysts to be more mindful of the role that finds have as indicators of site formation history. The resulting narratives have put forward both simple, chronological descriptions, and more sophisticated accounts of activity types on the site.

The process introduced here bridges the existing interpretive gap between excavation theory and practice, creating a method that can be integrated into existing excavation and post-excavation systems to provide both new and different accounts. With greater thought given to organising our data and related narratives around the stratigraphically ordered deposit, we will be able to construct new and more interesting reports. A different method of thinking about data, ordering data, using data, and presenting that data to viewers will draw greater interest and better utilize public and private investment in archaeological fieldwork.

References

ADAMS, M. (1992) *Stratigraphy after Harris: Some Questions,* Edinburgh, Scotland, Edinburgh:.

ADAMS, M. (2001) Chapter 10. The Optician's Trick: An Approach to Recording Excavation Using an Iconic Formation Process Recognition System. IN ROSKAMS, S. (Ed.) *Interpreting Stratigraphy – Site evaluation, recording procedures and stratigraphic analysis. Papers presented to the Interpreting Stratigraphy Conferences 1993-1997.* London, BAR International Series. 910,91-102.

ADAMS, R. (1960) Manuel Gamio and Stratigraphic Excavation. *American Antiquity,* 26, 99.

ADAMS, W. H. (2003) Dating Historical Sites: The Importance of Understanding Time Lag in the Acquisition, Curation, Use, and Disposal of Artifacts. *Historical Archaeology,* 37, 38-64.

ANDREWS, G., BARRETT, J. & LEWIS, J. (2000) Interpretation Not Record: The Practice of Archaeology. *Antiquity,* 74, 525-530.

ASCHER, R. (1968) Time's Arrow and the Archaeology of a Contemporary Community. IN CHANG, K. C. (Ed.) *Settlement Archaeology.* Palo Alto, National Press Books.

AULTMAN, J., GRILLO, K. & BON-HARPER, N. (2003) DAACS Cataloging Manual: Ceramics. *http://www.daacs.org/aboutDatabase/catalogingManual.html.* Digital Archaeological Archive of Comparative Slavery.

BAILEY, G. N. (1981) Concepts, Time-Scales and Explanations in Economic Prehistory. IN SHERIDAN, A. & BAILEY, G. N. (Eds.) *Economic Archaeology: Towards an Integration of Ecological and Social Approaches.* London, BAR International Series. 96,97-117.

BAILEY, G. N. (1983) Concepts of Time in Quarternary Prehistory. *Annual Review of Anthropology,* 12, 165-192.

BAILEY, G. N. (1987) Breaking the Time Barrier. *Archaeological Review from Cambridge,* 6, 5-20.

BAILEY, G. N. (2005) Concepts of Time. IN RENFREW, C. & BAHN, P. (Eds.) *Archaeology: The Key Concepts.* Cornwall, Routledge. 268-273.

BAKER, C. M. (1978) The Size Effect: An Explanation of Variability in Surface Artifact Assemblage Content. *American Antiquity,* 43, 288-293.

BANNING, E. (2000) *The Archaeologist's Laboratory : The Analysis of Archaeological Data,* New York, London, Kluwer Academic/Plenum Publishers, BARBER, J. (1984) A Comment on Dalland and Harris. *Scottish Archaeological Review*, 49-52.

BARKER, P. (1977) *Techniques of Archaeological Excavation,* London, Batsford,

BARTON, M., BERNABEU, J., AURA, E., GARCIA, O. & LA ROCA, N. (2002) Dynamic Landscapes, Artifact Taphonomy, and Landuse Modeling in Western Mediterranean. *Geoarchaeology,* 17, 155-190.

BATES, M. R., BARHAM, A. J., PINE, C. A. & WILLIAMSON, V. D. (2001) Chapter 7. Evaluation Strategies for Deeply Stratified Alluvial Areas: The Use of Borehole Stratigraphic Logs. IN ROSKAMS, S. (Ed.) *Interpreting Stratigraphy – Site evaluation, recording procedures and stratigraphic analysis. Papers presented to the Interpreting Stratigraphy Conferences 1993-1997.* London, BAR International Series. 910,49-70.

BECK, M. (2006) Midden Ceramic Assemblage Formation: A Case Study from Kalinga, Philippines. *American Antiquity,* 71, 27-51.

BERGGREN, A. & HODDER, I. (2003) Social Practice, Method, and Some Problems of Field Archaeology. *American Antiquity,* 68, 421-434.

BINFORD, L. R. (1981a) Behavioural Archaeology and the "Pompeii Premise" *Journal of Anthropological Research* 37, 195-208.

BINFORD, L. R. (1981b) *Bones: Ancient Men and Modern Myths,* New York, Academic Press,

BODDINGTON, A. (1978) *The Excavation Record: Part 1 Stratification,* Northampton, Northamptonshire County Council,

BOLLONG, C. (1994) Analysis of Site Stratigraphy and Formation Processes Using Patterns of Pottery Sherd Dispersion. *Journal of Field Archaeology,* 21, 15-28.

BONNER, J., BRERETON, S., PEARSON, N., SATTELBERGER, P., WHYMAN, M. & WIJAYAPALA, W. (1991) Excavations at 12 to 18 Swinegate, 8 Grape Lane and 14/18/20/22 Back Swinegate/Little Stonegate. York, York Archaeological Trust.

BOWDEN, M. (1991) *Pitt Rivers: The Life and Archaeological Work of Lieutenant-General Augustus Henry Lane Fox Pitt-Rivers, DCL, FRS, FSA.,* Cambridge, Cambridge University Press,

BRADLEY, J., AND MILLER, I, (forthcoming) The Medieval and Post-Medieval Pottery, in C Howard-Davis (ed) forthcoming The Carlisle Millennium Project. Archaeological Excavations in the Roman Fort and Medieval Castle, 1998-2001: Volume 2, the Finds and Environmental Evidence.

BRADLEY, R. (1991) Ritual, Time and History. *World Archaeology,* 23, 209-219.

BRADLEY, R. (2006) The Excavation Report as a Literary Genre: Traditional Practice in Britain. *World Archaeology,* 38, 664-671.

BRADLEY, R. & FULFORD, M. (1980) Sherd Size in the Analysis of Occupation Debris. *Bulletin of the Institute of Archaeology,* 17, 85-94.

BRAINERD, G. (1951) The Place of Chronological Ordering in Archaeological Analysis. *American Antiquity,* 16, 301-313.

BRANN, M. (1987) 1987.1 Coffee Yard Excavation Archive Report. York, York Archaeological Trust.

BRAUDEL, F. (1969) *Ecrits sur l'Histoire,* Paris, Flammarion

BREEN, E. (2004) Whose Trash is it Anyways? A Stratigraphic and Ceramic Analysis of the South Grove Midden (44FX762/17), Mount Vernon, Virginia. *Northeast Historical Archaeology,* 33, 111-130.

BROOKS, C. M. (1987) *Medieval and Later Pottery from Aldwark and Other Sites*, Council for British Archaeology,

BROWN, D. (1994) *Contexts, Their Contents and Residuality,* Norwich, Norwich. 1-8

BROWN III, M. & HARRIS, E. (1993) Interfaces in Archaeological Stratigraphy. IN HARRIS, E. (Ed.) *Practices of Archaeological Stratigraphy.* London, Academic Press. 7-20.

BROWN, J. & FREEMAN, J. (1964) A UNIVAC Analysis of Sherd Frequencies from the Carter Ranch Pueblo, Eastern Arizona. *American Antiquity,* 30, 162-167.

BROWN, M. & HARRIS, E. (1993) Interfaces in Archaeological Stratigraphy. IN HARRIS, E. (Ed.) *Practices of Archaeological Stratigraphy.* London, Academic Press. 7-20.

BUTZER, K. W. (1982) *Archaeology as Human Ecology,* Cambridge, Cambridge University Press,

CANNON, A. (1983) The Quantification of Artifactual Assemblages: Some Implications For Behavioural Inferences *American Antiquity,* 48, 785-792.

CARVER, G. (2006) Archaeological Information Systems (AIS), Adapting GIS to Archaeological Contexts. SUNY Buffalo/Universitat zu Koln.

CARVER, M. (1979) Three Saxo-Norman Tenements in Durham City. *Medieval Archaeology* 23, 1-80.

CARVER, M. (1980) The Excavation of Three Medieval Craftsmen's Tenements in Sidbury Worcester, 1976. IN CARVER, M. (Ed.) *Medieval Worcester:*

An Archaeological Framework. Worcester, Worcester Archaeological Society. 155-219.

CARVER, M. (1985) Theory and Practice in Urban Pottery Seriation. *Journal of Archaeological Science,* 12, 352-366.

CARVER, M. (1987) *Underneath English Towns: Interpreting Urban Archaeology* London, Batsford Ltd.,

CARVER, M. (1989) Digging for Ideas. *Antiquity,* 63, 666-674.

CARVER, M. (1990) Digging for Data: Archaeological Approaches to Data Definition, Acquisition and Analysis. IN D., F. R. A. M. (Ed.) *Lo scavo archeologico.* Firenze.

CARVER, M. (2003) *Archaeological Value and Evaluation*, Societa Archaeologica Padana, 2.

CASEY, M. (2006) Archaeological Investigation 109-113 George Street, Parramatta. Volume 1: Main Report. Marrickville NSW, Casey and Lowe Pty Ltd.

CASTEEL, R. W. (1972) Some Biases in the Recovery of Archaeological Bone. *Proceedings of the Prehistoric Society,* 38, 382-388.

CHADWICK, A. (1997) Archaeology at the Edge of Chaos. Further Towards Reflexive Excavation Methodologies. *Assemblage*

CHADWICK, A. (2003) Post-processualism, Professionalization and Archaeological Methodologies. Towards Reflective and Radical Practice. *Archaeological Dialogues* 10.1, 97-117.

CHILDE, V. G. (1925) *The Dawn of European Civilization,* London, Kegan, Trench, Trubner and Co.,

CLARK, J. & KIETZKE, K. (1967) Paleoecology of the Lower Nodular Zone, Brule Formation, in the Badlands of South Dakota. IN CLARK, J., BEERBOWER, R. AND K. KIETZKE (Ed.) *Oligocene Sedimentation, Stratigraphy and Paleoclimatology in the Big Badlands of South Dakota.* Fieldiana Geology Memoir 5. 111-137.

CLARK, K. (2001a) Chapter 3. Architect's Specification: Building Analysis and Conservation. IN ROSKAMS, S. (Ed.) *Interpreting Stratigraphy – Site evaluation, recording procedures and stratigraphic analysis. Papers presented to the Interpreting Stratigraphy Conferences 1993-1997.* London, BAR International Series. 910,17-24.

CLARK, P. (2001b) Chapter 11. Negative Features and Interfaces. IN ROSKAMS, S. (Ed.) *Interpreting Stratigraphy – Site evaluation, recording procedures and stratigraphic analysis. Papers presented to the Interpreting Stratigraphy Conferences 1993-1997.* London, BAR International Series. 910,103-106.

CLARK, P. (2001c) Chapter 19. Post-Excavation Analysis: Moving from the Context to the Phase. IN ROSKAMS, S. (Ed.) *Interpreting Stratigraphy – Site evaluation, recording procedures and stratigraphic analysis. Papers presented to the Interpreting Stratigraphy Conferences 1993-1997.* London, BAR International Series. 910,157-160.

COLLIS, J. (2004) *Paradigms and Excavation,* London, BAR International Series, 1256.

COOL, H. E. M., HOOLEY, A. D. & LLOYD-MORGAN, G. (1995) *Finds from the Fortress*, Council for British Archaeology,

COWGILL, G. L. (1968) Archaeological Applications of Factor, Cluster, and Proximity Analysis. *American Antiquity,* 33, 367-375.

COX, A. (2001) Chapter 24. Concepts in Finds Analysis. IN ROSKAMS, S. (Ed.) *Interpreting Stratigraphy – Site evaluation, recording procedures and stratigraphic analysis. Papers presented to the Interpreting Stratigraphy Conferences 1993-1997.* London, BAR International Series. 910,197-200.

CRUMMY, P. & TERRY, R. (1979) Seriation Problems in Urban Archaeology. IN MILLET, M. (Ed.) *Pottery and the Archaeologist.* London, Institute of Archaeology. 85.

CUTLER, A. (2003) *The Seashell on the Mountaintop: A Story of Science, Sainthood, and the Humble Genius Who Discovered a New History of the Earth* London, Heinemann,

DAACS (2004) Digital Archaeological Archive of Comparative Slavery. Thomas Jefferson Foundation. http://www.daacs.org/.

DALLAND, M. (1984) A Procedure for Use in Stratigraphical Analysis. *Scottish Archaeological Review.* , 116-127.

DANIEL, G. (1975) *A Hundred and Fifty Years of Archaeology,* London, Duckworth,

DANIEL, G. (1981) *A Short History of Archaeology,* London, Thames and Hudson,

DARWIN, C. (1881) *The Formation of Vegetable Mould Through the Action of Worms, with Observations on Their Habits,* London, John Murray,

DE BARROS, P. (1982) The Effects of Variable Site Occupation Span on the Results of Frequency Seriation. *American Antiquity,* 47, 291-315.

DEMPSEY, P. & BAUMHOFF, M. (1963) The Statistical Use of Artifact Distributions to Establish Chronological Sequence. *American Antiquity,* 28, 496-509.

DETHLEFSEN, E. & DEETZ, J. (1966) Deaths Heads, Cherubs, and Willow Trees - Experimental Archaeology in Colonial Cemeteries. *American Antiquity,* 31, 502-510.

DOBNEY, K., KENWOOD, H. & ROSKAMS, S. (1997) All Mixed Up But Somewhere to Go? Confronting Residuality in Bioarchaeology. IN DE BOE, G. & VERHAEGHE, F. (Eds.) *Method and Theory in Historical Archaeology, Papers of the 'Medieval Europe Brugge 1997' Conference.* Institute for the Archaeological Heritage. 10,

DOE (1990) Planning Policy Guidance 16: Archaeology and Planning. London, Her Majesty's Stationary Office.

DONEUS, M. & NEUBAUER, W. (2005) Laser Scanners for 3D Documentation of Stratigraphic Excavations. IN BALTSAVIAS, M., GRUEN, A., VAN GOOL, L. & PATERAKI, M. (Eds.) *Recording, Modeling and Visualization of Cultural Heritage.* Taylor and Francis. 193-203.

DRENNAN, R. D. (1996) *Statistics for Archaeologists : A Commonsense Approach,* New York, Kluwer Academic/Plenum Press,

DUNNELL, R. C. (1970) Seriation Method and Its Evaluation. *American Antiquity,* 35, 305-319.

DUNNELL, R. C. (1992) The Notion of Site. IN ROSIGNOL, J. & WANDSNIDER, L. (Eds.) *Space, Time, and Archaeological Landscapes.* New York, Plenum 21-41.

EDDINGTON, A. (1928) *The Nature of the Physical World,* London, MacMillan,

EGAN, G. (2005) *Material culture in London in an age of transition : Tudor and Stuart period finds c.1450-c.1700 from excavations at riverside sites in Southwark / Geoff Egan,* Museum of London Archaeology Service,

EGLOFF, B. J. (1973) A Method for Counting Ceramic Rim Sherds. *American Antiquity,* 38, 351-353.

EH (1991) Management of Archaeological Projects. London, English Heritage.

EMERY, P. A. (1992) *Interface Density and Stratigraphic Primacy: Quantitative Analyses for Urban Evaluation,* Edinburgh, Scotland, Edinburgh:. 49-54

EVANS-PRITCHARD, E. (1940) *The Nuer,* Oxford, Clarendon.

EVANS, D. H. & TOMLINSON, D. G. (1992) *Excavations at 33-35 Eastgate, Beverley, 1983-86,* Sheffield, J.R. Collis Publications,

EVANS, J. & MILLETT, M. (1992) Residuality Revisited. *Oxford Journal of Archaeology,* 11, 225-240.

FAGAN, B. (1983) *Archaeology: A Brief Introduction,* Boston, Little, Brown and Company,

FARRAND, W. (1984) Stratigraphic Classification: Living Within the Law. *Quarterly Review of Archaeology,* 5, 1-5.

FEDELE, F. G. (1984) Towards an Analytical Stratigraphy: Stratigraphic Reasoning and Excavation. *Stratigraphica Archaeologica,* 1, 7-15.

FORD, J. (1962) *A Quantitative Method for Deriving Cultural Chronology,* Columbia, University of Missouri,

FRERE, S. (1975) *Principles of Publication in Rescue Archaeology: Report by the Working Party of the Ancient Monuments Board for England Committee for Rescue Archaeology,* London, Department of the Environment,

GASCHE, H. & TUNCA, O. (1983) Guide to Archaeostratigraphic Classification and Terminology: Definitions and Principles. *Journal of Field Archaeology,* 10, 325-335.

GERRARD, R. (1993) Beyond Crossmends: Stratigraphic Analysis and the Content of Historic Artefact Assemblages on Urban Sites. IN HARRIS, E. (Ed.) *Practices of Archaeological Stratigraphy.* London, Academic Press. 229-249.

GIFFORD, D. (1981) Taphonomy and Paleoecology: A Critical Review of Archaeology's Sister Disciplines. *Advances in Archaeological Method and Theory,* 4, 365-438.

GOSDEN, C. (1994) *Social Being and Time,* Oxford, Blackwell,

GOULD, R. A. (1980) *Living Archaeology,* Cambridge, Cambridge University Press,

HALL, R. A. (1997) *Excavations in the Praetentura : 9 Blake Street* Archaeology of York ; 3/4, Council for British Archaeology,

HAMMER, F. (2001a) Chapter 17. The Structuring of Records: Different Systems in Use from Excavation Through to Publication. IN ROSKAMS, S. (Ed.) *Interpreting Stratigraphy – Site evaluation, recording procedures and stratigraphic analysis. Papers presented to the Interpreting Stratigraphy Conferences 1993-1997.* London, BAR International Series. 910,143-150.

HAMMER, F. (2001b) Chapter 20. From Field Record to Publication with a Minimum Archive Report. IN ROSKAMS, S. (Ed.) *Interpreting Stratigraphy – Site evaluation, recording procedures and stratigraphic analysis. Papers presented to the Interpreting Stratigraphy Conferences 1993-1997.* London, BAR International Series. 910,161-172.

HAMMER, F. A. (1993) Excavation and Post-Excavation Recording Methods in British Archaeology Today: Investigation of Strategies Pursued by 70

Archaeological Units and Projects During the 1980s. *M.Phil Thesis. Department of Archaeology* York, University of York.

HARRIS, E. (1974) New Method of Stratigraphic Synthesis. *Rescue News,* 8, 10.

HARRIS, E. (1975) The Stratigraphic Sequence: A Question of Time. *World Archaeology.,* 7, 109-121.

HARRIS, E. (1979) The Laws of Archaeological Stratigraphy. *World Archaeology.,* 11, 111-117.

HARRIS, E. (1984) The Analysis of Multilinear Stratigraphic Sequences. *Scottish Archaeological Review,* 127-133.

HARRIS, E. & OTTAWAY, P. (1976) A Recording Experiment on a Rescue Site. *Rescue News,* 12, 6-7.

HARRIS, E. C. (1989) *Principles of Archaeological Stratigraphy,* London, Academic Press,

HARRIS, E. C., BROWN, M. R. & BROWN, G. J. (1993) *Practices of Archaeological Stratigraphy,* London, Academic Press,

HASSAN, F. (1987) Re-forming Archaeology: A Forward to Natural Formation Processes and the Archaeological Record. IN NASH, D. T. & PETRAGLIA, M. D. (Eds.) *Natural Formation Process and the Archaeological Record.* London, Bar International Series. 352,1-9.

HAYES, A. (1993) *Archaeology of the British Isles,* London, B.T. Batsford,

HESSE, B. & WAPNISH, P. (1985) Animal Bone Archaeology: From Objectives to Analysis. *Manuals on Archaeology No. 5.* Washington, Taraxacum.

HODDER, I. (1989) Writing Archaeology: Site Reports in Context. *Antiquity,* 63, 268-274.

HODDER, I. (1991) *Reading the Past : Current Approaches to Interpretation in Archaeology,* Cambridge, Cambridge University Press,

HODDER, I. (1993) The Narrative and Rhetoric of Material Culture Sequences. *World Archaeology,* 25, 268-282.

HODDER, I. (1997) Always Momentary, Fluid and Flexible: Towards a Reflexive Excavation Methodology. *Antiquity,* 71, 691-700.

HODDER, I. (2000) *Towards reflexive method in archaeology : the example at Çatalhöyük,* McDonald Institute for Archaeological Research,

HOLE, F. & SHAW, M. (1967) Computer Analysis of Chronological Seriation. *Rice University Studies,* 53.

HOWARD-DAVIS, C., (ED) (forthcoming) The Carlisle Millennium Project. Archaeological excavations in the Roman Fort and Medieval Castle, 1998-2001: Volume 2, the Finds and Environmental Evidence.

HUTCHESON, A. (1992) *Interpretation of the Formation Processes of One Context on the North Downs in Kent,* Lincoln, Lincoln. 23-26

JONES, M. (2001) The Stratigraphic Examination of Standing Buildings: Problems and Solutions. IN ROSKAMS, S. (Ed.) *Interpreting Stratigraphy – Site evaluation, recording procedures and stratigraphic analysis. Papers presented to the Interpreting Stratigraphy Conferences 1993-1997.* London, BAR International Series. 910,113-124.

JOUKOWSKY, M. (1980) *A Complete Manual of Field Archaeology : Tools and Techniques of Field Work for Archaeologists,* Englewood Cliffs, N.J, Prentice-Hall,

KENDALL, D. (1969a) Incidence Matrices, Interval Graphs and Seriation in Archaeology. *Pacific Journal of Mathematics,* 28, 565-570.

KENDALL, D. (1969b) Some Problems and Methods in Statistical Archaeology. *World Archaeology,* 1, 68-76.

KENYON, K. M., WEINBERG, G. D. & WEINBERG, S. S. (1964) *Beginning in Archaeology,* London, J. M. Dent,

KIDDER, A. (1924) *Introduction to the Study of Southwestern Archaeology,* New Haven, Yale University Press,

KLEIN, R. G. & CRUZ-URIBE, K. (1984) *The Analysis of Animal Bones from Archaeological Sites,* Chicago, University of Chicago Press,

KOBYLINSKI, Z. & MOSZCZYNSKI, W. (1992) Conjoinable Sherds and Stratificational Processes: an Example from Wyszogrod, Plock Province, Poland. *Archaeologia Polona,* 30, 109-126.

LAST, J. (2006) Potted Histories: Towards an Understanding of Potsherds and Their Contexts. IN PAPACONSTANTINOU, D. (Ed.) *Deconstructing Context: A Critical Approach to Archaeological Practice.* Oxford, Oxbow Books. 120-137.

LEBLANC, S. A. (1975) Micro-Seriation - Method for Fine Chronologic Differentiation. *American Antiquity,* 40, 22-38.

LEE, E. (2006) Management of Research Projects in the Historic Environment: The MoRPHE Project Managers' Guide. Swindon, English Heritage.

LEFEBVRE, H. (1994) *The Production of Space,* Oxford, Blackwell.

LEVI STRAUSS, C. (1966) *The Savage Mind,* London, Weidenfeld & Nicholson, LOWE, C. E. (1992) *Data Washing, the Database and the Dalland Matrix,* Edinburgh, Scotland, Edinburgh:. 23-26

LUCAS, G. (2001) *Critical Approaches to Fieldwork,* London, Routledge,

LUCAS, G. (2005) *The Archaeology of Time,* London, Routledge,

LYELL, C. (1875) *Principles of Geology, or, The Modern Changes of the Earth and its Inhabitants Considered as Illustrative of Geology* London, John Murray,

LYELL, C. (1885) *Elements of Geology,* London, John Murray,

LYMAN, R. L. (1994a) Quantitative Units and Terminology in Zooarchaeology. *American Antiquity,* 59, 36-71.

LYMAN, R. L. (1994b) *Vertebrate Taphonomy,* Cambridge, Cambridge University Press,

MARQUARDT, W. H. (1978) Advances in Archaeological Seriation. *Advances in Archaeological Method and Theory,* 1, 257-314.

MCCARTHY, M. R. (1990) *A Roman, Anglian and Medieval site at Blackfriars Street, Carlisle: Excavations 1977-79,* Cumberland And Westmorland Archaeological and Antiquarian Society, Research Series 4

MCTAGGART, J. M. E. (1908) The Unreality of Time. *Quarterly Review of Psychology and Philosophy,* 17, 456-473.

MEADOW, R. (1981) Animal Bones - Problems for the Archaeologist Together with Some Possible Solutions. *Paleorient,* 6, 65-77.

MEIGHAN, C. W. (1959) A New Method for the Seriation of Archaeological Collections. *American Antiquity,* 25, 203-211.

MICHELMORE, D. (1987) Coffee Yard Historical Background. York, Historic Building Specialists Limited.

MILLER, G. (1991) Thoughts Towards a User's Guide to Ceramic Assemblages. *CNEHA Newsletter,* 18, 2-5.

MILLER, G., SAMFORD, P., SHLASKO, E. & MADSEN, A. (2000) Telling Time for Archaeologists *Northeast Historical Archaeology,* 29, 1-22.

MILLETT, M. (1979) How Much Pottery? IN MILLETT, M. (Ed.) *Pottery and the Archaeologist.* London, UCL Institute of Archaeology Occassional Publication No. 4,

MONAGHAN, J. (1997) *Roman Pottery from York,* York, Council for British Archaeology, 16/8 Archaeology of York.

MOORHOUSE, S. (1986) Non-Dating Use of Medieval Pottery. *Medieval Ceramics,* 10, 85-123.

MORENO-GARCIA, M., ORTON, C. & RACKHAM, J. (1996) A New Statistical Tool for Comparing Animal Bone Assemblages. *Journal of Archaeological Science,* 23, 437-453.

MURRAY, T. (1993) Archaeology and the Threat of the Past: Sir Henry Rider Haggard and the Acquisition of Time. *World Archaeology,* 25, 175-186.

MURRAY, T. & MAYNE, A. (2001) Imaginary Landscapes: Reading Melbourne's 'Little Lon'. IN MURRAY, T., A. MAYNE (Ed.) *The Archaeology of Urban Landscapes: Exploration in Slumland.* Cambridge, Cambridge University Press.

MVLA (1903) *Historical Sketch of Ann Pamela Cunningham "the Southern Matron" founder of "The Mount Vernon Ladies' Association",* Queensborough NY, Marion Press

NEEDHAM, S. & STIG-SORENSEN, M. (1988) Runnymede Refuse Tip: A Consideration of Midden Deposits and their Formation. IN BARRETT, J. & KINNES, I. (Eds.) *The Archaeology of Context in the Neolithic and Bronze Age: Recent Trends.* Sheffield, Department of Archaeology and Prehistory University of Sheffield. 113-126.

O'BRIEN, M. & LYMAN, R. (1999) *Seriation, Stratigraphy, and Index Fossils : the Backbone of Archaeological Dating,* New York ; London, Kluwer Academic/Plenum,

O'CONNOR, T. P. (1996) A Critical Overview of Archaeological Animal Bone Studies. *World Archaeology,* 28, 5-19.

O'CONNOR, T. P. (2003) *The Analysis of Urban Animal Bone Assemblages : A Handbook for Archaeologists* York, The Council for British Archaeology, 19/2.

OA (2004) The Carlisle Millennium excavations 1998-2001: Post-Roman Phase Narrative, unpublished report. OA North.

ORTON, C. (1975) Quantitative Pottery Studies: Some Progress, Problems and Prospects. *Science and Archaeology,* 16, 30-35.

ORTON, C. (1980) *Mathematics in Archaeology,* London, Collins,

ORTON, C. (1982) Computer Simulation Experiments to Assess the Performance of Measures of Quantity of Pottery. *World Archaeology,* 14, 1-20.

ORTON, C. (1985) Two Useful Parameters for Pottery Research. *Computer Applications in Archaeology,* 13, 114-120.

ORTON, C. (1989) An Introduction to the Quantification of Assemblages of Pottery. *Journal of Roman Pottery Studies,* 2, 94-97.

ORTON, C. & TYERS, P. (1990) Statistical Analysis of Ceramic Assemblages. *Archaeologia e Calcolatori,* 1, 81-110.

OTTAWAY, P. (1997) The Sewer Trenches in Low Petergate. *Interim: Archaeology in York,* 22, 15-23.

PAPACONSTANTINOU, D. (2006) Archaeological Context as a Unifying Process: An Introduction. IN PAPACONSTANTINOU, D. (Ed.) *Deconstructing Context: A Critical Approach to Archaeological Practice.* Oxford, Oxbow Books. 1-21.

PETRIE, W. M. F. S. (1899) Sequences in Prehistoric Remains. *Journal of the Anthropological Institute,* 29, 295-301.

POGUE, D. (1991) Summary Report on the "House for Families" Slave Quarter Site (44 Fx 762/40-47), Mount Vernon Plantation, Mount Vernon, Virginia. Mount Vernon Ladies' Association.

POGUE, D. (2003) House For Families. Digital Archaeological Archive of Comparative Slavery. http://www.daacs.org/

POLLARD, R. J. (2001) Chapter 26. Assemblage Formation Processes: a Case Study from Leicester. IN ROSKAMS, S. (Ed.) *Interpreting Stratigraphy – Site evaluation, recording procedures and stratigraphic analysis. Papers presented to the Interpreting Stratigraphy Conferences 1993-1997.* London, BAR International Series. 910,207-212.

PRAETZELLIS, A. (1993) The Limits of Arbitrary Excavation. IN E. HARRIS, M. B. A. G. B. (Ed.) *Practices of Archaeological Stratigraphy.* London, Academic Press. 68-86.

RAUXLOH, P. (2001) Chapter 27. Stratigraphy, Residuality and a Relational Database. IN ROSKAMS, S. (Ed.) *Interpreting Stratigraphy – Site evaluation, recording procedures and stratigraphic analysis. Papers presented to the Interpreting Stratigraphy Conferences 1993-1997.* London, BAR International Series. 910,213-216.

REITZ, E. & WING, E. (1999) *Zooarchaeology,* Cambridge, Cambridge University Press,

ROBINSON, W. (1951) A Method for Chronologically Ordering Archaeological Deposits. *American Antiquity,* 16, 293-301.

ROGERS, A. R. (2000) On Equifinality in Faunal Analysis. *American Antiquity,* 65, 709-723.

ROSKAMS, S. (1990) Book Review, Principles of Archaeological Stratigraphy 2nd edition by Edward Harris. *Antiquity,* 64, 971-972.

ROSKAMS, S. (1992) *Finds Context and Deposit Status,* Lincoln, Lincoln. 27-29

ROSKAMS, S. (2001a) Chapter 9. Chinese Boxes at Wharram. IN ROSKAMS, S. (Ed.) *Interpreting Stratigraphy – Site evaluation, recording procedures and stratigraphic analysis. Papers presented to the Interpreting Stratigraphy Conferences 1993-1997.* London, BAR International Series. 910,83-90.

ROSKAMS, S. (2001b) Chapter 29. Landuse Diagrams at Carthage. IN ROSKAMS, S. (Ed.) *Interpreting Stratigraphy – Site evaluation, recording procedures and stratigraphic analysis. Papers presented to the Interpreting Stratigraphy Conferences 1993-1997.* London, BAR International Series. 910,225-228.

ROSKAMS, S. (2001c) *Excavation,* Cambridge, U.K. ; New York, Cambridge University Press,

ROWE, J. (1955) *Max Uhle, 1856-1944.,* Los Angelas, University of California Press,

ROYAL COMMISSION ON HISTORICAL, M. (1981) *An Inventory of the Historical Monuments in the City of York. Vol.5 The Central Area,* H.M.S.O.,

SAUNDERS, T. (2004) Breaking Up Time: The Problems of 'Phasing Stratigraphy'. IN CARVER, G. (Ed.) *Digging in the Dirt: Excavations in a New Millenium.* London, BAR International Series. 1256,163-171.

SCHIFFER, M. B. (1972) Archaeological Contexts and Systemic Context. *American Antiquity* 37, 156-165.

SCHIFFER, M. B. (1974) On Whallon's Use of Dimensional Analysis of Variance at Guila Naquitz. *American Antiquity,* 39, 490-492.

SCHIFFER, M. B. (1976) *Behavioural Archaeology,* New York, Academic Press,

SCHIFFER, M. B. (1988) The Structure of Archaeological Theory. *American Antiquity,* 53, 461-485.

SCHIFFER, M. B. (1996) *Formation Processes of the Archaeological Record,* Salt Lake City, University of Utah Press,

SCHIFFER, M. B. & SKIBO, J. M. (1989) A Provisional Theory of Ceramic Abrasion. *American Anthropologist,* 91, 101-115.

SCHREVE, D. (2006) The Taphonomy of a Middle Devensian (MIS 3) Vertebrate Assemblage from Lynford, Norfolk, UK, and its Implications for Middle Palaeolithic Subsistence Strategies. *Journal of Quaternary Science* 21, 543-556.

SCOLLAR, I. (1990) The Bonn Seriation and Archaeological Statistics Package: Version 4.1. Remagen.

SERJEANTSON, D. (1991) 'Rid Grass of Bones': A Taphonomic Study of the Bones from Midden Deposits at the Neolithic and Bronze Age Site of Runnymede, Surrey, England. *International Journal of Osteoarchaeology,* 1, 73-89.

SHANKS, M. & TILLEY, C. (1987) *Social Theory and Archaeology,* Oxford, Polity Press,

SLOWIKOWSKI, A., NENK, B. & PEARCE, J. (2001) *Minimum Standards for the Processing, Recording, Analysis and Publication of Post-Roman Ceramics,* Essex, Medieval Pottery Research Group,

SMITH, R. (2001) Chapter 14. Recording for Recording's Sake. IN ROSKAMS, S. (Ed.) *Interpreting Stratigraphy – Site evaluation, recording procedures and stratigraphic analysis. Papers presented to the Interpreting Stratigraphy Conferences 1993-1997.* London, Bar International Series. 910,125-128.

SOUTH, S. (1977) *Method and Theory in Historical Archaeology* New York, Academic Press,

SPAULDING, A. (1953) Statistical Techniques for the Discovery of Artifact Types. *American Antiquity,* 18, 305-313.

SPAULDING, A. (1960) Statistical Description and Comparison of Artifact Assemblages. IN HEIZER, R. & COOK, S. (Eds.) *The Application of Quantitative Methods in Archaeology.* Chicago, Quanrangle Books. 60-83.

STEANE, K. (1992a) *Land Use Diagrams - a Hierarchy of Site Interpretation,* Edinburgh, Scotland, Edinburgh:. 11-14

STEANE, K. (1992b) *Reinterpretation: Thoughts from the Backlog,* Lincoln, Lincoln. 40-42

STEIN, J. (1985) Deposits for Archaeologists. IN SCHIFFER, M. B. (Ed.) *Advances in Archaeological Method and Theory.* New York, Academic Press. 8,337-395.

STEIN, J. (2005) Principles of Stratigraphic Succession. IN RENFREW, C. & BAHN, P. (Eds.) *Archaeology: The Key Concepts.* Cornwall, Routledge. 243-247.

SULLIVAN, A. P. (1989) The Technology of Ceramic Reuse: Formation Processes and Archaeological Evidence. *World Archaeology,* 21, 101-114.

THOMAS, J. (1996) *Time, Culture and Identity,* London and NY, Routledge,

TILLEY, C. (1989) Excavation as Theatre. *Antiquity,* 63, 275-280.

TIPPER, J. (2004) *The Grubenhaus in Anglo-Saxon England: An Analysis and Interpretation of the Evidence from a Most Distinctive Building Type,* Colchester, Landscape Research Centre Ltd,

TORBEN, C., ERLANDSON, J. & VELLANOWETH, R. (2006) Taphonomy and Site Formation on California's Channell Islands. *Geoarchaeology,* 21, 567-589.

TRIGGER, B. G. (1989) *A History of Archaeological Thought,* Cambridge, Cambridge University Press,

TRIGGS, J. (1993) The Seriation of Multilinear Stratigraphic Sequences. IN HARRIS, E. (Ed.) *Practices of Archaeological Stratigraphy.* London, Academic Press. 250-273.

TRIGGS, J. (1998) Matrix Seriation: A Relative Dating Technique for Sites with `Multilinear Stratigraphic Sequences. *Department of Anthropology.* Toronto, University of Toronto.

VILLA, P. (1982) Conjoinable Pieces and Site Formation Processes. *American Antiquity,* 47, 276-290.

VINCE, A. (1977) Some Aspects of Pottery Quantification. *Medieval Ceramics,* 1, 63-74.

VINCE, A. (1994) *Approaches to Residuality in Urban Archaeology,* Norwich, Norwich. 9-14

WARD, D. (1984) Collecting Isolated Microvertebrate Fossils. *Zoological Journal of the Linnean Society,* 82, 245-259.

WATSON, B. (2001) Chapter 18. MAP 2 Nine Years On: A Review of Post-Excavation Procedures. IN ROSKAMS, S. (Ed.) *Interpreting Stratigraphy – Site evaluation, recording procedures and stratigraphic analysis. Papers presented to the Interpreting Stratigraphy Conferences 1993-1997.* London, BAR International Series. 910,151-156.

WEBB, M. (1995) Beyond the "Pompeii Premise": Identifying Deposit Status for the Integrated Analysis of Assemblages from Urban Sites. *Department of Archaeology.* York, The University of York.

WESSA, P. (2007) Free Statistics Software, Office for Research Development and Education, version 1.1.21-r3, URL http://www.wessa.net/.

WESTMAN, A. (Ed.) (1994) *Archaeological Site Manual: Museum of London Archaeology Service,* London, Museum of London.

WESTMAN, A. (2001) Chapter 12. Upright Stratigraphy: Understanding and Recording Buildings in London. IN ROSKAMS, S. (Ed.) *Interpreting Stratigraphy – Site evaluation, recording procedures and stratigraphic* *analysis. Papers presented to the Interpreting Stratigraphy Conferences 1993-1997.* London, BAR International Series. 910,107-112.

WILLEY, G. & PHILLIPS, P. (1955) Method and Theory in American Archaeology II: Historical-Developmental Interpretation. *American Anthropologist,* **57**, 723-819.

WILSON, B. (1996) *Spatial Patterning Among Animal Bones in Settlement Archaeology: An English Regional Exploration,* Oxford, BAR, 251.

WINCHESTER, S. (2001) *The Map that Changed the World,* New York, Harper Collins,

WOOD, W. R. & JOHNSON, D. L. (1978) A Survey of Disturbance Processes in Archaeological Site Formation. *Advances in Archaeological Method and Theory,* **1**, 315-381.

WOODBURY, R. (1960) Nelson's Stratigraphy. *American Antiquity,* **26**, 98-99.