An assessment of the cesspit deposits of Northern England: An archaeobotanical perspective AN ARCHAEOBOTANCIAL PERSPECTIVE

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AN ASSESSMENT OF THE CESSPIT DEPOSITS OF NORTHERN ENGLAND:

AN ARCHAEOBOTANCIAL PERSPECTIVE

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SUMMARY

The thesis presents an analysis of the published and unpublished archaeobotanical remains from cesspit deposits in Northern England with taphonomic considerations as to their formation. This encapsulates a review of the literature of digestive taphonomy in archaeological studies, a discussion on the logic of choosing the particular study area, a database and statistical analysis of the cesspit samples within the study area, a series of taphonomic experiments on certain plant remains, a historical review of plant remains from a sample of medieval recipes, and the concluding remarks and discussion. The study concludes that the dataset available for Britain and Ireland during the medieval period should become the focus of a wider study on dietary and environmental change in the medieval period for North-West Europe.

INTRODUCTION

1.1 BACKGROUND

"Do you not understand that everything that enters into the mouth goes into the gut, and is cast into the sewer?" Matthew 15:17

1.1.1 This study is focused on the formation and analysis of cesspit deposits recovered from archaeological excavations of medieval sites in Northern England (c.9th-16th century AD). The main theme examined here is the inconsistent archaeobotanical record available to allow inferences to be made regarding the role of plant foods in the diet of medieval Northern England. As a subtopic, the effect of the human digestive process as a taphonomic agent in archaeobotanical studies is examined. As will be discussed below, this is merely one of a number of taphonomic processes which link human cultivation or collection of plants in the past to the dissemination of the results of archaeobotanical analysis in the modern period. For all aspects of archaeology an understanding of what is lost to taphonomic processes is as important as understanding what survives to be studied in the present (Schiffer 1987, Huntley and Stallibrass 2000). The problem for archaeobotanical studies is that the mechanisms of taphonomic loss are poorly understood, particularly when compared to the wealth of studies which have been devoted to taphonomic processes in archaeozoology (O'Meara 2014). Understanding these patterns of preservation and loss are the first step in trying to assess the significance of archaeobotanical remains (Woolgar et al. 2006, 6-7). For the medieval period understanding the changing patterns of medieval diet is important as the period represents a period of increasing internationalisation of the food trade, at a time of urban socio-economic changes, building up to the period

of the post-medieval/Capitalist world. The period under review here is also one where continuous, uninterrupted urbanism is clearly established in Northern England (Petts and Gerrard 2006, 206; Newman and Brennard 2007, 82; Newman and Newman 2007, 102), notwithstanding some early remains which are present within later urban areas, but are not clearly associated with urban settlements (Graves 2002). As such this study also falls within the beginnings, formation, and development of an urban culture within Northern England; with cultural change being reflected within the archaeobotanical remains.

1.1.2 First, a review of previous studies on digestive taphonomy will be presented. Experimental methodologies have been employed with greater frequency by environmental archaeologists since the 1970s as a means of understanding samples of archaeological deposits, though some examples of digestive taphonomy studies in archaeology can be found in the 19th century (O'Meara 2014, 134-35). The results of these experiments are often focused on a single issue which is of interest to the specialist. They play an important part in answering questions relating to a particular taphonomic process, or a taphonomic issue relating to a specific archaeological site. However, these studies are often not followed up by further quantitative analysis despite the frequent call for such analysis in the concluding remarks of these publications (e.g. Calder 1977 as a case in point for digestive taphonomy).

1.1.3 Secondly, a literature review of archaeobotanical cesspit deposits will be presented from sites in Northern England (Northern England, as defined by the English Heritage 'Northern Region'; Figure 1, p27). This is greatly aided by the regional review conducted by Allan Hall and Jacqui Huntley for English Heritage (Hall and Huntley 2007), which provided references for many of the sites discussed in this study. The review conducted here is

concerned with the original technical reports, in particular the methods of quantification employed, the context of the recovery of the material (both the archaeological context and the reason/context in which the excavation was undertaken), and the basis of the interpretation that the material was deriving from human faecal waste. The assessment of the current evidence forms the basis of a database of plant remains recovered from cesspit deposits in Northern England. As well as discussing the literature on archaeobotanical investigations in Northern England discussion will also include an examination of the concept of 'The North', and whether this sort of division is an artificial divide of what we now know as Great Britain, or whether Northern England is a defined archaeological/cultural region. It will be argued that the history and development of Northern England is a crucial taphonomic factor to understanding the context of the archaeobotanical record from this region.

1.1.4 Thirdly, a series of taphonomic experiments will be undertaken to examine how contemporary experimentation might be employed to aid our understanding of the archaeobotanical record for food plants. The particular focus will be on the role of mastication of food as a taphonomic process. As will be discussed, this series of experiments raises more issues than it answers and should be seen as introducing the field of digestive taphonomy for further study, rather than providing a definitive series of answers to conclude the topic.

1.1.5 Finally, a review of medieval historic recipes was undertaken to place the results of the archaeobotanical review in context. The separate biases which apply to these recipes surveyed will be discussed, as well as the nature of the most common plant ingredients recorded, and the significance of these remains in the context of the archaeobotanical survey, and recommendations for future work in this field.

1.1.6 This study finishes with the combined conclusions of the archaeobotanical literature review, the review of historic recipes, and the experimental activities. This will demonstrate several gaps in our current knowledge of this topic and period, but will also demonstrate a number of cultural patterns which can be interpreted from the data.

1.2 EXAMINING DIET THROUGH ARCHAEOBOTANY

"The only incontrovertible proof that a particular plant or animal species was actually consumed is the presence of its traces in stomach contents or desiccated ancient faecal matter" (Renfrew and Bahn 2012, 266).

1.2.1 A key aspect of archaeobotanical studies is the accurate identification of plant remains. Such a statement might appear extremely simplistic even to non-archaeologists, however it is crucially important that the inherent biases within archaeobotany are understood in order to correctly assess the evidence. This is important not just in studies of macroplant remains (Rowley-Conwy 2000, Kenward and Hall 2000a), but also for other areas of archaeobotany such as palynology (Tipping 2000) and phytolith studies (Shillito 2013). Apart from the bias within the archaeological record of preserved material, it must also be acknowledged that differences in the personal skills of the archaeobotanist means that it is possible several archaeobotanists would reach different conclusions if presented with the same sample. A case in point is the frequent identification of moss species from archaeological sites in York, or the identification of arils of nutmeg from the drains in Paisley Abbey, Scotland (Dickson 1996). In this case the skills of the two archaeobotanists (Allan Hall in the case of York, and Camilla Dickson in the case of the Paisley Abbey samples) may not be easily correlated with the work of other specialists; though it will be hypothesised below that the imbalance in identified moss remains may be a real archaeobotanical difference driven by changes in personal sanitation rather than solely a bias due to inconsistent modern analysis.

1.2.2 Second to this must be the appreciation that the preserved archaeological material is only a fraction of the original plant material utilised by the past

population. This factor was appreciated even in the very early days of archaeology when Montelius could observe that: "Only a small part of what once existed was buried in the ground; only a small part of what was buried has escaped the destroying hand of time" (Montelius 1888). As Hall warns; "preservation is usually differential, never complete, and, as we shall see, we know much more about the use of foods like fruits with resilient pips and stones than we do about vegetables, of which almost nothing preservable survives cooking or digestion" (Hall 2000, 24). In terms of animal remains O'Connor discusses the problems that "the information which may be obtained about the human activities which led to the formation of the original assemblage is both reduced in quantity and modified in content" (O'Connor 2000, 19). This is not merely a problem for archaeology. In historical studies we are also faced with a number of biases in the medieval period such as the better representation of churchmen and widows in historical documents of diet, compared to the greater lords, peasants and urban communities (Woolgar et. al 2006, 4). In the case of archaeology this is where the appreciation of what survives must rest with both quantitative and qualitative experimental analysis. Presenting broad general rules on what we assume does or does not survive because it is hard or soft leads to circular arguments why the remains of a certain organisms are rarely found or else found very commonly. Just as leaves of *Allium* species (onion/leek) were not regularly identified until the analysis by Tomlinson (1991), so too there may be more species which can be identified through the preservation of their vegetative parts; an issue also raised by Tomlinson for her study on the identification of dye plants in the archaeobotanical record (Tomlinson 1985). As will be discussed in the experimental section below there is not a direct relationship between the hardness/toughness of a plant material and the likelihood of its survival through the digestive system. Indeed, far from

taking a negativist viewpoint on taphonomy as representing the loss of material the more positive view taken by Orton emphasises "many taphonomic inputs represent the addition of information to the assemblage, providing evidence regarding the processes which have taken place" (Orton 2012, 321). Likewise, Behrensmayer popularised the view that taphonomy concerns "the study of the process of preservation and how they affect information in the fossil record" (Behrensmayer and Kidwell 1985). This dual interest in loss of the archaeological record, and the modification of what remains is a key aim of research into digestive taphonomy.

1.3 ORIGINS OF THIS STUDY

1.3.1 For all aspects of environmental archaeology biases begin from the moment of harvesting/butchery/death, and continue until after the writing of an archaeobotanical report centuries or millennia later (O'Connor 2000, 20). For archaeobotanical assemblages there are numerous taphonomic pathways which lead to imperfect preservation, though a particular focus here will be the processes of digestion. It is for this reason this study takes the medieval cesspits of the Northern England as a case study. Initially the justification for studying these features is that we can be reasonably sure that a high (though not always the highest) portion of the plant remains recovered relate to faecal waste, and thus relate to diet. However, many cesspit deposits will also contain material derived from sources such as locally growing vegetation, charred domestic waste and plant remains probably derived from animal fodder, an important caveat when interpreting their remains (Moffett 2006, 42-43).

1.3.2 The original focus of this study was not to study medieval archaeobotany, nor the archaeology of cesspits. The original intention was to focus on the problems of interpreting the archaeobotanical remains from rural archaeological sites, particularly where remains are sparse and where the

plant remains recovered could be from common wild species. In particular finds of uncharred brambleberry pips (*Rubus* species) or sloe/cherry stones (*Prunus* species) are often difficult to interpret as either archaeological material, or intrusive later material. This stemmed from my work as an archaeobotanist in the commercial archaeology sector, working mainly in Northern England. From personal experience I noted many reports from archaeological evaluations produced remains that could not be interpreted clearly by reference to comparisons with other sites or to historic/ethnographic parallels. Equally, when such comparisons could be tentatively made they could not be done in a statistically secure manner due to the small numbers of seeds recovered. Remains of brambleberry species are a good example of a plant that is both ecologically common and a known food plant. Therefore the significance of its remains, when encountered in low numbers on rural sites, is open to various interpretations. However, it is at least generally well acknowledged that the berries of this plant have been commonly consumed from the prehistoric to the historic period. Plants such as *Polygonum lapathifolium* and *Chenopodium album* have been suggested as important collected plants for prehistoric and historic communities (Behre 2008, Stokes and Rowley-Conwy 2002), while plants such as *Spergula arvensis* have been suggested as a medieval famine food (Drury 1984). The archaeological evidence for the use of these plants is based on finds of large caches of this material from excavated contexts or from historic references. Where this material is found in low frequencies on rural archaeological sites it is questionable whether this is from a collected economic source, or as part of the background 'seed bank' present in the soil (Hall 2003, 24-26; Carruthers and Straker 1996). Thus, the question arose; is there a means of assessing the presence of possible food plants which does not rely on large volumes of this type of material being recovered? Could there be a

taphonomic marker caused by the digestive process which would allow the differentiation between digested and non-digested food plants? Or at the very least, can digestive taphonomy in archaeobotany be developed to a usable stage in the same way it has become an important field of research in archaeozoology?

1.3.3 In order to assess low frequencies of material from poorly preserved contexts this study needed to begin by examining what is known about food remains from well preserved, securely dated contexts. In this way the analysis of the stomachs of bog-bodies are valuable sources of information regarding wild plant consumption in the prehistoric period (Behre 2008, Holden 1986), but the possible ritual nature of the deposition of these individuals means the plant remains recovered from their stomach contents may not represent a 'typical' meal for the period (Stead et al. 1986). Another manner in which past human diets can be investigated is through the analysis of the well preserved, organic rich cesspits. These features are relatively more common and with a greater geographic spread in northern Europe than the remains of bog bodies.

1.3.4 What constitutes food waste, and what constitutes a secure archaeological deposit is open to interpretation however. Some foods such the fruits of brambleberry species or *Sambucus* species (elder) are edible but also common weeds in the British Isles therefore their presence in contexts not directly associated with the disposal of food waste is open to interpretation; such as caches of food in animal burrows. Other plant remains such as fig seeds and grape pips are seen as a reliable indicator of the presence of food as these are imported species and therefore their presence in archaeological deposits will likely reflect human food waste in some form (Moffett 1996). Even in this case, however, reworking of earlier deposits (e.g. Jacques et al. 2004, 7) and levelling or land reclamation activities (e.g. as seen from the

remains at the Newcastle Quayside; Huntley 1995b) can mean later activities disperse earlier remains into secondary contexts not directly associated with faecal waste disposal. Therefore, the identification of patterns of digestive taphonomy on seed structures may be an important means of distinguishing between food waste and non-food waste, but archaeological context is still extremely important to the interpretation of the nature of the plant remains. This problem is highlighted particularly where well preserved waterlogged plant remains are recovered. Knights et al. (1983) discuss the recovery of bran material from a 2nd century AD ditch fill along the Antonine Wall which was variously interpreted as either food waste or faecal waste. An understanding of how digestive taphonomy affects macroplant material might be a useful method of distinguishing these two types of waste. Though examinations of this kind have been undertaken on animal dung (Valamoti and Charles 2005, Wilson 1979), there is much potential for examinations of this kind to focus on human digestive taphonomy.

1.3.5 Another important reason for choosing medieval cesspit deposits is that they consistently demonstrate the some of the highest levels of preservation of organic remains from anthropogenically formed deposits across the temperate regions of Northern Europe. Thus, these features act as an upper baseline below which other sites and other contexts from other historic or prehistoric periods will generally demonstrate poorer levels of preservation.

1.3.6 However, as will be discussed further below digestive taphonomy is not the only, and probably not even the main, taphonomic agent acting on archaeobotanical remains. Therefore, if an understanding of the medieval diet and economy is to be achieved by the integration of results from urban and rural archaeological sites the environmental archaeologist needs to appreciate the cultural and natural formation processes which have acted on their material while it was still active in the systemic context

('biostratinomy'; to use the term developed by Weigelt), before inferences are made concerning the degradation which occurred when such material is incorporated into an archaeological context (the process of diagenesis), i.e. the final resting place of this material before it is excavated (Weigelt 1989; Schiffer 1987, 3). These biases have been recognised on a city wide or regional scale in some areas. The deep 12th-13th century deposits from Prague provide a much greater environmental archaeological resource than the shallower 15th-16th century deposits, a difference that has been attributed to changing rubbish disposal practices (Schofield and Vince 2003, 18). In York deposits from the post-Roman to Norman period are relatively rare and so form only a limited part of the archaeological record for the city, though have been studied in a detailed manner because of their archaeological importance; thus one bias is somewhat counterbalanced by another (Kenward and Hall 1995). Post-16th century deposits are common in York, but due to restrictions on resources and a greater interest in deposits of earlier periods these too form only a limited element of the total record (Hall 2000). While this study focuses on one particular taphonomic agent (human digestion), it will be shown that narrow examinations of particular taphonomic processes must themselves be examined within the geographic region, and the circumstances under which the excavation takes place.

1.3.7 The experimental element of this study aims to demonstrate in a quantitative way some of the taphonomic effects of digestion on several of the food plants regularly identified in archaeological deposits and historic records. In this way it is hypothesised that a baseline level of differential preservation for a small number of species will be established and this will allow inferences to be made regarding levels of preservation from other sites. The experiments will consist of an investigation of the physical effects of mastication on the appearance of certain common food plants when

examined under low-level microscopy (x60 magnification). One of the themes being examined here is whether there can be a working model for the taphonomic effects of digestion, or whether there are too many variables to consider in light of the variety of other factors the archaeobotanist needs to consider.

1.3.8 Of equal importance is to identify differences in preservation between regions and cities. This will be dealt with more fully at the end of the literature review. It can be shown, (to take two extreme examples), that the loose, clinker dominated deposits which seem characteristic of the Newcastle-Durham region cannot be compared on equal terms with the well stratified, high organic, anoxic preservation conditions of regions such as York. Likewise, the proactive work of the York Archaeological Trust over several decades has generated enormous amounts of archaeological information from the Roman to post-medieval deposits; much of which may not have been recorded should local heritage groups have been less proactive in establishing robust local protections for such remains. As an aside, it will also be suggested that the context in which the archaeobotanist is working is as important as the levels of onsite preservation when trying to compare different sites or regions (i.e. how consistent the work has been undertaken through time).

2 PREVIOUS WORK ON DIGESTIVE TAPHONOMY

2.1 LITERATURE REVIEW OF EARLIER WORK

2.1.1 There have been a number of studies on the phenomenon of digestive taphonomy relating to archaeological issues, as well as those developed in a paleontological context and then adapted for archaeological purposes. The field of research has a history of almost two centuries in archaeological research and has played an important part in many archaeological debates (O'Meara 2014).

2.1.2 The idea that contemporary process could be used to infer patterns of dietary taphonomy was identified as long ago the 1820s by the antiquarian William Buckland (Buckland 1823). Buckland observed a hyena kept in an Oxford menagerie consuming bones and producing patterns of breakage that he had observed in deposits from Kirkdale Cave, North Yorkshire. His observation on the pattern of bone destruction led him to conclude that; "The state and form of this residuary fragment are precisely like those of similar bones at Kirkdale...there is absolutely no difference between them, except in point of age" (Buckland 1823, 38). This allowed Buckland to infer that hyenas had been the active taphonomic agent bringing mammal bones into the cave. The concept that observing contemporary animals and their mode of feeding could elucidate past processes became the basis for digestive taphonomy experiments. Later in the 1850s the Danish geologist and early archaeologist J.J. Steenstrup fed bird remains to dogs in order to infer the effects of canid scavenging on Mesolithic midden remains. Morlot reports that "Mr Steepstrup bethought himself of keeping some dogs in confinement, and giving them for a certain time birds to eat. He then found that all that the dogs left were the same long bones as the Kjoekkenmoedding [shell middens] present" (Morlot 1861, 300-301). By considering the feeding patterns of wolves, foxes and dogs Steenstrup was

able to conclude that dogs were the active taphonomic agent and by extension commensal animals at the time of the deposition of the middens. He also concludes that the absence of juvenile birds, which he notes as being a delicacy in Denmark during the 19th century, may have been consumed in prehistory but for reasons of canid taphonomy were unlikely to be preserved easily. From a North American perspective Wyman quotes the work of Steenstrup in his own work on shell middens (Wyman 1868, 73-74). Of interest here is that though they were both researching shell middens Wyman used Steenstrup's experimental work from Denmark as the basis for interpreting the middens of the east coast of North America. Though such cross comparison must be used cautiously the value of experimental archaeology from one region being used to interpret the remains of another is a theme that continues up to the present day.

2.1.3 Despite these early successes in archaeology for much of the 20th century the study of vertebrate taphonomy was developed within the field of palaeoecology and palaeontology. In particular this includes the work of Weigelt who coined the term biostratinomy, a concept which focuses on the processes between the death of an organism and its burial (Weigelt 1989). However, with the growing scientific spirit of New/Processual Archaeology the instigation of long term taphonomic experiments, such as the Experimental Earthwork Project, generated new interest in the application of an experimental approach to issues of taphonomy. This, at least in Britain, encouraged the view that taphonomic experiments could take place over decades or centuries (or ultimately 128 years in the case of the Experimental Earthwork Project). As was suggested after the project had been running for its first 32 years: "The history of the project reflects in some ways several currents in contemporary archaeology with considerable accuracy, for example in theory and method, in organization and personnel, and in

changes externally in the climate of research and internally in the growth of professionalism" (Bell et al. 1996, xix). Due to these experiments, and through the influence of the archaeological shift to Processual Archaeology with its promotion of consideration of taphonomic issues, the role of digestive taphonomy in archaeological interpretations was being redeveloped in the 1960s. One of its early major contributions was via the work of C.K. Brain. Brain's careful examination of the bone accumulating habits of a range of animals such as hyenas, leopards, porcupines and eagle owls, and his observation of scavenging patterns around human settlements in Africa (1967; 1981) lead him to conclude that the osteodontokeratic culture of early Australopithecines proposed by Raymond Dart for caves in Makapanasgat, South Africa were more likely to be hyena dens. In his other studies in Africa Brain demonstrated evidence of carnivore gnawing on a juvenile Australopithecine skull, while a skull from a site at Taung showed evidence of being predated by large birds of prey. The results of these studies demonstrated how careful taphonomic considerations could raise important issues for archaeological interpretations; in this case whether early hominids were, in Brains own words, "Hunters or the Hunted?" (Brain1981). The idea that archaeological sites, or even whole cultures were being misidentified due to an inadequate knowledge of site formation processes led to a growth of studies which sought to test some commonly held views on the identification of early hominid activity. One typical problem was the attribution of spiral bone fractures to specifically human activity, therefore offering a possibly proxy indicator for the presence of hominids. Johnson showed that spiral fractures could be produced by trampling and gnawing activity while studies of incorrectly identified 'pseudotools' became the focus for the re-examination of some early evidence for hominid activity (Johnson 1985; Schiffer 1987, 187-89). The use of digestive taphonomy by

Lewis Binford (a key figure in the development of the 'New Archaeology' in the 1960s) further demonstrated the importance of taphonomic models to understanding site formation. His studies in Alaska, such as his methodology for identifying feeding at wolf kill-sites versus Inuit dog-packs further demonstrated the value of digestive taphonomy studies to archaeological interpretations (Binford 1981, 48-49).

2.1.4 The range of digestive taphonomy research in archaeology has expanded greatly since the 1970s as researchers with specific questions undertake their own experiments to answer questions that are often site specific. A notable early example from the field of archaeobotany was Angela Calder's work on the Maori diet (Calder 1977). This is notable for being an early experiment that used a controlled experimental methodology to examine the role of human digestive taphonomy to answer an archaeological question. As part of these experiments various components of the Maori diet were ingested. The faecal matter resulting from this was examined in order to understand the differences between the plant and fish material before and after digestion. The qualitative nature of the experiments was noted and it was suggested that a quantitative approach was needed; this is a call echoed by many who conduct experiments in experimental archaeology. Furthermore, the digestion of the fish scales was not expected as finds of fish scales had been common in archaeological contexts described as originating from faecal material (Calder 1977, 148). Angela Calder undertook her research in 1969, and when she publishing her finds in 1977, concluded that more experimentation was needed in order to assess her conclusions further, though as will be shown this has not been widely adopted by archaeobotanists.

2.1.5 In Britain, probably the best known example of human digestive taphonomy was the experiments undertaken by Andrew K.G. Jones (Jones 1986). Here

fish bones were fed to a dog, a pig and a human and the subsequent faecal matter examined to determine how the digestive process (from mastication to excretion) impacted on the original ingested bone assemblage. Notwithstanding that only three species were examined (herring mackerel and haddock), and only one of these ingested by the human participant (herring) this information has played an important part in the interpretation of fish remains generally since its publication (Jones 1986; Wheeler and Jones 1989). This publication ends with the statement "Clearly more work needs to be carried out before an accurate picture can be established of the survival potential of each bone of the species represented in archaeological deposits" (Jones 1986, 56), a rallying called picked up by Rebecca Nicholson in a much wider study of fish bones taphonomy and human digestion (Nicholson 1993), and further examined by Butler and Schroeder (1998).

2.1.6 Later experiments sought to examine the taphonomic process operating on the skeletons of micromammalian fauna (Crandall and Stahl 1995), using methods similar to Jones. In this case the examination focused on a single, unmasticated, cooked shrew, which the authors admit only answers questions relating to digestive taphonomy in a limited way (Ibid. 795). Generally the range of experimental archaeology work undertaken on the human digestive system and its possible affect on the environmental archaeology record has received relatively little attention. This might be due to the origins of the discipline in the case of archaeobotany (discussed further below), and possibly because apart from fish bones other animal bones might not be perceived as regularly consumed by human populations. Of course, it is also a question of proceeding "undeterred by the social consequences" from the perspective of the interested analyst (Nicholson 1993, 39).

2.1.7 Though the work on human digestive taphonomy is relatively limited there is a large body of literature relating to the digestive taphonomy of scavenging animals. In this respect the considerations raised by Buckland and Steenstrup in the 19th century were still being examined, and expanded upon, in the late 20th century: the identification of the patterns of breakage, and the consideration how this might manifest on an archaeological site, or lead to bias in archaeological assemblages (or to paraphrase O'Connor—the reduction in size and the modification of content). In some of these cases it is actualistic experiments by palaeontologists that are used to explain processes identified from archaeological sources. This is likely to owe its origins to palaeontological concerns for the disturbance that can occur from the death of an animal to its burial; the movement from biostratinomy to diagenesis. There have also been a number of experimental activities learning from research in one ecological region and attempting to form new conclusions by repeating the same experiment in different ecological zones. This has been practiced by Andrews (Andrews 1990; Andrews 1995) in the desert zone of the United Arab Emirates and in temperature Northern Europe, with an explicit acknowledgement of Behrensmeyer's work in East Africa. Some of these experiments deal with small scale issues, such as shrew gnawing of amphibian bones (an important issue for the archaeology and taphonomy of cave assemblages), whereas an experiment conducted in Rhulan, Wales involved over 150 carcases (cows, horses, sheep, foxes, badgers and small mammals), left in a variety of locations over a number of years. This series of experiments began in 1978 and is the essence of the long term archaeological experiments in taphonomy which began with the Experimental Earthwork Project (Andrews 1990, 149). This strong interdisciplinary tradition between archaeology and ecology/palaeontology to investigate digestive taphonomy has examples elsewhere. The

applicability of field observations to archaeological issues can be seen in work such as Huchet et al. (2011), where termite gnawing was identified on a human skeleton from Peru with reference to work in Africa by Thorne and Kinsey (1983), and Watson and Abbey (1986). Smith reviewed the evidence for the excarnation of human remains in the British Neolithic by examining the scavenger gnawing present on archaeological human remains (Smith 2006). In this case he specifically cites the work of Binford (1981) in his examination as to whether the bones were scavenged by dogs or wolves. In this particular case the implications for Smith's study go beyond the identification of the main taphonomic factor and raise important questions for mortuary practice in British prehistory. This was concluded in much the same way as Steenstrup's study of dog scavenging went beyond identifying how dogs might scavenge a midden site, and raised questions on the nature of human-animal commensal living in the prehistoric period. However, due to the long period between the work of Buckland and Steenstrup it cannot be said that archaeological researchers built directly upon their work. Rather, the proliferation of taphonomic concerns experiments in the 1980s were building on the development of Processual Archaeology and the work of Brain and Binford.

2.1.8 From an experimental archaeology point of view a division can be made between field observations of a carcase either from a naturally fallen animal, or one placed in a specific environment, and on the other hand experiments which utilise feeding a specific food item to an animal, either a captive wild animal or a domestic animal living commensally with the researcher.

2.1.9 An early example of the enclosed type of experiment to answer an archaeological research question was the work of Payne and Munson in their experiment feeding squirrels to a dog in order to investigate the taphonomic effect of canids on small mammals (Payne and Munson 1985).

Jones work (also discussed above) also incorporated the effects of dog and pig digestion in his fish bone experiments (Jones 1986), work that was later complimented by the field observations of pig consumption of bones by Greenfield (Greenfield 1988). However as an example of the spirit of taphonomic investigation at the time Stallibrass was also undertaking her own research on canid scavenging, though in this instance she was approaching the problem by exposing sheep carcases to fox scavenging (Stallibrass 1984). Through Stallibrass's acknowledgment of Binford's work on Numamuit settlements in Alaska (Binford 1978), and references to work that would becomes Payne and Munson's 1985 paper it can be seen that networks of taphonomic work (either indirectly within the academic community, or directly via researchers who may personally know each other) was creating a more unified approach to taphonomic research. In this respect researchers were subconsciously addressing Weitgelt's criticism in his time that "most of the papers are not systematic or goal orientated...analysing isolated phenomena without attempting to integrate their findings into a more comprehensive point of view" (Weigelt 1989, 1).

2.1.10 In North America work on the bone modification patterns of grey wolves and owls was used to interpret bone accumulations associated with cultural deposits at Granite Cave, Missouri, USA (Klippel et al. 1987). In this particular instance the authors acknowledged work by other researchers but also used their own experiments feeding deer carcases to captive wolves in order to interpret the remains they encountered at the Granite Cave site. The range of these experiments increased through the 1980s with a synopsis of various lines of evidence being summarised by Stallibrass (1990). In this later work Stallibrass utilised both closed experiments by feeding pig bones to a dog, as well as open experiments collecting fox scats in order to assess the feeding habits of wild canids. The importance of understanding how canid

scavenging might reduce and modify bone assemblages was an important consideration since the work of Steenstrup, or as Stallibrass put it the consideration of "the non-human agents of accretion, attrition or removal" (Stallibrass 1984, 259).

2.1.11 In the 1990s the field of digestive taphonomy was further built upon as new research questions were considered and developed. This included work on canid scavenging on deer bones (Morey and Klippel 1991) and cat gnawing actions (Moran and O'Connor 1992), Lam's work on hyena dens (Lam 1992), coyote scavenging (Schmitt and Juell 1994) and foxes as taphonomic agents (Modini 1995). These experiments represent a range of geographical areas, different animal species and different methodologies. Moran and O'Connor's work giving a sheep scapula and humeri to a domestic cat was a very different approach to Schmitt and Juell's work collecting coyote scats to assess their role as accumulators of small-medium sized mammal bones. Both, however, were concerned with taphonomic issues specific to their specific research fields; Moran and O'Connor with urban Britain, and Schmitt and Juell with the south-west of the United States. Others like Lam were concerned with adding to the body of knowledge of an animal that had already been given some attention. The case of Lam's research should be of interest to all experimental archaeologists as it presents some of the problems associated with research fields that are either well researched or poorly researched. Lam pointed out that "further observations have demonstrated that hyena behaviour is more idiosyncratic and less susceptible to strict definition than originally anticipated" (Lam 1992, 390). In a pattern that many researchers will be familiar with it can be seen that a field of research is often at its most confident and clearest early on in its history of investigation. Later it can be shown that patterns once observed are actually more complex than originally anticipated, necessitating more

research, which may or may not bring more clarity. In many of these works from Calder, to Jones, and to Moran and O'Connor a common theme emerges that though the investigator is generally happy with the results of their experiment to answer their initial research question, they encourage further work in that specific field. Moran and O'Connor state that: "Without wishing to encourage the undue proliferation of gnawing experiments, there is evidently the need for further work to establish whether bone modification by cats is consistent enough to be reliably distinguished from that caused by dogs" (Moran and O'Connor 1992, 30). Though this has not been addressed consistently there is now a growing body of literature relating to certain species that will hopefully be developed further in the future.

2.1.12 Since the year 2000 an increasing body of work has been produced by researchers. Of note if the study by Lotan (2000) which examined the effects of hyena, boar, jackal, dog and fox as part of the scavenging system within the Jordan Valley. Explicitly this study set out to provide actualistic data for the region of the Jordan Valley as: "the microclimate at every archaeological locality may differ from the better-known global–regional palaeoclimatic conditions. Since the taphonomic processes will follow conditions of the microenvironment, taphonomic results will be very site specific" (Lotan 2000, 408). More and more researchers are developing models based on their own geographical regions, or based on their own research interests. This includes many studies which utilise captive animals in zoos or wildlife parks including foxes that were fed rabbits (Lloveras et al. 2012), the feeding habits to Iberian wolves (Esteban-Nadal et al. 2010, Esteban-Nadal 2012), the feeding of rabbits to lynx (Rodríguez-Hidalgo et al. 2013), and even the scavenging effects of bears (Saladie et al. 2013) and the role of bears as accumulators of fish bone deposits (Russ and Jones 2011). The use of wild

animals to undertake field based observations still has much to offer as the work of Sala and Arsuaga demonstrate in their study on the feeding habits of bears in Northern Spain (2013). Similarly, K.T. Smiths work on a large assemblage of reptile remains from Qesem Cave, Israel expanding further on the need to carefully consider past taphonomic agents: "We argue that a focus on extant, especially European, populations could distort our understanding of their feeding biology and is vulnerable to counterexample" (Smith et al. 2013). Here Smith questions the reliance of archaeological and experimental work in regions that are not comparable to the Levant in terms of geology, climate or ecology. This move to an appreciation of greater numbers of regional studies is likely to be increasingly seen in the future for experiments in digestive taphonomy. However, one notable field based observation of digestive taphonomy of bone which might do most to challenge preconceptions of bone biostratinomy can be seen in the work of Hutson et al. (2013) in their analysis of bones chewed by giraffes; though obviously this will not apply to all archaeological contexts in many geographical areas.

2.1.13 It will be noticed that the majority of the digestive taphonomy studies discussed so far have been focused on archaeozoology studies. The fact that most digestive taphonomy experiments are based on vertebrate remains is a legacy of the origins of vertebrate taphonomy in palaeontology. In contrast the major questions in archaeobotany during its development concerned the origins and development of cereal agriculture. As cereal remains in Europe are most commonly encountered in a charred state, it was natural that experimental archaeology in archaeobotany would involve experiments in charring (Boardman and Jones 1990; Smith and Jones 1990; Markle and Rosch 2008). Though taphonomic concerns were appreciated by archaeobotanists, because the origins of that field of research lay with botany

they did not share the same concerns with archaeozoology, which was perhaps more heavily influenced by palaeontology. This difference in approach is in part due to the differing origins of archaeobotany and archaeozoology, but for digestive taphonomy of plant material "because of the multivariate nature of the process, it is exceedingly difficult to produce any reliable model for extrapolation" (Patricia Wiltshire pers. comm.). The topic has not been widely developed by archaeobotanists, and much of the experimental research in this field has been conducted from the perspective of forensic science (Boch et al. 1988). Notable studies which sought to examine the digestive taphonomy from a botanical perspective include Mondini and Rodríguez (2006) study of preserved plant remains from scavenger coprolites in the South American Andes, while Vermeeren examined pollen remains from fox faeces and raised issues for site interpretation in her study of seasonality which appeared to contradict other evidence available for the site (Vermeeren 1998). Recently an enclosed experiment utilising a rigorous experimental approach lead to a series of actualistic experiments on the digestive taphonomy of domestic ruminants (Wallace and Charles 2013). This was undertaken in the context of research into the manifestation of dung in archaeological deposits in the early Neolithic of the eastern Mediterranean.

2.1.14 There is, however, one field of human digestion in the archaeological record that has generated a large, and at times heated and conflicting, body of literature. This is the identification of cannibalism. Identifying cannibalism in the archaeological record carries with it so much social and political baggage that “there is nothing worse than calling someone a cannibal, which perhaps explains why many researchers are reluctant to accept this interpretation” (Hurlbut 2000). Much of this debate has centred on the archaeology of the North American southwest, particularly associated with (though not

exclusive to) Anasazi sites. The criteria set out by Turner and Turner (1999) are so stringent that they acknowledge that they approach may be overly cautious, however their book 'Man Corn: Cannibalism and Violence in the Prehistoric American Southwest' presents their findings and the instances where their conclusions have been criticised for social/political rather than academic reasons. In this case even if experimental work was rigorously undertaken with human remains donated to science and willing participants to consume the prepared remains the social baggage around labelling a past society as cannibals means using this sort of experiment as evidence to infer past activities may still not be embraced by those who perceive their ancestors being labelled as cannibals. This is a good example (though perhaps an extreme one) of the limits at which experiments on digestive taphonomy can proceed.

2.2 STUDIES OF FAECAL MATERIAL

2.2.1 For North-West Europe the best preserved examples of faecal material are found in the study of waterlogged, urban deposits, particularly those from the Romano-British and medieval periods. In other regions of the world, particularly the south-west United States, desiccated faecal matter will often be preserved due to the hot-dry climate and the low moisture levels of the sediments into which faecal matter may be deposited (Shahack-Gross 2010, 208-212). Though focusing on the same type of environmental resource the processing of wet and dry material is quite different, though ultimately both seek to answer similar questions pertaining to diet and health in past populations. For the desiccated faeces the somewhat self contained nature of the object (as it represents the passage of faecal matter from one individual in one act) allows the researcher to focus on the material that should reflect only remains that passed through the human gut (notwithstanding micro-organisms which may have been active on the material before it became

desiccated). This has been applied to waterlogged material where preservation allowed the identification of individual coprolites (Jones 1983), though such preservation is the exception rather than the norm for waterlogged archaeological deposits of North-West Europe. For both groups (wet and dry), however, digestive taphonomic processes play a role in creating a biased record of preservation which archaeologists must acknowledge. Seeds with tough endocarps such as those of brambleberry and elder species may be more likely to survive compared to plants such as leek and onion, even though we know from historic records that large quantities of these vegetables were eaten (Dyer 2006). Alternatively, seeds such as brambleberry and elder may be more easily spotted and identified by researchers.

2.2.2 For those who study waterlogged faecal material when dealing with archaeological layers rather than individual coprolites the issue of allochthonous versus autochthonous material must also be considered. This may create difficulties in interpretation where 'wild' plants that may have colonised the area around the cess pit may also have been integrated into the deposit (Hall 2000, 24; Smith 2013, 539-540); as is seen in the Old English poem 'The Owl and the Nightingale' where Owl declares "I catch you by the privy house, with weeds and nettles overgrown" (Stone 1988). Again, an understanding of digestive taphonomy may allow the analyst to distinguish between locally growing plants and those that were actually consumed.

2.2.3 Thus, this study is concerned with the following hypothesis: Can the products of human digestion be detected as morphological changes on the surface of macroplant remains, and do the remains of different species undergo differential rates of decay which may alter their ratios between ingestion and egestion? To frame this discussion, however, a consideration

must be given as to what we already know about the diet of medieval Northern England as interpreted from its cesspit remains.

3 LITERATURE REVIEW METHODOLOGY

3.1 THE DATASET

3.1.1 When creating a database of medieval cesspit deposits from Northern England it was first assumed that due to the extensive medieval excavations within the region decisions would have to be made on how to subsample cesspit deposits. This would involve choosing only the best preserved deposits with the narrowest dating ranges. Using the regional archaeobotanical review as a starting point, (Hall and Huntley 2007), as many published and unpublished archaeobotanical reports as could be acquired that contained references to cess deposits were consulted. Archaeobotanists working in Northern England were also contacted to ensure some of their more recent work would be included.

3.2 CHRONOLOGICAL EXTENT

3.2.1 The period from the growth of Anglo-Scandinavian towns (c. mid-9th century) to the Dissolution of the Monasteries (1536) was initially chosen as a research period from which data would be extracted; due to the presence of consistent urbanism after this time in this region. Thus, in archaeological terms the 9th to the 16th centuries. This timescale was chosen as it was seen as a period defined by events which impacted on both the historic and archaeological records. The earlier period of this study marked the time when the patterns of towns and villages, the basic social hierarchies and the urban, market based exchange networks were put in place (Dyer 2009). The end of the study period was marked by the social upheaval and re-distribution of wealth which characterised the Dissolution of the Monasteries in the mid-16th century. The later time bracket also occurs at a time before the widespread influence of New World foods entered the foodways of the British Isles; as well as a period before the social and industrial changes which increasingly characterised the 17th century. In this

respect the study here concerns itself with periods M2-M5 of the recent review of the archaeobotany of medieval Britain (van der Veen et al. 2013, 153).

3.3 GEOGRAPHIC EXTENT

3.3.1 The area defined as English Heritage's 'Northern Region' was chosen as the core focus for this study, i.e. south of the Scottish border and north of (and including) the counties of Cheshire, Greater Manchester, South Yorkshire, North Lincolnshire and North-East Lincolnshire (see Figure 1, p27). Politically the borders of this region are somewhat arbitrary. To the north the border with Scotland changed several times in the medieval period while in the south the boundaries are those defined by the Local Government Act 1972. However, the southern extent corresponds roughly to an imaginary line running from the estuary of the Humber in the east to the estuary of the Dee in the west, while in the north the region is bordered by the Cheviot Hills. This gives the study area rough geographic boundaries. As has been discussed elsewhere, the incompletely formed political entities of Great Britain in the medieval period make generalisations about the island as a whole difficult or impossible (Dyer 2009, 2). It was decided that the northern half of England would make a concise study area, rather than surveying the whole country at this stage. It is theorised that a survey of the southern half of the country would reveal different patterns to those identified here, for reasons which are discussed below. Thus, it was decided that as far as possible a full literature review would be conducted for the English Heritage Northern Region.

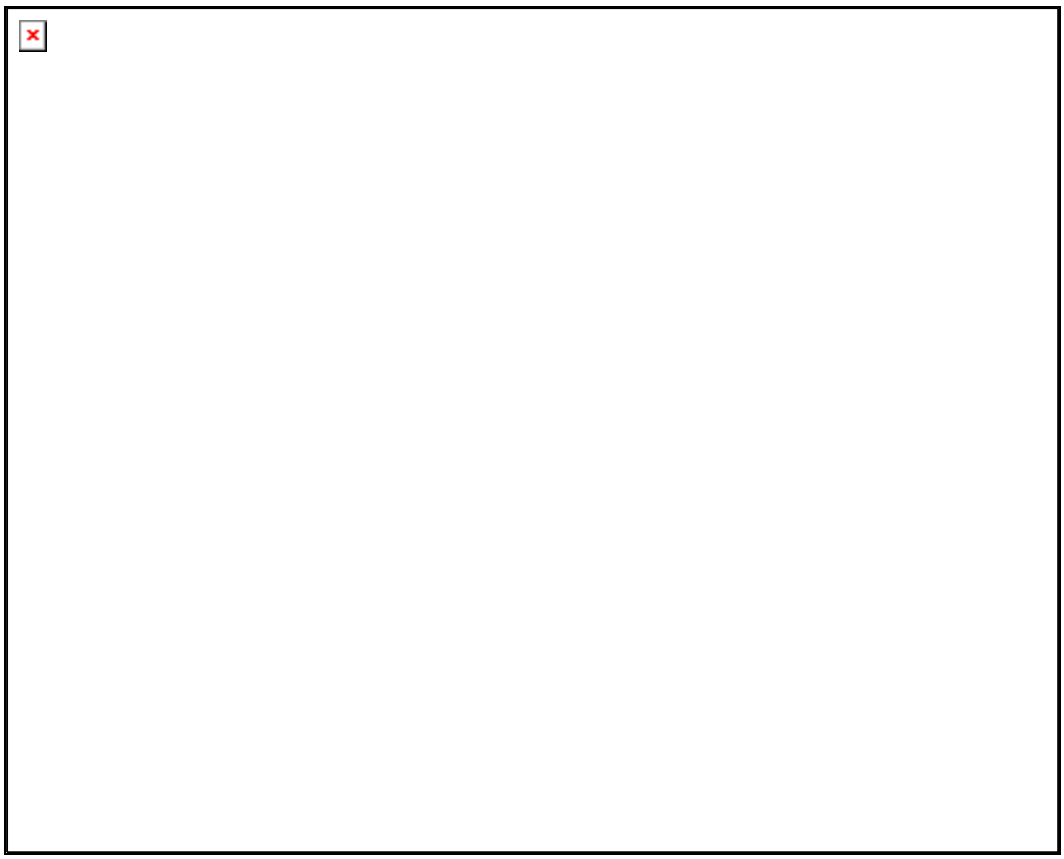

Figure 1: Towns and Cities Mentioned in the Text

1. Appleby-in-Westmoreland
2. Alnwick
3. Berwick-upon-Tweed
4. Beverley
5. Boroughbridge
6. Carlisle
7. Chester
8. Doncaster
9. Driffield
10. Durham
11. Grimsby
12. Hartlepool
13. Hedon
14. Howden
15. Hull
16. Kendal
17. Lancaster
18. Nantwich
19. Newcastle
20. Northallerton
21. Ripon
22. Scarborough
23. Selby
24. Whitby
25. Yarm
26. York

3.4 ARCHAEOLOGICAL CRITERIA

3.4.1 When the literature review was first undertaken it was clear from the outset that problems of interpretation and terminology existed for this field, which made the creation of a database somewhat difficult. Thus Underdown could

speak of the excavation of a garderobe from Hull (Underdown 1980); even though strictly speaking the garderobe is the space above a toilet where clothes may be stored, or by extension the structure of the toilet itself (Bottomley 1979, 70). Greig highlighted that even this terminology does not translate well with Continental European researchers who do not use the term to relate to a toilet in the same way their British counterparts might (Grieg 1992). Grieg has discussed the problems of terminology and etymology, though his suggestion that 'shitpit' is the most accurate term in English due to its ancient Anglo-Saxon etymology has not yet been adopted by researchers (Ibid.). The variations in terminology by present researchers are not an insurmountable problem when the original technical reports are examined. It is in itself of cultural interest as the various uses of terminology are merely the most recent phenomenon of a process whereby western society has distanced itself physically and culturally from engaging directly with matters pertaining to human bodily wastes (Morrison 2008). This treatment of faecal waste physically and culturally/symbolically is in itself worthy of a more detailed study, particularly in the context of urbanisation and urban development, though beyond the scope of this particular study.

3.4.2 Broadly speaking a database was created of pit contexts where based on contextual information, and recovered plant remains, it could be suggested that the remains of human faecal matter was preserved. In some cases this involved disagreeing with the previously presented information. For Hartlepool (discussed under the section on 'Small Towns' below), it was felt that Huntley's conclusion that sample 34 from Micklegate did not contain material derived from human cess was incorrect. Likewise whereas some researchers include material derived from layers (such as Moffett's use of material from the Mansion House: Moffett 2006; see Newcastle section

below for details), it was felt that pit fills were likely to be more secure contexts archaeologically.

3.4.3 Thus the basic criteria are:

1. Material from excavated contexts which lie between the Anglo-Scandinavian period to the later 16th century.
2. Material from sites within English Heritage's Northern Region.
3. Material derived from pits.
4. Material which is likely to contain human faecal waste as a major component of the context.

3.5 THE FORMAT OF THE DATABASE

3.5.1 As part of this review a database of all samples fulfilling the above criteria was collated. This information was collated onto a Microsoft Excel Spreadsheet with information on the bibliographic source, context number/type, dating of the sample and quantified plant remains. While amalgamating this database all information was entered as it appears in the published/technical report. Thus a mixture of total counts, relative abundances and presence-absence methods were entered in the format presented in the original report/publication. However, it became clear that this was a problem for the quantification of this data and therefore for the data analysis stage a Presence-Absence approach was utilised. This was based on the experiences of another archaeobotanical study, though in this case utilising charred Neolithic material from Scotland (Bishop et al. 2009).

4 THE 'NORTH' IN ARCHAEOLOGY

4.1 THE STUDY AREA: A HISTORIC JUSTIFICATION

4.1.1 When trying to assess the cities and towns of Northern England it should perhaps be considered that economically and socially the Northern region did not develop in parallel with developments in Southern England or in Scotland. Though this north-south divide is oft appealed to in the modern period for social or economic reasons (Jewell 1994; Royle and Marshall 1998) there is also a divide that can be assessed from the archaeological and historical records.

4.1.2 Based on the work of Alan Dyer and others (Dyer 2000), patterns emerge in the size, taxable income and economic development of towns and cities within Northern England that can demonstrate these divisions. Of the pre-Conquest towns in England ranked by size only Chester, York and Durham feature in the 38 listed by Hill (Hill 1981, 143; Dyer 2000). Likewise, only Chester and York feature on the list of towns ranked on the number of surviving coins from their mint (Metcalf 1998). Dyer urges caution in the interpretation of these figures, but there is a clear bias here to suggest greater urban and economic development south of the region to which this study is focused. When ranked by taxable wealth of the top 100 towns a number of towns from the region are included; York, Newcastle, Beverley (all in the top 20), Hull, Scarborough (all in the top 50), Doncaster, Barton-on-Humber and Whitby (the top 100) (Glasscock 1975, Dyer 2000, 757). As this assessment does not include counties Chester or Durham it can be suggested, optimistically, that Chester, Nantwich, Durham and Hartlepool would all have made it into the top 100. In which case of the top 100 town ranked according to taxable wealth, 12 are from the northern region. When ranked by number of persons paying the 1377 poll tax similar results are achieved, though certain biases can be seen, such as Newcastle ranking 4th

for taxable wealth, but 12th in terms of payees for the poll tax; likely due to a combination of economic growth from trade and mining, combined with a large urban poor who would be exempt from the poll tax. Though it is acknowledged that the use of figures in this way is rather crude (and should perhaps be augmented with a dedicated study), it does demonstrate that the urban centres of northern England developed later, generated wealth through different means to towns south of the region, and had smaller/poorer populations than their counterparts south of the region.

4.1.3 Speaking in general terms does, however, average out some of the diversity of the region. Van der Veen's criticism of using ecological zones in overly broad strokes are as valid a criticism for the medieval period as they were for her assessment of the Iron-Age to Roman period (van der Veen 1992). Though much of the landscape can be classed as upland (over 500 feet), there are notable areas of lowland plains near both coasts, as well as major river routes suitable for navigation. North-South transport links can be made either by sea, or by roads and routeways, often those that had been developed by the Romans. East-West transport is more difficult due to the Pennine Mountains, but a number of routes such as the Hadrian's Wall Corridor to the north, or routes through the Teesdale valley were well developed by the medieval period (Kermode 2000). The cumulative effect of this geography probably restricted development to those areas east or west of the Pennines where transport links were developed and climate was more amenable. The many micro-regional areas within the North has also been highlighted; such as Tyne-Tees, Tees-Humber, Solway Plain, Lake District, Eden-Lune, Lune-Ribble, Ribble-Mersey, Cheshire Plain (Mercer 2002, 10).

4.1.4 Urban development was also strongly linked to economy, and the development of a stable economy depended on periods of peace within the region. Along the northern border Scottish raids could be devastating with

sites such as Holm Cultram on the Solway Coast being raided frequently (Jamroziak 2008; O'Meara 2013), or towns such as Alnmouth on the North Sea coast being almost completely razed in 1336 (Kermode 2000, 671). Some urban centres benefited from such belligerence however, with Chester acting as a defence against possible Welsh attacks, while Carlisle and Berwick-upon-Tweed (via Newcastle) were given royal patronage to defend against Scottish attacks. The economies of the North benefitted from deposits of coal and ores, while the Chester salt industry was a source of wealth since the Roman period (McNeill and Roberts 1987). Wool exports were an important source of wealth, particularly for the expanding Cistercian monasteries of the Vale of Yorkshire and in Cumbria, but equally outbreaks of sheep murrain in the 14th century and a declining international trade also impacted on the northern economy.

4.1.5 A full assessment of the economy of the Northern Region is outside the scope of this study, however, it can be concluded that this area of England can be classified as a distinct archaeological region, united by a number of factors:

- The dominance of the north-south mountain range of the Pennines.
- A north-south road network with limited east-west routes across the Pennines.
- Fewer towns, with smaller populations, with less tax revenue paid compared to urban centres south of this region.
- The threat of attack, and actual attack by Scottish armies during the Scottish Wars from the 13th century onwards, as well as low level interpersonal violence cause by a lack of royal authority on the Anglo-Scottish borders. Most famously this manifests itself in the phenomenon of Border Reivers operating in the region until the later medieval period.

- Physical distance from the centre of political decision making (London), during an important period of state formation, but a recognition that the North needed an organisation to deal with its own unique issues as seen in Richard III's creation of the Council of the North in 1483.

4.1.6 For the purposes of this study the key point here is that the region being assessed shares a number of common geographic and historic characteristics which make it a unit of archaeological study. There are also of course intra-regional differences, which will be discussed in the next section. These include the natural and cultural formation processes (such as geography, local economy and history) which result in the pattern of results observed during the compilation of the database.

5 LITERATURE REVIEW – INTRODUCTION

5.1 INTRODUCTION

5.1.1 Based on the criteria outline in Section 3.4.3 the literature review was compiled throughout the duration of the project. Though a number of reports could not be sourced by the time the thesis was completed, including (Huntley 1989, Huntley 1991, Huntley 1994, Huntley 1995d, Daniell and Huntley 1999), it is believed that most of the main cesspit sites in Northern England were consulted for this research. Of note was the system adopted by researchers in York where most of the Environmental Archaeology Unit reports are available online and the raw data available easily from Dr Allan Hall.

5.1.2 All of the towns mentioned in the study are presented in Figure 1 (p28 above). This includes towns present in the literature review, and those which were examined for relevant material but which did not produce remains that could be incorporated into this study. The literature review includes sites from Newcastle, Durham, Hartlepool, Beverley, Chester, Hull, York and Appleby-in-Westmoreland. As discussed below, several urban centres and small towns did not produce suitable remains for inclusion on the database. This is particularly noticeable for sites in the north-west part of this region. In particular, for Carlisle known cesspit deposits were recovered from the Scotch Street excavations but these are unanalysed at the time of writing and unavailable for examination. The literature review will discuss the assessment of reports and preservation conditions from Beverley, Carlisle, Chester, Doncaster, Durham, Hull, Newcastle, York, and a number of small medieval towns.

5.2 BEVERLEY

5.2.1 The town of Beverley in East Yorkshire is a good example of a situation where a once prosperous medieval town does not develop into a city in the

later medieval/early modern period. In this respect it is analogous to the nearby town of Hedon (discussed below under the section on small towns). However, Beverley's prosperity (much greater than that of Hedon) derived in part from its association with St John of Beverley. It became a vibrant pilgrimage site from the time it received the patronage of King Athelstan after his AD 937 victory over the Scots and grew due to a combination of pilgrimages to the shrine of St John and its connections with the wool trade. Its decline was linked directly to the effects of the Reformation and the end of the pilgrimage culture surrounding the shrine of St John. The town has produced a number of deposits of direct relevance to this study and the current small size of the town belies the rich organic preservation beneath the town (in stark contrast to cities such as Durham and Newcastle).

5.2.2 The excavations at Lurk Lane 1979-82 uncovered deposits relating to activity from the Saxon to later medieval periods (Armstrong et al. 1991). The archaeobotanical analysis included material from the fills of two pits filled with deposits dated to the 15th century (McKenna 1991). These deposits, despite their small size (0.25-0.5kg) produced abundant remains of food plants such as fig seeds, cereal bran, grape seeds and fennel seeds. Excavations at 33-35 Eastgate produced a number of samples incorporated into the database for the study. These features are all pits, contained abundant faecal concretions and numerous intestinal parasites. The diversity of plant remains within these features was quite poor however, with limited number of *Prunus* species (sloe/damson) being present in all samples (McKenna 1992). In some respects this material is analogous with the sample from Shaw's Wiend, Appleby-in-Westmoreland (discussed under the section on 'Small Towns'), where archaeological information strongly suggests the presence of a cesspit fill, but the diversity of plant remains is quiet low; in favour of harder seeds with tough endocarps.

5.2.3 In contrast the excavations at the Dominican Priory 1986-89 did not produce clear evidence for deposits with a strong faecal waste element (Allison et al. 1996). Here food remains were present in the remains of water conduits, and in what was described on excavation as a latrine/conduit fill, but these probably relate to backfilling activities, rather than primary deposits of faecal material (Allison 1996, 208). The presence of the conduits was not followed up with environmental analysis that would reveal the nature of the wastes that were disposed of here (Foreman 1996, 246), and certainly this phase of excavations did not reveal the rich preservation uncovered during the Lurk Lane excavations. However, considering the religious function of this area this is not to be unexpected. This is an issue for excavations at religious sites in general from Northern England where organised waste disposal was the norm (Hall and Huntley 2007, 168).

5.2.4 Though inferences regarding the presence of faecal matter from medieval deposits have been made through the presence of parasite eggs, these will not be included here unless accompanied by the criteria set out in paragraph 3.4.3. Reports typical of such remains can be found in reports such as 6 John Street, Beverley (Hall et al. 2003, 5) and 69-73 Morton Lane, Beverley (Hall 2004, 5).

5.2.5 An evaluation of remains recovered from Keldgate, Beverley revealed one sample from an early 13th century pit fill that was interpreted as containing faecal matter. This evidence included the remains of cereal bran, fragments of *Agrostemma githago* (Corn-cockle) and faecal concretions (Carrott et al. 1995a), though this is only summarised in the technical report and therefore is not incorporated into the database. The manner in which published material is presented is a consistent problem when trying to compare data from different sites.

5.2.6 Other material examined as part of evaluations or small scale excavations in Beverley have produced evidence of cloth processing, possible tanning and ecological evidence for alluvium silts and exploitation of peat deposits. However, as far as this study is concerned the evidence recovered does not provide material suitable for entering on the database. Food plant remains are generally sparse and though excavation has revealed features identified as latrines or cesspits, these have not produced well dated plant assemblages.

5.2.7 Thus, for the town of Beverley nine samples have been entered onto the database: four from Lurk Lane (McKenna 1991) and five from 33-35 Eastgate (McKenna 1992).

5.3 CARLISLE

5.3.1 Material published from the Carlisle Millennium Project (Howard-Davis et al. 2009) did not produce material relevant to this study. Though waterlogged remains were recovered from both the Roman and Medieval periods, cesspit fills were not recovered from the medieval period (Huckerby and Graham 2009, 935). Material from excavations in Scotch Street did produce possible cesspit fills which may have been relevant to this project but this material has not been fully analysed and is currently unavailable for analysis (Frank Giecco pers. comms). The lack of material available from Carlisle may be linked to geological and historical developments which mean that the waterlogged deposits are better represented in the deeper Roman layers, sealed by post-Roman debris, than in the higher medieval layers. A study of the water-logged deposits of the city concluded that "the Roman levels tend to exhibit better, and more extensive, organic preservation than those of the medieval period, for the simple reason that they lie in closer proximity to the water-table and are usually well-sealed by thick accumulations of post-Roman material" (Zant et al.

32). The exception to this is the case of the medieval town defences, which are deep enough to cut into the water-table and thus exhibit the type of organic preservation observable from Roman deposits. However, as these deposits do not represent in situ layers representing domestic activity (such as floor layers), or deposits such as cesspits they are not included in this study. The extensive series of excavations at the location of The Lanes did produce some examples of medieval wells with water-logged deposits, but none which were relevant to this study (McCarthy 2000).

5.4 CHESTER

5.4.1 Chester is notable within this survey as it sits in the south-west corner of the study area and is one of the few relevant sites located to the west of the Pennines. It's location near the Welsh borders may have lead to much of its 13th century prosperity during the reign of Edward I and his various campaigns against the Welsh Princes (Laughton 2008, 19). Indeed, of the thirteen samples from Chester included in the database for this study twelve date to the period after the mid-13th century. Much of this prosperity was also connected to its trading links with Ireland, a factor discussed by the chronicler Robert of Gloucester. In this respect it can be suggested that the increasing trade enjoyed by the city during the later medieval period is reflected in the archaeobotanical record, with seven of the twelve later medieval deposits producing grape pips and eleven of the twelve producing fig seeds.

5.4.2 As noted in regional reviews of archaeobotanical evidence, Chester has not produced as many publications on the analysis of medieval material as some of the other small towns in the northern region (Hall and Huntley 2007, 156). However, in terms of the quality of the material preserved, and identified, Chester can be compared to York. Identifications of *Allium* species epidermis, *Prunus* species exocarp and apple endocarp were all identified by

Greig from a stone lined pit from the 12 Watergate Street excavations (Grieg 1988). The presence of food species and copious amounts of bran, as well as the ova of intestinal parasites, were evidence that in its final phase this pit had been used as a latrine during the mid 13th century. Interestingly, there are also several historic references to cesspits/latrines in Chester during the late 16th and early 17th century. These relate to disputes amongst neighbours due to overflowing latrines. From the same area where the 1988 Watergate excavations took place this entry was made in the Mayors' Books and Quarter Sessions:

"William Clough of Chester, cook, had made a privy in Watergate Street, adjoining the shop in which the said John Sconce of Chester sold victuals, and that filth from the said privy ran into his said shop" (quoted in Garner et al. 2008, 416).

5.4.3 More recent work at 25 Bridge Street in Chester produced ten samples relevant to this study (Jacques et al. 2004). The cesspit samples are all somewhat sparse however, with a limited number of food plants being represented, and no cereal bran. The other three samples represented in the database come from the 25 Watergate Street samples.

5.5 DONCASTER

5.5.1 Material from Doncaster relevant to this review was not uncovered from the large excavations undertaken at North Bridge Street from November 1993-June 1994. The samples were examined for their archaeobotanical potential but in many cases this was rather poor for evidence of food remains (Carrott et al. 1994a, Carrott et al. 1997). Finds of hazelnut shell, *Rubus* species seeds and *Prunus* species stones were interpreted as being 'snack foods' and "Overall the evidence suggests that the number of people using the site was

small and that they used it only during 'working hours'." (Hall et al. 2003b, 137). In particular fig seeds, often a proxy indicator of cess remains, were limited to the basal fill of a 13th century pit fill, however, this is not a clear enough indication of well preserved cess remains to include this deposit in this study. It does however highlight the paucity of food plant remains at this site which are often seen as typical of medieval deposits (see for example the material from Newcastle recovered in construction layers discussed above). The analysis of material from Doncaster, though poorly preserved, did lead to a study examining the significance of botanical and etymological remains from such urban deposits, where often the impetus is only to examine the richest, best preserved assemblages. This study (Hall et al. 2003b), serves as a reminder that many of the sites discounted by regional studies can reveal much about site activities and formation process if studied carefully.

5.6 DURHAM

5.6.1 Despite its regional and national importance as a religious and administrative centre in medieval England, Durham city has not produced the well preserved, waterlogged, organic remains seen in other medieval civil and religious centres; York being the best example. The reasons for this might lie in either the natural burial conditions of the medieval city, or it may be due to contemporary building development (or lack thereof). Due to the hilly topography and the sandstone bedrock it is likely that waterlogged preservation would only be present due to wholly artificial conditions, as opposed to waterlogging by groundwater. However, it has also been suggested that the lack of well preserved medieval deposits may in part be due to the lack of excavations which have penetrated through layers dominated by the coal ash/clinker deposits of the city (Huntley and Daniell 2001, 75).

5.6.2 Archaeobotanical remains recovered from excavations within Durham appear to suffer from generally poor preservation, a factor it shares with nearby Newcastle. Durham does, however, have an early example of an urban medieval excavation with examination of material by a broad multidisciplinary team. The 1974 excavations of Saddler Street benefited from the support of Rosemary Cramp, as well as due to the location of the excavation under a building formerly occupied by the Department of Archaeology, Durham University. Seven samples were analysed by Donaldson of which two came from cesspit fills and, four from midden layers and one from a storm drain. This analysis highlights the issues facing archaeobotanical research as the midden remains are in many respects indistinguishable from the cesspit deposits. However, the finds of *Rubus* seeds in the cesspit pit (158 in total) are far in excess of those recovered from the other five samples (2 seeds in total for the other sample). In this case the deposits were dated to the 11th-12th century date (Carver 1979, Fig. 32). Excavations from 13th-15th century layers from Durham Castle (Huntley 1991) produced a generally poorly preserved assemblage with uncharred elder and blackberry seeds suggested as representing the remains of once richer assemblages (Hall and Huntley 2007, 152). Late 13th and early 14th century material from excavations at New Elvert (Fraser et al. 1995) produced mainly wild taxa with some charred cereal grains, though the author of the archaeobotanical report acknowledges the difficulty in separating cultivated and wild radish based on the material recovered (Huntley 1995, 75). From the Leases Bowl excavations material from 12th-13th century contexts was examined (Huntley and Daniell 2001). As with the material from Durham Castle there are issues here of differential preservations and "It is concluded that only woody seeds are recorded in quantity – fig, blackberry and elderberry – and that we probably do have

faecal material again although delicate material, once again, is lacking" (Huntley and Daniell 2001, 78). The material from context (560) being slightly anomalous, however, with "figs, thousands of blackberry, a few elderberry and potential medicinal plants – deadly nightshade and henbane" being recovered (Huntley and Daniell 2001, 79). This material is one of the best examples of possible undisturbed cess from excavations within Durham city, albeit with some possible intrusion of clinker from layers above this fill (Carne 2001, 49).

5.6.3 The material from the Walkergate excavation also provides some clear evidence for cesspit fills within the area of Durham city, though the cinder/coal dominated non-waterlogged deposits favour certain seeds such as *Rubus* species, *Chenopodium* species and elder. Rackham notes this as being an import caveat when interpreting the results of his report; "These robust seeds characteristically survive longer in the soil than more fragile species and their dominance may reflect a preservational scale and loss of all the less robust seeds" (Rackham 2000). Three contexts can be positively identified as deriving from cess material based on the archaeobotanical component and archaeological context. All three contexts are from pits which contain fig remains, thus it is interpreted this material derived from cess. A floor layer from this site, context (695), also contains fig remains, though in this case it is the archaeological context (a floor layer), which distinguishes this material from samples retrieved from pit fills. All three cesspit samples are of 15th century date. The details of the plant material recovered from these samples are outlined in the database, along with the details of material recovered from context (560) from Leazes Bowl (Huntley and Daniell 1995).

5.7 HULL

5.7.1 The city of Kingston-upon-Hull, or Hull, was a major port on the east coast of England from the medieval period onwards, at times second only to London in terms of the value of its trade. Detailed analysis of the value of the material passing through the port show that between 1275-90 Hull made the third largest customs contribution to the exchequer after London and Bristol. The trade passing through the town has been examined via the archaeological and historical records, with important implications for this study (Evans 1999). With York and Beverley it was one of the three biggest towns in Yorkshire by the 14th century and enjoyed a thriving trade with other towns and cities on the east coast, as well as trade from Continental Europe. Excavations have been undertaken consistently since the mid 1970s, largely as a result of the actions of the Humberside Archaeology Unit which was formed in response to the building of an orbital ring-road and its impact on the remains of urban archaeology (Evans 1993, 2). Since the 1970s the number of published archaeological reports is also notable with much of the early interventions published through the Hull Old Town Report Series.

5.7.2 Excavations from Hull have uncovered a number of well preserved medieval pit fills of relevance to this study. However, the early date of several of these investigations means that in certain cases only the presence of certain species are recorded, not their relative abundance. These include a particularly early study by Dorian Williams from samples recovered during the 1974 Sewer Lane excavations (Armstrong 1977). Samples here were taken from columns (Williams 1977, 18) and are thus somewhat detached from their original single context. This makes this report somewhat unsuitable for the study being undertaken here, though it is interesting to note that remains of food plants were frequently encountered, including fig, as well as herb plants such as marigold (*Calendula officinalis*), celery (*Apium graveolens*; though presumably the wild variety), coriander (*Coriandrum*

sativum) and *Brassica* species. As an aside, the regional review notes leek and wheat/rye bran as being recovered from this site (Hall and Huntley 2007, 132). References to leek could not be found in the report and bran is not identified further than 'grain epidermis', though presumably this was from a cultivated cereal. Indeed, the presence of grain is largely inferred from the presence of cut-leaved cranesbill (*Geranium dissectum*); few cereal grains were recovered and are mainly recorded as 'charred grain', rather than to a species level. Also of note is the reference in later excavation reports that this site contained cesspits (Underdown 1979, 74); the presence of cesspits here is inferred from the fig remains and not from the excavated depositional context itself. The excavations at Scale Lane/Lowgate in 1974 recorded two contexts described as cesspits (Armstrong 1980). However, it is questionable whether in light of the archaeobotanical material recovered whether one of these was indeed used for the deposition of human faecal matter. Context 22 from Section 2 produced a very limited assemblage of plant remains, including a single fig seed, no *Rubus* seeds and no *Prunus* species stones (in contrast to the other cesspit context from this site which produced 344 *Prunus* species stones) (Underdown 1980, 88). Therefore its identification as a cesspit should perhaps be reassessed. In contrast the remains from the chalk lined pit, described as a garderobe in the excavation report, produced an assemblage much more indicative of the remains expected from human waste. In this case the remains were dated by the pottery evidence to no later than the second half of the 14th century. The excavations at High Street and Blackfriargate undertaken from 1973-77 uncovered a number of pits identified as cesspits, all with a rather limited range of species present, though with a strong proportion of these being known food plants (McKenna 1987, 255-61). Three of these cesspit samples are included in the database for this study. Though the number of species represented is quite

limited the identification of numerous ova of intestinal parasites and cereal bran may suggest this material was derived from human waste. Also included is the spot sample from the Ousefleet property where 18 date stones (*Phoenix dactylifera*) were recovered, as well as 1350 fig seeds. Unfortunately this is also the only sample where the relative volumes of the seeds are recorded in the published report, therefore the plant remains in the cesspit samples are merely recorded as 'present'. Material sampled from various 14th-16th century pits uncovered during the excavation at Mytongate in Hull produced notable numbers of seeds of carrot (*Daucus carota*; presumably wild carrot entering the city as part of grassland fodder) and purging flax (*Linum catharicum*) but little to suggest these features functioned as cesspits (Miller et al. 1993, 195-198). As an example, pit (429) produced the widest assemblage of seeds but the near absence of fig seeds and the total absence of *Rubus* species seeds (both dense, woody seeds) may allow the suggestion that the interpretation is not biased by poor preservation but by a genuine lack of food waste within these pits. Excavations at Queen Street produced a large number of *Prunus* species stones, as well as walnut, fig, hazelnut and two grape pips. Though interesting to note this site is not included in the database as it felt there are a number of issues regarding the recovery of plant remains which may have biased this record (a problem acknowledged by the original analyst: McKenna 1993, 198). Similarly, excavations at Chapel Lane Staith in 1978 (Ayers 1979), the Magistrates Court Site (Hall et al. 2000), Blanket Row (Carrot et al. 2001) all produced the remains of food plants such as fig seeds, but in light of their depositional context they do not present material relevant to this study. Material from Liberty Lane examined in 1999 included two samples which were relevant to the study here and are entered onto the database for Hull (Large et al. 1999). The possible fill of a 14th

century cesspit pit from 37 High Street (Carrot et al. 1994) was examined but as concluded in the assessment report - "The absence of food remains and parasite eggs, and the lack of a distinctive insect assemblage, moreover, militate against the interpretation of the fill examined as having a faecal origin"; a statement which could apply to several of the supposed cesspit fills from the Northern region.

5.7.3 Thus, for Hull seven samples have been entered onto the database: four from High Street and Blackfriargate (McKenna 1987), two samples from Liberty Lane (Large et al. 1999) and one sample from Lowgate (Underdown 1980).

5.8 NEWCASTLE

5.8.1 The city of Newcastle-upon-Tyne represents one of the largest modern urban areas within this study. However, compared to work in York the excavations here have not uncovered deeply stratified organic/waterlogged deposits of the same extent or with the same frequency. Much of this bias may be due to the history and topography of the city. Newcastle did not maintain an important status during the medieval period, compared to York which was an important ecclesiastical and administrative centre for the whole of northern England. Topographically the city is built on an area of raised ground and added to significantly by medieval land reclamation and quay construction (e.g. as discussed by O'Brien et al. 1988). Therefore archaeological deposits were generally not of the deep, anoxic type, which are typical of low-lying urban sites such as Beverley, York or London, which also benefit from water-tables conductive to organic preservation.

5.8.2 Excavations at Queen Street and Dog Bank (O'Brien et al. 1988) produced a range of samples from both waterlogged and non-waterlogged deposits. For this purposes of this study none of these samples can be securely linked to in situ cess material. Though finds of food plant remains were recovered from

several deposits these were generally in low frequencies. In the non-waterlogged deposits the remains of charred food plants were interpreted as representing " a very low 'background' assemblage, probably originating in domestic ash, which was the principle component in many of the non-waterlogged deposits" (Nicholson and Hall 1988, 113). The waterlogged remains were quite organic from this site, though dominated by wood fragments. The majority of plant remains from the waterlogged samples were seeds of waste ground type taxa, with some from plants of wetland environments. Excavations at the Crown Court Site (O'Brien et al. 1989) produced similar results to the Queen Street and Dog Bank excavations from the point of view of this study.

5.8.3 From the Mansion House site food plants included fig, *Rubus* species, various *Prunus* species and grape seeds, as well as charred cereal remains were recovered, however, none of these were identified as deriving specifically from a cess type deposit; "Seeds from waterlogged exotic taxa occur scattered throughout but are never abundant and are therefore unlikely to reflect faecal material" (Huntley 1995c, 198). Much the same can be said of the excavations at Close Gate (Fraser 1994). The Mansion House samples produced a number of well documented food plants including rivet wheat, bread wheat, rye, barley and oat as well as pea, flax, dill, walnut and, notably, an olive stone. Moffett includes these samples as part of her review of medieval food plants and they are very likely to reflect common foods and herbs consumed in the city at the time (Moffett 1996, 43), though as stated in the introduction this deposit is not included in the database as it represents material from a layer, rather than a possible cesspit.

5.8.4 More definite cess material was identified during the excavations at 42-48 High Bridge Street where the fill of a 13th century latrine and material from a c. 14th-16th century cesspit was analysed (O'Brien 2006a). Notably there was

an absence of exotic plant taxa from these samples, in contrast to the relatively common finds of fig and grape pips from other Newcastle sites. This lead the analyst to interpret the samples as representing the food remains from a relatively low status site. The finds of exotic taxa may be considered as deriving from imported food, and by extension ultimately from human faecal waste, but reworking of sediments or the incorporation of faecal waste into garden soil seems to have prevalent in Newcastle. Two of the samples from this project were included on the database. Samples from Tuthill Stairs (O'Brien 2006b) produced grape pips from several medieval contexts while samples from 1-7 Westgate Road also produced remains of fruit stones, apple and hazelnut shell (O'Brien 2009) none of which were attributed as being cesspit constructions. Likewise from recent excavations on Westgate Road (O'Meara forthcoming) fig seeds are ubiquitous and occur with as much frequency as plants such as elder, goosefoot and nettle seeds, plants often attributed to the background 'noise' of the soil seed bank (Kenward et. al 1986, 272).

5.8.5 Thus, only the two samples from High Bridge Street are included here as part of the cesspit database (O'Brien 2006a).

5.9 YORK

5.9.1 The archaeological excavations in York represent the most intensively studied urban environmental records from medieval deposits within the region being explored here. Nationally this city is only rivalled by London in terms of the extensive rescue and research based work that has been undertaken since the early 1970s. The rigorous application of macroplant, palynological, entomological, parasitological and archaeozoological studies have all been applied to try and answer issues relating to the past human land use of the city of York and its surrounding hinterland. During the course of the archaeological investigations many deposits have been

uncovered that have been interpreted as incorporating material of faecal origin, therefore the material from a single excavation in York, such as 16-22 Coppergate, has often produced more material for analysis than the entire corpus for excavated material from other cities in this region; easily seen in the database attached to this study where the 37 cesspit deposits from Appleby-on Westmoreland, Beverley, Chester, Durham, Hartlepool, Kingston-upon-Hull and Newcastle are matched by 110 deposits from York.

5.9.2 This extensive body of research has not, however, been followed by complete publication of all results; which would in any case fill many, many volumes. Nevertheless this lack of formal publication is offset by the ease at which grey literature can be accessed via the Environmental Archaeology Unit website and the Archaeological Data Service website, both hosted by the University of York. On the subject of human agency it much also be remarked that the presence of Dr. Allan Hall within the city must also be an important factor in the production of high quality data from the city. Dr. Hall's skill as an archaeobotanist is followed by the openness with which raw data from his work is dispensed in easily accessible digital formats. In the case of this study the access to data produced by Dr. Hall has led to a thorough review of the raw data from not only York, but also Beverley, Chester and Hull. This type of consistency, where one individual would work and be based in a single city for over 30 years creates continuity of report format and analysis that is lacking for other areas.

5.9.3 From an early date it was recognised that the environment of York was naturally conducive to the preservation of organic remains; in particular the water-table that has been rising in the region throughout the Holocene (Buckland 1974). Coupled with the natural conditions, there has been a pattern of human activity that resulted in the successive deposition of cultural material since the Roman period (with a short post-Roman

hiatus/contraction). The combination of natural and anthropogenic factors is key to York's importance for environmental archaeologists. In contrast other cities may have had successive deposition of cultural material, but not the natural conditions conducive to organic preservation; such as the ashy, well drained deposits from Newcastle and Durham. Conversely, some of the developing towns of the medieval period, such as Heddon, east of Hull, had ideal natural conditions for preservation but not the consistent levels of cultural deposition which would allow the development of deep, well stratified archaeological layers (see the section below on Small Towns).

5.9.4 From the York material a common means of assessing whether material is of faecal origin or not is to assess it for the egg cases, or ovum, of two common intestinal parasites (Kenward et al. 1986, 246). In this case the relative frequency in a volume of deposit of *Trichuris trichuria* and *Ascaris lumbricoides* were used as a proxy means of determining whether the archaeological deposit being examined incorporates faecal matter. Their densities per gram of sediment being calculated using a standard methodology originally developed for the examination of intestinal infection amongst populations of domestic animals (Ministry of Agriculture 1977). The presence of bran within a deposit is also referred to as being a proxy for the identification of faecal matter (Hall et al. 1983). However, as this material is also commonly used for feeding livestock it was recognised that its presence within a deposit may not be so clear cut as a proxy indicator of cesspit material. Occasionally rarer material is discovered which may point to a faecal origin. From the excavations at the Church Street sewer system (Buckland 1976), while sampling for diatom casts some fragments of sea sponge were recovered. This was interpreted as evidence of anal wipes, in this case a slightly more up upmarket version of the moss pads commonly found during excavation (Buckland 1976, 14). Some insects commonly

associated with sewerage have also been studied and also noted from excavations at Coney Street (Kenward and Williams 1979, 13), though in this case parasitological investigations did not contribute in a significant way to the interpretation of deposits form this site. It is stated that most seeds recovered from this feature were from deposits of human faecal matter. This was concluded based on the recovery of seeds of grape. In his analysis of this material Greig concluded that this would not have been a food stuff available to non-human mammals in York, therefore it was most likely from faecal matter originating from a human diet (Buckland 1976, 26); though the present author has seen grapes cultivated outside successfully in present day York, suggesting the possibility that their seeds would not necessarily represent imported food stuffs. Later the presence of seeds of a *Rubus* species was also interpreted as being evidence of material which originated from faecal matter, though finds of parasite remains from this deposit were low in number and abraded, suggesting disturbed or poorly preserved material (Ibid. 32).

5.9.5 The focus for this present study is on the fills of cesspits from the medieval period and therefore much information from York has not been incorporated into this study. This has occurred even when samples were interpreted as containing a faecal component; this mainly applies to layers, gullies and drainage channels. When assessing the reports from material recovered from York this study focuses on those which have been recovered from a pit, and in the opinion of the excavator or archaeobotanical analyst contains a strong faecal component. The presence of possible food plant material within a pit fill was not in itself taken as an indication that the primary purpose of the pit was to act as a cesspit. Factors such as the opinion of the excavating archaeologist, the presence of faecal concretions and the presence of intestinal parasites are all used to determine how likely

it is a particular pit fill would contain the remains of human faecal waste. The difficulties interpreting the presence or absence of cesspit material is discussed further below.

5.9.6 The following material was incorporated into the database for this study: Samples from 1-9 Micklegate were examined both for their archaeobotanical and archaeoentomological potential by Hall and Kenward (Kenward and Hall 2000a). Clear evidence for cess pit deposits from the 9th-10 century and 10-11th century were identified via the information from the excavation and from the range of plant remains recovered from the various samples. Eight of the best preserved samples are included in this study. Though most of the samples included some elements of possible food waste only those from pits, which were interpreted during analysis as deriving from cess material, were included here. Even from the pit deposits, however, finds of wood chips, including *Prunus* species thorns, suggest that non-food material also become incorporated into these deposits. Mosses associated with use as anal wipes, such as *Antitrichia curtipendula* and *Neckera complanata*, and mosses associated with use as a dye plant, such as the clubmoss (*Diphasium complanatum*) also represent non-dietary food remains from this site. Indeed, from some of the pits dye plants dominated the assemblages recovered. This incorporation of non-food plant remains into cesspit deposits is one of the major problems facing cesspit studies, and our understanding of taphonomic pathways for food remains.

5.9.7 The range of plants from 4-7 Parliament Street closely resembled those from 1-9 Micklegate, particularly the frequent occurrence of fruit remains, cereal chaff and dye plants. In the case of the 4-7 Parliament Street material organic preservation was described as "as good as the author had ever seen" (Hall and Kenward 2000, 4), however, interpretation is hampered by the nature of the archaeological work which took place. In this case a narrow shaft pit

where contexts were inferred and samples taken from the walls of the pit. The study raises the possibility that the material from 4-7 Parliament Street contains pig faecal matter. This was inferred from the very frequent occurrence of uncharred cereal chaff, which it is suggested was deposited either as a dump of unwanted remains from cereal processing or via animal faeces (in this case the authors suggest via pigs). Indeed, in all cities where localised or regional flooding is likely the take place the possibility that animal faecal matter could be incorporated into deposits of human waste is highly likely. Alternatively the inhabitants of the area may have periodically cleaned animal faecal matter into latrines and cesspits, in which case the archaeobotanist must be mindful that several processes other than the use of the context for depositing human faecal waste could be present within a pit fill. Even by York's standards preservation here was particularly good and included, among other plant remains, preserved Prunus species mesocarp. The weakness of this site, however, lies with the effective absence of a site dating or a stratigraphic sequence that would allow the results to be placed within the context of other sites from the city.

5.9.8 In contrast to 4-7 Parliament Street, the material from 44-45 Parliament Street was generally poorly preserved with only the denser seeds such as fig and brambleberry being preserved. This, it is suggested, was the result of recently initiated oxidation of the archaeological deposits (Carrott et al. 1995b). The hypothesis that the remains at this site were undergoing contemporary degradation prompted the initiation of a monitoring program into the local water table and soil water chemistry at the site (Davis et al. 2001).

5.9.9 In contrast to the comparisons which can be made between 1-7 Parliament Street, 1-9 Micklegate and 16-22 Coppergate (i.e. the frequent occurrence of food remains and mosses associated with dying activity), the site at 118-26

Walmgate was seen as atypical on several levels. The association of food plants and dye plants was not present, oats were found in greater frequency and floor deposits differed from those of sites from contemporaneous periods (Kenward and Hall 2000b). Therefore the analysts concluded that this might have been an area where animals were penned (with pigs being suggested). The implications of this is the difficulty separating pit deposits with human faecal waste from those that contain the waste of animals fed on human food waste; a point illustrated for 118-26 Walmgate by pit fills (3468) and (3475), which have not been included in the database. Four other samples recovered from this site have been incorporated into the database for this study as it was interpreted these represented more secure cesspit deposits. Here again, however, these deposits were also interpreted as containing at least some plant debris which may have been collected during the clearing of an area of overgrown waste ground.

5.9.10 Nearby the site of 41-9 Walmgate has been investigated by numerous technical reports; Carrott et al. 1991, Johnstone et al. 2000, Jaques et al. 2001 and Hall et al. 2002. Despite these numerous reports, little of relevance for this study was uncovered. Only one pit fill sample from these investigations was added to the database (Hall et al. 2002). The material was only examined as a spot sample, though the presence of faecal concretions, intestinal parasites and food plant strongly suggest this 'bath-shaped' pit contains human faecal material (Ibid. 7).

5.9.11 Material from 44-5 Parliament Street produced a range of deposits from periods ranging across the pre- and post-Conquest period. Several of these deposits contained faecal concretions and parasite remains, though generally moderate to poor preservation means samples from this site are not included in the database (Carrott et al. 1995b). This is somewhat analogous to the material from the Gilbertine Priory excavations (Kemp and Graves

1996). These problems are familiar to other monastic sites where often poor preservation of soft biological remains is noted (Allison et al. 1996, fiche C14).

5.9.12 Material from Saint Andrewgate produced several samples from the fills of cesspits (Jaques et al. 2002). This site is a good example of how the archaeological context is as important for interpreting the presence of autochthonas human faecal material as the actual assemblage of plant material present. As an example, material from context (1150) produced faecal concretions and wheat/rye bran fragments, and is derived from a pit believed to have been used as a cesspit, or at least to have received faecal material as a component of its fill. Likewise layers of a trampled floor (1224) and (1344) produced small (<30mm) fragments of faecal concretions and in the case of (1344) plant remains which might be indicative of faecal material, however, it is context (1150) rather than contexts (1224) and (1344) that is incorporated into the database for this study. The context (1542) produced a range of remains which are highly indicative of faecal material, but again this material was from a slope layer, and based on the variable preservation seems to contain material from a range of sources (Jaques et al. 2002, 3). As it stands the pit fills (1150) and (1528) have been added to the database for cesspit pit fills.

5.9.13 The sites investigated as part of 12-18 Swinegate, 8 Grape Lane, and 14, 18, 20 and 22 Back Swinegate/Little Stonegate (Carrott et al. 1994) produced a number of samples relevant to this study. Four contexts were added to the database on the basis of the interpretations expressed in the reports of the excavating archaeologist and the environmental specialists.

5.9.14 Material analysed from the sites at Saint Saviourgate produced material from pits which are highly indicative of faecal remains (Carrott et al. 1998). Of particular interest for this study were the four samples dating to the 16th

century, a period generally poorly represented in the environmental archaeology of York (the focus being more readily on Roman or Anglo-Scandinavian deposits). Two 12th/13th century cesspit fills were also of relevance for this study. Interestingly though the deposits from this excavation which dated to the Anglo-Scandinavian period showed frequent evidence for weeds of nitrogen rich soils which might indicate a particularly foul local environment (Ibid. 18), there was little evidence of food plants indicative of human faecal remains even in the layer deposits; the exception being occasional fragments of corn cockle (*Agrostemma githago*). Likewise the absence of mosses used in dying was rather unusual for deposits from Anglo-Scandinavian York.

5.9.15 The publication of environmental evidence from the Colonia of York (which includes the sites of 5 Rougier Street and the General Accident site) (Hall and Kenward 1990) extensively uses parasitical remains as a proxy means of identifying a faecal component to an archaeological deposit. In some deposits the high concentrations of *Trichuris trichuria* and *Ascaris lumbricoides* ovum almost certainly point to a faecal component. In other deposits the study of macroplant remains and parasite ovum present a more complicated picture, and raise difficult issues for anyone studying material from urban sites with high levels of organic preservation. One sample from Period 3, Phase 3, context (460), contained bran fragments, fig seeds and seeds of corn cockle (presumable from poorly sorted flour) (Kenward and Hall 1995, 514), all of which may suggest plant materials that represent the end products of ingested food. However only one *Trichuris* ova was recovered (Hall and Kenward 1990, 345), which cast doubt as to whether this material was indeed of faecal origin. Here the interpretation of the fig seeds contrasts with the conclusions reached from Kenward and Williams (1979), where a grape seed was seen as evidence of a human faecal component, though

presumable figs would have been as inaccessible to livestock as grapes during the Roman period at this site (see Greig's comments in Buckland 1976, 23-28). Other samples follow a similar pattern, where the presence of plant remains which could have formed part of the diet of the local populace is contrasted by the low numbers, or absence, of parasite ova. Sample (443) from Phase 3, period 3 contained much bran remains, though the absence of parasites is interpreted as being evidence that this is not faecal in origin (Hall and Kenward 1990, 352). Sample (327) from the same phase contained the plant remains of leek bran fragments, as well as concretions interpreted as of faecal origin, but the low numbers of parasite remains again suggest that this material is not of faecal origin (Ibid. 354). Later these interpretations are modified where it is stated that "although lack of parasite eggs is not in itself, of course, conclusive proof of the absence of faeces" (Ibid. 366). Later, in a Period 7, Phase 1 deposit from context (2036) high levels of parasite ovum are recorded with fish bones, crushed in the manner which taphonomic experiments had shown to be due to chewing of the material (Jones 1986). From this area three samples, <74>, <76> and <97>, all produced the remains of plants interpreted as being from digested origin, human parasites, and fish bones crushed in the manner described in context (2036) above (Ibid. 369). These are all good examples where parasite remains coupled with a taphonomic interpretation can complement each other to deduce the same conclusions from two distinct sources. Period 12 contexts produced further clear evidence of a combination of food plants, high numbers of parasite remains and crushed fish bone (Ibid. 373), providing what could be described as the three most ideal proxies for the interpretation of a deposit as being of human faecal origin. Five samples from the General Accident site and four from 5 Rougier Street were incorporated into the database for this study (Hall and Kenward 1990).

5.9.16 The excavations at 16-22 Coppergate produced a large number of well preserved organic deposits, and again the studies of parasite remains played an important part in the interpretation of deposits containing faecal matter (Kenward and Hall 1995). For the purposes of the study here contexts that were identified by the archaeobotanist (Allan Hall) as being derived from cess material were incorporated into the database. This allows a selection of high quality contexts to be subsampled from the main assemblage. One upshot of this intensively investigated site id that it creates an imbalance within the study as a whole. There are 77 samples from 16-22 Coppergate within the database created for this study, over half of all the samples. As discussed above this must be accepted as a combination of excellent local preservation, intensive research into this site, and the presence of experienced analysts for the range of environmental proxies examined as part of this site investigation. The data can be broken down as 42 samples from period 3 (mid 9th to early 10th century), 13 samples from period 4A and 4B (late 9th to early 10th century), 3 samples from 5A (c.975 AD), 11 samples from 5B (c.975- early 11th century) and 8 samples from the mid-late 11th century. Though there is some overlap with samples from other urban centres examined for this study these samples represent the earliest phases of the medieval period. In contrast the rest of the database largely represents samples from deposits dating to the post-Norman Conquest/Later medieval period.

5.10 SMALLER TOWNS

5.10.1 Within this study area a number of important medieval cities are located - however, it must also be remembered that the term 'city' is an administrative title often with historical roots and does not reflect the size of an urban area. Thus today Durham with a population of less than 30,000 is a city, but Scunthorpe in Lincolnshire with almost 80,000 is not. Likewise

Chester and Gateshead have roughly the same population but the former is a city and the latter is not.

5.10.2 A combination of demographic and socio-economic change from the later medieval period onwards means many towns do not now reflect their past importance. Examples include Beverly in Yorkshire which was superseded by cities such as Leeds and Bradford due to shifting industrial patterns, in this case in the cloth trade during the Industrial Revolution (James 1990). Further north the defensive importance of Carlisle and Berwick-on-Tweed consistently declined through the extension of English royal authority from the 16th century to the 1707 Act of Union, and beyond (notwithstanding the capture of the former during 1745 Jacobite Rising).

5.10.3 In most cases these smaller towns have not produced deeply stratified, organic rich archaeological deposits found in some of the larger cities (Beverly in this case being a notable exception). This may be due to local preservation factors, or because the large scale development which takes place in growing cities has not exposed archaeological deposits for investigation, an issue noted for the archaeology of Durham (Huntley and Daniell 2001, 75).

5.10.4 A brief overview of the towns within the study area is given, though little of direct relevance to the study being undertaken here has been uncovered. Notably, there is a bias in favour of small towns in Yorkshire being investigated by archaeobotanical analysis (see Figure 1). This may be due to several factors. In a contemporary sense there may be greater development in this (large) region which required archaeological intervention. It may also be that economic fortunes of areas further north, and to the west of the Pennines, did not improve until the extension of centralised law and order throughout the whole of the border with Scotland in the 16th-17th centuries; previous to which small towns may have struggled to prosper in this region.

In this case the absence of well stratified organic archaeological deposits is partially indicative of lack of economic development both in the past (to create these deposits), and in the present (the requirement for archaeological mitigations before development): though this link may need to be investigated more thoroughly. Finally; many of the smaller towns of counties Durham, Cumbria, Northumberland, and the greater Tyne-and-Wear regions (Newcastle to Sunderland), developed through mining or other industrial activities in the later and post-medieval periods; after the smaller medieval towns within this region were already well established. Though again, the pattern of urban development as a factor in the creation of archaeological deposits is probably more subtle than this broad statement suggests and worthy of further consideration.

5.10.5 An assessment of a sample taken from a well fill at Cartergate, Grimsby, Lincolnshire produced a number of food plants including fig, wheat/rye bran, apple and fragments of hemp capsules, though a mixture of grassland taxa (suggested as deriving from fodder/animal dung) were also recovered (Carrot et al. 1994c, 5). However, the general assessment nature of this report precludes it from being incorporated into the database for this study. The urban development of Grimsby suffered mixed fortunes through the medieval period, as did the town of Hedon, discussed below. Rigby has suggested that the latter half of the 14th century was the zenith of Grimsby's medieval development. Changing economic trends meant that by the mid 16th century the population of the town may have been half of what it was during the late 14th century (Rigby 1993). Archaeologically this might manifest as a lack of continuous stratigraphic deposition, and the general impoverishment of the archaeobotanical record.

5.10.6 The town of Hedon, Yorkshire was once an important port though it was superseded by Hull in the later medieval period due to siltation of the port

and the development of larger ships, unable to navigate the shallow river to the town (Hey 1986, 48). However, it is likely the town was already being badly affected by restrictive trading rules on the River Humber which favoured Hull, which was at that time competing against traders from London and Gainsborough (Gillett and MacMahon 1980, 136-37). Its absence in the Doomsday book suggests a post-Conquest foundation, with a foundation as a town in the early 12th century by the Counts of Aumale being most likely. Its current size belays it previous importance and the current town is believed to be only 1/3 of the previous medieval settlement (Hey 1986). Finds of fennel and celery from a ditch fill suggested some human faecal matter was present during the analysis of material from 17-19 Saint Augustine's Gate, dated to the 15th century (Carrot et al. 1993). A charred grape pip from the same sample also represented food remains, though in this case the charred nature of the pip suggests it may have reached the ditch fill in a form other than directly from faecal matter. Other work from Hedon has not produced material of interpretative value for this study. Considering Hedon's former importance as a port town this is somewhat unfortunate considering these sites are the gateways for food import/export (as the finds of date stones from nearby Hull have shown).

5.10.7 From Selby a number of samples have yielded assemblages that were interpreted as deriving from human waste. An evaluation of material from Gowthorp, Finkle Street and Micklegate produced some material which may reflect deposits of human waste, but the technical report was unavailable for viewing at the time of writing (Daniell and Huntley 1999).

5.10.8 An investigation of deposits in Middlegate, Hartlepool revealed a number of deposits dated from the 12th-17th century. Among these was a cesspit fill with numerous plant remains indicative of the medieval diet (Huntley 1988). This sample (number 33 in the technical report) was initially included in the

database for this study but later removed from the statistical analysis because at the time of writing it could not yet been discerned what period this feature has been dated to (except to say it is designated 'Phase 4' in the technical report). Though extremely rich for remains of *Prunus* stones and apple remains (presumably pips but not explicitly recorded as such in the report), this pit fill did not present a wide range of wild taxa, such as have been recorded for cesspit fills in other areas. Also, in the technical report Huntley rejects the suggestion by the supervising field archaeologist that a lower sample, Sample 34, represents material which may have leaked from the cesspit. However, the presence of fig seeds, flax seeds, an abundance of hazelnut fragments and *Cannabis sativa* seeds (Hemp), none of which were found in sample 33, raises the possibility that the opinion of the supervising archaeologist may have been correct. Though dominated by seeds of grassland taxa, as pointed out in the report, the presence of high number of these species suggests that some food-waste may be present. It is also acknowledged that material such as charred heather twigs represent material which arrived in the pit from a different taphonomic path to the food waste. This context has not been included in the database due to the poor dating of the deposit and the contrast between the opinion of the site director and the original analyst. Material from Southgate, Hartlepool, excavated between 1981 and 1982 produced nine soil samples, eight of which contained material which included potential food remains (Huntley 1987, 53-54, and Microfiche pp.21-27). However, based on the excavation report these did not derive from potential cesspit contexts. Five of the nine samples produced over 100 fragments of hazelnut, while grape pipes were recovered from four samples. Finds of hemp seeds from three contexts were thought to relate to the use of the plant in the production of hemp rope, rather than the use of the plant as a narcotic. Certainly the port would have

created a ready market for rope. The other main excavation into medieval layers in Hartlepool, Church Close 1984-85, produced only two pear pips from samples which produced in general a low density of plant remains (Huntley 1990, 399).

5.10.9 The town of Appleby-in-Westmoreland, Cumbria was a well established medieval foundation, its castle forming an important element of the defensive system for the northern border, along with castles such as Carlisle, Brough and Brougham. Excavations within the medieval town have been limited but recent work did uncover the remains of medieval cesspits in the area of Shaw's Wiend (O'Meara unpub.). A sub-rectangular pit 1.7m long, 1.2m wide and 0.4m deep was uncovered with a hard yellow-green 0.02m-thick layer of faecal concretions. The well-drained nature of this site precluded the recovery of waterlogged remains, making the remains recovered one of the least diverse in the entire database with only some *Chenopodium* species, *Carex* species and many hundreds of blackberry and raspberry seeds being recovered.

5.10.10 Many of the smaller towns within this region have had at least some archaeological interventions. In the course of this work many have also had deposits examined for archaeobotanical purposes, giving a wide geographic range of potential cesspit deposits. However, an examination of the smaller towns has shown that many lack deposits which are of interest to this study. That is not to say that these sites have not produced important archaeological remains. The excavations of the Benedictine abbey in Whitby, excavations in Lancaster (which produced Wilson's important paper on the identification of horse manure; Wilson 1988), the excavations of Roman and medieval waterlogged remains of saltworks from Nantwich all fall within the region. However, remains of cesspit fills from the period under review here have not been particularly rich. No relevant material from the small

towns Howden, Driffield, Boroughbridge, Ripon (technically a city!), Northallerton, Scarborough, Whitby, Richmond and Yarm (all in Yorkshire) were interpreted as relevant to this study. Neither was material from Alnwick in Northumberland, Kendel in Cumbria, Lancaster in Lancashire and Nantwich in Cheshire.

5.11 CONCLUSIONS FROM THE LITERATURE REVIEW

5.11.1 Looking at the total sample of sites available, and the number of contexts examined within these sites, certain patterns emerge which need to be considered when examining medieval diet in Northern England via the archaeobotanical record. In total 146 dated samples from seven towns and cities are represented.

5.11.2 The first and most obvious bias is for York to be far better represented than any other city or town; indeed better than all of the other sites combined. In total the nine sites examined from York which contained suitable cesspit remains produced 109 cesspit samples which were entered into the database. From the other towns and cities a total of 37 cesspit samples were recorded. For the discussion here it was decided that the two samples from Hartlepool would not be considered as they were only ascribed a broad 'Medieval' date. One sample from York also fell into this category as it was classed as merely 'Late medieval'; pit **(1172)** from Carrott 1994b. Even within the York samples there is a bias, with 77 of the 109 samples coming from the excavations at 16-22 Coppergate (Hall and Kenward 1999).

5.11.3 From a chronological perspective the total number of samples from York shows a bias towards the earlier period of this study, with 92 of the 110 samples falling exclusively before AD 1100 (essentially pre-Norman Conquest). For the rest of the study only one other site produced a sample exclusively dated to this period; Chester, sample <5124> (Jacques et al. 2004). Two samples from Durham straddled the end of this period being dated to

the 11th-12th century (Donaldson 1979). Contra to this position most of the samples dated exclusively after AD 1100 occur from sites outside York. Only 17 of the York samples occur in this period, while 34 of the samples from sites outside York are dated to the period after AD 1100 if we adopt a strict criteria for such a measurement and exclude those samples which were dated to the 11-12th centuries which might straddle this period (See Table 1).

5.11.4 The numbers of samples suitable for this study which have been entered onto the database are as follows:

Appleby-in-Westmoreland: 1

Beverley: 11

Chester: 13

Durham: 5

Hull: 5

Newcastle: 2

York: 109

Dated periods	Samples	Sites	City/Town
9th – mid 10th century	**59**	**3**	**1**
Late 10th – 11th century	**25**	**4**	**2**
11th – 13th century	**21**	**5**	**2**
13th – 15th century	**27**	**12**	**7**
16th – 17th century	**14**	**4**	**3**

Table 1: Main period divisions; sites, samples and cities represented

5.11.5 This summarises the timescales of the periods which will be discussed in the diachronic study. It also includes the number of samples available which fall exclusively within this timescale, the number of archaeological sites which produced these samples, and the number of individual cities/towns represented by these sites. As stated earlier, the earlier part of this database is dominated by samples from Anglo-Scandinavian York. The sample of urban centres is at its most diverse in the 13th-15th centuries.

5.11.6 One of the aims of this study is to assess the ability of archaeobotanical studies from cesspit remains to present evidence of a diachronic change in patterns of food consumption from the early medieval period to the later medieval period. In this case the dating of archaeological deposits is a major problem for either assessing change through time, or for examining specific time periods. The case of Hartlepool is a casing point, where the label 'Medieval' is not specific enough when a study is focused only on the medieval period. In other cases a sample may be dated to a general period, but a date range of longer than a century means interpreting the sample in the context of the medieval time frame may become over-generalised. On the basis of pottery analysis the sample from Appleby-in-Westmoreland dates to the 13th-15th century, a period which could cover AD 1200-1500. A key feature of dating from medieval sites must be the appreciation that they are often dated by dates from the analysis of ceramic typologies. It is no coincidence that the dated samples fitted neatly into five time periods, periods which represent the main typological groups.

5.11.7 The problem with these dates is that by straddling a broad time frame they can be included in several periods and may bias a diachronic study. However, the nature of the dataset available means a somewhat broader approach needs to be taken. Part of this problem is also linked to the historical research of the medieval period which shows that the medieval period was one of rapid social and economic change. Rapid social change may not manifest in a dataset which uses a two-century resolution. This problem for connecting medieval archaeobotanical studies with medieval historical studies has many parallels with Mike Baillie's concept of 'Suck in and Smear' for the prehistoric period; where the annual dendrochronological record sits against the often very broadly dated archaeological time scales (Baillie 1991). However, it could also be argued

that the value of environmental archaeology is to examine the broader changes to diet and economy, rather than the changes wrought by a single war or a particular royal reign. The use of broad time scales for diachronic changes to diet has been successful for other archaeobotanical studies for the historic period (van der Veen et al. 2008), as well as for the pre-historic period (Bishop et al. 2009; Bishop et al. 2013). It could be argued, however, that a much more thorough examination of the archaeobotanical record for medieval Northern England could be justified in light of the large dataset and historic records for the period. The focus here is very much limited to the remains from a discreet urban cultural context, in the form of cesspit remains.

6 PLANTS IN THE DATABASE

6.1 BOTANICAL FAMILIES

6.1.1 In total there are 61 botanical families represented among the vascular plants of this database (excluding the domestic cereals). These are presented in Table 2. In many cases only a single species represents a family. Thus the Iris family are represented only by the species Yellow Flag (*Iris pseudacorus*) and the Araliaceae only by a single record for the Marsh Pennywort (*Hydrocotyle vulgaris*). However, some of these single families represent economically important or imported plants. Thus, though the Arecaceae are represented by only a single species, and a single find, the species from this family – dates – (*Phoenix dactylifera*) from Hull are an important, and as yet the only, find of this species in medieval Northern England. Similarly the Moraceae are represented by a single species, but again in this case the fig (*Ficus carica*) represents an important imported fruit. Other families are better represented with the Asteraceae and the Rosaceae both represented by 24 separate species. Sometimes the total entries on the master database do not match the number of species recorded on Table 2. This is because some species such as apple have multiple entries which represent apple seeds, apple endocarp, apple seed base cups and indeterminate Apple/Pear remains. In this case Table 2 would record the seeds, endocarp and base cups as 1 entry for species *Malus sylvestris*, and the Apple/Pear identification as 1 entry for a genus identification (these distinctions were maintained in the master database however).

6.1.2 The advantage of examining the database by Family and not by Genus type, or alphabetically by species name is that is groups together plants into defined groups with common properties. Thus the Solanaceae are all poisonous to varying degrees and have been used in the past as medicinal plants. However, grouping them by genus or species would split then into

different parts of the database. Likewise a family such as the Polygonaceae are best examined on a family level as it ensures a plant such as Black Bindweed (*Fallopia convolvulus*) is examined in the same context as Common Knotgrass (*Polygonum aviculare*).

Botanical Family	Family	Genus	Species
Adoxaceae			2
Alismataceae		1	1
Amaranthaceae		4	5
Amaryllidaceae		1	1
Apiaceae	1	1	20
Aquifoliaceae			1
Araliaceae			1
Arecaceae			1
Asteraceae	1	10	24
Betulaceae		2	2
Boraginaceae	1	1	1
Brassicaceae	1	1	10
Cannabaceae			2
Caryophyllaceae	1	3	11
Cucurbitaceae			1
Cyperaceae	1	1	7
Dennstaedtiaceae			1
Dipsacaceae			2
Dryopteridaceae		1	
Equisetaceae		1	
Ericaceae		1	4
Euphorbiaceae			2
Fabaceae	2	3	6
Fagaceae		1	
Grossulariaceae			1
Hypericaceae		1	
Iris			1
Juglandaceae			1
Juncaceae		2	7

Botanical Family	Family	Genus	Species
Linaceae		1	2
Lythraceae			1
Malvaceae		1	2
Menyanthaceae			1
Moraceae			1
Myricaceae			1
Myrsinaceae			1
Onagraceae		1	1
Orobanchaceae		2	3
Oxalidaceae			1
Papaveraceae		2	2
Piperaceae			1
Plantaginaceae		1	3
Poaceae	1	4	4
Polygonaceae	1	1	12
Portulacaceae			1
Potamogetonaceae		1	1
Ranunculaceae		3	7
Resedaceae		1	1
Rosaceae		7	24
Rubiaceae			1
Rubieae		1	1
Salicaceae		2	
Scrophulariaceae			1
Solanaceae		1	4
Typhaceae		1	
Urticaceae			2
Valerianaceae			1
Violaceae		1	

Juncaginaceae			**1**	**Vitaceae**			**1**
Lamiaceae		**6**	**9**				

Table 2: Botanical Families; with numbers of individuals identified to Family, Genus or Species level.

6.2 ADOXACEAE

6.2.1 The family Adoxaceae are present as two species the relatively uncommon Dwarf Elder (*Sambucus ebulus*; 3 records) and the very frequently recovered Elder (*Sambucus nigra*; 96 records). *Sambucus nigra* is the fifth most common species in the database, being found in 70% of samples from the 9th-13th century, though slightly less so after this period. Its presence in cesspit deposits could represent several taphonomic pathways. As a plant which grows very rapidly on rich organic soils, as can be found in urban back-plots it may have been a common sight in medieval townscapes, as well as a plant which can produce a prodigious number of seeds, which may also have decay resistant properties. The pungent smell of the leaves has been used to ward off flies and for this reason it may have been deliberately planted near privies and cesspits, though this interpretation may be a retrospective one (Mabey 1997, 343). Despite its common archaeological occurrence it was only recorded in one of the 217 recipes surveyed for the later medieval period (see below), which might suggest that among the urban elite its popularity declined as exotic imports were consumed in greater quantities.

6.3 AMARANTHACEAE SUBFAMILY CHENOPODIOIDEAE

6.3.1 This group consists of the combination of the entries for *Atriplex* species (Oraches) and the *Chenopodium* species (Goosefoots). Both seeds are morphologically similar, and 24 entries describe '*Chenopodium*/*Atriplex*' species. Identifications of *Atriplex* species and *Chenopodium* species are relatively even with 99 entries for the former and 90 for the latter. A number of identifications to species level are present for *Chenopodium* species. These are a single identification for *Chenopodium bonus-henricus* (Good King

Henry), 5 for *Chenopodium ficifolium* (fig-leaved goosefoot) and 7 entries for *Chenopodium murale* (Nettle-leaved goosefoot). *Chenopodiaceae* have been suggested in the past as possible pre-historic foodstuffs, with archaeological finds, as well as historical accounts, attesting to its use (Stokes and Rowley-Conwy 2002). In the case of *Chenopodium bonus-henricus* it is likely that the leaves were an important source of food and therefore not as easily preserved archaeobotanically as the seeds. For Fat-hen (*Chenopodium album*) the seeds may have been a food source in their own right, or added to flour to bulk up its nutritional value (as reported from ethnographic accounts in Stokes and Rowley-Conwy 2002, 96). The fact that the plant can grow quite rapidly in well manured areas also means that in medieval urban environments there would have been much opportunity for plants to become established and produce seeds which became incorporated into archaeological layers. Their absence in the 15th century cesspit from Durham (Rackham 2002) and with eight of the nine deposits from Chester containing no Chenopodioideae remains from the late 15th- early 17th century deposits (Jacques et al. 2004) might suggest some regional variation within cities. They are almost ubiquitous from 16-22 Coppergate with 73 of the 77 samples containing a species of Chenopodioideae. Their absence from a particular site might be indicative of an area that was relatively clear of wayside environments or abandoned areas where the plants could become established. Alternatively it could represent areas where domestic ungulates or equids were present; their browsing being sufficient to control the growing plant. What is not clear is whether this plant was recognised as a food plant in the medieval period, or if it appears in medieval texts.

6.3.2 Another member of the Amaranthaceae family is represented by the two entries for *Beta vulgaris* (Beet/Sea-beet). It is unclear however, whether this

might be cultivated or wild beet. It is perhaps noteworthy that both of these entries occur in 13th century York (Hall et al. 1990; Jacques et al. 2002).

6.4 AMARYLLIDACEAE

6.4.1 The Amaryllidaceae are represented by 30 records for the *Allium* species; leek (*Allium porrum*), onion (*A. cepa*) and garlic (*A. sativum*). These are by-and-large represented by the identification of 'leek'. The remains consist of leaf epidermis, which can survive digestion and be preserved archaeologically under certain stable waterlogged conditions (Tomlinson 1991). The finds of leek epidermis could be considered (perhaps along with *Prunus* sp. *mesocarp*) as representing the upper level of preservation from medieval waterlogged deposits (with *Rubus* species and *Chenopodiaceae* representing the other, more decay resistant end of the spectrum). The remains in this region have only been identified in Chester (Greig 1988) and York (Kenward and Hall 2000a; Hall and Kenward 1990; Carrott et al. 1998, Kenward and Hall 2000b; Hall and Kenward 1999). The distribution is chronologically quite general with remains recovered from deposits dated from the late 9th century to the 16th century. In the context of the historic records for onion/leek production this may be considered a rather poor representation as garlic and onions are regularly mentioned in historic texts as garden produce and as imports; such as the shipment of over 100,000 onions brought in a single cargo into Exeter in the early 14th century (Dyer 2006, 34). The historic records demonstrate consistently the importance of these crops as food stuffs, though they are rarely represented as income generating crops in the same manner cereals are. The cheapness of garden produce might suggest that most of the population had access to plants such as the *Alliums*, therefore from an archaeobotanical perspective it needs to be asked whether the issues for identification is one of preservation, or one of recognition by archaeobotanists. In the case of garlic the reproduction of the

plant by vegetative reproduction is probably a factor in the lack of seeds recovered from archaeological contexts (Zohary 2013, 156). In the case of onion it may be a combination of poor preservation, and lack of identification which hampers the recording of this species.

6.5 APIACEAE

6.5.1 There are 22 entries for the Apiaceae family, representing 20 species, as well as a general entry for 'Umbelliferae indeterminate types' and a general entry for Water-Dropwort species (*Oenanthe* species). This group contains several flavourings; dill (46 entries), fennel (10) and coriander (15). The taxonomic identification of celery (44 entries) is important considering that the cultivated *Apium graveolens* was not developed until the 17th century, but is in the strict taxonomic sense identical to wild *Apium graveolens*. In this respect celery is comparable to finds of wild carrot (*Daucus carota*), recovered from 13 samples, and parsnip (*Pastinaca sativa*) recovered from three samples (also discussed in Moffett 2006, 53-54). Wild carrot has many of the characteristics of the cultivated carrot plant (including leaves that smell of carrots when crushed; Mabey 1997, 298), but without the large edible tap root. Finds of dill, fennel and coriander may be more accurately described as flavourings and therefore indicative of food remains.

6.6 AQUIFOLIACEAE

6.6.1 The family Aquifoliaceae are represented by the single species holly (*Ilex aquifolium*), found as leaf fragments in 15 samples. These are found sporadically from the 9th-13th centuries in Chester and York. It seems unlikely these represented the remains of digested material from human consumption. They might be the remains of garlands of the plant brought into the cities during winter period, or could equally be derived from animal dung, the holly being a nutritious and effective fodder plant for sheep and cattle (Spray 1981).

6.7 ARECACEAE

6.7.1 The Arecaceae are represented by the single cache of 17 date stones (*Phoenix dactylifera*) from Hull (McKenna 1987). Common references to dates in recipes of the period suggest that this fruit was more common than the archaeobotanical record might suggest, being present in over 20% of the recipes surveyed for the medieval period (discussed further below section 9.7.1).

6.8 ASTERACEAE

6.8.1 The 35 entries for the Asteraceae represent one of the largest families. These 35 entries represent 24 plants identified to the species level, 10 identified to genus groups and one group of entries which does not give an identification more detailed than the family Asteraceae/Compositae. This group contains a number of species which may have been exploited for their medicinal properties, but none that can be identified specifically as food plants. These medicinal plants include Yarrow (*Achillea millefolium*), a plant whose leaves have properties which were believed to be good for staunching wounds; indeed, the plant is named after the Greek hero Achilles who was known for his abilities to stem the flow of blood using a preparation made from the plant (Harrison 2012, 16). It is present in four samples from the late 9th to early 11th century in York; though it is likely that should it have been used for medicinal properties the leaves would be gathered before the seeds developed. In contrast the seeds of Stinking Chamomile (*Anthemis cotula*) were found very commonly with occurrences in 70 samples. This plant, in contrast to yarrow, does not seem to have been used for medicinal properties and its seeds are likely to be derived from plants growing in the urban environments. The same could be said for thistle species (*Carduus*/*Cirsium* species; 36 occurrences) and *Centaurea* species (34 occurrences of *C. scabiosa*/*nigra*/*cyanus*, as well as general '*Centaurea* species').

Corn-marigold (*Glebionis/Chrysanthemum segetum*) also occurs relatively commonly with 18 occurrences. It is noteworthy as a noxious weed of cornfields and its appearance is likely to be due in part to fodder/straw being brought into urban areas. With only 5 occurrences of corn-marigold in 77 samples from 16-22 Coppergate (just under 4% of the samples from this period) there may be a suggestion that its distribution is not just the 'background noise' of the urban environment, but rather due to a particular ecological or cultural context that was relatively less common in York than in other areas. The plant reaches a peak in the 11th-15h centuries where it is found in 27% of samples. Other common Asteraceae include 74 occurrences of Nipplewort (*Lapsana communis*), 20 occurrences of Sowthistle (*Sonchus oleraceus*) and 49 occurrences of Spiney Milk-thistle (*Sonchus asper*). In contrast to these species, Dandelion (*Taraxacum offininale*) occurs only three times; which is interpreted as unusual as it is such a common plant at the present time. Its modern occurrence is no doubt aided by its ability to adapt to the close cutting regimes of mechanical lawn mowers. However, three occurrences in 146 samples still seems very low.

6.9 BETULACEAE

6.9.1 The Betulaceae are represented by finds of alder (*Alnus* species; 9 occurrences), birch (*Betula* species; 7 occurrences) and hazel (*Corylus avellana*; 80 occurrences). In these cases it is clear that the alder and birch form part of the less common plant species recovered from urban deposits. However, with its 80 occurrences, hazelnut (here represented mainly by the shell) is one of the most common plants in the database being found in several urban centres and in multiple periods.

6.10 BORAGINACEAE

6.10.1 For the Boraginaceae the rare finds of Forget-me-not (*Myosotis* species; 4 occurrences) and Field Gromwell (*Lithospermum/Buglossoides arvensis*; 3 occurrences) are not interpreted as being archaeobotanically significant.

6.11 BRASSICACEAE

6.11.1 The plants of the Brassicaceae are relatively common with nine identified species and two more general groups which encompass 'Brassicaceae seed' or '*Brassica/Sinapis'*. Unfortunately these general identifications are also two of the most common occurrences of the seed with 51 and 35 records respectively. Economically important plants include the six records for woad, though as discussed in the section below on dye plants there are many taphonomic considerations which need to be considered for this plant. In this case the six records are no doubt an under-representation of the plant's importance in the medieval period. Common finds include Wild Radish (*Raphanus raphanistrum*; 73 occurrences) and Turnip (*Brassica rapa*; 53 occurrences); though *Brassica rapa* consists of a broad number of subspecies which can include, though is not limited to, cultivated turnip.

6.12 CANNABACEAE

6.12.1 Two plants of the Cannabaceae family were recovered; both of them economically important plants. These are Hemp (*Cannabis sativa*; 28 records) and Hops (*Humulus lupus*; 35 records). As suggested by Huntley for hemp seeds from Hartlepool, hemp was probably an important plant for the extraction of bast fibres for rope or sack making; both of which would presumably been in demand at maritime ports (Huntley 1990; Zohary et al. 2013, 106). The cultivation of the crop was enforced by law during the Tudor period and succinctly described by a 16th century description; "No Shippe can sayle without hemp, no Plowe, or Carte, can be without ropes, the fisher and fouler muste have hempe to make nettes. No archer can wante his bowe string, and the Malt man for his sackes, with it the belle is rong for service in

the Church" (Bevan-Jones 2009, 74). Despite the economic importance of the plant it does not seem to have been smoked as a psychoactive substance in medieval Britain, instead its medicinal used being as an ingredient in salves and ointments.

6.13 CARYOPHYLLACEAE

6.13.1 The plants of the Caryophyllaceae family are represented by 11 identifications to the species level, and with three genus level identifications. However, in general these species occur in quite small numbers. With the exception of the three most common species all other entries occur less than seven times. The 65 occurrences of Common Chickweed (*Stellaria media*) are likely to represent plants growing in urban environments as it can thrive in rough ground, waysides and gardens (Mabey 1997, 99). Corn-spurry (*Spergula arvensis*) is present in 25 samples, though its presence may be due to the plant growing locally, being brought in as part of fodder/dung, or indeed as a potential food additive as recorded in historic sources (Stokes and Rowley-Conwy 2002, 96). The 109 occurrences of Corn-cockle (*Agrostemma githago*) make it the most common single species found in medieval cesspit deposits, and in this case can be more firmly identified as being an (unwanted) part of the diet.

6.14 CUCURBITACEAE

6.14.1 The single native Cucurbitaceae is represented by the 10 finds of white bryony (*Bryonia dioica*). All of these occur in York with a strong late 9th – early 10th century distribution (seven occurrences) with three occurrences from late 10th – 11th century contexts. It is possible that in this context the plant was being utilised as a medicinal herb, though it is also a potential poison which Culpepper in his herbal warns is "not to be tampered with by the unskillful" (Bevan-Jones 2009, 144).

6.15 CYPERACEAE

6.15.1 The sedges, or Cyperaceae, are represented relatively commonly, but with little detailed species analysis. Seven species identifications are made but of these only common spike-rush (*Eleocharis palustris*) occurs with frequency, having 61 occurrences. No other species occurs more than 5 times, though the general identification of 'Carex species' is given 86 times.

6.16 DENNSTAEDTIACEAE

6.16.1 Finds of bracken (*Pteridium aquilinum*; Dennstaedtiaceae family) occur 40 times; 39 times from York and once from Chester. There is perhaps more of a pre-Norman distribution to this species, to be discussed further in the chronological section below.

6.17 DIPSACACEAE

6.17.1 The Dipsacaceae family is represented by the two teasel species *Dipsacus sativus/fullonum* (5 occurrences) and Field Scabious (*Knautia arvensis*; 3 occurrences). The Dryopteridaceae is represented by 2 occurrences of fragments of Wood/Buckler Fern (*Dryopteris species*), while the Equisetaceae (horsetails) are represented by a single record (Kenward and Hall 2000b).

6.18 ERICACEAE

6.18.1 The Ericaceae family are represented by finds of ling (*Calluna vulgaris*; 23 occurrences), cross-leaved heath (*Erica tetralix*; 3 occurrences) and bilberry seeds. Finds of bilberry have been combined; therefore identifications of '*Vaccinium myrtillus*' were combined with '*Vaccinium* species' identifications of seeds and pistil bases to give 36 total occurrences of bilberry.

6.19 EUPHORBIACEAE

6.19.1 Two species from the Euphorbiaceae family are recorded; sun spurge (*Euphorbia helioscopia*; 11 records) and caper spurge (*E. lathyris*; 1 record). The sap of sun spurge is purportedly an effective penile stimulant, though the identification of this use archaeobotanically might require further research; the nature of such research is unclear at this time.

6.20 FABACEAE

6.20.1 The Fabaceae family are represented by 16 entries, though with varying levels of identification detail. Dyers Greenweed (*Genista tinctoria*) is recorded in a total of 30 samples. This occurs as 28 records for stem fragments and 7 records for leaf fragments; all from York. Its importance may lie chiefly as a dye plant; discussed below in the dye plant section. The rather general identification of 'Leguminosae' is recorded for flowers, petals, pods and tracheid bars. This demonstrates the importance of a general knowledge of plant anatomy, though for the purposes of this study the identification to family level is too general. However, garden pea (*Pisum sativum*) is recorded from fragments of hilum, parenchyma and epidermis. In this case the identification of these remains is an important means of identifying an important plant which does not survive well archaeobotanically. Certainly the 15 total records for *Pisum sativum* do not reflect the economic importance of this plant. An indirect means of identifying the presence of beans may be in the identification of the bean beetle (genus *Bruchus*). This was recorded from 13th-15th century deposits from Cartergate, Grimsby and interpreted as indirect evidence of bean storage (Carrott et al. 1994c). Infrequent occurrences of clover (*Trifolium pratense*; 1 record: *Trifolium* species; 4 records) and gorse (*Ulex* species leaf spines; 4 records) represent some of the other less common members of the Fabaceae family.

6.21 FAGACEAE- GROSSULARIACEAE- HYPERICACEAE- JUGLANDACEAE

6.21.1 The Fagaceae are represented by infrequent finds of oak bud scales (*Quercus* species; 12 records) while the Grossulariaceae family is represented by a single find of gooseberry (*Ribes uva-crispa*) from mid 13th century Chester (Greig 1988). The appearance of gooseberry at such an early date is at odds with the post-medieval date (post 16th century) often ascribed to the cultivated plant. However, as wild varieties do grow in Britain it is likely

that the 13th century example is from a wild seed. It is of interest, however, that the wild plant does not seem to have been widely consumed in Northern England during the medieval period. The Hypericaceae family is represented by a single find of St. John's-wort (*Hypericum* species) from 16-22 Coppergate, York. The Iris family is represented by 6 records for Yellow Flag (*Iris pseudacorus*) while the Juglandaceae are represented by 5 records for walnut (*Juglans regia*). Though few records are present the remains of walnut seem to cross the Anglo-Scandinavian/Norman period.

6.22 JUNCACEAE

6.22.1 The Juncaceae family (rushes) are represented by 8 species identifications and one general '*Juncus* species' identification. The most common species is the toad rush (*Juncus bufonius*) with 22 records. There may be several routes by which this material reaches urban deposits, and could be studied in the same ways in which sedge remains reach urban areas. Rush pith was commonly used in the manufacture of lamp wicks well into the post-medieval period while rushes may also have been utilised as a regularly replaced floor covering (Mabey 1997, 387). It is also possible that rushes were utilised as a thatching material.

6.23 LAMIACEAE

6.23.1 The Lamiaceae family are represented by 16 entries; 9 identified to the species level, 6 to the genus level and 1 to the level of family. In this case it is probably the 32 records for summer savoury (*Satureja hortensis*) which are most likely to represent food remains. This flavouring was one of the eight focused upon by another archaeobotanical research program looking at the dispersal of plant flavourings in the Roman to medieval period of north-West Europe (Livarda and van der Veen 2008).

6.24 LINACEAE

6.24.1 Finds of seeds from the flax species (*Linum usitatissimum* – flax; *L. catharticum* – fairy flax) are quite common, though with far more of the former (68 records) than the latter (6 records). Flax seeds are found across the period under review, and from multiple urban centres (Beverley, Chester, Hull, Newcastle and York). Its presence is likely to be connected to the use of its seeds as a source of oil, and possibly as a topping/flavouring for bread. Evidence of linen production would not normally be found via seed remains as the stalks are harvester for fibres before the maturation of the seed head (Zohary et al. 2013, 101). Its presence is not ubiquitous however and its absence of some sites may be as interesting as its presence in others. It is not presence in the samples from 33-35 Eastgate Beverley or from Liberty Lane (McKenna 1992; Large et al. 1992) but present in three of the four Lurk Lane samples (McKenna 1991). Likewise it is present in sample from 12 Watergate Street, Chester (Greig 1988), but absent from 25 Bridge Street (Jacques et al. 2004). It is absent from Durham, though common in York. How this might reflect cultural differences is at this time unclear however.

6.25 LYTHRACEAE

6.25.1 Three records for purple loose strife (*Lythrum salicaria*) are the only records for the Lythraceae family, while the Malvaceae are represented by dwarf mallow (*Malva neglecta*; 2 records) and common mallow (*M. sylvestris*; 2 records), as well as three general Malva species identifications. A single species represents the family Menyanthaceae, with 16 records for bog bean (*Menyanthes trifoliata*).

6.26 MORACEAE

6.26.1 The Moraceae family are also represented by a single species, though in this case the 35 records for fig (*Ficus carica*) are of archaeological interest. One record for mid-9th – early 10th century York (from 16-22 Coppergate), was unusual enough that Hall suggested it might be intrusive. All other records

represent remains which as likely to post-date the Norman invasion. What is unclear at this time is whether this represents the arrival of Franco-Norman dietary preferences, or the opening up of new trade routes focused in the Mediterranean/Southern Europe.

6.27 MYRICAEA FAMILY

6.27.1 Finds from the Myricaea family are represented by 7 finds of bog myrtle leaves/twig fragments (*Myrica gale*). The leaves of this plant have been suggested as both beer flavouring and as having a sweet smelling sap which made it useful as a plant to be hung over latrines and in out-houses (Behre 1999). In this case the remains might be derived from either source. The remains are all found in samples from York though from contexts which date from the late 9th to the late 13th century.

6.28 ONAGRACEAE AND OXALIDACEAE FAMILY

6.28.1 The family Onagraceae are represented by two plants, both with only a single record: Enchanters nightshade (*Circaea lutetiana*) and a species of willowherb (*Epilobium* species). Likewise the Oxalidaceae family are represented by the two finds of wood-sorrel (*Oxalis acetosella*).

6.29 OROBANCHACEAE FAMILY

6.29.1 The Orobanchaceae family is represented by three species identifications and a single identification to the genus level. These are all generally uncommon, though the semi-parasitic Marsh Lousewort (*Pedicularis palustris*) was recorded 12 times, all from deposits likely to be from the pre-Norman period.

6.30 PAPAVERACEAE

6.30.1 The Papaveraceae are recorded as two species identifications: Prickly Poppy (*Papaver argemone*; 5 records) and Opium Poppy (*Papaver somniferum*; 25 records) and two genus identifications; Fumitory (*Fumaria* species; 7 records) and Poppy (*Papaver* species; 1 record). It has been suggested that the British

climate is not conductive to the production of the narcotic latex which makes this an important economic plant in other regions. Its presence in Britain seems to be as a weed of waysides and arable regions, though also perhaps as a flavouring. It is present in samples which date from the 9th to the 15th century.

6.31 PIPERACEAE

6.31.1 The single find from the Piperaceae family, a Black Pepper seed (*Piper nigrum*) from early 14th century Hull is a notable import, though it should also perhaps be wondered why this plant is so rare considering it is known to have been economically important, and imported; appearing in over 36% of recipes surveys for this period. An important factor in this respect is the utilisation of this plant a ground-pepper, rather than as whole pepper-corns.

6.32 PLANTAGINACEAE FAMILY

6.32.1 Plants from the Plantaginaceae family are generally found infrequently with three species identifications for plantains (*Plantago lanceolata, P. major, P. media*) and one genus identification (*Veronica* species); though none of these plants are interpreted as economically or archaeobotanically significant.

6.33 POACEAE FAMILY

6.33.1 Nine entries were recorded for members of the Poaceae family. Poaceae, like Carex species, perhaps suffer from a presumed difficulty in their identification among archaeobotanists, compounded by the perception that they occupy common ecological niches and therefore are not worth pursuing to a species level of identification. The 9 entries consist of 4 species identifications, 4 genus identifications and 1 section for general family (Poaceae) identifications. This last group is also the largest with 52 entries. Broom grass (*Bromus* species; 19 entries) and Common Heathgrass (*Danthonia decumbens*; 11 entries) were also relatively common.

6.34 POLYGONACEAE FAMILY

6.34.1 The 14 entries for the Polygonaceae family consist of a number of species which occur quite commonly in this database. This includes Black-Bindweed (*Fallopia convolvulus*; 68 records), Common Knotgrass (*Polygonum aviculare*; 64 records), Pale Persicaria (*Polygonum lapathifolium*; 59 records) and Redshank (*Polygonum persicaria*; 54 records). Likewise the Ranunculaceae are represented by 7 species identifications, 1 genus identification and 2 subgenus identifications. The subgenus Ranunculus subgenus Ranunculus contains the most common identifications for this family with 77 entries. Other common finds are Lesser Spearwort (*R. flammula*; 21 entries) and Celery Leaved Crowfoot (*R. sceleratus*; 20 entries). Like the Polygonaceae and the Poaceae the Ranunculaceae are all commonly found in cesspit remains but their common distributions and the ability of many of the species to live within urban environments means deducing detailed archaeobotanical or ecological information from their presence or absence is not straightforward. The remains of Pale Persicaria have been highlighted as a possible prehistoric food-stuff, though with a number of stringent criteria to ensure that archaeobotanical finds can be confidently identified as such (Behre 2008, 65). Also, many of these remains may have been brought to the urban centre as fodder, or indeed been expelled as animal dung, therefore representing a very different taphonomic pathway to the foods and flavourings ingested by people.

6.35 POTAMOGETONACEAE FAMILY

6.35.1 The Potamogetonaceae family are represented by a single species identification (1 entry for *Zannichellia palustris*; Horned pondweed) and a genus identification (*Potamogeton* species; pondweed). Little more can be said of these remains at this time.

6.36 RESEDACEAE FAMILY

6.36.1 The Resedaceae family are represented by 10 identifications for Weld (*Reseda luteola*), as well as a single general entry for *Reseda* species. This important dye plant (discussed further under the 'Dyeplants' section) is native to the chalky and sandy soils of southern England, with its expansion likely to have been due to the effects of the human cultivation of the plant (Mabey 1997, 157). Its total absence from 16-22 Coppergate samples is interesting, and may point to a post-Norman expansion of use for the plant, though it has been found in remains from 1-9 Micklegate, York dating to the 10th-11th century, suggesting that it was not altogether absent from the late Anglo-Scandinavian period. The remains have been found in Beverley (14th-15th centuries), Hull (late 13th early 14th centuries) and York (13th and 16th centuries), which are coincidently within the Yorkshire-Lincolnshire regions where cultivation was concentrated in Northern England (with Essex-Kent being the principle southern growing regions).

6.37 ROSACEAE FAMILY

6.37.1 By far the best represented family are the Rosaceae with 39 entries comprising 24 species identifications and 7 genus identifications. Some species have multiple entry points where different elements of the plant were recovered, discussed above for apple remains (Section 6.1.1). Thus apples are recorded separately as seeds, seed base cups and endocarp (core fragments). Likewise there are various records for members of the *Prunus* species are with records for stones, as well as mesocarp in some cases of exceptional preservation. Importantly this group contains three of the most common food plants within the database: brambleberry species, apple and *Prunus* species. Apple remains (*Malus sylvestris*) are recorded in a total of 100 samples. This represented 81 entries for apple core fragments, 6 entries for seed base cups and 86 entries for apple seeds. Some issues for the

identification of pears are also obvious with 1 entry for Apple/Pear and 2 entries each for Pear/Quince endocarp and stone cells.

6.37.2 The morphology of stones of the Prunus species could fill a whole study, and indeed many attempts have been made to provide a definitive typology for the size and shape of these seeds (Pollman et al. 2005). In this case identifications have been made for *Prunus cerastifera*, *P. cerasus*, *P. domestica*, *P. institia*, *P. padus* and *P. spinosa*. *Prunus cerastifera* (Cherry plum) is recorded only from Hartlepool and therefore levels of consumption in medieval Northern England are questionable. As it is native to southeast Europe and the fruit does not form regularly in Britain it may be that these identifications were of imported fruits, or indeed misidentified stones. *Prunus cerasus* (Morello cherry) is recorded 23 times both as *Prunus cerasus* (11 records) and *Prunus* cf. *cerasus* (12 records). *Prunus domestica* (plum) are recorded as *Prunus domestica* (35 records) and *Prunus* cf. *domestica* (11 records); a total of 46 samples which contain records for plum. *Prunus institia* (Damson) is recorded from 22 samples, while *Prunus padus* (Bird cherry) has only one record; from late 9th-early 10th century 16-22 Coppergate. By far the most common remains are the stones of *Prunus spinosa* (Sloe) which are recorded from 90 samples. Their near ubiquitous nature in 16-22 Coppergate, and their absence from Durham, Hull and most samples from 25 Bridge Street, Chester is of interest to the possible social context of their consumption and will be dealt with further below.

6.37.3 Four members of the genus *Sorbus* are also represented amongst the Rosaceae family. These are generally uncommon, though with 8 records for Rowan (*Sorbus aucuparia*); all from late 9th-11th century deposits at 16-22 Coppergate.

6.38 RUBIACEAE FAMILY

6.38.1 The Rubiaceae are represented by the single species Madder (*Rubia tinctorum*). This economically important dye plant is recorded 30 times and is examined further below in the 'Dyeplants' section.

6.39 RUBIEAE FAMILY

6.39.1 The Rubieae are represented by *Galium* species, though are not seen as archaeobotanically significant. Likewise the Salicaceae are represented by low numbers of *Populus* species bud scales and Salix species bud scales, while the Scrophulariaceae are represented by a single record for figwort (*Scrophularia nodosa*).

6.40 SOLONACEAE FAMILY

6.40.1 The Solonaceae family are represented by 4 species and one genus identification. The genus identification is only recorded once as *Solanum* species. The other 4 species – *Atropa belladonna* (Deadly nightshade; 6 records), *Hyoscyamus niger* (Henbane; 35 records), *Solanum dulcamara* (Bittersweet; 1 record) and *Solanum nigrum* (Black nightshade; 12 records) – all have medicinal properties to varying degrees. In particular the 35 records for henbane may point to incidents of its use as a painkiller. This is well recorded from historical sources and from an archaeobotanical point where all parts of the plant, including the seeds, were used medicinally (Bevan-Jones 2009, 76-82). The identification of medicinal plants should be taken cautiously however, and previous studies have warned against the tendency to reach a single conclusion when remains are recovered (Long et al. 2000).

6.41 TYPHACEAE FAMILY

6.41.1 The Typhaceae family are represented by a single record for a *Sparganium* species (Bur-reed species).

6.42 URTICACEAE FAMILY

6.42.1 The two species represented in the family Urticacaea are amongst the most commonly recovered species from within the database: small nettle and

stinging nettle, with 89 and 63 records respectively. Stinging nettle (*Urtica dioica*) and small nettle (*Urtica urens*) both occur commonly throughout the database but with a distinct decline in its frequency towards the later time period.

6.43 VALERIANACEAE

6.43.1 The family Valerianaceae is represented by the 20 records for a Narrow-fruited cornsalad (*Valerianella dentate*).

6.44 VIOLACEAE

6.44.1 The Violaceae family are represented by the genus identification *Viola* species (Violet), with 32 records for this plant.

6.45 VITACEAE FAMILY

6.45.1 The Vitaceae family are also represented by a single species, though in this case the economically significant grape (*Vitis vinifera*). The 32 records for this plant are culturally significant as it is imported (presumably dried like figs) from Continental/Mediterranean Europe. Grapes, either as currants, raisins or grapes, is the sixth most commonly recorded plant in historic recipes for the later medieval period. The cultural significance of this plant and its consumption in medieval Europe is discussed below.

7 FREQUENCY OF VASCULAR PLANT REMAINS

7.1 INTRODUCTION

7.1.1 In total there are 206 vascular plants identified to the species level present in the analysis for this study (discounting the cereals). There are 71 identifications of vascular plants to the genus level and 10 identifications which are not more detailed than the family level. As well as this there are 41 mosses identified to the species level and 17 identified to the genus level. The four domestic cereals are represented (wheat, barley, oats, rye). Remains are not all restricted to seeds with the mosses being identified based on their leaf morphology, leek being identified by fragments of leaf epidermis and bog myrtle being identified by fragments of leaf and twig. This gives some indication as to the range of botanical knowledge needed before someone may qualify themselves as an 'expert' on analysis of waterlogged urban archaeobotanical remains. These species do not of course all occur in the same frequencies, and in many cases they appear as interesting botanical rarities rather than of strictly archaeobotanical interest. An expanded study to look at the ecology of urban environments should be considered in the future to place these records properly within the context of their palaeoecological and archaeological importance.

7.1.2 In terms of assessing the relative importance of certain plants it helps to determine which plants occur frequently and which are occasional rarities. In total there are 81 plants for which there is only one record (Table 8). This consists of 57 distinct species, as well as 24 more general identifications to the genus level. In some of these cases possibly important economic plants are represented. These include exotics such as dates (a single record from Hull was found as a spot sample with 18 date stones; McKenna 1987) and pepper (a single record from Liberty Lane, also in Hull; Large et al. 1999). That these two exotics should both be found in Hull demonstrates the

excellent preservation present for the town's medieval layers, and also to its position as an international trading entrepot during the medieval period. Why these items have not been found elsewhere in Northern England during this period is a matter for debate and further investigation. Even accepting that the samples from York are heavily biased in favour of the pre-Norman period it is interesting to note that pepper has not been recovered in cesspit deposits (though perhaps date stones would not be typically recovered in cesspit deposits unless consumed by a particularly masochistic individual).

7.2 RARE FRUITS

7.2.1 Fruits which only occur as single records include bird cherry (*Prunus padus*), gooseberry (*Ribes uva-crispa*) and service tree (*Sorbus torminalis*). A single record for crowberry (*Empetrum nigrum*) occurred in Middlegate, Hartlepool (Huntley 1988), but not noted as being of particular interest. As this plant grows more towards the northern part of the Northern Hemisphere it is to be wondered if this is indeed an import from Scandinavia, either directly as a fruit or indirectly via a sea-travellers faeces; as stated earlier this site suffers from dating issues which means the single record for crowberry falls somewhat outside the general analysis. The record for gooseberry from 12 Watergate Street, Chester (Greig 1988) would seem to be an unusually early record (coming from a mid-13th century deposit); suggesting perhaps some intrusive material was present. If the original flot could be located then perhaps a radiocarbon date for this item would determine whether this was an early record for the fruit, or a wild species which was being consumed prior to the common cultivation of this plant in Britain post-16th century. The record for service tree in interesting as it occurs in the same sample as that

for the gooseberry (Greig 1988), as well as being a plant suggested as a beer flavouring.

7.3 RARE POTHERBS

7.3.1 Known pot herbs represented by only one occurrence include ground-elder (*Aegopodium podagraria*), pot marigold (*Calendula officinalis*), Good King-Henry (*Chenopodium bonus-henricus*) and chamomile (*Matricaria recutita*), while a single record also exists for the medicinal herb for St John's Wort (*Hypericum* species). The difficulty for identifying the economic utilisation of these plants rests with the use of their leaves rather than seeds. As archaeobotanical identification often relies on the preservation of seeds rather than vegetative parts it is likely that plants of this nature will continue to be under-represented in the archaeobotanical record, and when found their significance may be ambiguous.

7.4 PLANTS WITH 2-10 RECORDS

7.4.1 More common plants, such as those with 2-10 records, are represented by 130 entries. This includes 78 distinct species, as well as entries which are not more detailed than genus or family. Thus, for the database of vascular wild and domestic plant species being discussed here (293 plants identified to either family, genus or species) a total of 211 species, or over 70% of the plants recorded have fewer than 10 records. Alternatively, it can be looked at in the context of the entire database that even a plant which occurs with ten entries will occur in fewer than 7% of samples. Of the plants represented by two occurrences 18 species are identified, as well as 10 plants identified to the genus level. This includes beet (*Beta vulgaris*), white horehound (*Marrubium vulgare*), and pear (*Pyrus communis*). Uncommon finds of pear may be connected to it being mistaken for apple, though this might be mitigated if closer attention was paid to the recovery and identification of the stone cells (sclereid structures). The low frequencies of beet may relate to

its main use as a leaf vegetable, while the role of white horehound may also need to be investigated as its rarity would belie the fact it is mentioned by both Columella and John Gerard as a medicinal plant.

7.5 PLANTS WITH 3-5 ENTRIES

7.5.1 Plants with three to five entries (totalling 56 records with 32 individual species) include parsnip (*Pastinaca sativa*), dandelion (*Taraxacum officinale*), black mustard (*Brassica nigra*), flixweed (S*isymbrium sophia*/*Descurainia Sophia*), walnut (*Juglans regia*) and mint (*Mentha* species), while Bilberry (*Vaccinium myrtillus*) is represented by four entries. As with many of the leaf vegetables, the infrequency of parsnip is to be expected (as would the remains of other root vegetables) and raises questions as to how archaeobotanists can contribute to the study of these plants, or whether they are best studied by historians. The same can be said for garden peas (*Pisum sativum*). The infrequency of dandelion is of interest as the plant is so common today it is to be wondered why it is so uncommon from medieval urban deposits (a factor also to be wondered for the two records of Ox-eye Daisy; *Leucanthemum vulgare*/*Chrysanthemum leucanthemum*). Part of its modern day spread is undoubtedly connected to its suitability to survive the regular, close cropping of urban and roadside grassland by mechanical lawnmowers; a factor which does not suit plants such as Yellow Rattle (*Rhinanthus minor*; 1 record) and Ragged Robin (*Lychnis flos-cuculi*; 2 records). The four records for Black Mustard (*Brassica nigra*) are of interest considering the use of this plant as a spice since before the medieval period. Indeed, even though the word mustard enters the English language via Anglo-Norman French language, records of mustard seed occur in York from the Anglo-Scandinavian period. The entries for Bilberry (*Vaccinium myrtillus*) are not discussed here as they represent just the occurrence of seeds of the plant identified to the species level. This fruit is more common

when the records for pistil bases and '*Vaccinium* species' are added. This is one of the more commonly found fruits and is discussed further below.

7.6 PLANTS WITH 6-14 RECORDS

7.6.1 Plants with six to fourteen records (totalling 64 records of 39 individual species) contain a number of plants which are of economic interest. Fourteen is used as a cut-off point in this case as above this frequency plants will occur in at least 10% of samples. Plants in this group include woad (*Isatis tinctora*; 6 records), deadly nightshade (*Atropa belladonna*; 6 records), bog myrtle (*Myrica gale*; 7 records), common agrimony (*Agrimonia eupatoria*; 7 records), rowan (*Sorbus aucuparia*; 8 records), dew berries (*Rubus caesius*; 9 records), weld (*Reseda luteola*; 10 records), fennel (*Foeniculum vulgare*; 10 records) and black nightshade (*Solanum nigrum*; 12 records). These plants represent a variety of uses including as dye plants (for woad and weld; discussed in section 7.12), as medicinal plants in the cases of agrimony and the nightshades, and flavourings in the case of bog myrtle and fennel. The possible medicinal uses of agrimony and the nightshades will be discussed in a separate section on medicinal plants. The role of bog myrtle as a beer flavouring has been suggested by both archaeobotanical and historical records (Behre 1999). Records for rowan might represent consumed fruits, though they may be considered in the same light as sloes, which are themselves quite bitter tasting; though also clearly more popular than rowan with 90 records from the database. Fennel is relatively uncommon, but of interest for this study as it does not appear in the 16-22 Coppergate samples, and seems to have a strong post-Norman Conquest distribution. This is in contrast to the flavouring dill, both of which will be discussed in the section on flavourings. The finds of dewberry (*Rubus caesius*), in contrast show a tendency to be found mainly in pre-Norman layers in York; eight of the nine records are found in this period. Two factors may be suggested here, one is

that there was a cultural preference for this fruit in the Anglo-Scandinavian period, the other is that Dr Hall in York is more confident about identifying these remains to the species level; whereas many would prefer to limit their identification to the genus level (*Rubus* species). A third, perhaps colloquial reason for their uncommon nature is the difficulty experienced in trying to collect the berries. Compared to the brambleberry and the raspberry which hold together quite easily if picked carefully, the dewberry has a tendency to burst as it is being picked, perhaps negating the ability to transport and sell it to an urban population.

7.7 PLANTS WITH 15-30 RECORDS

7.7.1 Plants with fifteen to thirty records (totalling 35 records with 25 individual species) contain those species which appear in 10-20% of samples. This includes finds of coriander (*Coriandrum sativum*; 15 records), wild strawberry (*Fragaria vesca*; 16 records), hemlock (*Conium maculatum*; 22 records), dwarf/sour cherry (*Prunus cerasus*; 23 records), raspberry (*Rubus idaeus*; 23 records), damsons (*Prunus insititia*; 23 records), opium poppy (*Papaver somniferum*; 25 records) and hemp (*Cannabis sativa*; 29 records). Records for coriander appear across the Anglo-Scandinavian (in the case of York) to Anglo-Norman (in the case of Beverley and Hull) periods, making it an interesting comparable flavouring when compared to dill and fennel. Wild strawberry is relatively uncommon, with only one record from outside York (12 Watergate Street, Chester), and two records from outside the Anglo-Scandinavian period (12 Watergate Street, Chester and a 16th century deposit from St Saviourgate, York; Carrott et al. 1998). This might suggest that this less juicy ancestor of the cultivated strawberry was more favoured during the Anglo-Scandinavian period than after when sweeter exotic imports were imported in increasing volumes. The identification of raspberry seeds can be related to the identification of dewberry discussed above. Similarly, many of

the issues for identifying *Rubus* species have been similarly debated for plants of the *Prunus* species. In the case of this study finds of *Prunus cerasus* occur across all periods and in several cities, namely, Beverley (7 records) Chester (2 records), Hull (1 record) and York (13 records from the 10th-13th century). As with dwarf cherry, finds of opium poppy occur in multiple cities (Chester, Durham, Hull, York) and across multiple periods (9th – 15th centuries). In contrast records for hemlock as heavily biased in favour of York with one record from mid-13th century Chester (Greig 1988), and the other 22 records coming from 10th-16th century York. Similarly hemp is found in 13th century Chester, as well as 10th-13th century York. One record for Hartlepool is present where Huntley attributed its presence to possible rope production for the maritime trade.

7.8 PLANTS WITH 30-50 RECORDS

7.8.1 Plants represented 30-50 times (20-33% of samples) occur 18 times in the database (with 15 individual species). This includes a number if economically important species. This includes the herbs Summer Savoury (*Satureja hortensis*; 32 occurrences), Celery seed (*Apium graveolens*; 43 occurrences) and Dill (*Anethum graveolens*; 46 occurrences). Both Plum (*Prunus domestica*; 46 total occurrences for *Prunus domestica* and *Prunus* cf. *domestica*) and Fig (*Ficus carica*; 36 occurrences) are also part of this group, as is the flavouring Hops (*Humulus lupus*; 35 occurrences) and the possible medicinal herb Henbane (*Hyoscyamus niger*; 35 occurrences). Summer savoury is restricted to York but occurs from the 9th to the 12th century, an example of a possible herb which maintains its popularity from the Anglo-Scandinavian to the post-Norman Conquest period. Celery seed seems to be largely restricted to the Anglo-Scandinavian period in York, with the one occurrence from outside York being from 14th century Beverley, though as discussed above the taxonomic identification of this seed as being a domestic

or wild form is difficult. The restriction of a flavouring to the pre-Conquest period is also reflected in the occurrences for dill, with the two post-Conquest records being for late 14th and 15th century Beverley compared to 46 records in total for this species.

7.9 PLANTS WITH 51-109 RECORDS

7.9.1 There are 31 records for plants which occur between 51-109 times; i.e. between 35-75% in the samples. This includes 22 species identifications, as well as three large combined groups: Chenopodioideae (*Chenopodium* and *Atriplex* species), *Rubus* species (*R. idaeus* and *fructicosus*) and *Malus* records (records for seeds, endocarp and seed base cups). These include many wild plants which are not likely to be food remains, as well as a number of plants which were consumed directly as food plants, or inadvertently consumed, as with the finds of Corn-cockle. *Brassica*/Brassicaceae seeds occur 51 times within the database, but this identification is of little use for archaeobotanical interpretation as this includes a range of cultivated and non-cultivated plants. Of more use are the 53 records for turnip (*Brassica rapa*) which allows consideration of the distribution of this specific species; occurring as it does from the late 9th to the 16th century, though with a tendency for these records to be found towards the earlier part of this period. Plants from the Polygonaecae occur quite frequently with finds of redshank (*Polygonum persicaria*; 54 records), pale persicaria (*P. lapathifolium*; 59 records), common knotgrass (*P. aviculare*; 64 records) and black-bindweed (*Fallopia convolvulus*; 68 records). The quote by the Owl in the medieval poem 'The Owl and the Nightingale' "I catch you by the privy house, with weeds and nettles overgrown" (Stone 1988), is quite apt as stinging nettle (*Urtica dioica*) occurs 63 times and small nettle (*Urtica urens*) occurs 89 times. In this group finds of flax seeds occur 68 times, and occur from Chester, Beverley, Hull and York, and range from the late 9th to the 15th century.

7.10 CEREALS

7.10.1 From the database for this study cereal remains were recorded in many of the samples. Both grains and chaff are represented and could be a mixture of cereal bran from bread, consumed grains, as well as grains which formed part of the background 'noise' of the urban seed bank, and which were incorporated into the cesspit deposit along with other plant remains during clearance episodes. It should also be considered that animals stalled in the urban environment and fed on grain might produce faecal matter that is incorporated into a pit which also contains human faecal waste, therefore care must be taken when trying to interpret these remains. In these cases recent experimental work on the digestive taphonomy of the animal digestive system could be used to aid in the interpretation of some remains (Wallace and Charles 2013). In this case a certain ambiguity remains regarding the taphonomic pathway which brought cereal grains to each cesspit sample. However, some useful patterns do emerge.

7.10.2 Firstly, all of the domestic cereals common to medieval Britain are found in the sample area; i.e. wheat, barley, oats and rye.

7.10.3 In terms of grains oats are the most common cereal recovered, being found in 60 samples. The majority of these are given a general identification of '*Avena* species', though in 11 cases enough of the grain was present to allow the identification of specifically cultivated oats. Barley varieties included twisted grain types (2) and naked barley (1). However, of the 36 occurrences of barley the majority are of '*Hordeum* species'. Wheat remains were most commonly identified as *Triticum aestivo-compactum* (compact type bread wheat), which were recorded in 30 samples. Less commonly there are 2 records for *T. spelta* (Spelt wheat), as well as one for 'Hexaploid bread wheat' and 14 for '*Triticum* species'. Rye was recorded in 15 samples, with nine

samples producing remains suggested as rye, with a further 9 identifications of 'Wheat/Rye'.

7.10.4 In terms of the chaff remains present it could be wondered whether the identifications have as much to do with the personal judgement of the analyst, as opposed to the actual contents of the samples. Wheat and barley rachis are only recorded once, with a single wheat floret base and a single oat floret base. Rye rachis is recorded three times, while oat glumes are recorded five times, as well as eight occurrences of oat bran. However, by far the most common cereal material, and one of the most common items recorded for the whole study are the 91 records for wheat/rye bran fragments. This occurs with such frequency that the presence of bran fragments is often used as a proxy method for identifying the presence of faecal material.

7.10.5 What the cereal remains from cesspit deposits tell us about medieval crop usage is unclear. The remains will have been exposed to a different range of taphonomic processes than those from the larger charred cereal assemblages such as those from corn drying kilns, but understanding this in the context of the medieval economy may need more research. Recent calculations for the national grain output for the 14th century are heavily biased in favour of scenarios in south-eastern England (Stone 2006, 21), and it is questionable whether these are even relevant to Northern English archaeological contexts as a whole.

7.11 MOSSES IN THE DATABASE

7.11.1 The mosses recovered from the cesspit deposits in Northern England represent a great diversity in the number of species present with 57 recorded in the data base for this study. These are present in 90 of the samples, 88 of which were from York (and therefore identified by Dr. Allan Hall). Of the species present 13 occurred in one sample only, 13 occurred in two samples and five occurred in three samples. The most commonly identified species

was *Neckera complanata* (flat neckera), which was identified in 65 samples. The rest of the top ten most commonly identified species ranged in frequency from 44 identifications to 20 identifications. The full list of recorded mosses is presented in Table 3 below.

7.11.2 Of the identified mosses it can be seen that a limited number of species (when one considers the available species in the Yorkshire region) occur across a number of sites. The other notable observation suggested here is that even within York there is a tendency for the moss deposits to be present in the Anglo-Scandinavian deposits, but not from those dated after this period. Looking at the samples from 25 Bridge Street Chester, which were also examined by Dr. Hall it can be seen that these samples dating from the 14th-17th century do not have records of mosses. Therefore three hypotheses can be proposed. The first, and the currently commonly held view, is that moss identification is poorly developed amongst archaeobotanists in Britain and are therefore commonly ignored as part of the vegetative detritus of urban archaeobotanical samples. The second view, suggested by Dr Hall, is that preservation is the main factor as the remains from 16-22 Coppergate were particularly well preserved even when compared with the remains from other (stratigraphically higher) periods in York. Thirdly, and the suggestion which is proposed here, is that the differences between the common occurrences of moss in York in the pre-Norman period, and the relative paucity of moss identification from the rest of the samples in the database (including post-Anglo-Scandinavian samples from York) is linked to changes in the use of mosses as anal wipes amongst those living in urban areas. If this is the case then this may be evidence of the profound effect that the arrival of Norman rule brought to Northern England. The mechanism for this change, and what is might mean as evidence for the cultural impact of the arrival of the Normans on the everyday activities of the population is

a topic which could be investigated more fully by further study, but cannot be discussed in great detail here. This could fall within a study of the material used in the medieval period as anal wipes, and by extension the role of personal hygiene in Britain during the medieval period. Should Reynolds's suggestion that hay was used as an anal wipe in the medieval period prove correct than its presence in medieval cesspit deposits could be evidence of more than the remains of fodder (Reynolds 1946).

Moss species	Common name	Total
Anomobryum filiforme		3
Anomodon viticulosus	Rambling Tail-moss	4
Antitrichia curtipendula	Pendulous Wing-moss	32
Atrichum undulatum	Common Smoothcap	1
Barbula cf. species	Beard-moss	1
Brachythecium/Eurhynchium sp		3
Bryum sp.	Thread-moss	2
Calliergon cf. giganteum	Giant Spear-moss	15
Calliergon cuspidatum	Pointed spear-moss	34
Campylium elodes	Fine leaved feather moss	2
Campylium stellatum (cf.)		5
cf. Amblystegium sp(p).	Creeping feather-moss	1
Cratoneuron commutatum	Curled hook-moss	2
Cratoneuron filicinum	Fern-leaved Hook-moss	1
Cratoneuron filicinum		1
Dicramun sp.	Wind Bloon/Fork Moss	5
Diphasium alpinium (D. complanatum)	Alpine Clubmoss	31
Drepanocladus aduncus	Knieff's Hook-moss	2
Drepanocladus sp.		12
Eurhynchium praelongum		12
Eurhynchium sp	Feather-moss	2
Eurhynchium speciosum		1
Eurhynchium striatum	Common Striated Feather-moss	19
Homalia trichomanoides	Blunt Feather-moss	7
Homalothcium nitens		1
Homalothcium sericeum/lutescens		19
Homalothcium sp		4
Hylocomium myosuroides		1

Hylocomium splendens		23
Hypnum cf. cupressiforme	Cypress-leaved Plait-moss	28
Isothecium myosuroides	Mouse-tail Moss	12
Isothecium myurum		20
Leucobryum glaucum	Large White-moss	2
Leucodon sciuroides	Squirrel-tail Moss	20
Lycopodium sp		1
Mnium hornum	Swan's-neck Thyme-moss	1
Neckera complanata	Flat Neckera	65
Neckera crispa	Crisped Neckera	6
Plagiomnium sp.		2
Plagiomnium undulatum	Hart's-tongue Thyme-moss	3
Pleurozium schreberi		1
Polytrichum formosum		1
Polytrichum species		3
Pseudoscleropodium purum	Neat Feather-moss	11
Racomitrium canescens	Hoary Fringe-moss	2
Rhynchostegiella tenella (cf.)	Tender Feather-moss	1
Rhynchostegium sp	Feather-moss	2
Rhytidiadelphus sp.	Turf-moss	10
Rhytidiadelphus squarrosus	Springy Turf-moss	8
Rhytidiadelphus triquetrus		2
Scorpidium scorpioides	Hooked Scorpion-moss	13
Sphagnum imbricatum		2
Sphagnum Section Acutifolia		2
Sphagnum Section Sphagnum		1
Sphagnum sp.		1
Thamnobryum alopecurum	Fox-tail Feather-moss	3
Thuidium cf. tamariscinum		44
Ulota crispa	Crisped pincushion	1
Ulota species		21

Table 3: Moss species, their common name and their occurrence in the sites sampled

7.12 DYE PLANTS

7.12.1 *Rubia tinctorum* (Madder) was identified in 30 samples. In all cases they were identified as coming from Anglo-Scandinavian deposits. This may suggest the use of the plant as a dye exclusively in the Anglo-Scandinavian period,

though it is as yet unclear if its use ceased completely after the arrival of the Normans. The red colour which this plant produces seems to be most strongly present in the rhizomes, and it was these that Tomlinson identified as part of her study of vegetative remains from the 16-22 Coppergate material (Tomlinson 1985). Thirty samples also contained *Genista tinctoria* (Dyers greenweed), a shrub similar in appearance to broom which can be used to create a yellow colour. In this case 29 of the samples came from Anglo-Scandinavian deposits. One sample not firmly dated to the Anglo-Scandinavian period was from the Colonia. This was dated to the 11th-12th century, and therefore could conceivably also be from a late Anglo-Scandinavian deposit (Hall and Kenward 1990, Pit <76>). As with the finds of madder stem, there is a strong link between the Anglo-Scandinavian period and this plant, though its uses from the Norman period onwards are as yet unclear. Woad (*Isatis tinctora*) and Dyer's Rocket/Weld (*Reseda luteola*) are two dye plants present in the database for this study, but are not recorded particularly commonly. There are six records for woad in cesspit deposits, with a concentration of three of these from late 9th-early 10th century deposits in 16-22 Coppergate; with a further two from Coppergate and one from Micklegate (Kenward and Hall 2000). This is likely to be a combination of the lack of taphonomic pathways bringing the woad to the cesspit deposits, as well as the complicated preparation process which is unlikely to leave remains easily identifiable in the archaeobotanical record. As the preparation process for this plant involves fermenting the crushed leaves then the infrequent presence of woad seeds may not necessarily point to the lack of use of woad in dying (Mabey 1997, 144). The noxious smell of this process may also suggest that its preparation was not something that could be undertaken in an urban area without attracting complaints from other citizens; best noted in the declaration by Queen Elizabeth in the 16th

century that woad production should cease temporarily in any town she was passing through (Hurry 1930). Many of the masses of fermented vegetative matter from the Anglo-Scandinavian deposits may have been from woad, but as it is most easily identified via its seeds then this does not allow it to be as easily discerned as the madder roots or Alpine clubmoss. Weld is unusual among the dye plants as it is present not just in samples from York, and not mainly from Anglo-Scandinavian deposits. Records are also present for late 14th century and for 15th century Beverley, late 13th-early 14th century Hull, as well as two for 10th/11th century York, late 13th century York and 4 for 16th century York. This might suggest that weld is simply growing in these areas as a common weed of nitrogen rich waste ground, as identified by Huntley at the Mansion House, Newcastle (Huntley 1995c).

7.12.2 Alpine clubmoss (*Diphasium alpinium/complanatum*) is a final plant associated with dying. Its use in York has been suggested as being more likely to be linked to its use as a mordant than as a dye in its own right. This is due to its ability to absorb aluminium from the soil (Mabey 1997, 230). Tomlinson references a number of experiments which suggest it is only of minimal value as a dye plant in its own right (Tomlinson 1985, 277). As can be seen on Chart 1 below there is a general pattern visible in the finds of dye plants within the region. A high is reached in the late-10th to 11th century where Dyer's Greenweed, Alpine Clubmoss and Common madder all reach their most common levels. A fall in the 11th century does not recover and all three do not appear after the 13th century. It is proposed that these plants were all dye-plants associated with the Anglo-Scandinavian population in York. Economic changes after the arrival of the Normans might have lead to the movement of dying industries elsewhere (perhaps even to Flanders where much raw English wool was exported). It can also be seen that woad was never a particularly common find from this periods, the reasons for which

have been discussed above. Finds of weld may not be so easily linked to dying as it is also a common find in waste ground (in contrast to the other dye-plants recovered weld is identified via it's seeds, rather than vegetative parts which hold the actual active dye ingredient).

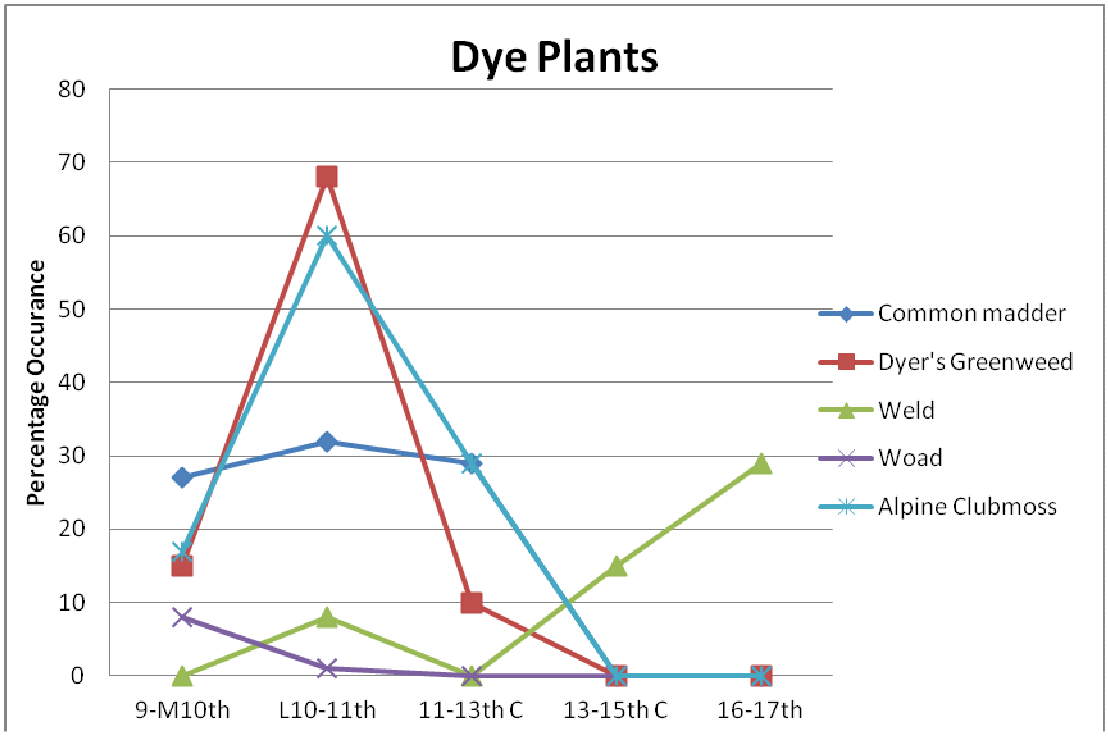

Chart 1: Changing pattern of dye-plant recovery

7.13 MEDICINAL PLANTS

7.13.1 A number of plants occur in the database which are categorised as medicinal plants. An examination of medieval herbal treatises might classify many more of the wild plants found within the survey areas as medicinal. In this case a small number of species were chosen which have known medicinal properties; generally pain relief associated with members of the Solonaceae family.

7.13.2 As can be seen in Chart 2 below there is much variance in the recovery of the six medicinal plants examined. Generally there is a downward trend through the period of study, but there are great internal variances; such as

the presence of henbane which varies from 39-3-29% across the first three periods. The only plant which becomes more common between the beginning and end of the study period is Deadly Nightshade, though it is not recovered at all from the 11th-15th century. The identification of *Cannabis sativa* as being either a narcotic or more prosaically a raw material for rope manufacture (hemp) depends on context of recovery. Its decline through the study period cannot be interpreted as a decline in the need for rope, as highlighted in the quote highlighted above (Section 6.12.10). Indeed, it might be the expansion of a professional based rope industry which directed hemp plants away from contexts in which they might be preserved and towards centralised, industrial sites of manufacture. The evidence from the current study suggests that the cesspit remains may not provide an even representation of the consumption of medicinal plants during the medieval period. It is perhaps the idiosyncratic nature of their consumption which means they are not deposited in cesspits in a consistent and predictable manner. It must also be appreciated that the leaves, or the crushed seeds and berries form an important means of administering the drugs, therefore reducing the likelihood of their appearance in archaeobotanical samples.

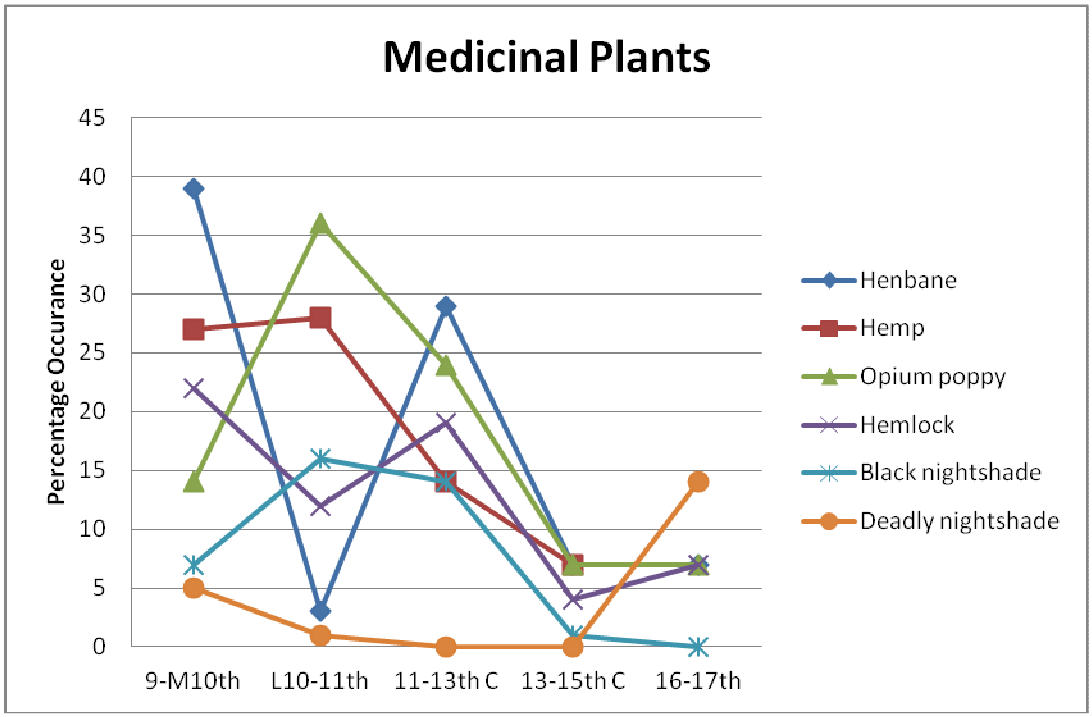

Chart 2: Changing pattern of medicinal plant recovery

7.14 FLAVOURINGS

7.14.1 A number of flavourings are recorded within the database, though much like the medicinal plants it can be disputed what exactly constitutes a flavouring. Here five particular flavourings are examined on the basis that we have good historical and archaeobotanical records for their use. These are two beer flavourings (hops and bog myrtle) and three food flavourings (fennel, dill and coriander). Across the period under review apart from fennel there is a decline in the number of these plants recovered. Both hops and dill decline across the period, while coriander starts from a high of being found in 20% of 9th-mid 10th century samples and does not appear again until the 13th century. The decline and disappearance of hops seems to contradict the historic evidence for the period in which hops increase as a beer flavouring, and eventually dominate the flavouring of beer by the later medieval period, as least in Germany (Behre 1999). The decline in the recovery of hops may have more to do with the movement of beer production away from the indivudal household level, than with its real

decline or disappearance from English brewing. In other cases the declining recovery of the food flavourings highlighted here might be linked to a shift to exotic imports (See Chapter 9 below for the historic records), or a shift in usage which lead to the utilisation of the leafy parts of the plant, rather than the seeds. Such a phenomenon has been suggest for the changing patterns of fennel and parsley from the Roman to medieval period (Livarda and van der Veen 2008, 207)

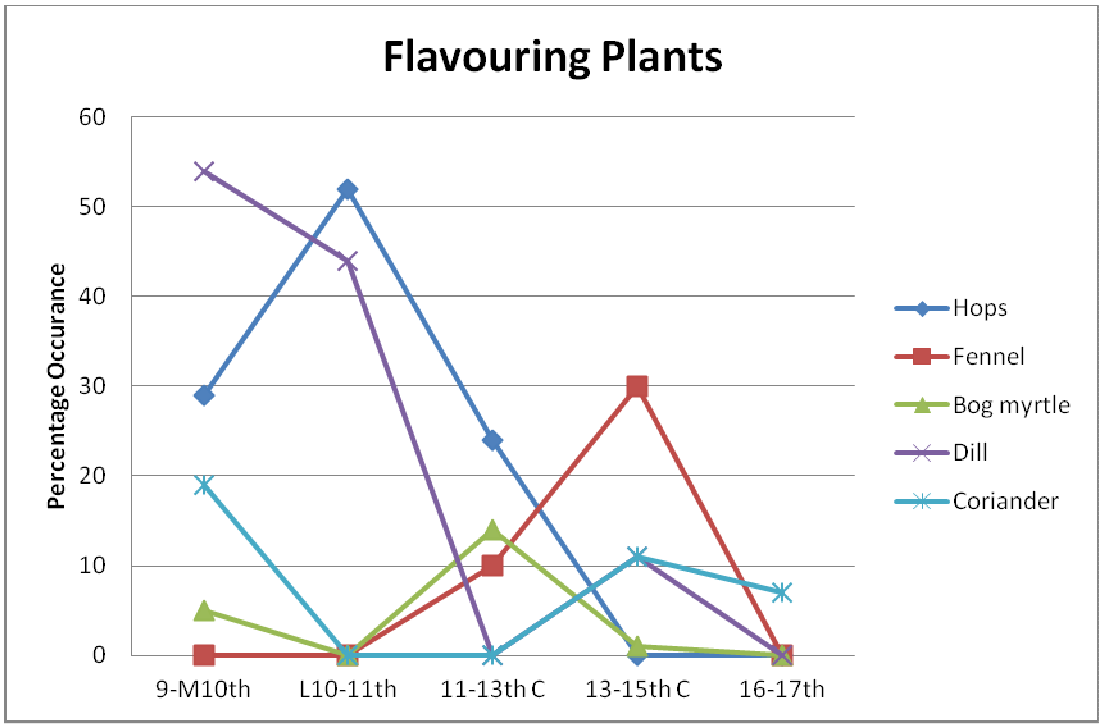

Chart 3: Changing pattern of flavouring plant recovery

7.15 Native Fruits and Vegetables

7.15.1 Chart 4 presents the changing frequency of seven fruits, as well as remains of onion. These plants are highlighted as they were all commonly available growing in Northern England. It can be seen that in general there is a downward trend in the frequency of these remains, though in the cases of brambleberry and elder the pattern is less clear. From a high of 75% for sloes and 85% for apple remains both of these plants decline across the period to 14% and 36% respectively. The same can be seen for hazelnut and flax remains which are half as common in the 16th-17th century period as they

were for the 9th-mid 10th century period. These results can be compared with the finds of onion. We know from historic records that onions were consumed in large quantities, though we also know they were never expensive, even if imported from the Netherlands (Dyer 2006). We also know that the remains of onion need very good preservation conditions before the remains will be available for archaeobotanical identification, in contrast to the dense, more easily preserved seeds of brambleberry, sloe or elder. With all these factors combined it can be seen that onion reaches a peak frequency in the late 10th-11th century, being found in 36% of samples, but here after declines to being present in 14% of samples.

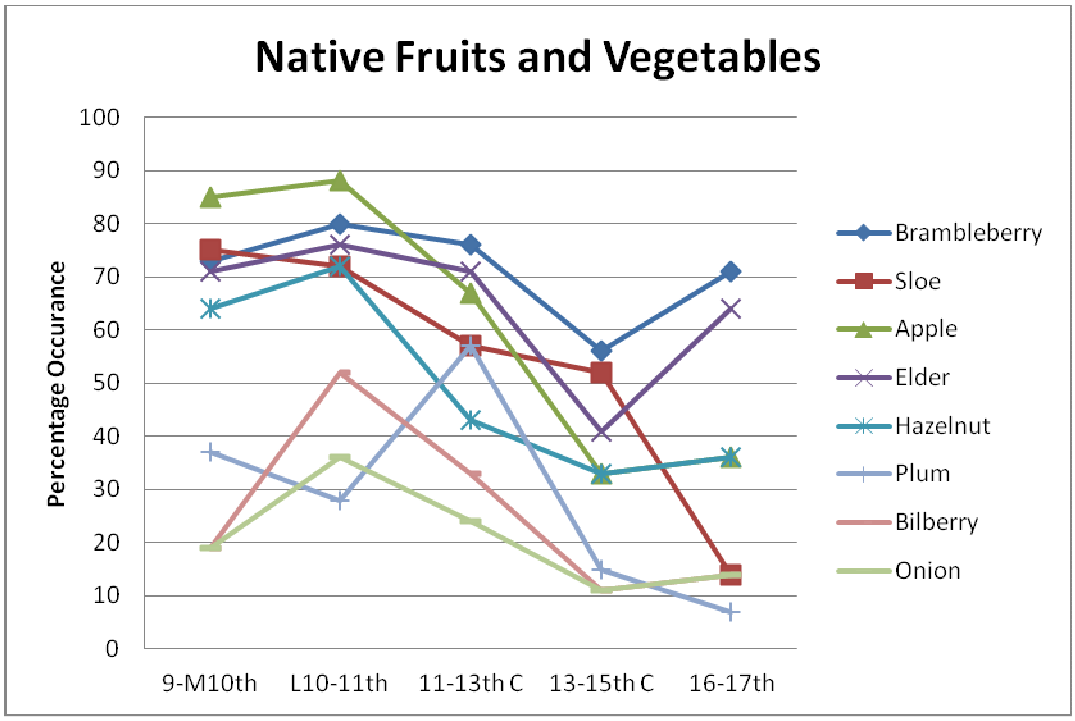

Chart 4: Changing pattern of native fruit and vegetable recovery

7.16 IMPORTED FRUITS

7.16.1 Imported fruits form an increasingly important element of the archaeobotanical assemblages recorded for this study. As can be seen in Chart 5 during the 13th-15th century, just at the time many native fruits are decreasing in popularity there is a corresponding rise in imported fruits. This includes fig seeds which are found in abundance by thru 16th-17th

century, as well as strawberry, which was only brought into cultivation for its berries in the later medieval period. Walnut is recovered at consistently low levels, and is also only infrequently mentioned in the medieval recipes surveyed.

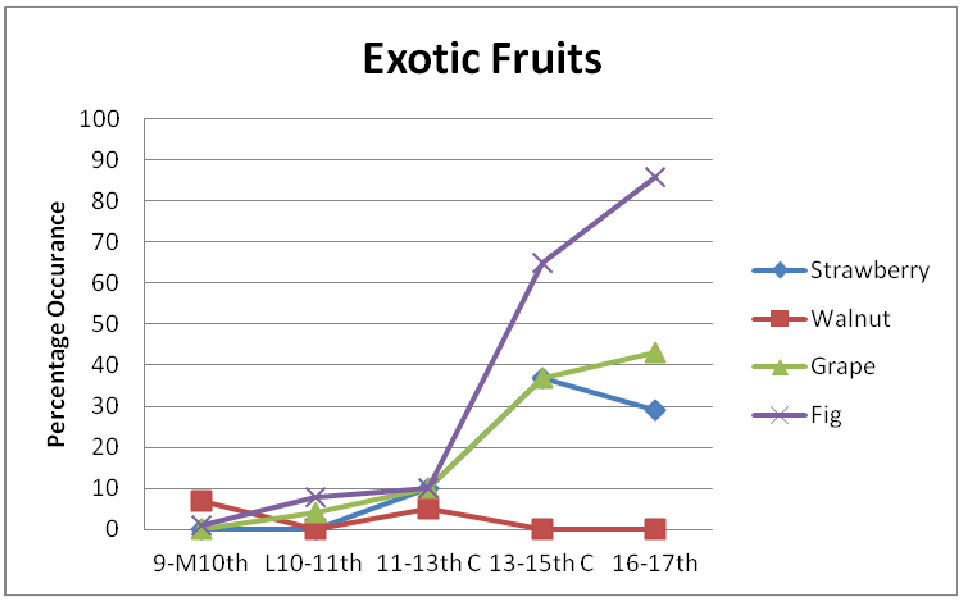

Chart 5: Changing pattern of exotic fruit remains recovery

7.16 General Conclusions

7.16.1 Fourteen species occur in at least 50% of the samples recorded and include a number of food plants. This includes 80 records for hazelnut (Corylus avellana), 100 records for apple (*Malus sylvestris/domesticus*), 104 records for blackberry (*Rubus fructicosus*) and 90 records for sloe (*Prunus spinosa*). To this may be added elder (*Sambucus nigra*), though the identification of this species as a food plant is hampered by its tendency to grow well on abandoned urban sites and the likely longevity of its seeds in the soil. Further research will be needed in order to assess how important this plant may have been in the medieval diet, such as by comparing its frequency in cesspit and non-cesspit deposits from urban sites in order to assess whether it is equally or unequally common to both sets of contexts. It is noteworthy that two of the top five most common plant species are from the

Chenopodiaceae; *Chenopodium album* (90 records) and *Atriplex patula/prostrate/hastate* (99 records). As with the elder seeds this may relate to the ability of these species to produce prodigious numbers of seeds, and their longevity in the soil. When these two groups are combined this gives a combined count of 113 occurrences for Chenopodioideae. Indeed deposits of Chenopodiaceae, elder and nettle which dominate assemblages has been used to infer poor preservation in some urban sites (Kenward et. al 1986, 272). It is notable that of the top ten most commonly recorded plants all can be shown to have tough seeds likely to survive for long periods in the soil: e.g. hazelnut, apple seeds, blackberry pips, sloe stones, Chenopodiaceae seeds, elder and corn-cockle. This final seed is the plant species most commonly recorded single species in the database. Corn-cockle (*Agrostemma githago*) occurs in 109 samples, or just over 75% of cases. This weed has long been recorded as a persistent and poisonous weed of cereal fields. Its ability to survive the cereal processing sequence and to be milled into bread flour is likely to be the cause of its success. In this respect the frequency of its recovery in medieval cesspit deposits is a testament to the importance of bread consumption.

7.13.2 The frequency of corn-cockle finds deserves further consideration on a number of points. First, it is of interest archaeobotanically as it is neither a food plant, nor a common weed of urban sites; its presence in urban deposits being due presumably to its role as a food contaminant. Secondly, it is common across the chronological extent of this study, and in most areas, suggesting little improvement in the control of this plant at least from the Anglo-Scandinavian period to the Elizabethan period. The public health impacts of this plant may have been considerable due to the bitter taste and grey appearance it gives bread, its hard texture and the indigestion often experienced by those who consume it (Cooper and Johnson 1984, 78). The

other way of thinking about this phenomenon is the effect of eating white bread which had been properly cleaned of corn-cockle seeds. Who had access to bread of this nature is an important element of medieval foodways and it should be considered as much of a luxury item as imported figs and grapes. Indeed, it is worth considering the occurrences of fig, grape and corn-cockle. From late 14th century and 15th century Beverley seven of the eleven deposits contain fig, grape and corn-cockle (McKenna 1991; McKenna 1992). Of the remainder one contains corn-cockle while the rest contain none of these species. This pattern was also observed from the barrel latrine in Worcester where both cesspit deposits produced corn-cockle, fig and grape remains. From 15-17th century Chester fig seeds were recovered from all ten of the samples from this period (Jacques et al. 2004). Of these ten samples six also contained grape pips, but no deposits contained remains of corn-cockle. Similar results could be seen from two sites in Durham where two samples from the 11th-12th century produced corn-cockle remains but no fig or grape (Donaldson 1979), while three 15th century deposits all produced fig remains, and one abundant record for grapes, while producing no corn-cockle remains (Rackham 2000). Records for Hull and York are more variable. Four of the five Hull samples producing either corn-cockle and fig seeds, or corn-cockle and grape seeds, a pattern also seen in York where only four occurrences of fig and/or grape occur independently of corn-cockle; compared to 12 total records of fig/grape (a pattern which needs to be considered in the context of the predominantly pre-Norman York deposits and their generally low occurrences of fig and grape). In comparison no remains of corn-cockle, grape or fig was recorded from 13th century Newcastle (O'Brien 2006), while from the drains at Paisley Abbey fig was recorded but not grape or corn-cockle (Dickson 1996).

7.13.3 The presence of corn-cockle seed remains but not fig or grape is the most common scenario to be encountered from medieval deposits. As discussed above its presence in bread, in trace or noticeable amounts, is likely to have been a normal part of the medieval diet. In deposits where corn-cockle does not occur it should be borne in mind that this might be evidence of the consumption of higher quality bread, and therefore it may be a reflection of the social status of the occupants of that particular property. In some scenarios mentioned above it occurs with grape and fig seeds. This might be a normal scenario for a household which could afford occasional luxuries, at certain times of the year, and possibly also occasionally white bread, but for whom the consumption of bread which had been baked with corn-cockle infested flour would also have been a normal part of their diet. The third group, households where exotics occur, but not corn-cockle, might be indicative of the highest social classes, those who could afford to consume bread made from properly cleaned flour, as well as consume imported luxury products. The expansion of the cash economy in the 9th century allowed wealthy landowners to purchase the trappings of aristocratic luxury. Some economic historians point to the use of this money to purchase items such as higher quality horses and cloth, or armour and weapons (Dyer 2002, 33). However, the diversification or refinement of their diet may also be a product of the increasing wealth of an individual or a household. The shift in political and economic influence from Scandinavia to France and Southern Europe which occurs during the shift from the Anglo-Scandinavian to Anglo-Norman periods may be an element of this refinement. However, in the case of the contrast between the lack of corn-cockle/presence of fig and grape in Durham (Donaldson 1979, Rackham 2000) and the lack of exotics/presence of corn-cockle in Newcastle (O'Brien 2006) it can be seen that even in the later medieval period there will still exist

regional social differences. The question remains whether this is indicative of economic and social differences, insufficient sampling in some cities, or whether the elites of different regions found different ways to express their social status. This is not merely a question of clearly identifying the 'haves and the have nots'. As Graves has pointed out: "Consumption patterns are embedded in the social concerns and practices of different social groups or classes, and not simply reducable to relative wealth" (Graves 2002, 182).

7.14 DIACHRONIC CONSIDERATION

7.14.1 As discussed earlier, and summarised in Table 1 (repeated here) the entire database can be broadly divided into five sections based on the grouping of samples around particular periods:

Dated periods	Samples	Sites	City/Town
9th – mid 10th century	59	3	1
Late 10th – 11th century	25	4	2
11th – 13th century	21	5	2
13th – 15th century	27	12	7
16th – 17th century	14	4	3

Table 1: Main period divisions; sites, samples and cities represented (repeated from above)

7.14.2 Though the entire assemblage can be examined as a whole, some subtle changes can be observed across time. This demonstrated several important conclusions:

- For the medieval period the grouping of several contexts from different periods to examine diet may lead to imbalances in our knowledge of specific periods, or changes between periods.
- There are changes observable across the period being examined by this review; these may be changes relating to diet, preservation or urban ecology.
- When discussing what may be representative of an 'average' medieval cesspit the suite of remains we might need to consider changes through

time; a typical Anglo-Scandinavian cesspit is not the same as a typical later medieval cesspit.

7.14.3 There are a number of factors which should be borne in mind before considering the diachronic change across the time period for this study. Firstly, the period divisions which have been proposed are not evenly represented. Therefore the 9th-mid 10th century has the largest number of samples (59), but is represented by one city, with 55 of these samples coming from 16-22 Coppergate. The other four periods are somewhat more evenly comparable, though there is still a problem of under-representation from the 16th-17th century period.

7.14.4 The second issue is the decline is the diversity of plants across the period under review. It can be seen that there is a consistent decline in the number of vascular plants (only plant occurrences identified to the genus or species level) and mosses represented from the 9th – 17th century, as can be seen in Table 4:

Dated periods	Vascular Plants	Bryophytes
9th – mid 10th century	184	38
Late 10th – 11th century	177	43
11th – 13th century	141	28
13th – 15th century	131	8
16th – 17th century	69	4

Table 4: The apparent declining diversity of plant remains across the period of study

7.14.5 This declining diversity of species recorded across the period needs to be further considered when comparing periods. It is proposed that this is occurring for two reasons:

- Firstly, the excellent waterlogged preservation which characterised the sites in the earlier periods is not consistently present for the later periods.
- Secondly, the ecology of the urban spaces in the later medieval period is altering due to changes in building materials, organised urban waste

disposal and possibly due to social changes which means animals are less frequently kept in urban areas in such large numbers.

7.14.6 If we further examine the data then it can be asked: what plants are present in the earlier periods and become rarer in the later periods? Also, are these mainly delicate remains and/or from rare plant species. If they are delicate or rare items then the differences in the database may be more firmly ascribed to post-burial taphonomic degradation. The decline in the occurrences of moss species may be evidence of just such a trend.

7.14.7 However, it can been seen that many of the plants that decline through the period are neither rare nor are they represented by delicate remains. In addition many of the species which are in decline could be regarded as archaeobotanically easy to identify:

Species		%	%	%	%	%
Anthemis cotula	Stinking Chamomile	58	80	43	22	7
Apium graveolens	Celery	42	52	19	4	-
Brassica rapa	Turnip	34	68	62	7	7
Cannabis sativa	Hemp	27	28	14	7	-
Crataegus monogyna	Hawthorn	24	32	24	7	-
Fallopia convolvulus	Black-bindweed	66	80	43	-	-
Hyoscyamus niger	henbane	39	12	29	7	7
Polygonum aviculare	Common Knotgrass	54	72	29	26	7
Polygonum hydropiper	Water pepper	25	48	29	4	-
Polygonum persicaria	Redshank	46	68	38	7	-
Prunus domestica total	Plum species	37	28	57	15	7
Raphanus raphanistrum	Wild radish	59	88	48	19	7
Rubia tinctorum	Common madder	27	32	29	-	-
Sonchus asper	Spiney milk thistle	32	72	33	19	-

Table 5: Example of the declining species though time expressed as a the percentage likelihood that the species is present in the samples from each period

7.14.8 As can be seen, even plants which produce hard seeds such as hawthorn and sloe are in decline across the study period. Therefore it is suggested that the decline in species diversity is due to both poorer levels of preservation, as

well as cultural changes to the urban environment. Both of these fields should be of interest to both archaeologists and archaeobotanists, particularly when we consider Orton's view that "many taphonomic inputs represent the addition of information to the assemblage, providing evidence regarding the processes which have taken place" (Orton 2012, 321).

7.14.9 Declining frequency through time is a factor for many of the species, however, (summarised in Table 5 and presented more fully in Table 12 below in the Additional Table Section), in the database as a whole there is a fairly consistent rise from the 9th – mid 10th century to the Late 10th – 11th century period, before a decline thereafter. It is possible this rise in the frequency of many species in York (most of the samples from these early periods are from York), are due to environmental or cultural factors at the time these deposits were formed, and before the creation of the overlying late 10th-11th century deposits, rather than later post-burial taphonomic processes. This is presumed as these processes would need to somehow circumvent the Late 10th – 11th century layers in order to begin to act upon the earlier deposits. Why this is occurring may need to be examined via a broader examination of the records for York.

7.15 CHANGES THROUGH TIME

7.15.1 The changing patterns of plant remains are summarised on Table 12 below. Here, in Table 6, a synopsis of the main changes to food plants, possible medicinal plants and key wild plants will be given, in a similar manner as presented in Table 6 (the colour coding is derived from Table 12 where it is used as a visual aid for looking at the different species).

	Total	9-M10th	L10-11th	11-13th C	13-15th C	16-17th
Agrostemma githago	75	78	92	90	59	36
Rubus species fructicosus/idaeus total	71	73	80	76	56	71
Malus records - total	68	85	88	67	33	36
Corylus avellana	55	64	72	43	33	36
Linum usitatissimum	47	44	96	57	11	21
Anethum graveolens	32	54	44		11	
Humulus lupus	24	29	52	24		
Prunus domestica total	32	37	28	57	15	7
Ficus carica	24			10	63	86
Alliums (combined)	21	19	36	24	11	14
Hyoscyamus niger	24	39	12	29	7	7
Cannabis sativa	19	27	28	14	7	
Vitis vinifera L.	13		4	10	37	43
Fragaria vesca	11			10	37	29
Coriandrum sativum	10	19			11	7
Foeniculum vulgare	7			10	30	
Conium maculatum	15	22	12	19	4	7

Table 6: A summary of the percentage presence of the main food and medicinal plants in the database

7.15.2 As can be seen from table, there is a wide variation in the frequency of occurrence of some economically important plants. This may be because the plant was unlikely to be consumed in large volumes (in the case of the possible medicinal plants), is a new introduction (or reintroduction) in the medieval period (as in the cases of grapes and fig), or represents seeds remains with varying degrees of hardness, or ease of identification.

7.15.3 The pattern observed for *Agrostemma githago* (Corn-cockle), is of social and economic interest as though it is common for the database as a whole (occurring in 75% of samples), this varies through the medieval period from 78% at the start to 36% by the end. This might represent changes to crop

processing procedures through the medieval period which led to greater care being taken to remove it from cereal fields (including by the enactment of royal statutes).

7.15.4 Fruits such as apple, brambleberries and *Prunus* species (sloes, damsons, plums), are all relatively common, though with the noticeable decline towards the later medieval period, possible as new fruits such as grapes and figs become favoured. This pattern of decline towards the later medieval period is also seen in the decline and eventual disappearance of hops (*Humulus lupus*). This decline is also noticeable with the recorded occurrences of dill (*Anethum graveolens*), which is contrasted with the appearance of fennel after the start of the 11th century.

8 EXPERIMENTAL RESEARCH

8.1 INTRODUCTION

8.1.1 The experimental aspect of this project involves an examination of the effects of the human mastication process on a number of fruits and plant flavourings common in medieval archaeobotanical deposits. A number of other plants were also included in order to study the effects of chewing on seeds of different shapes and sizes (many flavourings being of the characteristic *Apiaceae* shape). The examination of the effects of mastication was chosen as this is the main site of mechanical wear to ingested food.

8.2 MASTICATION EXPERIMENT

8.2.1 A number of experiments were undertaken on the mechanical damage caused by the process of chewing food, i.e. the mastication process. The purpose of this experiment was to assess the physical changes to the gross morphology of certain food plants and flavourings caused by the mechanical grinding of the teeth. Based on the observations of the author the seeds of certain plants, such as figs and *Rubus* species, can prove quiet difficult to break by chewing, even when one is consciously trying to do this. A systematic series of experiments was devised to examine how different plants are affected by the effects of chewing.

8.2.2 Factors that to be looked for included:

- Breakage patterns on individual seeds
- Breakage ratios amongst the number of seeds recovered
- Possible early effects of starch digestion caused by the exposure of the internal seed embryo to amylase in the mouth.

8.3 EXPERIMENTAL METHODOLOGY

8.3.1 The first issue to be considered was the choosing of a suitable chewing medium into which the spices being examined would be mixed. This was

done to reproduce a naturalistic chewing action, one which would not be achieved simply by placing a measure of raw seeds into the mouth and chewing. Chewing mediums such as mashed potato, cold custard and stewed fruit were all considered but these were all problematical as it was felt the process of washing off this material lead to further mechanical damage when they were experimented with. A chewing medium needed to chosen which could be washed off easily and leave little residue on the remains being examined. Therefore it was decided that marshmallows would be used as they fulfilled the qualities needed in a chewing medium:

- They reproduced the effects of naturalistic chewing.
- They would remain within the mouth for at least 20 chewing actions.
- They could be spat out with the flavourings and dissolved in warm water without further treatment, meaning theoretically the only mechanical damage would originate from the action of the teeth.

8.3.2 The process for examining the flavourings involved cutting a single marshmallow in half (Image 1) and dipping the freshly cut section into the spice or flavouring (Image 2, Image 3); the freshly cut surface acted as an adhesive for this material. When each half was coated in the flavourings the two halves of the marshmallow were put back together and placed in the left side of the jaw (see below in the section concerning grape seeds how the different sides of the oral cavity produced different results). It was then chewed for a set number of times before being spat into a beaker with warm water at c.50ºC. After gentle stirring for 5 minutes the marshmallow dissolves completely leaving the flavouring completely clean (Image 4). The contents of the beaker there then poured though a 250-micron geological sieve (Image 5 and Image 6), and then placed into a glass vial with 70% ethanol for examination during the next week.

8.3.3 The process for examining the fruits (fig, grape, strawberry, blueberry) did not involve the use of a medium as naturalistic chewing could be achieved simply by chewing the fruit itself.

8.4 RESULTS

8.4.1 The results here are presented on a species by species basis.

8.4.2 The plants remains to be examined in this manner were:

Flavourings:

Brassica nigra – black mustard

Sinapis arvensis – Field Mustard

Foeniculum vulgare – fennel

Papaver somniferum – opium poppy

Nigella sativa – Fennel flower/Onion seed (kalongi)

Cuminum cyminum – cumin

Carum carvi – Caraway

Anethum graveolens – dill

Apium graveolens – celery seed

Coriandrum sativum – coriander

Linum usatissimum – flax

Fruits:

Rubus fructicosus – Blackberry

Rubus idaeus – Raspberry

Vitus vinifera – Grape

Malus domestica – Apple

Citrus × sinensis – Orange

Ficus carica– Fig

Weed Seed:

Agrostemma githago – Corncockle

8.5 *BRASSICA NIGRA* – BLACK MUSTARD

8.5.1 Three records of black mustard have been recorded in the database; all from York. The three records from York suggest a pre-Norman use of black mustard; though there are many more records for other Brassica species from the database (see Section 6.10.1).

8.5.2 Results of chewing *Brassica nigra*: Mustard seeds were chewed to assess how they would be damaged, but also to compare the results with the chewing of wild field mustard seeds (discussed below in the section on 'Other Plants'). The chewed mustard seeds can be divided into three groups:

- 119 seeds were undamaged after chewing.
- 41 were crushed, but identifiable
- c.20-30 were crushed in a manner which separates the testa and the endosperm.

8.5.3 These groups, undamaged, lightly damaged and heavily damaged are illustrated in Images 6-10.

8.6 *SINAPIS ARVENSIS* – FIELD MUSTARD

8.6.1 The group '*Brassica* sp./*Sinapis arvensis*' consisted of thirty-five records. Interestingly all are recorded from York.

8.6.2 If we take the Brassica group as a whole then there are 97 samples where they occur. This includes: *Brassica campestris* (Wild Turnip), *Brassica nigra* (Black mustard), *Brassica rapa* (Turnip), *Sinapsis arvensis* (Field Mustard) and general *Brassica* species. Of these 88 are from York and 9 are from elsewhere.

8.6.3 Results of chewing *Sinapis arvensis*: Seeds of field mustard were chewed in order to compare the results with those from cultivated black mustard (*Brassica nigra*). The seeds were chewed 20 times and can be divided into three categories:

- 85 seeds appeared to be undamaged by chewing.

- 52 seeds with single splits in the seed coat along one side. This exposes the internal endosperm.
- 6 seeds were crushed and completely split open in such a way that the testa and the endosperm were separated from each other.

8.6.4 The results here contrast with the results of the chewing experiment in black mustard. The field mustard seeds more likely to survive intact than those from the mustard which seemed to have a greater tendency to be crushed in a manner which separates the testa from the embryo (compare images 7 and 8). This is likely to be due to the thinner testa of the domestic mustard seeds.

8.7 *FOENICULUM VULGARE* – FENNEL

8.7.1 Ten records for fennel were recorded. Five of these were from Beverley. Of the total group one occurrence in York was dated to the 11th century, but the others dated from the 13th century to the 15th century, suggesting a largely post-Norman adoption of this herb. Considering the assemblage is dominated by Anglo-Scandinavian deposits it can be said with some confidence. Of the ten occurrences five derived from samples from Beverley, two from Chester, one from Hull and two from York.

8.7.2 Results of chewing Foeniculum vulgare: After being chewed 20 times the examined fennel seeds can be divided into four groups:

- 42 pairs of seeds where the *Apiaceae* structure is maintained.
- 48 undamaged single seeds.
- 35 where 50-75% of the seed has been damaged by crush damage. Of this group perhaps half of the seeds were damaged to the extent that identification to a species level might be hindered.
- 12 proximal or distal ends consisting of less than 25% of the seed were also recovered, though this can be viewed as a subset of group 3.

8.8 *PAPAVER SOMNIFERUM* – OPIUM POPPY

8.8.1 Opium poppy seeds were recorded in 25 samples, with no clear chronological pattern to suggest some periods were particularly better represented than others.

8.8.2 Results of chewing *Papaver somniferum*: Considering the large number of poppy seeds that were collected by the moist marshmallow (a factor of their small size), these seeds were not counted individually. A sample of 300 seeds was examined, which suggested that there were c.2000 seeds in the whole assemblage. Of these c.10% showed crush damaged, leading to the fragmentation of the seed; see Image 13.

8.8.3 Their small size suggests that even if caught between two teeth a poppy seed would only be crushed if caught between two cusps due to the inefficient nature of the human mastication process.

8.9 *NIGELLA SATIVA* – FENNEL FLOWER/ONION SEED (KALONGI)

8.9.1 Though this is not a common medieval spice in a Northern European context it was examined in order to assess the effects of chewing on a wider range of seed forms than the *Apiaceae* forms common to many of the flavourings from medieval contests. A sample of these seeds was chewed twenty times in the same manner as other seeds being examined here. The divided into two groups:

- 70 seeds had no damage or minimal damage. Minimal damage includes small (less than 0.5mm) splits along the seed testa. Some of these splits were very discreet and it was difficult in many cases, with the magnification being employed, to determine whether damage was present or not.
- c.25 seeds we heavily damaged, where 50% or more of the seed exhibited splits to the seed testa, or heavy crush damage.

8.9.2 It is notable that only a minority of the seeds examined from this group can be described as being undamaged. This may be in part due to the shape of

the seeds which are an uneven trigonous shape, exhibiting abrupt angles in the seed testa. This shape may be more conductive to being damaged by chewing than smaller, round seed, or those of the same shape as the *Apiaceae.* However, as stated above, some of this damage was so discreet as to be difficult to identify.

8.10 *CUMINUM CYMINUM* – CUMIN

8.10.1 As with other flavourings the seeds of cumin were chewed 20 times. The resultant seeds can be divided into four groups:

- 31 seeds were recovered as undamaged pairs, a pattern common for many flavourings of the *Apiaceae* family.
- 91 seeds were undamaged, showed no signs of mechanical damage to indicate the effects of chewing.
- 151 seeds showed evidence of major crush damage indicative of the masticating effect of the molars.
- c. 40 fragments represented material where 50% or less of the seed remained, with much material with a 'ragged' appearance, indicative of seeds that had been heavily damaged to the point of being largely broken apart during chewing.

8.11 *CARUM CARVI* – CARAWAY

8.11.1 Caraway seeds, and the other flavourings discussed below, were consumed by chewing them with the marshmallow medium discussed above. The sample was chewed twenty times before being disaggregated in water. The resultant seeds fell into four categories:

- 170 were undamaged with no change to their gross morphology.
- 12 pairs of seeds were still intact. Technically this group can be combined with the first group, but it is notable how little damage some of the seeds can be exposed to that even the simple process of separating the pair seeds has not been achieved

- 45 showed evidence of crush damage; where the seed showed evidence of being crushed, but sections of the seed had not broken away.
- 90 fragments were recorded, representing perhaps 40-45 seeds. 18 fragments represented at least 70% of a whole seed, with the rest consisting of fragments generally between 25-50% of the length of a whole seed. In these cases a complete break had occurred to separate the whole seed into sections. All of these breaks were lateral breaks, with no longitudinal damage being recorded from the assemblage; see Image 14.

8.12 ***ANETHUM GRAVEOLENS* – DILL**

8.12.1 Forty-six records of dill were recorded with three of these being from outside York. Within York all records for dill occurs in the Anglo-Scandinavian period (though those from outside York are from the 12th-15th century). Just as there was an absence of fennel from York's pre-Normal samples, there seems to be a concentration of dill records from this period within York. This might suggest a cultural preference in the Anglo-Scandinavian period for dill.

8.12.2 Results of chewing *Anethum graveolens*: After being chewed 20 times the dill seeds can be grouped into four categories:

- 55 pairs of seeds where the *Apiaceae* structure is maintained.
- 50 undamaged single seeds.
- 160 seeds with damage mainly to one or more of the five longitudinal wings which run from the proximal to the distal end of the seed.
- 22 severely crush damaged seeds. Many of these are longitudinal fragments of material, loose wing elements, or fragment of the seed embryo; see Image 15.

8.13 ***APIUM GRAVEOLENS* – CELERY SEED**

8.13.1 Comparable with the remains for dill, the forty-three celery records all occur from the Anglo-Scandinavian layers of York.

8.13.2 Results of chewing *Apium graveolens*: As with the poppy seed the small nature of the size of the celery seed meant a subsample of the total seed was counted. It is estimated c.3000 seeds were chewed for 20 times as part of this sample. Of these c.40-50% remained as paired seeds. Crush damage was limited to c.5% of seeds, with the remainder consisting of largely undamaged seeds.

8.14 *CORIANDRUM SATIVUM* – CORIANDER

8.14.1 The fifteen coriander records occur between Beverly, Hull and York, suggesting perhaps a link between the maritime trade in East Yorkshire and the import of this spice. It occurs from the Anglo-Scandinavian period, through to the 14th and 15th centuries in Beverley and Hull.

8.15.2 Results of chewing *Coriandrum sativum*: The coriander seeds chewed 20 times can be divided into 5 groups:

- 40 seeds remained completely intact, that is to say both sides of the *Apiaceae* seed remained intact; Image 16.
- 67 seeds (half of the seed pod) remained intact, with the testa and internal elements remaining intact. Of these fifteen showed minor crush damage which was insufficient to separate the seed embryo and the testa, and generally led to minor cracking of the testa; Image 17.
- 13 seeds showed significant crush damage with c.50% of the seed was intact: Image 18.
- 5 seed embryos had been separated from their testa and were largely intact: Image 19.
- 9 free floating testas were noted: Image 20.

8.15.3 As well this, a small amount of material was present which represented which appeared to be seed embryos which had been largely rendered unidentifiable due to heavy crush damage. This material does not seem to represent more than a few (less than 10) seeds.

8.16 *LINUM USATISSIMUM* – FLAX

8.16.1 The Sixty-eight records for flax seeds occur with several periods represented, but with a notable concentration of sixty-two of these records occurring from the Scandinavian layers at York. As with dill and celery seed it is suggested that flax seeds were a particular component of the Anglo-Scandinavian diet.

8.16.2 Results of chewing *Linum usatissimum*: After being chewed 20 times the resultant seeds can be divided into three groups:

- 85 undamaged seeds, seeds where no visible damage to the seed testa was recorded.
- 50 seeds with slight damage; the seed testa had split but had not broken into sections.
- c.5 seeds which were heavily damaged; the seeds had broken into fragments smaller than 50% of a seed.

8.16.3 As with other plants recorded here there is a tendency for the majority of seeds to remain undamaged after chewing. In this case the damage recorded was minimal, being largely recorded as splits to the seed testa.

8.17 SUMMARY OF MASTICATION EFFECTS OF FLAVOURINGS

8.17.1 The results of this series of experiments is summarised in Table 7.

		Total	Undamaged	Damaged but identifiable	Heavily damaged, identification difficult	% which might become unidentifiable
Caraway	***Carum carvi***	**272**	**182**	**45**	**45**	**17**
Celery seed	***Apium graveolens***	**3000**	**2850**		**150**	**5**
Charlock	***Sinapis arvensis***	**143**	**85**	**52**	**6**	**4**
Coriander	***Coriandrum sativum***	**125**	**107**	**13**	**5**	**4**
Cumin	***Cuminum cyminum***	**312**	**121**	**151**	**40**	**13**
Dill	***Anethum graveolens***	**287**	**105**	**160**	**22**	**8**
Fennel	***Foeniculum vulgare***	**126**	**90**	**18**	**18**	**14**
Flaxseed	***Linum usatissimum***	**140**	**85**	**50**	**5**	**4**
Mustard	***Brassica nigra***	**185**	**119**	**41**	**25**	**14**
Onion Seed/Kalongi	***Nigella sativa***	**95**	**70**		**25**	**26**
Opium poppy	***Papaver somniferum***	**2000**	**1800**		**200**	**10**

Table 7: Summery of the taphonomic effects of mastication on some flavourings

8.17.2 It can be seen from the results that c.5-25% of the seeds in a particular assemblage may be damaged by the effects of the human chewing process. There is some variation however with celery, charlock, coriander, dill, flax and poppy falling into a category where less than 10% of the seeds are damaged by chewing. The seeds of caraway, cumin, fennel, mustard and kalongi all experience between 13-26% damage to the seeds chewed.

8.18 *CITRUS × SINENSIS* – ORANGE

8.18.1 No records for orange occur in the sample area, though historical records for Hull show that this fruit was imported during the medieval period (Evans 1999, 67).

8.18.2 Results of chewing *Citrus* × *sinensis*: Rather than eating whole citrus fruits only the seeds were chewed in order to assess how they are affected. These were chewed in a number of ways.

8.18.3 Firstly, five seeds were chewed once (and chewed one by one). After being chewed the seeds were mainly split longitudinally, often with one main split that runs the entire length of the seed. Four or five partial longitudinal splits were also recorded which extend c.50%-70% of the length of the seed. In this state the seed is mainly held together by its seed embryo, which if then passed through the rest of the digestive system would most likely not survive (based on personal observations of digested material). In this case the seed is likely to split apart and would need to be identified by fragments of its seed testa, rather than by an identified crushed seed: see Image 21. The results from the chewing of citrus seeds should be compared to the results from chewed apple pips.

8.18.4 Secondly, five seeds were chewed three times as a group (that is to say they were placed in the near the molars and treated as a single bolus of food). Two of these seeds survived with minimal damage, with the other three split longitudinally in the manner noted with the first group. Again, these seeds are largely held together by their internal seed embryo, which presumably would not survive digestion. It was notable, however, that when they crushed once they did not seem to undergo further large scale damage, being comparable to the level of damage noted for the seeds chewed only once. In this respect it seems that after being crushed, and having their shape modified this allowed the seed to avoid more severe damage i.e. a seeds

chewed three times would not necessarily be three times as damaged at that which was chewed once.

8.18 *MALUS DOMESTICA* – APPLE

8.18.1 There are exactly 100 records for apple within the database for this study. This is divided between occurrences for apple cores (81), seed base cups (6) and apple seeds (86). It can be stated generally that this was a popular fruit during all stages of the medieval period, though the frequency of its occurrence decline from the early medieval period to the later medieval period; from being present in 85% of samples in the first phase, to 36% of samples in the later phase.

8.18.2 Results of chewing *Malus domestica*: As with the lemon seeds apple seeds were chewed without eating the fruit itself.

8.18.3 Firstly, four seeds were chewed once (and chewed one at a time). It was observed that the seeds split along their longitudinal sections with all seeds having splits that emanate from the proximal end. Two of the seeds also had breaks emanating from the distal end; see Image 22.

8.18.4 Secondly, six seeds where chewed as a group four times (again, as with the orange seeds these were treated as a single bolus of food). Two of these seeds showed damage analogous to that seen for the first group; splits emanating from the proximal end with the seed generally still held together. Another two seeds show multiple proximal-distal breaks with a tendency for these breaks to be wider towards the proximal end of the seed. The final two seeds were notably 'ragged' towards its proximal end, likely to be evidence of them being chewed multiple times. One of these had c.30% of the seed coat removed completely with a triangular wedge (c.2mm x 3mm) broken away from the seed, the apex of the triangle originating from the proximal point.

8.18.5 The third apple group consisted of five seeds chewed as a group four times, as with the lemon seeds this group was treated as if it were a bolus of food. All of these seeds maintained their structure with no material being lost or broken off the seed testa. Damage to these seeds ranged from one proximal-distal split to multiple proximal-distal splits. Of the whole group two had simple proximal-distal breaks, while two had complex ragged breaks near the proximal end. This was also noted with two seeds from the second group. All of this group were likely to be easily identified after digestion.

8.18.6 The fourth and final group were six seeds chewed twice with the incisors. In order to do this the seeds had to be held directly between the teeth. It is likely that damage to apple seeds by incisors would occur only rarely as the pattern of eating an apple core would involve chewing the core with the molars, rather than the incisors which would merely break the core in half. One of the points being examined for here was how lateral splits may be formed or if they are formed at all during the mastication process. It was noted from all other groups that the tendency was for only longitudinal splits to be present in apple seeds. Even with this group, however, there was only one seed with a clear lateral split. More commonly short splits at the proximal ends were noted, which ran in a proximal-lateral orientation.

8.18.7 For apple there is a strong tendency for seeds to split along their longitudinal axis, as with the lemon seeds. However, these splits were generally quite 'clean', with little other damage spreading out from these main breakage lines. Even when the internal seed embryo is digested it can be seen from other observations that the seed coat as a whole will retain much of its integrity and be physically identifiable. There is a strong tendency against lateral splits which is likely to be a result of the cellular structure of the individual seed. This is likely to be as a result of how the seed breaks to facilitate the growth of the radical during germination.

8.19 *RUBUS FRUCTICOSUS* – BLACKBERRY AND *RUBUS IDAEUS* – RASPBERRY

8.19.1 Blackberries were identified from 86 samples, while 23 samples were specifically identified as raspberries. Looking at the combines occurrences for the Rubus species there are 104 records for Rubus *fructicosus, R. idaeus, R. fructicosus/ idaeus, R. caesius* (Dewberry) and general *Rubus* species. As with apple this native fruit was undoubtedly popular in many periods. A notable exception in this case being the results from Hull where only one of the seven samples contained seeds of a *Rubus* species. Considering the large number of fig seeds recorded from these deposits, as well as exotics like date stones (one sample), pepper (one sample) and grapes (3 samples) the infrequency of blackberries/raspberries is notable here.

8.19.2 Results of chewing *Rubus idaeus* – Raspberry: Ten raspberry fruits were chewed twenty times. As with the fresh fig this was far more than one would normally need to chew a raspberry for, but the aim was to assess the maximum amount of damage that might be inflicted on these remains. In total 872 seeds were present in the pulp produced after the material has been spat out. Of these seeds 11 showed evidence of crush damage. This usually manifested as the crushing of c.25-50% of a seed.

8.19.3 In many ways these results mimic those from the fig. Fruit that produces numerous, hard seeds are very likely to survive the effects of chemical digestion. Coupled with this when these seeds are covered in a soft pulp they do not seem to be easily caught between two opposing molars. This factor is discussed further in the conclusions below.

8.19.4 Results of chewing *Rubus fructicosus* – Blackberry: As with the raspberry fruits, ten individual blackberries were chewed a total of ten times. In total 472 seeds were recovered and examined. In total two of these showed the pattern of crush damage also recorded with the raspberry seeds. Considering the differences in numbers between the seeds produced in each

fruit there seems to be a general pattern of less than 3% of seeds from a *Rubus* species being damaged by chewing action. One factor which may be affecting this is the tendency for *Rubus* seeds to appear largely undamaged even when deliberately chewed. By chewing individual seeds held between the incisors it was noted that unless the bite broke through the seed it may be difficult to identify damaged seeds unless seed testa has not been completely split i.e. it was difficult to spot gradations of damage; they were either crushed and broken or appeared to be largely intact.

8.20 ***FICUS CARICA*– FIG**

8.20.1 The thirty-six occurrences of fig are heavily biased in the period after the Norman Conquest. Three occurrences before this period from York might suggest earlier imports of this fruit, though only one of these (from a mid-9th to early 10th century pit from 16-22 Coppergate) could be considered very early, the other two dating to the 11th century, and thus possibly early Norman material.

8.20.2 Results of chewing *Ficus carica* – Fig: 1 fresh fig fruit was chewed 20 times with the resultant pulp retained and examined for damaged and undamaged seeds. Normally a fresh fig would not need to be chewed so many times, and this attempt was to ensure that the maximum amount of seed breakage would be recorded. Approximately 650 mature seeds were recovered, as well as immature seeds. Immature seeds were those where the seed testa had not formed completely, visible as seeds which were translucent. These numbered c.200-250 seeds.

8.20.3 Of all the mature seeds from the fruit 7 were damaged, while 3 undeveloped seeds were damaged. As well as this 12 fragments of seed testa less than 0.5mm were recovered. In all cases the breaks were uneven and appeared to result from crush damage. Of all the seeds recorded as damaged this damage was noted where the edge of a seed had been caught and crushed,

rather than whole seeds. The low numbers of fig seed fragments suggested that in general fig seeds survive the chewing process very well. This is not just based on the effect of one seed placed between two molars, but rather the whole nature of the fruit in the context of a relatively inefficient human mastication process. Figs represent a plant that possess a combination of hard, durable seeds, in great numbers in a single fruit, which due to their shape will easily survive possible physical damage through chewing. Thus, for archaeobotanical study their ubiquity in many medieval urban cesspit samples can be expressed as a combination of these factors.

8.20.4 One factor which might need to be changed for future research is the use of dried rather than fresh figs. Presumably it was in this form that the seeds were imported during the medieval period. The effect of the drying process on the fruit pulp may affect the manner in which the fruit is chewed (as it is denser, with less water to lubricate the pulp and the seeds), leading to greater breakage.

8.21 *VITUS VINIFERA* – GRAPE

8.21.1 As with the occurrences for fig seeds, there is a tendency for the grape pips to occur in the later medieval period. This might suggest a package of Continental European/Mediterranean foods to arrive with the influence of the Normans and their successors.

8.21.2 Results of chewing *Vitus vinifera*: As with the apple seeds the grape seeds were chewed in a number of different ways in order to assess the multiple ways these seeds can be affected by chewing processes. One of these factors was the variations within an individual oral cavity. During preparation for this series of experiments it was noted that the left side of the oral cavity (of the present author) was more efficient than the right side, due to the manner in which the molars met on either side. The differences in efficiency can be seen in the case of the grape seeds; Images 23 and 24.

8.21.3 Firstly, eight seeds were placed individually in the right side of the oral cavity and chewed once. One of these showed no damage, while six of the eight showed minor damage that cracked, but did not break apart, the seed testa. One was heavily crushed and is likely to disintegrate upon digestion.

8.21.4 In contrast, eight seeds were then chewed in the left side of the mouth. In all cases seeds showed significant crush damage. Four of the eight grapes may not even be easily identifiable as grapes when considering the change in their gross morphology after being chewed. In these cases the survival of the proximal end of the seed was quite consistent and in cases where seeds are being counted the search for, and counting of, these proximal ends might be the best way to calculate the number of grapes present in a sample.

8.21.5 The third group of grape seeds were consumed within whole grapes. This produced 5 seeds. Three of these were heavily damaged, with one crushed to the extent that only its proximal end was identifiable. One survived very well with some limited damage to the exterior which did not break through to the centre of the seed.

8.21.6 For grapes it is notable that few survived without damage. In an assemblage where large numbers of grape seeds are recovered the analyst should expect to see at least some of the preserved pips with evidence of chewing damage. In cases where this damage is not noted then the consumption of the fruits may be in a different form than simply being eaten without other preparation.

8.22 *AGROSTEMMA GITHAGO* – CORNCOCKLE

8.22.1 With 109 occurrences corncockle was the single most common plant species recovered. In this context however its presence is somewhat unusual as it is both a proxy indicator for faecal matter, while also being crop contaminant which is at best unpleasant and at worst directly harmful to human health. In this context its absence from any of the 25 Bridge Street, Chester samples

is interesting and might suggest the consumption of higher quality flour for this location than was typical for many other cities in medieval Northern England.

8.22.2 Results of chewing *Agrostemma githago*: Of the seeds consumed 51 were undamaged after being chewed 20 times; see Image 23. A group of 41 seeds showed minor crush damage. This split the seed but at least 80% of the seed was maintained together. The three pointed split pattern was quite common, reflecting the manner in which the seed breaks open under pressure. A lesser group of 30 fragments, representing c.10 seeds were also recovered.

8.22.3 One of the problems chewing corncockle seeds was their dense nature, making comfortable chewing difficult. They also rapidly group together around the cusps of the molars, further hindering naturalistic chewing. Considering the manner in which corncockle fragments are often found in cesspits, being generally heavily fragmented, it is likely that the milling process is the main taphonomic agent for these seeds. In cases where whole seeds are present as a grain/flour contaminant this process can aid in our appreciation of how much of a luxury item white bread made from flour free of corncockle would have been. Apart from the numerous physiological dangers from consuming corncockle the gritty, hard nature of these seeds would have given the bread a texture which would seem far inferior when compared to that from clean white bread.

8.23 CONCLUSIONS FROM THE TAPHONOMIC EXPERIMENT

8.23.1 The experimental activity undertaken here has demonstrated a number of considerations for the manner in which the human body may act as a taphonomic agent on food remains. Of particular interest is the variability of this taphonomic action between different types of flavourings and different types of fruits. However, as this particular group of experiments was

undertaken with one individual and in one experimental session these results cannot be easily extrapolated to the population at large without further experimentation. Therefore the results here should be seen as indicative of the potential for further research in this field, rather than definitive conclusions.

8.23.2 The flavourings displayed results which showed no clear patterning based on the size or morphology of the seeds examined. The black mustard seeds could be suggested as liable to chewing damage on account of their rounded nature. Their length-breath-height ratio, coupled with their overall dimensions does not give much flexibility to the seed when it might find itself between two molars. In contrast the smaller size of the poppy seeds means that even when placed between two molars they might still be able to fit between the cusps of the teeth and avoid damage.

8.23.3 In contrast, though a seed such as coriander is similarly rounded, with a similar length-breath-height ratio, as well as generally the same overall dimensions its ability to apparently resist the crushing action of the molars might be due to the process by which the seed slits apart into two halves (the seeds being schizocarp in form). Coupled with a tough seed testa coriander can resist the effect of chewing to a greater extent than mustard seeds. This is also borne out by the wild charlock seeds. Here they are almost indistinguishable from mustard seeds, but their tougher testa means they do not split apart in the same manner mustard does. The lighter seed coat in this case being as a result of the domestication process.

8.23.4 The contrast between cumin and caraway is less clearly explained as both seeds are of a very similar size and morphology (belonging to the family Apiaceae and being schizocarp seed forms). The reasons for this might be due to factors in the cellulose of the seed coat, not observable under a

stereomicroscope, or it might be an idiosyncratic difference which is observed here, but would not be replicable in future experiments.

8.23.5 In the case of the fruits examined their seed structures showed a much greater variability than that seen by the flavourings (where were in 6 flavourings from the Apiaceae family).

8.23.6 It can be seen that fruits such as strawberry, fig and brambleberries are naturally more conductive to the dissemination of seeds, the survival of these seeds through a digestive system, and the subsequent survival of these seeds in an archaeological context. This is as the result of the production of many seeds, which are small enough to fit between the cusps of teeth even when chewed, and tough enough to survive in an archaeological context due to their hard testas.

8.23.7 In the cases of the fruits of apple and orange it can be seed that the seeds of apple with their relatively harder testa can largely survive even being directly chewed. As discussed above in the case of the orange seeds, they are unlikely to survive in an easily identifiable form as the testa is likely to separate when the endosperm has been digested in the intestine (a separate series of experiments has shown that if the testa is not broken the seed will survive intact through the human digestive tract).

9 ARCHAEOLOGY AND HISTORICAL EVIDENCE

9.1 INTRODUCTION

9.1.1 Thus far the archaeobotanical evidence has been presented, as well as the evidence from the taphonomic studies. It can be seen from the archaeobotanical evidence that there is a wide range of potential plants which can be recovered from cesspit deposits, including native wild food and flavourings, wild weed species, as well as imported exotic species. The experimental element of this study shows that digestive taphonomy, though an important part of the digestive process may not be the key taphonomic factor for food plants. This can be seen in the presence of historical references to oranges and dates being imported into Northern England (via Hull); but their limited archaeobotancial presence, as can be seen in the remains of dates, or absence, in the case of oranges. Thus, a third line of evidence has been consulted. This is the use of medieval recipes for information on how food preparation might affect the likelihood that particular plants will survive the processes of biogenesis and diagenesis.

9.1.2 A sample of 217 recipes which date from the late 13th-late 15th century were consulted to examine what plants are utilized and how they were prepared. Recipes were chosen which contained two or more plant based ingredients and care was taken to avoid repetitive recipes for condiments (such as the myriad of recipes for almond milk, all of which are basically combinations of crushed almond and water with a little sugar/honey). The work of the medieval historian C.B. Hieatt was particularly important with the database largely composed of recipes from her catalogues (Hieatt et al. 2006; Hieatt 2013). This review is intended to highlight some of the taphonomic issues relating to the examination of medieval diet via archaeobotany and is not a comprehensive examination of the historical sources for medieval diet, though it is recommended that such a review take place in the future.

9.1.3 Before examining the results of the examination of the historical evidence two biases need to be pointed out in this evidence. Firstly, the recipes do not cover the entire period of this study with the earliest recipes being for the later 13th century and therefore do not represent the earlier chronological half of the broader archaeobotanical view. Secondly, the archaeobotanical evidence is likely to contain material consumed by a broader social base than those who utilised written recipes, particularly those recipes which contain exotic ingredients. Therefore the historical evidence from the recipes should be seen as the potential for evidence from high status sites, rather than what should be regarded as typical of urban cesspit deposits.

9.2 RESULTS OF THE ANALYSIS OF RECIPES

9.2.1 In total 217 recipes were entered onto a database in much the same manner as done for the analysis of the cesspit remains, thus material was assessed as a presence-absence, rather that attempting to quantify volumes. This identified 56 plants to the species level, 28 to the genus level and 9 generic plant names which cannot be identified to specific species; including terms such as gum Arabic, spikenard, spice powder. The results of this survey are summarised in Table 11 below.

9.2.2 What is immediately obvious is that there are few plants which are common to both the archaeobotanical record and to the historic records of the recipes. It is also true that the vegetative parts of many spices and flavourings are the key utilized part, and thus liable to be missed by archaeobotanists only familiar with the seed structure of the plant. Saffron is the most common plant recorded, being present in almost 50% of recipes. It seems unlikely that the delicate anther, which is the consumed element of the flower, would survive either cooking or digestion (while acknowledging that this is of course is exactly type of circular argument this study sought to go beyond). Likewise, the presence of ginger in just over 45% of recipes is not likely to be

identified as it is the rhizome of the plant which imparts the flavour. If the plant were imported as dried roots then it is possible the dense pith would survive the cooking and digestive process. However, it is likely that ground ginger, rather than whole roots, was the main way in which this plant was imported. The same can be said for cloves, which appear in just over 45% of recipes. Here it seems possible that a whole clove would survive the passage through the human digestive system, by these have not been identified in Northern England to date. That delicate remains could survive within the archaeological record is borne out by the material identified in the drains at Paisley Abbey (Dickson 1996). At that site mace/nutmeg was identified, which is not surprising as it appears in over 28% of medieval recipes. What makes this identification unusual was the manner in which the arils of the nutmeg were identified from their vegetative parts, an identification akin to Tomlinson's identification of onion (Tomlinson 1991).

9.3 ADOXACEAE

9.3.1 The finds of elder (*Sambucus nigra*) were common with the database of archaeobotanical remains; being found in over 65% of samples. In contrast only one record for elder could be found in the recipes surveyed; this consists of a single record for the use of elder flowers. From a taphonomic point of view it is unclear whether such remains would survive, and if they could be identified as food remains rather than urban waste ground vegetation. The use of elder-berries as a fruit in the medieval period would seem unclear from these historic records.

9.4 AMARYLLIDACEAE

9.4.1 The finds of the family Amaryllidaceae are relatively common in the historic record. Onions are mentioned in just over 10% of recipes, though garlic (3%), as well as leeks, scallions, and spring onions (less than 1%) appear less commonly. Considering they are recovered in just over 20% of the

archaeobotanical samples it would seen that they may be under-represented in the historic record.

9.5 ANACARDIACEAE

9.5.1 The two records in the recipes for pistachio (*Pistacia vera*), are not complemented by archaeobotanical record, therefore it may be suggested that this as a rare food in the medieval period in Northern England.

9.6 APICAEAE

9.6.1 The family Apicaeae contains a number of important flavourings, and are well represented in the archaeobotanical records. Interestingly they are not particularly common in the historic records. The most common historic reference is for parsley, present in 17% of recipes. After parley anise is the next most common, being present in over 5% of recipes. Neither of these plants are present in the archaeobotanical records for this study. All others (caraway, coriander, cumin, dill, fennel) are only mentioned in c.1% of recipes. Of these plants coriander is present in c.10% of archaeobotanical samples for the period under review, though interestingly the majority of these are for the Anglo-Scandinavian period which is not covered by the review of historic recipes. Dill is recorded in over 30% of archaeobotanical records, but again the majority (43 of 46 total records) are for the period not covered by the review of the historic evidence. Fennel is found in just over 6% of archaeobotanical samples, all within the period also covered by the historic review. This might suggest it was only ever an occasional flavouring.

9.7 ARECACEAE

9.7.1 In contrast to the remains for the Apicaeae the single archaeobotanical record for the Arecaceae, represented by dates (*Phoenix dactylifera*), is present in 21% of recipes, (see section 6.6.1 above). Frequent reference is made to the stones in the historic recipes (suggesting they were present in the dates

when imported), therefore it seems this plant is being under-represented in the archaeobotanical record.

9.8 BETULACEAE

9.8.1 The opposite can be said for the remains of hazelnuts (Corylus avellana). This plant is one of the most commonly encountered in the archaeobotanical record, being present in over 50% of samples. However, it is referenced in only two recipes, or less than 1%. This may be part of the general turning away from locally growing wild plants which, it is suggested, is a feature of the archaeobotanical record for Northern England through the medieval period. This can also be seen in the absence of reference to brambleberry in the historic recipes. It must also be appreciated that the recipe would call for hazelnut, whereas archaeobotanically it is hazelnut shells which are commonly recovered. Therefore it may not be comparing the two strands of evidence equally due to the different taphonomic pathways open to these two structures.

9.9 BORAGINACEAE

9.9.1 The family Boraginaceae is represented by a flavouring, Borage (*Borago officinalis*), and the food dye Alkanet (*Alkanna tinctoria*). Neither of which are particularly common.

9.10 BRASSICACEAE

9.10.1 The family Brassicaceae is represented in the historic record by three references to mustard. This contrasts with the common finds of *Brassica* species in the archaeobotanical record. However, within the archaeobotanical record there are three references to Black mustard (*Brassica nigra*), showing a balance between the archaeobotanical and historical frequency. Again, this brings into question the popularity of mustard as a plant based flavouring.

9.11 ERICACEAE

9.11.1 The single record for bilberry/hurtleberry in the historic record contrasts within its relatively common occurrence in the archaeobotanical record; being found in almost 25% of samples. However, this species also follows the general pattern of declining in popularity through the medieval period, and therefore may have been falling out of favour by the time the recipes were compiled.

9.12 EUPHORBIACEAE

9.12.1 The Euphorbiaceae are represented by the food dye Turnsole (*Chrozophora tinctoria*), present in just under 4% of recipes, but not in the archaeobotanical record. As the vegetative parts of this plant are the most important for its dying properties it is questionable if the plant could be identified easily.

9.13 IRIDACEAE

9.13.1 The Iridaceae are analogous to the finds of Turnsole above. The single species from this family, saffron/crocus (*Crocus sativus*) is present in almost 50% of samples, but not recovered from the archaeobotanical record. Considering the particularly delicate remains of saffron it is not clear whether it would survive the digestive system or even the methods used to process waterlogged archaeobotanical samples. The delicate nature of the remains has also been highlighted as a barrier to the archaeobotanical identification of the early use of saffron, despite some historical and art-historical evidence (Zohary et al. 2013, 165).

9.14 JUGLANDACEAE

9.14.1 The finds of walnuts are rare both in recipes (just over 2%), and in the archaeobotanical record (also just over 2%).

9.15 LAMIACEAE

9.15.1 Several species of the family Lamiaceae are present in the historic records, including mint, oregano, rosemary and sage. However, only hyssop (4%), sage (8%) and savoury (4%) occur regularly. Of these only savoury (*Satureja*

hortensis) is also common in the archaeobotanical records; being present in just over 20% of samples.

9.16 LAURACEAE

9.16.1 The single species of the family Lauraceae represent an exotic spice, but again one which might suffer from identification problems. Cinnamon (*Cinnamomum verum*) is present in just over 46% of recipes, but not identified in the archaeobotanical record. As it is the bark of the tree which produces the cinnamon flavour the remains of cinnamon might not be easily identifiable, or if present sorted as part of the woody material within a flot. Alternatively, it may have been imported as crushed cinnamon powder, rather than the sticks which are more familiar today. It is certainly under-represented in the archaeobotanical record for the period under review.

9.17 LYTHRACEAE

9.17.1 The uncommon references to pomegranate (*Punica granatum*) in the historic records (being present in just over 2% of recipes), and its absence in the archaeobotanical record, might suggest that it was not a popular import during the medieval period.

9.18 MORACEAE

9.18.1 The Moraceae family is represented by two exotic fruits; mulberry and figs. Only figs are recorded commonly in the historic recipes; being present in 15% of recipes (compared to the single record for mulberry). Archaeobotanically figs are present in 24% of the samples, with the majority of these falling into the period covered by the historic review. In fact, leaving the Anglo-Scandinavian records aside figs are present in 50% of samples which date from the 11th-17th century. As this plant was also consumed as a fruit in its own right then this discrepancy would seem to be justified.

9.19 MYRISTICACEAE

9.19.1 The Myristicaceae family is represented somewhat unusually, by one species, but two spices. The species (*Myristica fragrans*) produced both a nut (nutmeg), as well as the spice from the aril which embraces the nut, and gives it its characteristic venation (mace). As discussed above, the presence of this species at Paisley Abbey but its absence elsewhere is likely to rest with the detailed analysis undertaken by Camilla Dickson, rather than Paisley being nationally exceptional (Dickson 1996). This analysis shows that with a detailed botanical knowledge this sort of delicate material can be recovered and identified. Significantly for this study mace is referenced far more commonly than nutmeg; being referenced in 28% and 1.2% of recipes respectively.

9.20 MYRTACEAE

9.20.1 The identification of cloves (*Syzygium aromaticum*) may depend on their preparation. Whole cloves are highly likely to survive the digestive process, assuming they are not first crushed. As they are present in over 45% of recipes, but not at all in the archaeobotanical record, it can be proposed that they are being missed in archaeobotanical samples. Their identification might require familiarity with wet, or slightly decomposed, cloves as they would not appear as well defined as the dried cloves which can be purchased commercially today.

9.21 PINACEAE

9.21.1 The relatively frequent references to pine nuts (*Pinus* species; present in 11% of recipes) is contrasted with their absence in the archaeobotanical remains. The taphonomic pathways open to nuts, discussed briefly above for hazelnuts, is likely to be a factor here, where it is the remnants of the pine cone which are more likely to be recovered than the nuts themselves. Where the cones were prepared is also likely to be an important factor; particularly

if the nuts are extracted close to the source and sent to urban centres as pre-prepared nuts.

9.22 PIPERACEAE

9.22.1 The Piperaceae family is represented extensively in the historic record, but is only represented by a single find in the archaeobotanical record. Combining references to 'pepper', 'black pepper' and 'ground pepper' brings the total number of references to 36% of recipes. The absence of cubebs (*Piper cubeba*) from the archaeobotanical record contrasts with its presence in historic recipes (11%). The taphonomy of food preparation may be an important factor here, particularly where ground pepper is concerned. It is likely that only very small fragmentary material may be present in archaeobotanical samples.

9.23 POACEAE

9.23.1 In contrast to the Piperaceae the Poaceae family is one of the most extensively studied species for all periods from the Neolithic onwards. It is interesting therefore that only two species appear in the historic records. Only wheat is present in the historic and archaeobotanical records, though in the historic records this constitutes a single record for 'wheat starch'. On the other hand rice (*Oryaz* species) is mentioned in 14% of recipes, commonly as ground rice. As the starch rich Poaceae are often best preserved by charring then there may be a taphonomic bias against rice. The rice would be presumably dried before transport and subsequently not placed in scenarios where it is exposed to charring preservation in the same way native grown cereal were.

9.24 ROSACEAE

9.24.1 Like the Apiaceae the Rosaceae are represented by a broad number of species. This includes a single record for hawthorn blossoms, infrequent reference to quinces (just over 2% of recipes; but not at all in the

archaeobotanical record), as well as relatively frequent reference to pears (7% in the historic literature). In contrast to pears apple are uncommon with references to less than 2% of recipes. The low numbers of identifications for pears and quinces in the archaeobotanical literature may be linked to difficulty differentiating pear and apple seeds, as well as quince and pear stone cells. For apple its underrepresentation in the historic literature contrasts with its frequency in the archaeobotanical remains; being present in over 68% of samples. Interestingly the records for sloes, damsons, bullaces, plums and cherries and all quite low for the historic record with this entire group being present in under 4% of recipes. The absence of references to brambleberries is similarly interesting and be part of the general movement away from native wild fruits through the medieval period. In contrast, the most commonly references member of this family is almond (*Prunus dulcis*) with its presence in 43% of recipes. Most commonly this is as part of an ingredient to almond milk (indeed the common references to almond milk are contrasted with the total absence of references to animal milk in the recipes surveyed). As almonds were crushed as part of the preparation they are unlikely to survive archaeobotanically, though it is perhaps interesting that their shells are also not recovered archaeobotanically.

9.25 VITACEAE

9.25.1 The collective records for grapes, currents and raisins means the species *Vitus vinifera* is found in 37% of historic recipes. For the period of the 11th-17h century grapes are recorded in 29% of archaeobotanical samples, showing a broad correlation. In terms of their presence in the historic and archaeobotanical records only figs and grapes can be described as relatively common to both.

9.26 ZINGIBERACEAE

9.26.1 The Zingiberaceae family is represented by three important spices, but only one of which is common, and none of which are present in the archaeobotanical samples. These species are Cardamom (*Elettaria*/*Amomum* species), Ginger (*Zingiber officinale*) and Grains of Paradise (*Amomum meleguetta*). Of these ginger is recorded in 46% of recipes, and as discussed in the introduction, is likely to be under-represented as the utilised element of the plant is the root, and the common means of preparation is to crush the root into a paste or powder.

10 RESULTS AND CONCLUSIONS

10.1 RESULTS

10.1.1 The main aims of this research was twofold; to assess the evidence for the medieval diet of Northern England via the samples recovered from cesspit remains, and to determine the taphonomic effects the human chewing processes may have on the archaeobotanical remains. In this respects the study can be finalised with a number of conclusions.

10.2 ARCHAEOLOGICAL CONCLUSIONS

10.1.1 The archaeobotanical study of our current knowledge of the diet of medieval Northern England via the cesspit remains concludes:

1. 146 samples were identified which represent dated, analysed cesspit samples within the geographic boundaries of this study, and within the period under review (See sections 3.2, 3.3, 3.4 above)
2. There is a chronological and geographic bias within our current dataset. This includes a heavy bias in favour of Anglo-Scandinavian York, with less material from other urban areas in other periods. These reasons for this have been discussed above (See sections 5.1.2, 5.9.1 and Section 5.11)
3. There are regional variations in preservation that can be seen from the literature review; such as the poor preservation of medieval material from Carlisle compared to the Roman material, the excellent waterlogging in York compared to the poor preservation in Durham-Newcastle.

10.2 ARCHAEOBOTANCIAL CONCLUSIONS

10.1.1 The database as a whole allows us to identify some archaeobotanical issues from the region:

1. The skills required for a thorough awareness of material from urban medieval sites Northern England includes knowledge of vegetative

elements (for over 60 species of mosses, as well as dye plants and onion/*Allium* species vegetative remains), cereals, and the seeds of over 250 species of vascular plants.

2. The diversity of remains changes through time; it can be suggested that earlier deposits with waterlogged preservation require a greater skill-set that samples from later periods, due to the declining diversity of remains which can be seen through the medieval period (See Table 4).
3. In general it is proposed that the urban archaeobotanical assemblages show a consistent decline in diversity through the medieval period, with a decline in native wild fruits and a corresponding rise in imported exotic material

10.3 HISTORICAL RECIPE CONCLUSIONS

10.1.1 The review of the historical recipes has highlighted a number of taphonomic issues, as well as biases in the historical record.

1. There are few plants common to both the historical recipes records and the archaeobotanical assemblages from archaeological sites, grapes and onions being the main exception.
2. Some of the most common plant based ingredients may not survive archaeobotanically, particularly items such as saffron and spice powder (which may be a catchall term for various imported spices).
3. Instructions to grind up material, such as ginger, rice and almonds may further hamper the ability of archaeobotanists to recover and identify such material.
4. The audience for such recipes may need to be investigated further. It is likely that the majority of the population would never taste many of the ingredients such as cloves, ginger, mace or dates (though the remains of exotics do occasionally show up on rural sites; O'Meara

and Hall 2014, 94). Even amongst the elite it is questionable in what quantities such ingredients were consumed.

10.4 CONCLUSIONS

10.4.1 This study aimed to provide a review of the archaeobotanical knowledge for medieval diet in Northern England via an examination of the grey literature and published reports for cesspit remains. To this was added a taphonomic study of the effects of mastication on food remains, and an archaeobotanical review of medieval recipes. An attempt was made to account for the biases in the remains recovered, but in all cases further biases can be pointed to.

10.4.2 The archaeological criteria focus only on a narrow section of the population of Northern England. The town dwellers of the Anglo-Scandinavian to Tudor periods are not likely to represent the nature of the largely rural population, or possible even the dwellers in small villages not connected directly to large trading ports. Even within the town differences between urban labourers, skilled crafts people, merchants, and members of the aristocracy make generalisations about the diet of the 'towns people' difficult. It is to be wondered whether this study is an examination of the diet of medieval Northern England, or simply a study of the identified plants from a certain type of archaeological feature from a certain part of the archipelago lying off north-west Europe.

10.4.3 The experimental element of this study sought to examine the taphonomic effects of mastication on certain food plants on the archaeobotanical record. The main conclusion is that this may be an idiosyncratic and complex process which this study has only treated in a superficial manner. Even studying variations within a single mouth demonstrates the difficulty inherit in creating patterns and simple rules for taphonomic processes in archaeobotany. In this respect the results here echo the conclusions of Lam's work on hyena scavenging when he demonstrated that the patterns of hyena

gnawing were "more idiosyncratic and less susceptible to strict definition than originally anticipated" (Lam 1992, 390). It is possible that further experimental work with different individuals would demonstrate further idiosyncrasies than those pointed out here.

10.4.4 The review of the historical recipes also has a number of biases within it. Who the intended audiences were for such books, whether the recipes were followed rigidly, and how often such food was consumed is still a matter worthy of further study. The literature simply highlights what foods and flavourings elements of the medieval population were aware of. An examination of further historic records, such as import tax rolls, would be needed to balance out the recipe record with records of the bulk volumes of imported spices and flavourings.

10.4.5 This study highlights, it is hoped, that in certain ways we still have much to learn about the nature of something as basic and fundamental as diet in the medieval period. The period covered by this study was an important time of state formation, as well as a period when social and economic changes in medieval north-west Europe would lead to the economic and social changes of the Industrial Revolution and international Capitalism. Whether these changes were materialist in nature and lead to conflicts between classes subsumed or raised by economic changes (in the Marxian sense), or whether these changes were caused by a cultural shift in the manner in which individuals related themselves to economic activity and personal salvation (in the Weberian sense) is debatable. It is proposed, however, that whatever the origins of these changes, their effects can be seen in the archaeobotanical record through the greater internationalisation of foods and flavourings. What is needed for future study is a further examination of medieval archaeobotany as a means of examining the cultural shifts in diet and the manner in which individuals or social groups sought to express their status

with changing food tastes and diet. Was the shift to imported exotic fruits done purely as a means of conspicuous consumption on the part of a rising urban based elite, or did improvements in trade and transport mean it was as efficient to import barrels of dried figs from the Mediterranean as it was to collect a similar volume of blackberries from the rural hinterland?

10.4.6 The historic record for recipes highlights that there is still a problem for archaeobotanical studies to identify many of the exotic imports which were being consumed in England during this period. Though the study can present a number of conclusions which add to our current knowledge of medieval foodways, it also highlights the lack of research in some fundamental areas of this line of study.

10.4.7 In conclusion, this study has demonstrated that using the current dataset for the well dated cesspits of Northern England we can observe changing patterns of consumption, urban environment and archaeological visibility. From the experimental work it can be shown that archaeobotanical studies in digestive taphonomy face different issues to those in archaeozoology studies and are more idiosyncratic than first proposed at the beginning of this study.

10.4.8 On a more positive note, however, we are reaching a stage with the Archaeobotancial dataset for Britain where we do not need to examine themes such as diet and economy using broad chronological timescales, though these reviews are important in their own right (Livarda and van der Veen 2008; Livarda 2011). We can now focus on narrow time periods, and on the consumption of specific elements of society such as the diet of the urban classes in timescales of two centuries of less.

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Image 1: Cutting the marshmallow for experimental activity

Image 2: Attaching the seeds

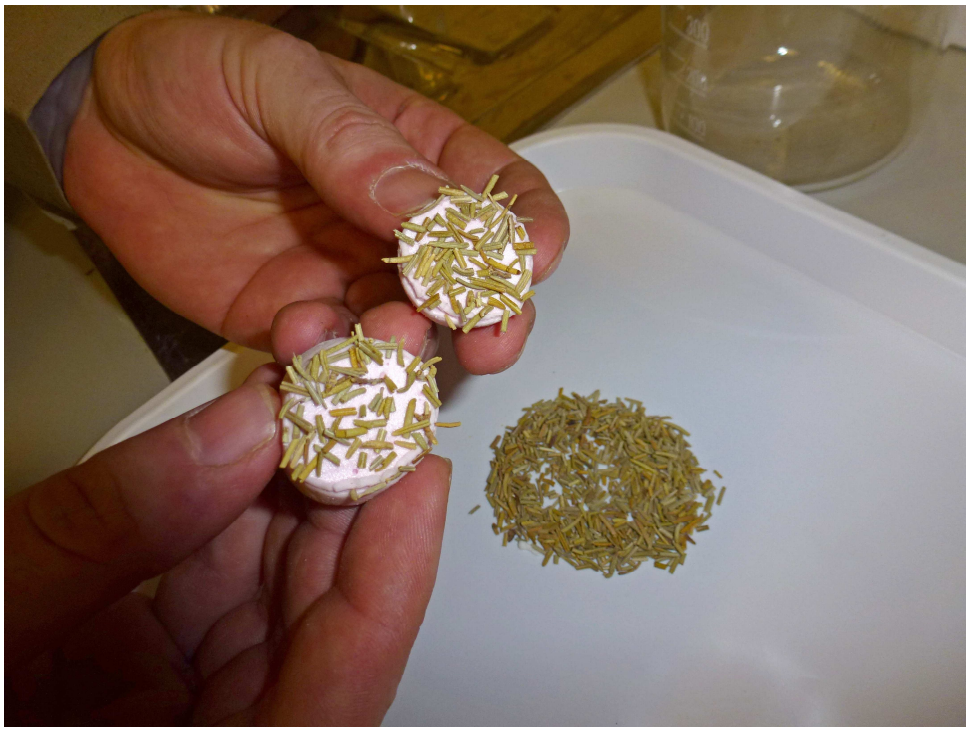

Image 3: Attached seeds

Image 4: Dissolving the chewed material

Image 5: Decanting the dissolved marshmallow and seeds

Image 6: Resultant material

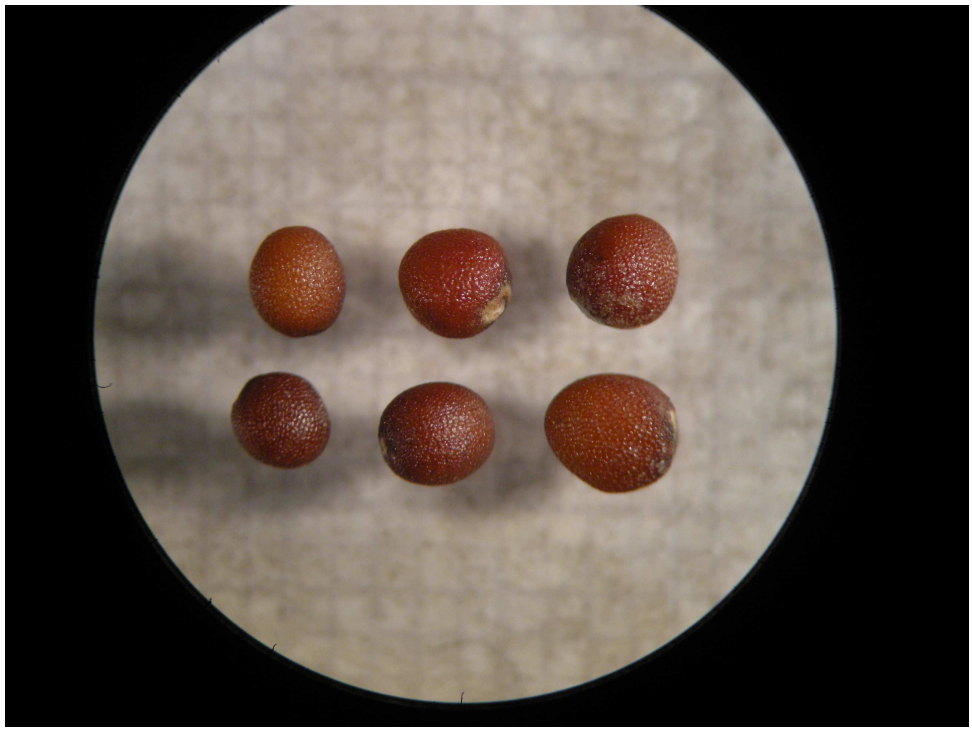

Image 7: Undamaged mustard seed

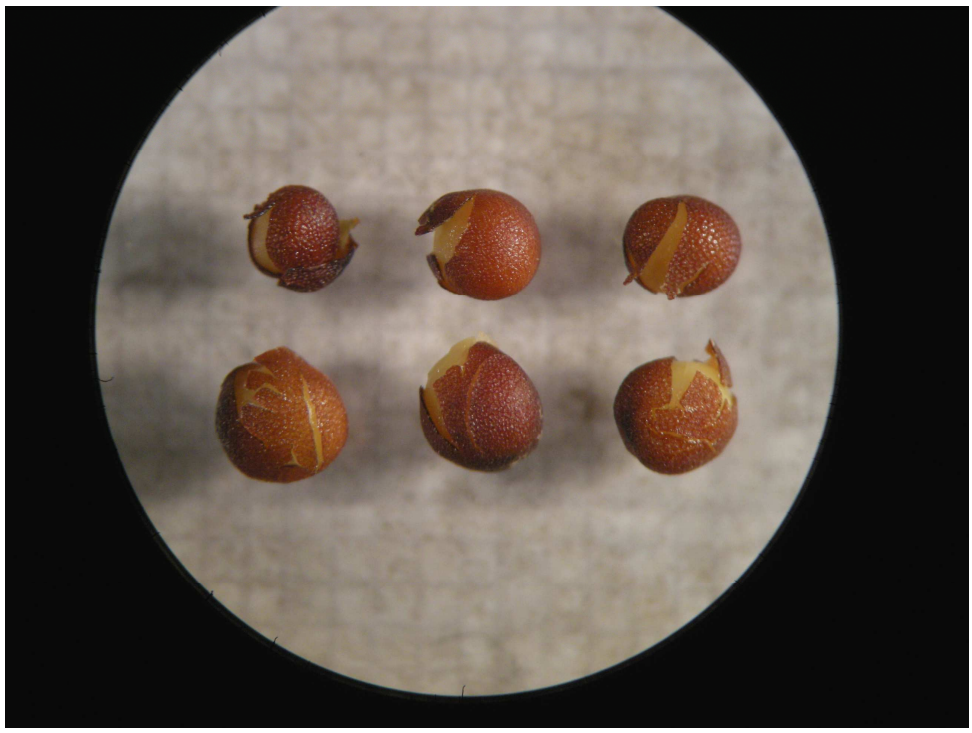

Image 8: Lightly damaged mustard seed

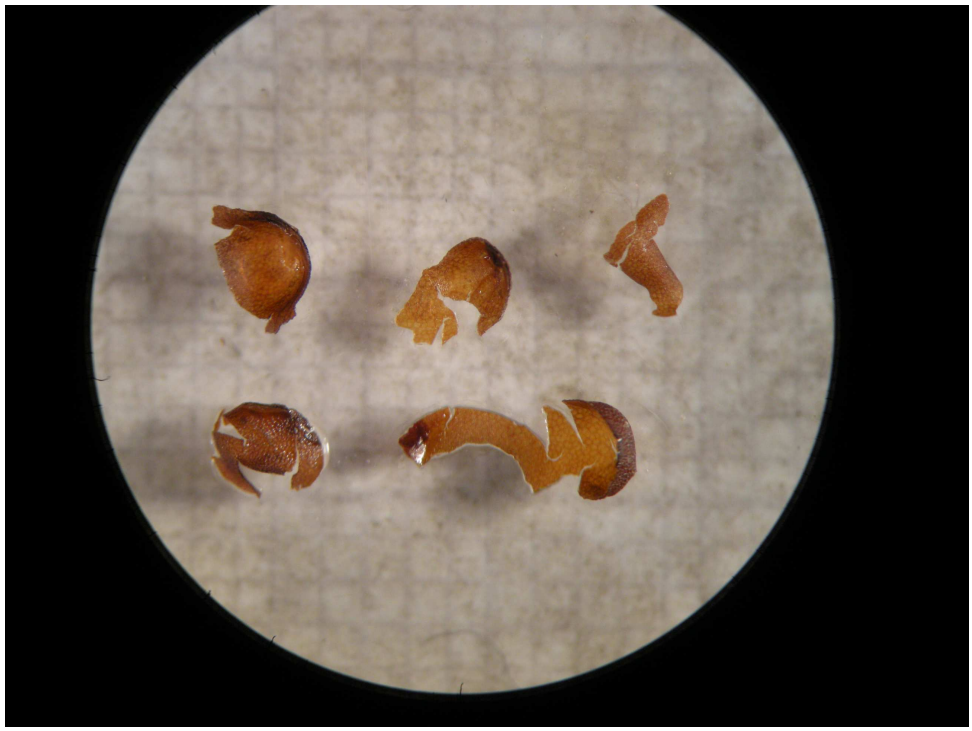

Image 9: Separated seed testa; mustard seed

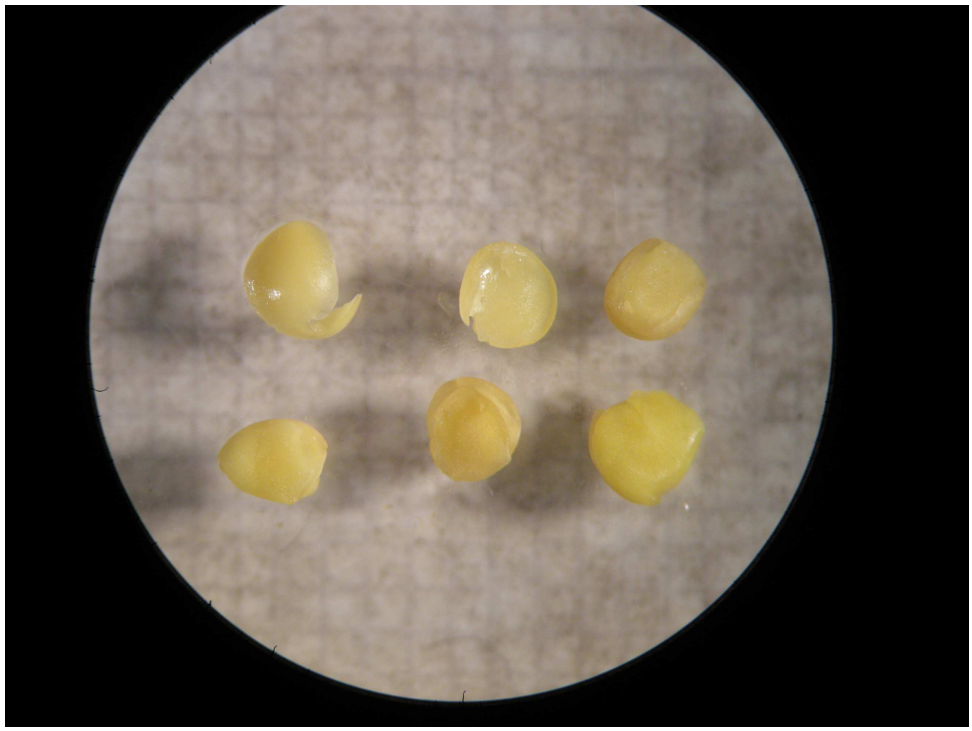

Image 10: Loose endosperm; mustard seed

Image 11: Mustard seeds: note the frequent free floating endosperm

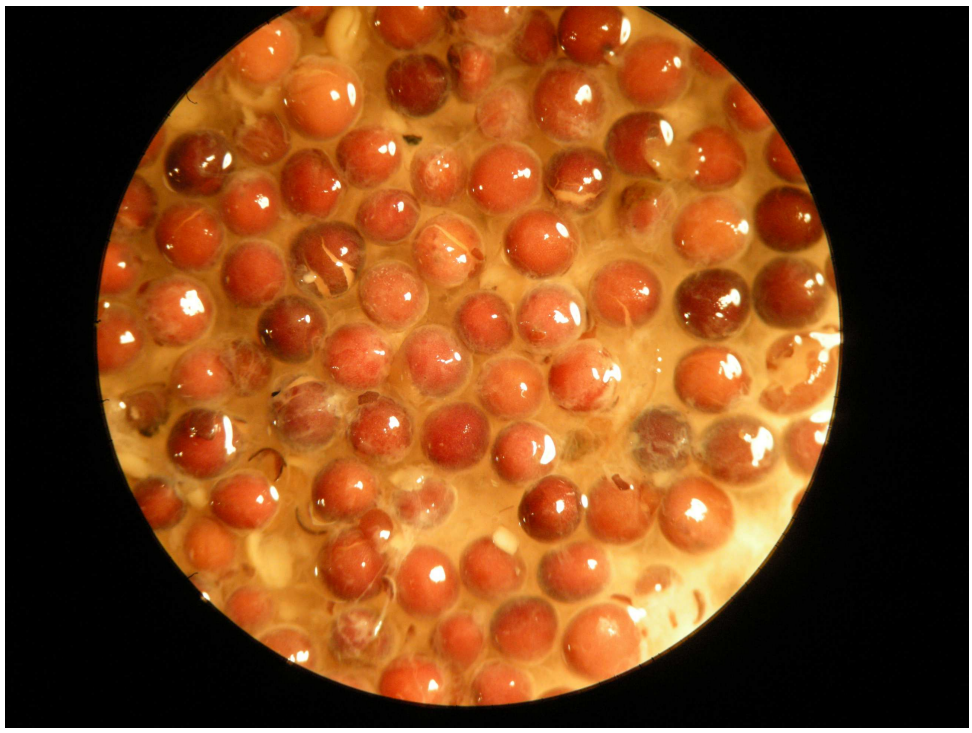

Image 12: Charlock seeds: note many seeds are damaged, but there are few free-floating endosperms

Image 13: Opium poppy seeds: note some seeds are damaged with more extensive

Image 14: Caraway seeds: damage to the seeds resulted in a limited number of breakage patterns

Image 15: Dill seeds: damage to the seeds resulted in a limited number of breakage patterns

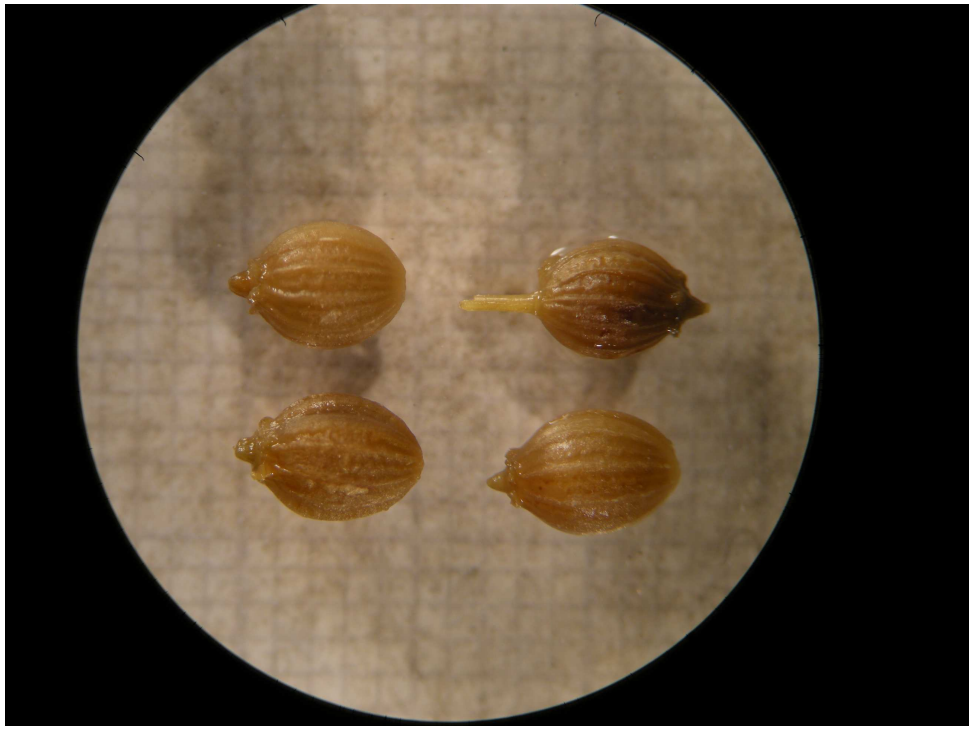

Image 16: Coriander seeds: Undamaged seeds

Image 17: Coriander seeds: Largely undamaged where only the two halves of the seed have separated

Image 18: Coriander seeds: Heavily damaged seeds.

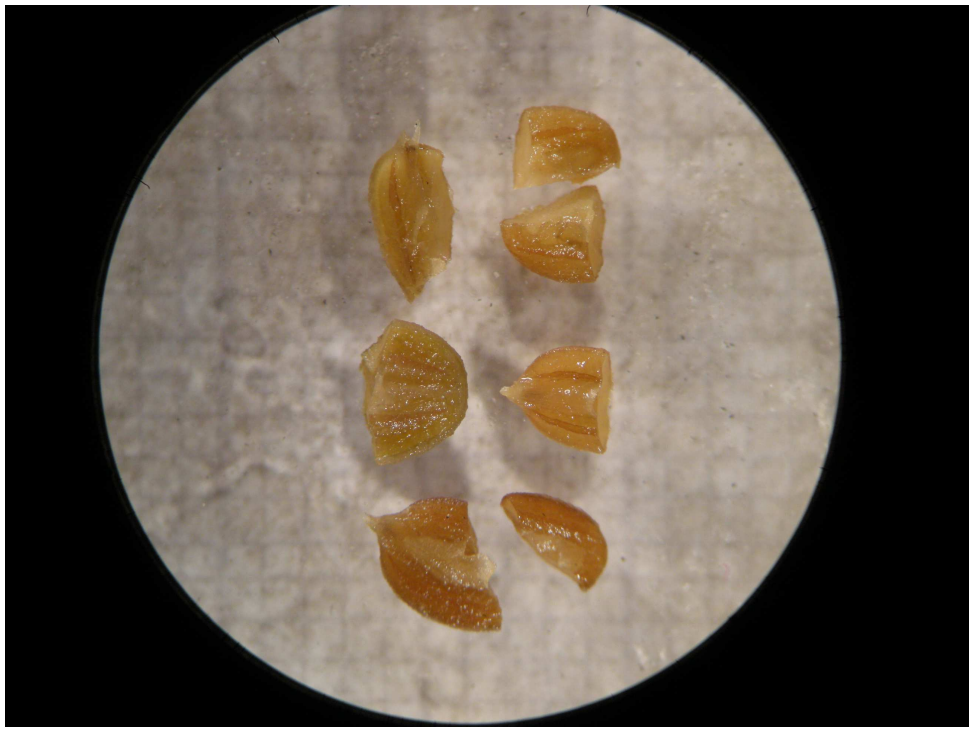

Image 19: Coriander seeds: Free floating endosperm

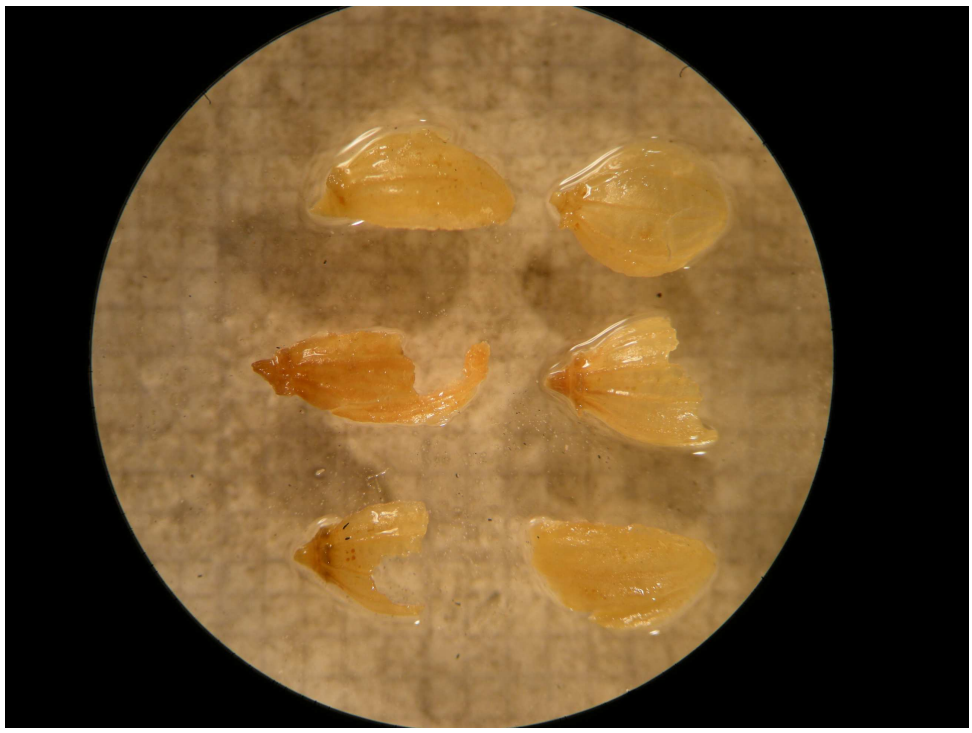

Image 20: Coriander seeds: Free floating testa

Image 21: Orange seed: chewed once

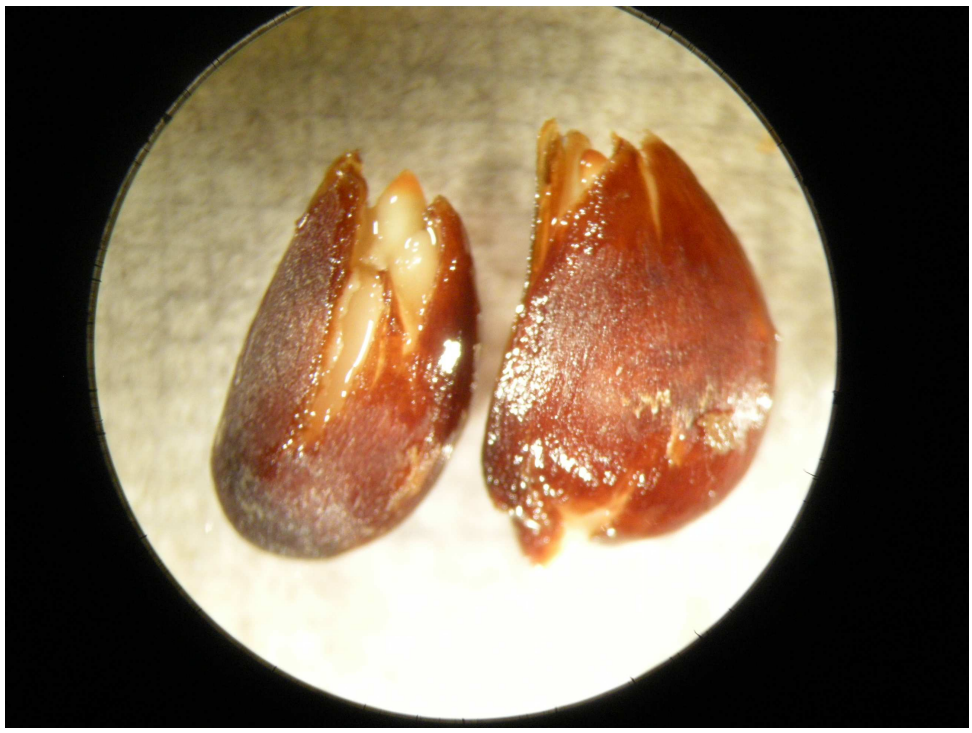

Image 22: Apple seed: chewed once

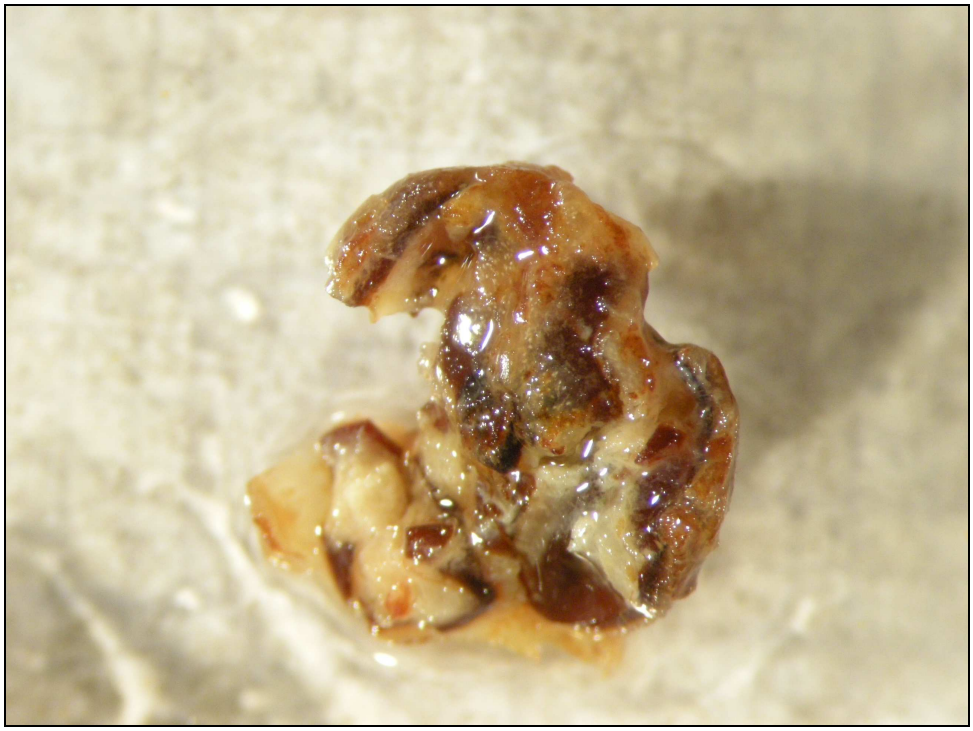

Image 23: Grape seed: chewed once on the left side of the mouth

Image 24: Grape seed: chewed once on the right side of the mouth

Image 25: Corn-cockle seed: chewed twenty times

Baldellia ranunculoides	**Lesser Water-plantain**
Achillea ptarmica	**Sneezewort**
Achillea sp.	**Yarrow species**
Aegopodium podagraria	**Ground elder**
Allium sp.	**Leek/Onion/Garlic?**
Anthriscus caucalis	**Bur chervil**
Aphanes australis/microcarpa	**Slender Parsley-piert**
Aster tripolium (cf.)	**Sea aster**
Boraginaceae	**Borage Family**
Bupleurum falcatum	**Sickle-leaved Hare's-Ear**
Calamintha arvensis/Acinos arvensis	**Basil thyme**
Calendula officinalis	**Pot marigold**
Carex (lenticular)	**Sedges**
Caryophyllaceae	**Pink Family**
Centaurea cf. scabiosa	**Greater Knapweed**
Chenopodium bonus-henricus	**Good King-Henry**
Circaea lutetiana	**Enchanters nightshade**
Crataegus cf. laevigata	**Midland Hawthorn**
Eleocharis multicaulis	**Many-stalked spike-rush**
Epilobium sp	**Willowherbs**
Equisetum sp nodel sheath fragments	**Horsetails**
Euphorbia lathyris	**Caper spurge**
Euphrasia/Odontities sp.	**Eyebrights**
Fabaceae indet.	**indet. legumes**
Glyceria fluitans	**Floating Sweet-Grass**
Glyceria species	**Sweet Grasses**
Hydrocotyle vulgaris	**Marsh Pennywort**
Hypericum sp	**St. John's-worts**
Juncus maritimus	**Sea Rush**
Lepidium coronopus (Coronopus squamatus)	**Swine-cress**
Luzula campestris	**Sweep's brush**
Lycopus europaeus	**Gypsywort**
Malus/pyrus	**Apple/Pear**
Montia fontana	**Blinks**
Oenanthe cf. lachenalii	**Parsley Water-dropwort**
Oenanthe fistulosa	**Tubular Water-dropwort**
Onopordum acanthium	**Cotton Thistle**
Papaver species	**Poppy**
Pastinaca sativa/Heracleum sphondylium	**Parsnip/Hogweed**
Persicaria hydropiper	**Water pepper**
Persicaria lapathifolia	**Pale Persicaria**
Phoenix dactylifera	**Dates**
Picris echioides	**Bristly Oxtongue**
Piper nigrum	**Black Pepper**
Pisum sp.	
Plantago media	**Hoary Plantain**
Potamogeton species	**Pondweed**

Prunus padus	**Bird cherry**
Ranunculus acris/ repens/ bulbosus	**'buttercups'**
Ranunculus lingua	**Greater Spearwort**
Ranunculus subgenus Batrachium	
Reseda sp	**Mignonettes**
Ribes uva-crispa	**Gooseberry**
Scirpus cf. sylvaticus	**Wood Club-rush**
Scleranthus annuus	**Annual Knawel**
Solanum dulcamara	**Bittersweet**
Solanum sp	**Nightshades**
Sonchus sp.	**Sowthistles**
Sorbus sp cf.	**Service**
Sorbus torminalis	**Wild Service-tree**
Sparganium sp	**Bur-reed**
Stachys sylvatica	**Hedge woundwort**
Stellaria holostea stem fragments	**Greater Stichwort**
Stellaria palustris/graminea	**Marsh/Lesser Stichwort**
Stellaria/Cerastium	**Stichworts/Mouse-ears**
Trifolium pratense	**Red Clover**
Veronica sp	**Speedwell**
Zannichellia palustris	**Horned pondweed**
Hypochaeris radicata	**Common cat's ear**
Leontodon hispidus	**Rough Hawkbit**
Matricaria recutita/chamomilla	**Chamomile**
Brassica campestris	**Wild turnip**
Carex (trigonus)	**Sedges**
Empetrum nigrum	**Black crowberry**
Galeopsis tetrahit	**Common hemp nettle**
Stachys palustris	**Marsh Woundwort**
Rhinanthus minor	**Yellow rattle**
Rumex acetosa	**Common sorrel**
Rumex obtusifolius	**Broad-leaved dock**
Prunus cerasifera	**Cherry plum**
Scrophularia nodosa	**Figwort**

Table 8: Plants with only one occurrence in the database

10	*Foeniculum vulgare*	Fennel
10	Bryonia cretica ssp. Dioica	White bryony
10	Juncus sp.	Rush
10	*Picris hieracioides*	Hawkweed Oxtongue
10	*Reseda luteola*	Weld
10	*Rubus fruticosus/idaeus*	blackberry/ raspberry
10	*Umbelliferae indet.*	Umbellifore
9	Leguminosae pods/frags	
9	Juncus acutiflorus/articulatus	Sharp flowered rush
9	*Phragmites australis*	Common Reed
9	*Plantago major*	Greater Plantain
9	*Rhinanthus species*	Rattle
9	*Rubus caesius*	Dewberries
8	*Oenanthe sp*	Water dropwort
8	*Hypochaeris sp.*	Cat's Ear
8	*Sorbus aucuparia*	Rowan
8	*Torilis japonica*	Upright hedge parsley
7	*Chenopodium murale*	Nettle-leaved goosefoot
7	Agrimonia eupatoria	Agrimony
7	Arctium sp.	Burdock
7	*Asteraceae/Compositae (inv fgts)*	?
7	Betula species	Birch
7	Bidens sp.	Bur-marigolds
7	*Fumaria species*	Fumitory
7	*Genista tinctoria leaf frags*	Dyer's Greenweed
7	Juncus inflexus/effusus/conglomeratus	Hard/Soft/Compact Rush
7	*Myrica gale leaf/twig fragments*	Bog myrtle
7	*Silene alba*	White Campion
7	*Stachys sp.*	Woundwort
7	*Vicia cf. tetrasperma*	Smooth Tare
6	Allium porrum	Leek
6	Alnus sp fca	
6	Atropa belladonna	Deadly nightshade
6	Caltha palustris	Marsh-marigold
6	Capsella bursa-pastoris	Shepherd's-purse
6	Cerastium sp.	Mouse-ear chickweed
6	*Heracleum sphondylium*	Hogweed
6	Iris pseudacorus	Yellow flag
6	Isatis tinctoria (pod fragments)	Woad
6	*Linum catharticum*	Fairy Flax
6	*Malus sylvestris seed base cups*	Apple seed base cups
6	Potentilla anserina	Silverweed
6	*Scandix pecten-veneris*	Shepherd's-Needle
6	*Senecio sp.*	Ragworts
6	*Stellaria media/neglecta*	C.mon/Greater Chickweed
6	*Vicia faba epidermis*	Broad bean spidermis
5	*Chenopodium ficifolium*	Fig-leaved goosefoot
5	*Cladium mariscus (epidermus*	Great Fen-sedge

	fragments)	
5	***Dipsacus sativus/fullonum***	**Teasel**
5	***Filipendula ulmaria***	**Meadowsweet**
5	**Juglans regia**	**Walnut**
5	***Luzula species***	**Wood-rush**
5	***Mentha species***	**Mint**
5	***Nepeta cataria***	**Catnip**
5	***Papaver argemone***	**Prickly Poppy**
5	**Polygonaceae**	**-**
5	**Potentilla reptans**	**Creeping cinquefoil**
5	***Sisymbrium sophia/Descurainia sophia***	**Flixweed**
5	***Vaccinium sp. pistil bases***	**Bilberry pistil bases**
5	***Vicia species***	**Vetch**
4	***Oenanthe cf. aquatica***	**Fine-leafed water dropwort**
4	**Achillea millefolium**	**Yarrow**
4	**Centaurea nigra**	**Common knapweed**
4	***Galeopsis species***	**Hemp-nettle**
4	***Galium species***	**Bedstraw**
4	**Juncus gerardi**	**Saltmarsh Rush**
4	**Labiatae species indeterminate**	**Dead-Nettle Family**
4	***Myosotis sp.***	**Forget-me-not**
4	***Odontites vernus***	**Red Bartsia**
4	***Poa annua***	**Annual meadow grass**
4	**Prunus sp**	
4	***Rubus species***	**Brambleberry**
4	***Scirpus maritimus/lacustris***	**Sea/Common Club-rush**
4	***Sonchus arvensis***	**Perennial Sowthistle**
4	***Stellaria graminea***	**Lesser Stichwort**
4	***Stellaria sp.***	**Stichworts**
4	***Trifolium species***	**Clover**
4	***Ulex***	**Gorse (leaf spine)**
4	***Vaccinium myrtillus***	**Bilberry**
4	***Vicia faba trachied bars***	**Broad bean trachied bars**
3	***Sambucus cf. ebulus***	**Dwarf elder**
3	**Agrostis species**	**Bent grass**
3	**Alisma species**	**Water plantains**
3	**Alnus glutinosa (cone)**	**Alder**
3	**Bellis perennis**	**Common daisy**
3	**Brassica nigra**	**Black mustard**
3	***Crepis sp.***	**Hawksbeard**
3	***Erica tetralix***	**Cross-leaved Heath**
3	***Galeopsis subgenus Ladanum***	**Red hempnettle**
3	**Knautia arvensis**	**Field Scabious**
3	**Lithospermum/Buglossoides arvensis**	**Field Gromwell**
3	***Lythrum salicaria***	**Purple loosestrife**
3	***Malva species***	**Mallow**
3	***Pastinaca sativa***	**Parsnip**
3	***Pisum sativum***	**Garden pea**
3	**Populus species bud scales**	**Poplar**
3	**Prunus sp. mesocarp**	
3	***Rumex crispus***	**Curled dock**

3	*Scirpus setaceus*	Bristle Club-rush
3	*Silene vulgaris*	Bladder Campion
3	*Taraxacum officinale*	Dandelion
3	*Thalictrum flavum*	Common Meadow-rue
2	Beta vulgaris	Beet
2	Allium sp. leaf fragment	Leek/Onion/Garlic?
2	Bupleurum rotundifolium	Thorow-wax
2	*Dryopteris sp*	Wood/Male/Buckler Fern
2	*Eleocharis sp.*	Spike-rush
2	*Elymus/Agropyron*	Couches
2	*Eriophorum vaginatum*	Hare's-Tail Cottongrass
2	Juncus subnodulosus	Blunt-flowered Rush
2	Leguminosae tracheid bars	
2	Leontodon taraxacoides	Lesser Hawkbit
2	Leucanthemum vulgare	Oxeye daisy
2	*Linum* sp. cf.	?flax
2	*Lychnis flos-cuculi*	Ragged robin
2	*Malva neglecta*	Dwarf mallow
2	*Malva sylvestris*	Common Mallow
2	*Marrubium vulgare*	White Horehound
2	*Oxalis acetosella*	Wood-sorrel
2	*Persicaria maculosa*	Redshank
2	*Plantago lanceolata* L.	Ribwort plantain
2	Prunus species epidermis	
2	Pyrus communis	Pear
2	Pyrus/Cydonia endocarp	Pear/Qunice
2	Pyrus/Cydonia stone cells	Pear/Qunice
2	*Sinapis arvensis*	Field Mustard
2	*Sorbus aria*	Whitebeam
2	*Thalictrum sp.*	Meadow-rues
2	*Triglochin maritima*	Sea Arrowgrass
2	*Tripleurospermum inodorum/Matricaria perforata*	Scentless Mayweed

Table 9: Plants with less than 10 occurrences in the database

Family	Genus/Species	Common Name	
Adoxaceae	Sambucus nigra	Elder blossoms	1
Amaryllidaceae	Allium sativium	Garlic	7
Amaryllidaceae	Allium ampeloprasum	Leeks	2
Amaryllidaceae	Allium cepa	Onions	23
Amaryllidaceae	Allium species	Scallions	1
Amaryllidaceae	Allium species	Spring Onions	1
Anacardiaceae	Pistacia vera	Pistachio	2
Apiaceae	Pimpinella anisum	Anise	12
Apiaceae	Carum carvi	Caraway	3
Apiaceae	Coriandrum sativum	Coriander	3
Apiaceae	Cuminum cyminum	Cumin	3
Apiaceae	Anethum graveolens	Dill	1
Apiaceae	Foeniculum vulgare	Fennel	3
Apiaceae	Petroselinum crispum	Parsley	37
Apiaceae	Pastinaca sativa	Parsnip	1
Apiaceae	Sium sisarum	Skirrets	1
Apiaceae	Apium graveolens	Smallage/Wild Parsley	1
Arecaceae	Phoenix dactylifera	Dates	46
Asteraceae	Artemisia abrotanum	Southernwood	1
Asteraceae	Tanacetum vulgare	Tansy	1
Betulaceae	Corylus	Hazelnut	2
Boraginaceae	Alkanna tinctoria	Alkanet dye (Red)	5
Boraginaceae	Borago officinalis	Borage	1
Brassicaceae	Brassica species	Mustard	3
Ericaceae	Vaccinium myrtillus	Hurtleberry/Bilberry	1
Euphorbiaceae	Chrozophora tinctoria	Turnsole (Dye)	8
Fagaceae	Quercus sp.	Acorn	1
Iridaceae	Crocus sativus	Saffron	108
Juglandaceae	Juglans species	Walnut	3
Lamiaceae	Calamintha sp.	Calamint	1
Lamiaceae	Salvia sclarea	Clarry	2
Lamiaceae	Hyssopus officinalis	Hyssop	10
Lamiaceae	Mentha species	Mint	5
Lamiaceae	Origanum vulgare	Oregano	1
Lamiaceae	Rosmarinus officinalis	Rosemary	4
Lamiaceae	Salvia officinalis	Sage	18
Lamiaceae	Satureja hortensis	Savoury	9
Lamiaceae	Thymus vulgaris	Thyme	5
Lauraceae	Cinnamomum verum	Cinnamon	91
Lepedium	Lepidiumus sativum	Cresses, Town	1
Lythraceae	Punica granatum	Pomegranate	5
Malvaceae		Mallows	1
Moraceae	Ficus carica	Figs	33
Moraceae	Morus species	Mulberry	1
Myristicaceae	Myristica fragrans	Mace	62
Myristicaceae	Myristica fragrans	Nutmeg	3
Myrtaceae	Syzygium aromaticum	Cloves	98
Paeoniaceae	Paeonia species	Peony	1

Pinaceae	Pinus species	Pine nuts	24
Piperaceae	Piper cubeba	Cubeb	24
Piperaceae	Piper longum	Long Pepper	3
Piperaceae	Piper nigrum	Black Pepper	1
Piperaceae	Piper nigrum	Ground Pepper	30
Piperaceae	Piper nigrum	Pepper	50
Poaceae	Oryaz species	Rice	31
Poaceae	Triticum species	Wheat (Starch)	1
Portulacaceae	Portulaca oleracea	Purslane	1
Rosaceae	Crataegus species	Hawthron Blossoms	1
Rosaceae	Cydonia oblonga	Quinces	5
Rosaceae	Fragaria × ananassa	Strawberry	2
Rosaceae	Malus sp.	Apple	8
Rosaceae	Prunus cf. avium	Cherry	2
Rosaceae	Prunus dulcis	Almond	94
Rosaceae	Prunus species	Cherry/Plum/Bulace	1
Rosaceae	Prunus species	Plums	1
Rosaceae	Prunus species	Prunes	1
Rosaceae	Prunus spinosa	Sloes	1
Rosaceae	Prunus insititia	Bullace	1
Rosaceae	Prunus insititia	Damson Plums	1
Rosaceae	Prunus insititia	Prunes of Damsons	1
Rosaceae	Pyrus species	Pears	16
Rosaceae	Rosa species	Rose hips	1
Rutaceae	Ruta graveolens	Rue	4
Santalaceae	Santalum species	Red Sandalwood	1
Violaceae	Viola species	Violet	1
Vitaceae	Vitus vinifera	Currents	48
Vitaceae	Vitus vinifera	Grapes	4
Vitaceae	Vitus vinifera	Raisins	36
Zingiberaceae	Elettaria/Amomum species	Cardamom	1
Zingiberaceae	Zingiber officinale	Ginger	100
Zingiberaceae	Amomum meleguetta	Grain of Paradise	7
	Aquilaria/Gyrinops species	Aloeswood	1
	?	Amydon	12
	Geum/Dryas species	Avens	1
		Dittany	1
		Galingale	22
		Gum arabic	1
		Sanders	40
	?Laserwort	Sermountain	1
		Spice Powder	32
		Spikenard	1
		Strong Spice Powder	5

Table 10: Plant ingredients from 217 surveyed recipes and the number of times they are mentioned

	Family	Genus/Species	Common Name
108	Iridaceae	Crocus sativus	Saffron
100	Zingiberaceae	Zingiber officinale	Ginger
98	Myrtaceae	Syzygium aromaticum	Cloves
94	Rosaceae	Prunus dulcis	Almond
91	Lauraceae	Cinnamomum verum	Cinnamon
82	Vitaceae	Vitus vinifera	Grapes (Total)
79	Piperaceae	Piper nigrum	Pepper (Total)
62	Myristicaceae	Myristica fragrans	Mace
50	Piperaceae	Piper nigrum	Pepper
48	Vitaceae	Vitus vinifera	Currents
46	Arecaceae	Phoenix dactylifera	Dates
40			Sanders
37	Apiaceae	Petroselinum crispum	Parsley
36	Vitaceae	Vitus vinifera	Raisins
33	Moraceae	Ficus carica	Figs
32			Spice Powder
31	Poaceae	Oryaz species	Rice
30	Piperaceae	Piper nigrum	Ground Pepper
24	Pinaceae	Pinus species	Pine nuts
24	Piperaceae	Piper cubeba	Cubeb
23	Amaryllidaceae	Allium cepa	Onions
22			Galingale
18	Lamiaceae	Salvia officinalis	Sage
16	Rosaceae	Pyrus species	Pears
12	Apiaceae	Pimpinella anisum	Anise
12		?	Amydon
10	Lamiaceae	Hyssopus officinalis	Hyssop
9	Lamiaceae	Satureja hortensis	Savoury
8	Euphorbiaceae	Chrozophora tinctoria	Turnsole (Dye)
8	Rosaceae	Malus sp.	Apple
7	Amaryllidaceae	Allium sativium	Garlic
7	Zingiberaceae	Amomum meleguetta	Grain of Paradise
5	Boraginaceae	Alkanna tinctoria	Alkanet dye (Red)
5	Lamiaceae	Mentha species	Mint
5	Lamiaceae	Thymus vulgaris	Thyme
5	Lythraceae	Punica granatum	Pomegranate
5	Rosaceae	Cydonia oblonga	Quinces
5			Strong Spice Powder
4	Lamiaceae	Rosmarinus officinalis	Rosemary
4	Rutaceae	Ruta graveolens	Rue
4	Vitaceae	Vitus vinifera	Grapes
3	Apiaceae	Carum carvi	Caraway
3	Apiaceae	Coriandrum sativum	Coriander
3	Apiaceae	Cuminum cyminum	Cumin
3	Apiaceae	Foeniculum vulgare	Fennel
3	Brassicaceae	Brassica species	Mustard
3	Juglandaceae	Juglans species	Walnut
3	Myristicaceae	Myristica fragrans	Nutmeg

3	Piperaceae	Piper longum	Long Pepper
2	Amaryllidaceae	Allium ampeloprasum	Leeks
2	Anacardiaceae	Pistacia vera	Pistachio
2	Betulaceae	Corylus	Hazelnut
2	Lamiaceae	Salvia sclarea	Clarry
2	Rosaceae	Fragaria × ananassa	Strawberry
2	Rosaceae	Prunus cf. avium	Cherry
1	Adoxaceae	Sambucus nigra	Elder blossoms
1	Amaryllidaceae	Allium species	Scallions
1	Amaryllidaceae	Allium species	Spring Onions
1	Apiaceae	Anethum graveolens	Dill
1	Apiaceae	Pastinaca sativa	Parsnip
1	Apiaceae	Sium sisarum	Skirrets
1	Apiaceae	Apium graveolens	Smallage/Wild Parsley
1	Asteraceae	Artemisia abrotanum	Southernwood
1	Asteraceae	Tanacetum vulgare	Tansy
1	Boraginaceae	Borago officinalis	Borage
1	Ericaceae	Vaccinium myrtillus	Hurtleberry/Bilberry
1	Fagaceae	Quercus sp.	Acorn
1	Lamiaceae	Calamintha sp.	Calamint
1	Lamiaceae	Origanum vulgare	Oregano
1	Lepedium	Lepidiumus sativum	Cresses, Town
1	Malvaceae		Mallows
1	Moraceae	Morus species	Mulberry
1	Paeoniaceae	Paeonia species	Peony
1	Piperaceae	Piper nigrum	Black Pepper
1	Poaceae	Triticum species	Wheat (Starch)
1	Portulacaceae	Portulaca oleracea	Purslane
1	Rosaceae	Crataegus species	Hawthron Blossoms
1	Rosaceae	Prunus species	Cherry/Plum/Bulace
1	Rosaceae	Prunus species	Plums
1	Rosaceae	Prunus species	Prunes
1	Rosaceae	Prunus spinosa	Sloes
1	Rosaceae	Prunus insititia	Bullace
1	Rosaceae	Prunus insititia	Damson Plums
1	Rosaceae	Prunus insititia	Prunes of Damsons
1	Rosaceae	Rosa species	Rose hips
1	Santalaceae	Santalum species	Red Sandalwood
1	Violaceae	Viola species	Violet
1	Zingiberaceae	Elettaria/Amomum species	Cardamom
1		Aquilaria/Gyrinops species	Aloeswood
1		Geum/Dryas species	Avens
1			Dittany
1			Gum arabic
1		?Laserwort	Sermountain
1			Spikenard

Table 11: Summary of the plants recorded from medieval recipes: most common to least common

#	%	Total
113	78	Chenopodioideae
109	75	Agrostemma githago
104	71	*Rubus species fructicosus/idaeus total*
100	68	*Malus records - total*
99	68	Atriplex patula/prostrata/hastata
96	66	*Sambucus nigra*
90	90	*Chenopodium album*
90	62	Prunus spinosa
89	61	*Urtica urens*
86	59	Carex species
86	59	*Malus sylvestris/domesticus*
86	59	*Rubus fruticosus*
81	55	*Malus sylvestris endocarp*
80	55	*Corylus avellana*
77	53	Ranunculus subgenus Ranunculus
74	51	Lapsana communis
73	50	*Raphanus raphanistrum*
73	50	*Rumex* spp.
70	48	Anthemis cotula
68	47	Linum usitatissimum
68	47	*Fallopia convolvulus*
65	45	*Stellaria media*
64	44	Polygonum aviculare
63	43	*Urtica dioica*
61	42	*Eleocharis palustris*
59	40	Polygonum lapathifolium
56	38	*Galeopsis subgenus Galeopsis*
54	37	Polygonum persicaria
53	36	Brassica rapa
52	36	*Graminae/Poaceae*
51	35	Brassica species/Brassicaceae seed
50	34	Aethusa cynapium
49	34	*Sonchus asper*
46	32	Anethum graveolens
46	32	Prunus domestica total

%	9th - mid 10th Century
93	Chenopodioideae
85	*Malus records - total*
85	Atriplex patula/prostrata/hastata
83	*Urtica urens*
81	*Chenopodium album*
78	Agrostemma githago
75	Prunus spinosa
73	*Rubus species fructicosus/idaeus total*
73	*Malus sylvestris/domesticus*
71	*Sambucus nigra*
67	Carex species
66	*Fallopia convolvulus*
64	*Malus sylvestris endocarp*
64	*Corylus avellana*
63	*Rubus fruticosus*
59	*Raphanus raphanistrum*
58	Anthemis cotula
58	*Galeopsis subgenus Galeopsis*
54	*Rumex* spp.
54	Polygonum aviculare
54	Anethum graveolens
51	Ranunculus subgenus Ranunculus
49	*Stellaria media*
48	Lapsana communis
46	Polygonum lapathifolium
46	Polygonum persicaria
44	Linum usitatissimum
44	*Eleocharis palustris*
44	Aethusa cynapium
44	Pteridium aquilinum
42	Apium graveolens
41	*Urtica dioica*
39	*Hyoscyamus niger*
37	Brassica species/Brassicaceae seed
37	Prunus domestica total

%	Late 10th - 11th Century
96	Chenopodioideae
96	Linum usitatissimum
92	Agrostemma githago
88	*Malus records - total*
88	Atriplex patula/prostrata/hastata
88	*Urtica urens*
88	Lapsana communis
88	*Raphanus raphanistrum*
84	*Chenopodium album*
80	*Rubus species fructicosus/idaeus total*
80	*Rubus fruticosus*
80	*Malus sylvestris endocarp*
80	Ranunculus subgenus Ranunculus
80	Anthemis cotula
80	*Fallopia convolvulus*
76	*Sambucus nigra*
76	Polygonum lapathifolium
72	Prunus spinosa
72	*Corylus avellana*
72	*Stellaria media*
72	Polygonum aviculare
72	*Sonchus asper*
68	*Rumex* spp.
68	Polygonum persicaria
68	Brassica rapa
68	*Genista tinctoria stem fragments*
64	Carex species
64	*Urtica dioica*
60	*Eleocharis palustris*
60	*Galeopsis subgenus Galeopsis*
56	*Graminae/Poaceae*
52	Aethusa cynapium
52	Apium graveolens
52	*Vaccinium cf. myrtillus (combined species)*
52	*Humulus lupus*

%	11th - 13th Century
90	Agrostemma githago
86	Chenopodioideae
76	*Rubus species fructicosus/idaeus total*
76	Atriplex patula/prostrata/hastata
71	*Sambucus nigra*
71	*Chenopodium album*
71	Lapsana communis
67	*Malus records - total*
67	*Urtica urens*
67	*Rubus fruticosus*
62	*Malus sylvestris endocarp*
62	*Eleocharis palustris*
62	Brassica rapa
57	Prunus spinosa
57	Carex species
57	*Malus sylvestris/domesticus*
57	Linum usitatissimum
57	*Stellaria media*
57	*Urtica dioica*
57	Prunus domestica total
48	Ranunculus subgenus Ranunculus
48	*Raphanus raphanistrum*
43	*Corylus avellana*
43	Anthemis cotula
43	*Fallopia convolvulus*
43	Polygonum lapathifolium
43	Prunus domestica
38	Polygonum persicaria
38	*Graminae/Poaceae*
38	Aethusa cynapium
38	Carduus/Cirsium sp.
38	Brassica sp./Sinapis arvensis
38	Prunus cf. cerasus total
33	*Rumex* spp.
33	Brassica species/Brassicaceae seed

%	13th - 15th Century
63	*Ficus carica*
59	Agrostemma githago
56	*Rubus species fructicosus/idaeus total*
52	Prunus spinosa
52	Carex species
52	Ranunculus subgenus Ranunculus
44	Chenopodioideae
44	*Rumex* spp.
41	*Sambucus nigra*
37	*Vitis vinifera* L.
37	*Fragaria vesca*
33	*Malus records - total*
33	*Corylus avellana*
33	*Graminae/Poaceae*
33	Prunus cf. cerasus total
30	Brassica species/Brassicaceae seed
30	*Prunus insititia*
30	*Foeniculum vulgare*
30	*Rubus fruticosus/idaeus*
26	Atriplex patula/prostrata/hastata
26	*Rubus fruticosus*
26	Lapsana communis
26	Polygonum aviculare
26	*Urtica dioica*
26	*Rumex acetosella*
22	*Malus sylvestris/domesticus*
22	*Malus sylvestris endocarp*
22	Anthemis cotula
22	*Eleocharis palustris*
22	*Chrysanthemum segetum*
19	*Raphanus raphanistrum*
19	*Stellaria media*
19	*Sonchus asper*
19	*Rubus idaeus*
19	*Menyanthes trifoliata*

%	16th - 17th Century
86	*Ficus carica*
71	*Rubus species fructicosus/idaeus total*
64	*Sambucus nigra*
57	*Rubus fruticosus*
43	Carex species
43	*Vitis vinifera* L.
36	Agrostemma githago
36	*Malus records - total*
36	*Corylus avellana*
36	*Raphanus raphanistrum*
36	*Rumex* spp.
29	Chenopodioideae
29	Atriplex patula/prostrata/hastata
29	*Malus sylvestris endocarp*
29	Brassica species/Brassicaceae seed
29	*Viola species*
29	*Fragaria vesca*
29	Centaurea cyanus
29	*Euphorbia helioscopia*
29	*Reseda luteola*
21	*Malus sylvestris/domesticus*
21	Ranunculus subgenus Ranunculus
21	Linum usitatissimum
21	*Urtica dioica*
21	Juncus sp.
14	*Chenopodium album*
14	Prunus spinosa
14	*Urtica urens*
14	Lapsana communis
14	*Graminae/Poaceae*
14	*Vaccinium cf. myrtillus (combined species)*
14	Prunella vulgaris
14	*Rumex acetosella*
14	Alliums (combined)
14	*Vaccinium sp.*

43	29	Apium graveolens
40	27	Pteridium aquilinum
36	25	Carduus/Cirsium sp.
36	25	*Vaccinium cf. myrtillus (combined species)*
35	24	Brassica sp./Sinapis arvensis
35	24	*Humulus lupus*
35	24	*Ficus carica*
35	24	Prunus domestica
35	24	*Hyoscyamus niger*
34	23	Polygonum hydropiper
32	22	Prunella vulgaris
32	22	*Satureja hortensis*
32	22	*Rumex acetosella*
32	22	*Viola species*
30	21	Alliums (combined)
30	21	*Vaccinium sp.*
30	21	Lamium section Lamiopsis
30	21	*Rubia tinctorum*
29	20	*Crataegus monogyna fruitstone*
28	19	Cannabis sativa
28	19	*Genista tinctoria stem fragments*
25	17	*Spergula arvensis*
25	17	*Papaver somniferum*
24	16	*Chenopodium/Atriplex* spp.
24	16	*Thlaspi arvense*
23	16	Allium porrum leaf fragment
23	16	Calluna vulgaris flower/leaf fragments
23	16	Prunus cf. cerasus total
23	16	*Rubus idaeus*
22	15	*Conium maculatum*
22	15	Juncus bufonius
22	15	*Prunus insititia*
21	14	Centaurea sp.
21	14	*Ranunculus flammula*
21	14	*Rosa sp.*
20	14	*Sonchus oleraceus*
20	14	*Vicia faba*
20	14	*Ranunculus sceleratus*

36	Brassica rapa
34	*Graminae/Poaceae*
32	*Sonchus asper*
29	Carduus/Cirsium sp.
29	*Humulus lupus*
27	Prunus domestica
27	*Satureja hortensis*
27	Lamium section Lamiopsis
27	*Rubia tinctorum*
27	Cannabis sativa
25	Brassica sp./Sinapis arvensis
25	Polygonum hydropiper
25	*Viola species*
24	*Crataegus monogyna fruitstone*
24	Juncus bufonius
22	Prunella vulgaris
22	*Thlaspi arvense*
22	*Conium maculatum*
19	*Vaccinium cf. myrtillus (combined species)*
19	Alliums (combined)
19	*Chenopodium/Atriplex* spp.
19	*Coriandrum sativum*
17	*Rumex acetosella*
17	*Vaccinium sp.*
17	Allium porrum leaf fragment
17	Calluna vulgaris flower/leaf fragments
17	*Vicia faba*
17	*Ranunculus sceleratus*
15	*Genista tinctoria stem fragments*
15	*Spergula arvensis*
15	*Rubus idaeus*
15	*Rosa sp.*
14	*Papaver somniferum*
14	*Sonchus oleraceus*
14	*Menyanthes trifoliata*
14	*Galium aparine* L.
14	*Phragmites australis*
12	*Ranunculus flammula*

48	Brassica sp./Sinapis arvensis
48	Polygonum hydropiper
48	*Vaccinium sp.*
48	*Spergula arvensis*
44	Anethum graveolens
44	*Satureja hortensis*
44	Calluna vulgaris flower/leaf fragments
40	Pteridium aquilinum
37	*Malus sylvestris/domesticus*
36	Carduus/Cirsium sp.
36	Prunella vulgaris
36	Alliums (combined)
36	*Papaver somniferum*
32	*Rumex acetosella*
32	*Viola species*
32	*Rubia tinctorum*
32	*Crataegus monogyna fruitstone*
32	*Valerianella dentata*
32	Leontodon sp.
28	Prunus domestica total
28	Prunus domestica
28	Cannabis sativa
28	Juncus bufonius
28	*Vicia faba*
28	*Ilex aquifolium (leaf fragments)*
28	*Pisum sativum hilum, parenchyma, epidermis*
28	Potentilla erecta
28	*Danthonia decumbens*
24	Lamium section Lamiopsis
24	*Thlaspi arvense*
24	Allium porrum leaf fragment
24	*Ranunculus flammula*
24	*Rosa sp.*
24	Bromus sp.
24	Anthriscus sylvestris
24	*Daucus carota*
20	Centaurea sp.
20	Potentilla species

33	*Sonchus asper*
33	*Vaccinium cf. myrtillus (combined species)*
33	*Sonchus oleraceus*
33	Bromus sp.
33	*Chrysanthemum segetum*
29	Polygonum aviculare
29	*Galeopsis subgenus Galeopsis*
29	*Hyoscyamus niger*
29	Polygonum hydropiper
29	Prunella vulgaris
29	*Vaccinium sp.*
29	*Rubia tinctorum*
29	*Prunus insititia*
29	Centaurea sp.
24	*Humulus lupus*
24	*Satureja hortensis*
24	*Rumex acetosella*
24	Alliums (combined)
24	*Crataegus monogyna fruitstone*
24	*Papaver somniferum*
24	*Chenopodium/Atriplex* spp.
24	*Ranunculus flammula*
24	*Salix species bud scale/leaf fragments*
24	Prunus cf. cerasus
19	Apium graveolens
19	Lamium section Lamiopsis
19	*Rubus idaeus*
19	*Conium maculatum*
19	*Ranunculus sceleratus*
19	Potentilla species
19	*Chenopodium murale*
14	*Viola species*
14	Cannabis sativa
14	*Thlaspi arvense*
14	Allium porrum leaf fragment
14	*Rosa sp.*
14	*Valerianella dentata*
14	Leontodon sp.

19	Centaurea cyanus
19	Prunus cerasus
15	*Chenopodium album*
15	Prunus domestica total
15	Centaurea sp.
15	Prunus cf. cerasus
15	Juncus sp.
15	*Reseda luteola*
11	Linum usitatissimum
11	Polygonum lapathifolium
11	Anethum graveolens
11	*Vaccinium cf. myrtillus (combined species)*
11	Prunus domestica
11	Alliums (combined)
11	Lamium section Lamiopsis
11	*Chenopodium/Atriplex* spp.
11	*Coriandrum sativum*
11	Ranunculus sardous
7	*Urtica urens*
7	Polygonum persicaria
7	Brassica rapa
7	Aethusa cynapium
7	Pteridium aquilinum
7	Carduus/Cirsium sp.
7	*Hyoscyamus niger*
7	Prunella vulgaris
7	*Viola species*
7	*Crataegus monogyna fruitstone*
7	Cannabis sativa
7	*Spergula arvensis*
7	*Papaver somniferum*
7	Allium porrum leaf fragment
7	*Ranunculus flammula*
7	*Rosa sp.*
7	*Vicia faba*
7	*Valerianella dentata*
7	*Pisum sativum hilum, parenchyma, epidermis*
7	*Euphorbia helioscopia*

14	Allium porrum leaf fragment
14	*Rubus idaeus*
14	Centaurea sp.
14	*Ranunculus sceleratus*
7	Anthemis cotula
7	*Stellaria media*
7	Polygonum aviculare
7	*Eleocharis palustris*
7	Polygonum lapathifolium
7	*Galeopsis subgenus Galeopsis*
7	Brassica rapa
7	Aethusa cynapium
7	Prunus domestica total
7	*Hyoscyamus niger*
7	Lamium section Lamiopsis
7	*Papaver somniferum*
7	*Chenopodium/Atriplex* spp.
7	*Thlaspi arvense*
7	Prunus cf. cerasus total
7	*Conium maculatum*
7	*Prunus insititia*
7	*Ranunculus flammula*
7	*Rosa sp.*
7	Sonchus oleraceus
7	*Coriandrum sativum*
2	*Chrysanthemum segetum*
1	Leontodon sp.
1	*Salix species bud scale/leaf fragments*
1	Quercus sp. bud scales
1	Potentilla erecta
1	Prunus cf. cerasus
1	*Prunus cf. domestica*
1	*Umbelliferae indet.*
1	*Phragmites australis*

20	14	*Valerianella dentata*
19	13	Bromus sp.
19	13	*Vitis vinifera* L.
18	12	*Chrysanthemum segetum*
16	11	Leontodon sp.
16	11	*Menyanthes trifoliata*
16	11	*Fragaria vesca*
16	11	Potentilla species
15	10	*Coriandrum sativum*
15	10	*Ilex aquifolium (leaf fragments)*
15	10	*Galium aparine* L.
14	10	Anthriscus sylvestris
14	10	Ranunculus sardous
14	10	*Salix species bud scale/leaf fragments*
13	9	*Daucus carota*
13	9	*Pisum sativum hilum, parenchyma, epidermis*
12	8	Leguminosae flowers/petals
12	8	Quercus sp. bud scales
12	8	*Pedicularis palustris*
12	8	Potentilla erecta
12	8	Prunus cf. cerasus
12	8	*Solanum nigrum*
11	8	Centaurea cyanus
11	8	*Euphorbia helioscopia*
11	8	Anagallis arvensis
11	8	*Danthonia decumbens*
11	8	Potentilla palustris
11	8	Prunus cerasus
11	8	*Prunus cf. domestica*
10	7	*Foeniculum vulgare*
10	7	*Umbelliferae indet.*
10	7	*Picris hieracioides*
10	7	Bryonia cretica ssp. Dioica
10	7	Juncus sp.
10	7	*Reseda luteola*
10	7	*Rubus fruticosus/idaeus*
9	6	Leguminosae pods/frags
9	6	Juncus acutiflorus/articulatus
9	6	*Rhinanthus species*
9	6	*Plantago major*

12	*Valerianella dentata*
12	Anagallis arvensis
12	Bryonia cretica ssp. Dioica
10	Bromus sp.
10	Potentilla species
10	*Ilex aquifolium (leaf fragments)*
10	Leguminosae flowers/petals
10	*Prunus cf. domestica*
8	*Daucus carota*
8	*Oenanthe sp*
7	Centaurea sp.
7	Anthriscus sylvestris
7	*Salix species bud scale/leaf fragments*
7	Quercus sp. bud scales
7	*Solanum nigrum*
7	Potentilla palustris
7	*Picris hieracioides*
7	Juncus acutiflorus/articulatus
7	*Plantago major*
7	*Sorbus aucuparia*
5	Prunus cf. cerasus total
5	*Prunus insititia*
5	Leontodon sp.
5	Ranunculus sardous
5	Potentilla erecta
5	*Umbelliferae indet.*
5	*Rhinanthus species*
5	*Rubus caesius*
5	*Chenopodium murale*
3	*Pisum sativum hilum, parenchyma, epidermis*
3	*Euphorbia helioscopia*
3	*Danthonia decumbens*
3	Prunus cerasus
3	*Rubus fruticosus/idaeus*
3	*Torilis japonica*
3	*Hypochaeris sp.*
2	*Chrysanthemum segetum*
1	*Ficus carica*
1	*Pedicularis palustris*
1	Prunus cf. cerasus

20	*Galium aparine* L.
20	Ranunculus sardous
20	Leguminosae flowers/petals
20	Leguminosae pods/frags
20	Juncus acutiflorus/articulatus
16	*Chenopodium/Atriplex* spp.
16	*Prunus insititia*
16	*Sonchus oleraceus*
16	*Ranunculus sceleratus*
16	*Salix species bud scale/leaf fragments*
16	*Solanum nigrum*
16	Potentilla palustris
16	*Umbelliferae indet.*
16	*Rhinanthus species*
16	*Torilis japonica*
16	*Hypochaeris sp.*
12	*Hyoscyamus niger*
12	*Rubus idaeus*
12	*Conium maculatum*
12	Quercus sp. bud scales
12	*Pedicularis palustris*
12	*Euphorbia helioscopia*
12	Anagallis arvensis
12	*Picris hieracioides*
12	*Plantago major*
12	*Rubus caesius*
12	*Sorbus aucuparia*
10	Brassica species/Brassicaceae seed
8	*Ficus carica*
8	Prunus cf. cerasus total
8	*Chrysanthemum segetum*
8	*Menyanthes trifoliata*
8	Bryonia cretica ssp. Dioica
8	*Reseda luteola*
8	*Oenanthe sp*
4	*Vitis vinifera* L.
1	Prunus cf. cerasus
1	Centaurea cyanus
1	Prunus cerasus
1	Juncus sp.

14	Ranunculus sardous
14	Quercus sp. bud scales
14	*Pedicularis palustris*
14	*Solanum nigrum*
14	Potentilla palustris
14	Prunus cerasus
14	*Prunus cf. domestica*
14	*Picris hieracioides*
14	*Rubus caesius*
10	Pteridium aquilinum
10	*Ficus carica*
10	*Genista tinctoria stem fragments*
10	*Spergula arvensis*
10	*Vitis vinifera* L.
10	*Fragaria vesca*
10	*Galium aparine* L.
10	*Pisum sativum hilum, parenchyma, epidermis*
10	*Foeniculum vulgare*
10	Leguminosae pods/frags
10	*Hypochaeris sp.*
5	Calluna vulgaris flower/leaf fragments
5	Bryonia cretica ssp. Dioica
1	Juncus bufonius
1	*Vicia faba*
1	*Menyanthes trifoliata*
1	*Ilex aquifolium (leaf fragments)*
1	Anthriscus sylvestris
1	*Daucus carota*
1	Leguminosae flowers/petals
1	Potentilla erecta
1	Centaurea cyanus
1	Anagallis arvensis
1	Juncus sp.
1	*Rhinanthus species*
1	*Oenanthe sp*
1	*Sorbus aucuparia*

7	*Danthonia decumbens*
7	*Umbelliferae indet.*
7	*Plantago major*
7	*Torilis japonica*
4	Apium graveolens
4	Polygonum hydropiper
4	*Thlaspi arvense*
4	Calluna vulgaris flower/leaf fragments
4	*Conium maculatum*
1	Leontodon sp.
1	Potentilla species
1	*Ilex aquifolium (leaf fragments)*
1	*Daucus carota*
1	Quercus sp. bud scales
1	*Solanum nigrum*
1	*Prunus cf. domestica*
1	Leguminosae pods/frags
1	*Rhinanthus species*

9	6	*Phragmites australis*
9	6	*Rubus caesius*
8	5	*Oenanthe sp*
8	5	*Torilis japonica*
8	5	*Hypochaeris sp.*
8	5	*Sorbus aucuparia*

1	Juncus sp.
1	Leguminosae pods/frags

Table 12: The summary of the main plants recovered by period – the species are represented as their percentage likelihood of occurring in the samples from a particular period

	Town/City	Appleby	Beverley	Beverley	Beverley	Beverley	Beverley	Beverley	Beverley	Beverley	Beverley	Beverley	Beverley	Chester	Chester	Chester	Chester	Chester	Chester	Chester	Chester
	Period	13th-15th	M/L 14C	M/L 14C	M/L 14C	M/L 14C	M/L 14C	15th C	15th C	15th C	15th C	E 14th	E 14th	Mid C.13th	Mid C.13th	Mid C.13th	900-1066	14-L15	L15-M17	L15-M17	L15-M17
	Feature	<21>	<1, 2>	<3, 4, 5>	<112>	<111>	<92>	<86>	<358>	<360>	<376>	20/T1	31/T1	F9	F9	F9	<5124>	<5161>	<5073>	<5075>	<5077>
	context	186	Pit 10 (47)	Pit 10 (55)	Pit96 (120)	Pit96 (135)	Pit 467	86	358	360	376	1031	1136	29	30	31	1175	1632	785	791	797
	vol.soil (l)	10						0.5	0.5	0.25	0.5	3	2	0.25-0.5	0.25-0.5	0.25-0.5					
	flot vol (ml)	25										1.2	6								
Cereal grains																					
Avena sativa	Cultivated oat spikelets																				
Avena sp(p).	oat	2*						1						*1			1	1	1	1	1
Avena strigosa	Bristle Oat																				
cf. *Avena* sp(p).	?oat																				
cf. *S. cereale*	?rye																				
Hordeum (naked)	Barley; naked																				
Hordeum sativum	barley															*+					
Hordeum sp.	Barley						1						1				1	1	1		
Hordeum (twisted naked)																					
indeterminate cereals	indet. grains (est.)	1*																			

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Secale cereale	rye															*+					
T. aestivum s.l.	free-threshing wheat																				
Triticum (hexapolid)	Bread wheat																				
Triticum aestivo-compactum	Bread wheat	1*																		1	
Triticum sp(p).	wheat				1	1								1*		*+	1	1	1		
Triticum spelta	Spelt wheat																				
Triticum/Secale	Wheat/Rye												1								
Cereal chaff																					
Cerealia indet culm fragments																					
Gramineae sect. Cerealia	Cereals, rhachis frag.																				
Indeterminate mineralised cereals												1			2						
Cerealia bran														++	+++						
Triticum floret base																					
Avena sativa floret base	Cultivated oat																				
Triticum aestivum s.l.	6x wheat rachis																				
Triticum species rachis	Wheat rachis																				
Secale cereale L.	rye rachis															+					
Avena glume fragment	Oat glume													13,4*	17						
Avena sp. bran fragments	Oat bran																				
Triticum/Secale bran	Wheat/Rye bran frag.				1			3	3	3	3	1	2								
Hordeum species rachis	Barley rachis fragments																				
Hordeum sp 'bran' fragments	Barley bran																				
Other plants																					
(M) Anomobryum filiforme																					
(M) Anomodon viticulosus	Rambling Tail-moss																				
(M) Antitrichia curtipendula	Pendulous Wing-moss																				
(M) Atrichum undulatum	Common Smoothcap																				
(M) Barbula cf. species	Beard-moss																				
(M) Brachythecium/Eurhynchium sp																					
(M) Bryum sp.	Thread-moss																				
(M) Calliergon cf. giganteum	Giant Spear-moss			1																	
(M) Calliergon cuspidatum	Pointed spear-moss			1																	
(M) Campylium elodes	Fine leaved feather moss																				
(M) Campylium stellatum (cf.)				1									1								
(M) cf. Amblystegium sp(p).	Creeping feather-moss																				
(M) Cratoneuron commutatum	Curled hook-moss																				
(M) Cratoneuron filicinum	Fern-leaved Hook-moss																				
(M) Cratoneuron filicinum																					
(M) Dicramun sp.	Wind Bloon/Fork Moss																				
(M) Diphasium alpinium (D. complanatum)	Alpine Clubmoss																				
(M) Drepanocladus aduncus	Knieff's Hook-moss																				
(M) Drepanocladus sp.				1																	
(M) Eurhynchium praelongum																					
(M) Eurhynchium sp	Feather-moss																				
(M) Eurhynchium speciosum																					
(M) Eurhynchium striatum	Common Striated Feather-moss																				
(M) Homalia trichomanoides	Blunt Feather-moss																				
(M) Homalothcium nitens																					
(M) Homalothcium sericeum/lutescens																					
(M) Homalothcium sp																					
(M) Hylocomium cf. brevirostre																					
(M) Hylocomium myosuroides																					

(M) Hylocomium splendens																					
(M) Hypnum cf. cupressiforme	Cypress-leaved Plait-moss																				
(M) Isothecium myosuroides	Mouse-tail Moss																				
(M) Isothecium myurum																					
(M) Leucobryum glaucum	Large White-moss																				
(M) Leucodon sciuroides	Squirrel-tail Moss																				
(M) Lycopodium sp																					
(M) Mnium hornum	Swan's-neck Thyme-moss																				
(M) Neckera complanata	Flat Neckera																				
(M) Neckera crispa	Crisped Neckera																				
(M) Plagiomnium sp.																					
(M) Plagiomnium undulatum	Hart's-tongue Thyme-moss																				
(M) Pleurozium schreberi																					
(M) Polytrichum formosum																					
(M) Polytrichum species																					
(M) Pseudoscleropodium purum	Neat Feather-moss																				
(M) Racomitrium canescens	Hoary Fringe-moss																				
(M) Racomitrium sp.	Fringe-moss																				
(M) Rhynchostegiella tenella (cf.)	Tender Feather-moss																				
(M) Rhynchostegium sp	Feather-moss																				
(M) Rhytidiadelphus sp.	Turf-moss																				
(M) Rhytidiadelphus squarrosus	Springy Turf-moss																				
(M) Rhytidiadelphus triquetrus																					
(M) Scorpidium scorpioides	Hooked Scorpion-moss			1									1								
(M) Sphagnum imbricatum												1									
(M) Sphagnum Section Acutifolia																					
(M) Sphagnum Section Sphagnum																					
(M) Sphagnum sp.													1								
(M) Thamnobryum alopecurum	Fox-tail Feather-moss																				
(M) Thuidium cf. tamariscinum																					
(M) Ulota crispa	Crisped pincushion																				
(M) Ulota species																					
Achillea millefolium	Yarrow																				
Achillea ptarmica	Sneezewort													1							
Achillea sp	Yarrow species																				
Acinos arvensis	Basil thyme																				
Aegopodium podagraria	Ground elder																				
Aethusa cynapium	Fool's parsley																				
Agrimonia eupatoria	Agrimonies																				
Agrostemma githago	Corn cockle				3	3		1	1	1	1	1	1	12=	27=	+					
Agrostis species	Bent grass																				
Alchemilla vulgaris	Ladies mantle																				
Alisma species	Water plantains																				
Allium porrum	Leek													1	1	1					
Allium porrum leaf fragment	Leek													+++	20						
Allium sp.	Leek/Onion/Garlic?																				
Allium sp. leaf fragment	Leek/Onion/Garlic?																				
Alnus glutinosa (cone)	Alder																				
Alnus sp fca																					
Alopecurus species	Foxtail grass																				
Anagallis arvensis	Scatlet Pimpernel																				
Anethum graveolens	Dill				1				1				1								

Anthemis cotula	Stinking mayweed				1	1								5	8	+					
Anthriscus caucalis	Burr-chervil				1																
Anthriscus sylvestris	Cow Parsley																				
Aphanes microcarpa	Slender Parsley-piert																				
Apium graveolens	Celery				1																
Arctium lappa/minus	Greater/Lesser Burdock																				
Arctium species	Burdock																				
Armorica rusticana	Horseradish																				
Aster tripolium (cf.)	Sea aster																				
Asteraceae	Daisy Family																				
Asteraceae/Compositae (inv fgts)																					
Atriplex hastata	Orache																				
Atriplex patula/prostrata	Common Orache																				
Atriplex sp.	Orache							1	1					+	4					1	
Atropa belladonna	Deadly nightshade																			1	
Baldellia ranunculoides	Lesser Water-plantain																				
Barberea vulgaris	Bittercress																				
Bellis perennis	Common daisy																				
Beta vulgaris	Beet																				
Betula pubescens	White birch																				
Betula species	Birch				1																
Bidens sp.	Bur-marigolds																				
Boraginaceae	Borage Family																				
Brassica campestris	Wild turnip																				
Brassica cf. oleracea/napus	Cabbage/rape/swede																				
Brassica nigra	Black mustard																				
Brassica rapa	Turnip																				
Brassica sp./Sinapis arvensis	Brassica/Charlock																				
Brassica species	Brassica species				1			1						+	2=	+					
Brassicaceae seed	Brassicaceae species																				
Brassicaceae/Cruciferae	Brassicaceae species									1											
Brassicaceae/Cruciferae (pedicles)	Brassicaceae species																				
Bromus sp.	Brome grass																				
Bryonia cretica ssp. Dioica	White bryony																				
Buglossoides arvensis	Field Gromwell																		1		
Bupleurum falcatum	Sickle-leaved Hare's-Ear																				
Bupleurum rotundifolium	Thorow-wax																				
C. leucanthemum	Ox-eye daisy																				
Calendula officinalis	Pot marigold																				
Calluna vulgaris flower/leaf fragments	Ling															+					
Caltha palustris	Marsh-marigold																				
Cannabis sativa	Hemp														1	+					
Capsella bursa-pastoris	Shepherd's-purse																				
Cardus/Cirsium species	Thistle family												1								
Carduus sp.	Thistle family																				
Carex (lenticular)	Sedges																				
Carex (trigonus)	Sedges																				
Carex elata	Tufted sedge																				
Carex flacca	Glaucous sedge																				
Carex hostiana	Tawny sedge																				
Carex leporina (C. ovalis)	Oval sedge																				
Carex nigra cf.	Common sedge																				

Carex oederi (Carex viridula)	Small fruited yellow sedge																				
Carex panicea	Carnation sedge																				
Carex remota	Remota sedge																				
Carex riparia/hirta	pond/hairy sedge																				
Carex rostrata cf.	Bottle sedge																				
Carex species	Sedge	30+			1			1	2	1	3		1	1	3	+		1		1	1
Carex sylvatica	Wood-sedge																				
Caryophyllaceae	Pink Family																				
Centaurea cf. scabiosa	Greater Knapweed																				
Centaurea cyanus	Cornflower													13=	19=	+					
Centaurea nigra	Common knapweed																				
Centaurea species	Knapweeds											1	1								
Cerastium fontanum	Common mouse-ear																				
Cerastium sp.	Mouse-ear chickweed														1						
Chaerophyllum sp cf.	Chervil																				
Chelidonium majus	Greater Celandine																				
Chenopodium album	Fat hen	30+			1															1	
Chenopodium bonus-henricus	Good King-Henry																				
Chenopodium ficifolium	Fig-leaved goosefoot				1																
Chenopodium murale	Nettle-leaved goosefoot																				
Chenopodium Section Pseudoblitum																					
Chenopodium species	Goosefoots														2	+					
Chenopodium/Atriplex spp.	goosefoots etc. oraches																				
Chrysanthemum segetum	(Corn marigold)				1									6=	29	+					
Circaea lutetiana	Enchanters nightshade																				
Cirsium species	Thistle																				
Cladium mariscus (epidermus fragments)	Saw sedge																				
Conium maculatum	Hemlock														1						
Coriandrum sativum	Coriander							1			1	1									
Corylus avellana	Hazel nut			3						1		1		1*	1=	1=			1*	1*	
Crataegus cf. laevigata	Midland Hawthorn																				
Crataegus monogyna fruitstone	Hawthorn													1							
Crepis species	Hawksbeard								1												
Cyperaceae	Sedge Family																				
Danthonia decumbens	Common heath grass				1				1												
Daucus carota	Wild carrot													+							
Dipsacus sativus/fullonum	Teasel								1												
Dryopteris sp	Wood/Male/Buckler Fern																				
Eleocharis multicaulis	Many-stalked spike-rush																				
Eleocharis palustris	Common Spike-rush								1	1	2			1	3			1			
Eleocharis sp.	Spike-rush										2										
Elymus/Agropyron	Couches				1																
Empetrum nigrum	Black crowberry																				
Epilobium sp	Willowherbs																				
Equisetum sp nodel sheath fragments	Horsetails																				
Erica tetralix	Cross-leaved Heath																				
Eriophorum vaginatum	Hare's-Tail Cottongrass												1								
Euphorbia helioscopia	Sun spurge																			1	1
Euphorbia lathyris	Caper spurge																				
Euphrasia/Odontities sp.	Eyebrights																				
Fabaceae indet.	indet. legumes																				
Fallopia convolvulus	Black-bindweed																				

Ficus carica L.	Fig				3			4	4	3	4	2	2	70	102		1	2	1	2	1
Filipendula ulmaria	Meadowsweet																				
Foeniculum vulgare	Fennel				3			2	2	1	3		1	2	1						
Fragaria vesca	Wild Strawberry				1			3	3	3		1	1		1	+					
Fumaria species	Fumitory								1												
Galeopsis species	Hemp-nettle																				
Galeopsis subgenus Galeopsis	Hempnettle																				
Galeopsis subgenus Ladanum	Red hempnettle																				
Galeopsis tetrahit	Common hemp nettle																				
Galium aparine L.	cleavers																				
Galium cf. spurium	False cleavers																				
Galium saxatile	Heath bedstraw																				
Galium species	Bedstraw																				
Genista tinctoria leaf frags	Dyer's Greenweed																				
Genista tinctoria stem fragments	Dyer's Greenweed																				
Geum rivale/urbanum	Avens																				
Geum urbanum	Wood avens																				
Glyceria fluitans	Floating Sweet-Grass																				
Glyceria species	Sweet Grasses																				
Graminae					1			1				1		1	1	+					
Heracleum sphondylium	Hogweed																				
Humulus lupus	Hops																				
Hydrocotyle vulgaris	Marsh Pennywort																				
Hyoscyamus niger L.	henbane																			1	
Hypericum sp	St. John's-worts																				
Hypochaeris radicata	Common cat's ear																				
Hypochoeris sp.	Cat's Ear																				
Ilex aquifolium (leaf fragments)	Holly															+					
Iris pseudacorus	Yellow flag																				
Isatis tinctora (pod fragments)	Woad																				
Isolepis setacea	Bristleleaf bulrush																				
Juglans regia	Walnut																				
Juncus acutiflorus/articulatus	Sharp flowered rush																				
Juncus bufonius	Toad rush																				
Juncus conglomeratus	Compact rush																				
Juncus gerardi	Saltmarsh Rush																				
Juncus inflexus/effusus/conglomeratus	Hard/Soft/Compact Rush																				
Juncus maritimus	Sea Rush																				
Juncus sp.	Rush							1								+					
Juncus squarrosus	Heath rush																				
Juncus subnodulosus	Blunt-flowered Rush																				
Knautia arvensis	Field Scabious																				
Labiatae species indeterminate	Dead-Nettle Family																				
Lamium section Lamiopsis					1																
Lamium sp	Dead-Nettles																				
Lapsana communis	Nipplewort				1							1		8=	16=	+					
Legume >4mm																					
Leguminosae flowers/petals																					
Leguminosae pods/frags																					
Leguminosae tracheid bars																					
Leontodon autumnalis	Autumn hawkbit																				
Leontodon autumnalis/hispidus	Autumn/Rough Hawkbit																				

Leontodon hispidus	Rough Hawkbit																				
Leontodon sp.	Hawkbit																				
Leontodon taraxacoides	Lesser Hawkbit												2	1							
Lepedium coronopus (Coronopus squamatus)	Swine-cress																				
Leucanthemum vulgare	Oxeye daisy																				
Linum catharticum	Fairy Flax								1	1											
Linum sp. cf.	?flax													3	+						
Linum usitatissimum	Flax							2						2							
Lithospermum arvense L.	corn gromwell																				
Luzula campestris	Sweep's brush																				
Luzula multiflora	Heath woodrush																				
Luzula species	Wood-rush																				
Lychnis flos-cuculi	Ragged robin				1																
Lycopus europaeus	Gypsywort																				
Lythrum salicaria	Purple loosestrife							1													
Malus sylvestris endocarp	Apple core				1			1		1		1	1								
Malus sylvestris seed base cups	Apple seed base cups																				
Malus sylvestris/domesticus	Apple				1	1		1				1		2	+						
Malus/pyrus	Apple/Pear												6								
Malva neglecta	Dwarf mallow																				
Malva species	Mallow													1							
Malva sylvestris	Common Mallow																				
Marrubium vulgare	White Horehound																				
Matricaria recutita	Chamomile																				
Mentha species	Mint																				
Menyanthes trifoliata	Bog-bean				1			1	1				1								
Montia fontana	Blinks																				
Myosotis sp.	Forget-me-not																				
Myrica gale leaf/twig fragments	Bog myrtle																				
Myristica fragrans (aril)	Mace (Nutmeg)																				
Nepeta cataria	Catnip																				
Nuphar lutea	Yellow water-lily																				
Odontites verna	Red Bartsia								1												
Oenanthe cf. aquatica	Fine-leafed water dropwort																				
Oenanthe cf. lachenalii	Parsley Water-dropwort																				
Oenanthe crocata	Hemlock water dropwort																				
Oenanthe fistulosa	Tubular Water-dropwort																				
Oenanthe sp	Water dropwort																				
Onopordum acanthium	Cottom Thistle																				
Oxalis acetosella	Wood-sorrel																				
Papaver argemone	Prickly Poppy																				
Papaver dubium	Long-headed poppy																				
Papaver somniferum	Opium poppy							1					1								
Papaver species	Poppy																				
Pastinaca sativa	Parsnip																				
Pastinaca sativa/Heracleum sphondylium	Parsnip/Hogweed																				
Pedicularis palustris	Marsh Lousewort																				
Persicaria hydropiper	Water pepper																				
Persicaria lapathifolia	Pale Persicaria																				
Persicaria maculosa	Redshank																				
Phoenix dactylifera	Dates																				
Phragmites australis	Common Reed																				

Picris echioides	Bristly Oxtongue				1																
Picris hieracioides	Hawkweed Oxtongue																				
Piper nigrum	Black Pepper												?1								
Pisum sativum	Garden pea													2*		5*					
Pisum sativum hilum, parenchyma, epidermis	Garden pea													22	32						
Pisum sp.	Garden pea																				
Plantago lanceolata L.	Ribwort plantain																				
Plantago major	Greater Plantain								1												
Plantago media	Hoary Plantain																				
Poa annua	Annual meadow grass																				
Poa trivialis	Rough bluegrass																				
Poaceae	indet grasses																				
Polygonaceae	-				1																
Polygonum arenastrum	Common knotweed																				
Polygonum aviculare	Common Knotgrass				1			1						1=	1	+					
Polygonum hydropiper	Water pepper														1						
Polygonum lapathifolium	Pale Persicaria													1	3						
Polygonum persicaria	Redshank							1					1								
Populus species bud scales	Poplar																				
Potamogeton species	Pondweed																				
Potentilla anserina	Silverweed				1																
Potentilla erecta	Tormentil																				
Potentilla palustris	Marsh cinquefoil																				
Potentilla reptans	Creeping cinquefoil																				
Potentilla species	Cinquefoils										1										
Prunella vulgaris	Self-heal				1				1												
Potentilla species	Cinquefoils										1										
Prunella vulgaris	Self-heal				1				1												
Prunus cerasifera																					
Prunus cerasus	Morello cherry		1	2	1				1		2										
Prunus cf. cerasus	Morello cherry					1	1							1	1						
Prunus domestica	Plum							1		1											
Prunus domestica cf.	?plum/bullace																				
Prunus insititia	Damson		2	1		1	1		1			1		2	4						
Prunus padus	Bird cherry																				
Prunus sp												2									
Prunus sp. mesocarp																					
Prunus species epidermis														9	2						
Prunus spinosa	Sloe		2	3	1	2	1	1	1	1		2		3	20	8					
Pteridium aqualinum	Bracken													2							
Pyrus communis	Pear													4	10						
Pyrus/Cydonia endocarp	Pear/Qunice													?		++					
Pyrus/Cydonia stone cells	Pear/Qunice													+++	83						
Quercus sp. bud scales	Oak bud scales												1								
Ranunculus acris/ repens/ bulbosus	'buttercups'																				
Ranunculus flammula	Lesser Spearwort								1						1						
Ranunculus lingua	Greater Spearwort																				
Ranunculus sardous	Hairy buttercup										1				1	+					
Ranunculus sceleratus	celery leaved crowfoot																				
Ranunculus subgenus Batrachium																					
Ranunculus subgenus Ranunculus	Buttercup				1	1		1	1	1	1		1			+					
Raphanus raphanistrum	Wild radish				1									2=	4=	+					
Reseda luteola	Weld				2				1												
Reseda sp	Mignonettes							1													

Rhinanthus minor	Yellow rattle																				
Rhinanthus species	Rattle							1													
Ribes uva-crispa	Gooseberry													+							
Rosa sp.	Rose-hip													+							
Rubia tinctorum	Common madder																				
Rubus caesius	Dewberries																				
Rubus fruticosus	Blackberry	200+			2		1	2	1	1							1	2		1	
Rubus fruticosus/idaeus	blackberry/ raspberry													8	21	+					
Rubus idaeus	Raspberry	200+						2	1										1		1
Rubus species	Brambleberry	200+																			
Rumex acetosa	Common sorrel																				
Rumex acetosella	Sheep's sorrel				1				1		1		1		6						
Rumex conglomeratus	Sharp dock																				
Rumex crispus	Curled dock																				
Rumex obtusifolius	Broad-leaved dock																				
Rumex pseudoalpinus	Monk's rhubarb																				
Rumex sanguineus	Bloody dock																				
Rumex spp.	Docks				1			1	1	1	1		1	1=	1	+					
Salix species bud scale/leaf fragments	Willow bud scales																				
Sambucus cf. ebulus	Dwarg elder																				
Sambucus nigra	Elder						1	1	1	1						+	1	1		1	1
Satureja hortensis	Summer savoury																				
Scandix pecten-veneris	Shepherd's-Needle				1																
Scirpus maritimus/lacustris	Sea/Common Club-rush																				
Scirpus setaceus	Bristle Club-rush																				
Scirpus sylvaticus cf.	Wood Club-rush																				
Scleranthus annuus	Annual Knawel																				
Scrophularia nodosa	Figwort																				
Senecio aquaticus	Marsh ragwort																				
Senecio cf. jacobea	Groundsel																				
Senecio species	Ragworts																				
Silene alba	White Campion										1										
Silene sp	Campion																				
Silene vulgaris	Bladder Campion				1																
Sinapis arvensis	Field Mustard																				
Sisymbrium officinale	Hedge mustard																				
Sisymbrium sophia/Descurainia sophia	Flixweed																				
Solanum dulcamara	Bittersweet																				
Solanum nigrum	Black nightshade														1						
Solanum sp	Nightshades																				
Sonchus arvensis	Perennial Sowthistle																				
Sonchus asper	Spiney milk thistle				1				1		1										
Sonchus oleraceus	Sowthistle																				
Sonchus sp.	Sowthistles																				
Sorbus aria	Whitebeam													1	1						
Sorbus aucuparia	Rowan																				
Sorbus sp cf.	Service																				
Sorbus torminalis	Wild Service-tree													+							
Spergula arvensis	Corn spurry														1	+					
Spherganium sp	Bur-reed																				
Stachys palustris	Marsh Woundwort																				
Stachys sp.	Woundwort							1													

Stachys sylvatica	Hedge woundwort				1																
Stellaria graminea	Lesser Stichwort										2										
Stellaria holostea stem fragments	Greater Stichwort																				
Stellaria media	Common chickweed				2			1	1												
Stellaria media/neglecta	C.mon/Greater Chickweed										2										
Stellaria palustris/graminea	Marsh/Lesser Stichwort																				
Stellaria sp.	Stichworts																				
Stellaria/Cerastium	Stichworts/Mouse-ears																				
Taraxacum officinale	Dandelion												1								
Thalaspi arvense	Field penny cress														1						
Thalictrum flavum	Common Meadow-rue							1		1											
Thalictrum sp.	Meadow-rues																				
Torilis japonica	Upright hedge parsley												1	1							
Trifolium pratense	Red Clover																				
Trifolium repens	White clover																				
Trifolium species	Clover																				
Triglochin maritima	Sea Arrowgrass												1								
Tripleurospermum inodorum/Matricaria perforata	Scentless Mayweed																				
Ulex	Gorse (leaf spine)														1				1		
Umbelliferae indet.	Umbellifore									1											
Urtica dioica	Stinging nettle				2			1	1		1				1						
Urtica urens	Small nettle				1										1						
Vaccinium myrtillus	Bilberry													16	28	+					
Vaccinium sp.	Bilberry																				
Vaccinium sp. pistil bases	Bilberry pistil bases																				
Valerianella dentata	Narrow-fruited cornsalad											1									
Veronica sp	Speedwell																				
Vica faba trachied bars	Broad bean trachied bars												1								
Vicia cf. tetrasperma	Smooth Tare																				
Vicia faba	Broad bean															5*					
Vicia faba epidermis	Broad bean spidermis														16	+					
Vicia species	Vetch																				
Viola palustris	Violets																				
Viola species	Violet							1												1	1
Vitis vinifera L.	grape				1			1	1	1	2	1	1	+				1	1		1
Zannichellia palustris	Horned pondweed																				
Total quantified remains														302	607						
Seed density per litre (quantified charred remains)																					

Period	Town/City	Reference		Notes
L15-M17	Chester	Jaques, D. Hall, A. Kenward, H. and Carrott, J. 2004. Technical report: plant, invertebrate and fish remains from excavations at 25 Bridge Street, Chester (site code: CHE/25BS'01). PRS 2004/46		Approximate amounts recovered, with total counts for the cereals. An asteriks '*' indicating the material was charred.
L15-M17	Chester	Jaques, D. Hall, A. Kenward, H. and Carrott, J. 2004. Technical report: plant, invertebrate and fish remains from excavations at 25 Bridge Street, Chester (site code: CHE/25BS'01). PRS 2004/46		A 4-point scale. 1=present (only a few). 2=abundant. 3= very abundant (less than 5%). 4=forms a major component of the residue.
L15-M17	Chester	Jaques, D. Hall, A. Kenward, H. and Carrott, J. 2004. Technical report: plant, invertebrate and fish remains from excavations at 25 Bridge Street, Chester (site code: CHE/25BS'01). PRS 2004/46		A 4-point scale. 1=present (only a few). 2=abundant. 3= very abundant (less than 5%). 4=forms a major component of the residue.
L15-M17	Chester	Jaques, D. Hall, A. Kenward, H. and Carrott, J. 2004. Technical report: plant, invertebrate and fish remains from excavations at 25 Bridge Street, Chester (site code: CHE/25BS'01). PRS 2004/46		A 4-point scale. 1=present (only a few). 2=abundant. 3= very abundant (less than 5%). 4=forms a major component of the residue.
L15-M17	Chester	Jaques, D. Hall, A. Kenward, H. and Carrott, J. 2004. Technical report: plant, invertebrate and fish remains from excavations at 25 Bridge Street, Chester (site code: CHE/25BS'01). PRS 2004/46		A 4-point scale. 1=present (only a few). 2=abundant. 3= very abundant (less than 5%). 4=forms a major component of the residue.
11-12th C.	Durham	Donaldson, A. In: Carver, M. 1979. Three Anglo-Saxon Tenements in Durham City. Medieval Archaeology, 23. 55-60.		A 4-point scale. 1=present (only a few). 2=abundant. 3= very abundant (less than 5%). 4=forms a major component of the residue.
11-12th C.	Durham	Donaldson, A. In: Carver, M. 1979. Three Anglo-Saxon Tenements in Durham City. Medieval Archaeology, 23. 55-60.		A 4-point scale. 1=present (only a few). 2=abundant. 3= very abundant (less than 5%). 4=forms a major component of the residue.
15th C.	Durham	Rackham, D.J. 2000. Walkergate, Durham City, DPM00. Environmental Archaeology Assessment. Unpublished Report. Environmental Archaeology Consultancy.		A 4-point scale. 1=present (only a few). 2=abundant. 3= very abundant (less than 5%). 4=forms a major component of the residue.
15th C	Durham	Rackham, D.J. 2000. Walkergate, Durham City, DPM00. Environmental Archaeology Assessment. Unpublished Report. Environmental Archaeology Consultancy.		A 4-point scale. 1=present (only a few). 2=abundant. 3= very abundant (less than 5%). 4=forms a major component of the residue.
15th C	Durham	Rackham, D.J. 2000. Walkergate, Durham City, DPM00. Environmental Archaeology Assessment. Unpublished Report. Environmental Archaeology Consultancy.		A 4-point scale. 1=present (only a few). 2=abundant. 3= very abundant (less than 5%). 4=forms a major component of the residue.
Med?	Hartlepool	Huntley, J.P. 1988. Plant Remains from Hartlepool, Middlegate 1987. Ancient Monument Laboratory Report 86/88		A 4-point scale. 1=present (only a few). 2=abundant. 3= very abundant (less than 5%). 4=forms a major component of the residue.
Med?	Hartlepool	Huntley, J.P. 1988. Plant Remains from Hartlepool, Middlegate 1987. Ancient Monument Laboratory Report 86/88		A 4-point scale. 1=present (only a few). 2=abundant. 3= very abundant (less than 5%). 4=forms a major component of the residue.
L 13th-E 14th C	Hull	McKenna, W.J.B. 1987. The Environmental Evidence. In: Armstrong, P. and Ayers, B. Excavations in High Street and Blackfriargate. East Riding Archaeologist Vol. 8. Hull Old Town Report Series, No. 5. The Hotham Property		
L 13th-E 14th C	Hull	McKenna, W.J.B. 1987. The Environmental Evidence. In: Armstrong, P. and Ayers, B. Excavations in High Street and Blackfriargate. East Riding Archaeologist Vol. 8. Hull Old Town Report Series, No. 5. Samples from the Wyteland Property.		
L 13th-E 14th C	Hull	McKenna, W.J.B. 1987. The Environmental Evidence. In: Armstrong, P. and Ayers, B. Excavations in High Street and Blackfriargate. East Riding Archaeologist Vol. 8. Hull Old Town Report Series, No. 5. Samples from the Wyteland Property.		
Mid 14th C	Hull	McKenna, W.J.B. 1987. The Environmental Evidence. In: Armstrong, P. and Ayers, B. Excavations in High Street and Blackfriargate. East Riding Archaeologist Vol. 8. Hull Old Town Report Series, No. 5. The Ousefleet Property.		A 4-point scale. 1=present (only a few). 2=abundant. 3= very abundant (less than 5%). 4=forms a major component of the residue.
1450-1500	Hull	Underdown, S. 1980. The plant remains. In: Armstrong, P. Excavations in Scale/Lowgate 1974. East Riding Archaeologist Vol. 6. Hull Old Town Report Series No.4.		A 4-point scale. 1=present (only a few). 2=abundant. 3= very abundant (less than 5%). 4=forms a major component of the residue.
13th C	Newcastle	O'Brien, C. 2006. High Bridge, Newcastle upon Tyne. Plant Macrofossil analysis and radiocarbon dates. ASUD, Durham University. Report 1443.		A 4-point scale. 1=present (only a few). 2=abundant. 3= very abundant (less than 5%). 4=forms a major component of the residue.
13th C	Newcastle	O'Brien, C. 2006. High Bridge, Newcastle upon Tyne. Plant Macrofossil analysis and radiocarbon dates. ASUD, Durham University. Report 1443.		A 4-point scale. 1=present (only a few). 2=abundant. 3= very abundant (less than 5%). 4=forms a major component of the residue.
9th-10th C	York	Kenward, H. and Hall, A. 2000. Technical Report: Plant and invertebrate remains from Anglo-Scandanavian deposits at the Queen's Hotel site, 1-9 Micklegate, York (site code 88-9.17). Reports from the Environmental Archaeology Unit, York, 2000/14.		A 4-point scale. 1=present (only a few). 2=abundant. 3= very abundant (less than 5%). 4=forms a major component of the residue.

	Feature																				
		<5081>	<5038>	<5031>	<5039>	<5171>	F100	F100	890	632	632	<33>	<34>	<15> M11	<313> M3	<322> M1	123	30/36	[7097] Lowest	[7097] Higher	<509>
	context	806	442	429	566	1697	1576	1575	870	811	655	750	790	468	1630	1642		Section 3	7096	7087	5050
	vol.soil (l)							5	25	27	27	8	24	0.1	0.1	0.1	0.06		5	5	2
	flot vol (ml)								260	190	165								160		1400
Cereal grains																					
Avena sativa	Cultivated oat spikelets																				1
Avena sp(p).	oat		1	1	1			1			1	3*/9	1*						1	1	2
Avena strigosa	Bristle Oat																				
cf. *Avena* sp(p).	?oat								1	1	1			+*							
cf. *S. cereale*	?rye										1										
Hordeum (naked)	Barley; naked												2*								
Hordeum sativum	barley																				
Hordeum sp.	Barley				1																
Hordeum (twisted naked)													1*								
indeterminate cereals	indet. grains (est.)								5		8		8*								
Secale cereale	rye																				
T. aestivum s.l.	free-threshing wheat							1					2*								
Triticum (hexapolid)	Bread wheat												1*								
Triticum aestivo-compactum	Bread wheat	1	1	1																	
Triticum sp(p).	wheat																			2	
Triticum spelta	Spelt wheat																				
Triticum/Secale	Wheat/Rye																				
Cereal chaff																					
Cerealia indet culm fragments																					
Gramineae sect. Cerealia	Cereals, rhachis frag.																				1
Indeterminate mineralised cereals																					
Cerealia bran															*	*					
Triticum floret base												1*									
Avena sativa floret base	Cultivated oat												1*								
Triticum aestivum s.l.	6x wheat rachis																				
Triticum species rachis	Wheat rachis																				
Secale cereale L.	rye rachis																				1
Avena glume fragment	Oat glume																				
Avena sp. bran fragments	Oat bran																				1
Triticum/Secale bran	Wheat/Rye bran frag.																	**			3
Hordeum species rachis	Barley rachis fragments																				
Hordeum sp 'bran' fragments	Barley bran																				
Other plants																					
(M) Anomobryum filiforme																					
(M) Anomodon viticulosus	Rambling Tail-moss																				
(M) Antitrichia curtipendula	Pendulous Wing-moss																				
(M) Atrichum undulatum	Common Smoothcap																				
(M) Barbula cf. species	Beard-moss																				
(M) Brachythecium/Eurhynchium sp																					
(M) Bryum sp.	Thread-moss																				
(M) Calliergon cf. giganteum	Giant Spear-moss																				1
(M) Calliergon cuspidatum	Pointed spear-moss																				1
(M) Campylium elodes	Fine leaved feather moss																				
(M) Campylium stellatum (cf.)																					
(M) cf. Amblystegium sp(p).	Creeping feather-moss																				
(M) Cratoneuron commutatum	Curled hook-moss																				1

(M) Cratoneuron filicinum	Fern-leaved Hook-moss																				
(M) Cratoneuron filicinum																					
(M) Dicramun sp.	Wind Bloon/Fork Moss																				
(M) Diphasium alpinium (D. complanatum)	Alpine Clubmoss																				
(M) Drepanocladus aduncus	Knieff's Hook-moss																				
(M) Drepanocladus sp.																					
(M) Eurhynchium praelongum																					
(M) Eurhynchium sp	Feather-moss																				
(M) Eurhynchium speciosum																					
(M) Eurhynchium striatum	Common Striated Feather-moss																				
(M) Homalia trichomanoides	Blunt Feather-moss																				
(M) Homalothcium nitens																					
(M) Homalothcium sericeum/lutescens																					1
(M) Homalothcium sp																					
(M) Hylocomium cf. brevirostre																					
(M) Hylocomium myosuroides																					
(M) Hylocomium splendens																					
(M) Hypnum cf. cupressiforme	Cypress-leaved Plait-moss																				1
(M) Isothecium myosuroides	Mouse-tail Moss																				
(M) Isothecium myurum																					1
(M) Leucobryum glaucum	Large White-moss																				
(M) Leucodon sciuroides	Squirrel-tail Moss																				
(M) Lycopodium sp																					
(M) Mnium hornum	Swan's-neck Thyme-moss																				
(M) Neckera complanata	Flat Neckera																				1
(M) Neckera crispa	Crisped Neckera																				
(M) Plagiomnium sp.																					
(M) Plagiomnium undulatum	Hart's-tongue Thyme-moss																				
(M) Pleurozium schreberi																					
(M) Polytrichum formosum																					
(M) Polytrichum species																					
(M) Pseudoscleropodium purum	Neat Feather-moss																				
(M) Racomitrium canescens	Hoary Fringe-moss																				
(M) Racomitrium sp.	Fringe-moss																				
(M) Rhynchostegiella tenella (cf.)	Tender Feather-moss																				
(M) Rhynchostegium sp	Feather-moss																				
(M) Rhytidiadelphus sp.	Turf-moss																				
(M) Rhytidiadelphus squarrosus	Springy Turf-moss																				
(M) Rhytidiadelphus triquetrus																					
(M) Scorpidium scorpioides	Hooked Scorpion-moss																				
(M) Sphagnum imbricatum																					
(M) Sphagnum Section Acutifolia																					
(M) Sphagnum Section Sphagnum																					
(M) Sphagnum sp.																					
(M) Thamnobryum alopecurum	Fox-tail Feather-moss																				
(M) Thuidium cf. tamariscinum																					
(M) Ulota crispa	Crisped pincushion																				
(M) Ulota species																					1
Achillea millefolium	Yarrow											1	8								
Achillea ptarmica	Sneezewort																				
Achillea sp	Yarrow species																				

Acinos arvensis	Basil thyme																				
Aegopodium podagraria	Ground elder																				
Aethusa cynapium	Fool's parsley			1																1	
Agrimonia eupatoria	Agrimonies																				
Agrostemma githago	Corn cockle						2	29				2			*	*	1	2			2
Agrostis species	Bent grass																				
Alchemilla vulgaris	Ladies mantle																				
Alisma species	Water plantains																				
Allium porrum	Leek																				
Allium porrum leaf fragment	Leek																				2
Allium sp.	Leek/Onion/Garlic?																				
Allium sp. leaf fragment	Leek/Onion/Garlic?																				
Alnus glutinosa (cone)	Alder																			1	
Alnus sp fca																					
Alopecurus species	Foxtail grass																				
Anagallis arvensis	Scatlet Pimpernel																				
Anethum graveolens	Dill																				1
Anthemis cotula	Stinking mayweed											9	214	+							2
Anthriscus caucalis	Burr-chervil																				
Anthriscus sylvestris	Cow Parsley																				
Aphanes microcarpa	Slender Parsley-piert																				
Apium graveolens	Celery																				1
Arctium lappa/minus	Greater/Lesser Burdock																				
Arctium species	Burdock																				
Armorica rusticana	Horseradish																				
Aster tripolium (cf.)	Sea aster																				
Asteraceae	Daisy Family																				
Asteraceae/Compositae (inv fgts)																					
Atriplex hastata	Orache						15	9										1?			
Atriplex patula/prostrata	Common Orache												32					1?			
Atriplex sp.	Orache											9		+	*		1				2
Atropa belladonna	Deadly nightshade			1																	
Baldellia ranunculoides	Lesser Water-plantain																				
Barberea vulgaris	Bittercress																				
Bellis perennis	Common daisy																				
Beta vulgaris	Beet																				
Betula pubescens	White birch																				
Betula species	Birch																				
Bidens sp.	Bur-marigolds																				1
Boraginaceae	Borage Family																				
Brassica campestris	Wild turnip											2									
Brassica cf. oleracea/napus	Cabbage/rape/swede																				
Brassica nigra	Black mustard												8								
Brassica rapa	Turnip						10	4													
Brassica sp./Sinapis arvensis	Brassica/Charlock																				
Brassica species	Brassica species											1*/1	72	+				20			1
Brassicaceae seed	Brassicaceae species																				
Brassicaceae/Cruciferae	Brassicaceae species																				
Brassicaceae/Cruciferae (pedicles)	Brassicaceae species																				
Bromus sp.	Brome grass											9									1
Bryonia cretica ssp. Dioica	White bryony																				
Buglossoides arvensis	Field Gromwell																				
Bupleurum falcatum	Sickle-leaved Hare's-																				

	Ear																				
Bupleurum rotundifolium	Thorow-wax																				
C. leucanthemum	Ox-eye daisy																				
Calendula officinalis	Pot marigold																				
Calluna vulgaris flower/leaf fragments	Ling																				1
Caltha palustris	Marsh-marigold																				
Cannabis sativa	Hemp												8								1
Capsella bursa-pastoris	Shepherd's-purse																				
Cardus/Cirsium species	Thistle family																				
Carduus sp.	Thistle family																				
Carex (lenticular)	Sedges											9	16						1		
Carex (trigonus)	Sedges											1	112								
Carex elata	Tufted sedge																				
Carex flacca	Glaucous sedge																				
Carex hostiana	Tawny sedge																				
Carex leporina (C. ovalis)	Oval sedge																				
Carex nigra cf.	Common sedge																				
Carex oederi (Carex viridula)	Small fruited yellow sedge																				
Carex panicea	Carnation sedge																				
Carex remota	Remota sedge																				
Carex riparia/hirta	pond/hairy sedge																				
Carex rostrata cf.	Bottle sedge																				
Carex species	Sedge		1			1	3	1						+	*	*					2
Carex sylvatica	Wood-sedge																				
Caryophyllaceae	Pink Family																		1		
Centaurea cf. scabiosa	Greater Knapweed																				
Centaurea cyanus	Cornflower																	4			
Centaurea nigra	Common knapweed																				
Centaurea species	Knapweeds													+							
Cerastium fontanum	Common mouse-ear																				
Cerastium sp.	Mouse-ear chickweed																				
Chaerophyllum sp cf.	Chervil																				
Chelidonium majus	Greater Celandine																				
Chenopodium album	Fat hen						31	23				9	208						2	3	1
Chenopodium bonus-henricus	Good King-Henry																				
Chenopodium ficifolium	Fig-leaved goosefoot																				
Chenopodium murale	Nettle-leaved goosefoot																				
Chenopodium Section Pseudoblitum																					
Chenopodium species	Goosefoots												8								
Chenopodium/Atriplex spp.	goosefoots etc. oraches																				
Chrysanthemum segetum	(Corn marigold)																		1	2	
Circaea lutetiana	Enchanters nightshade																				
Cirsium species	Thistle											9	24							1	1
Cladium mariscus (epidermus fragments)	Saw sedge													+							
Conium maculatum	Hemlock																				1
Coriandrum sativum	Coriander																	7			
Corylus avellana	Hazel nut	1*						1					99					*N	2	2	1
Crataegus cf. laevigata	Midland Hawthorn																				
Crataegus monogyna fruitstone	Hawthorn																		1		
Crepis species	Hawksbeard															*					
Cyperaceae	Sedge Family																				
Danthonia decumbens	Common heath grass																				1

Daucus carota	Wild carrot																				
Dipsacus sativus/fullonum	Teasel																				
Dryopteris sp	Wood/Male/Buckler Fern																				
Eleocharis multicaulis	Many-stalked spike-rush																				
Eleocharis palustris	Common Spike-rush						1	1				9	32								1
Eleocharis sp.	Spike-rush																				
Elymus/Agropyron	Couches																				
Empetrum nigrum	Black crowberry												8								
Epilobium sp	Willowherbs																				
Equisetum sp nodel sheath fragments	Horsetails																				
Erica tetralix	Cross-leaved Heath																				
Eriophorum vaginatum	Hare's-Tail Cottongrass																				
Euphorbia helioscopia	Sun spurge		1	1															1	1	
Euphorbia lathyris	Caper spurge																				
Euphrasia/Odontities sp.	Eyebrights																				
Fabaceae indet.	indet. legumes										1										
Fallopia convolvulus	Black-bindweed											1	72								1
Ficus carica L.	Fig	3	2	1	1	2			+*	+++*	+*		8	+	*	*	1350				
Filipendula ulmaria	Meadowsweet																				
Foeniculum vulgare	Fennel																				
Fragaria vesca	Wild Strawberry	2													*					1	
Fumaria species	Fumitory	1											8							1	
Galeopsis species	Hemp-nettle																			1	1
Galeopsis subgenus Galeopsis	Hempnettle																				
Galeopsis subgenus Ladanum	Red hempnettle																				
Galeopsis tetrahit	Common hemp nettle												8								
Galium aparine L.	cleavers																				
Galium cf. spurium	False cleavers																				
Galium saxatile	Heath bedstraw																				
Galium species	Bedstraw																				
Genista tinctoria leaf frags	Dyer's Greenweed																				
Genista tinctoria stem fragments	Dyer's Greenweed																				1
Geum rivale/urbanum	Avens																				
Geum urbanum	Wood avens																				
Glyceria fluitans	Floating Sweet-Grass																				
Glyceria species	Sweet Grasses																				
Graminae							3	4							*						
Heracleum sphondylium	Hogweed																				
Humulus lupus	Hops																				
Hydrocotyle vulgaris	Marsh Pennywort													+							
Hyoscyamus niger L.	henbane										+*									1	
Hypericum sp	St. John's-worts																				
Hypochaeris radicata	Common cat's ear											9	8								
Hypochoeris sp.	Cat's Ear																				
Ilex aquifolium (leaf fragments)	Holly																				
Iris pseudacorus	Yellow flag																				
Isatis tinctora (pod fragments)	Woad																				
Isolepis setacea	Bristleleaf bulrush																				
Juglans regia	Walnut																				
Juncus acutiflorus/articulatus	Sharp flowered rush																				
Juncus bufonius	Toad rush																				
Juncus conglomeratus	Compact rush																				

Juncus gerardi	Saltmarsh Rush																				
Juncus inflexus/effusus/conglomeratus	Hard/Soft/Compact Rush																				
Juncus maritimus	Sea Rush																				
Juncus sp.	Rush																		3	3	
Juncus squarrosus	Heath rush																				
Juncus subnodulosus	Blunt-flowered Rush																				
Knautia arvensis	Field Scabious																				
Labiatae species indeterminate	Dead-Nettle Family																	1			
Lamium section Lamiopsis																					
Lamium sp	Dead-Nettles																		1	1	
Lapsana communis	Nipplewort						2	16				9	48						1	3	1
Legume >4mm																					
Leguminosae flowers/petals																					
Leguminosae pods/frags																					
Leguminosae tracheid bars																					
Leontodon autumnalis	Autumn hawkbit																				
Leontodon autumnalis/hispidus	Autumn/Rough Hawkbit																				
Leontodon hispidus	Rough Hawkbit												8								
Leontodon sp.	Hawkbit													+							
Leontodon taraxacoides	Lesser Hawkbit																				
Lepedium coronopus (Coronopus squamatus)	Swine-cress																				
Leucanthemum vulgare	Oxeye daisy																				
Linum catharticum	Fairy Flax																				
Linum sp. cf.	?flax																				
Linum usitatissimum	Flax												24					2		1	3
Lithospermum arvense L.	corn gromwell										1**										
Luzula campestris	Sweep's brush							2													
Luzula multiflora	Heath woodrush																				
Luzula species	Wood-rush																				
Lychnis flos-cuculi	Ragged robin											9									
Lycopus europaeus	Gypsywort																				
Lythrum salicaria	Purple loosestrife																				
Malus sylvestris endocarp	Apple core																				
Malus sylvestris seed base cups	Apple seed base cups																				
Malus sylvestris/domesticus	Apple											99						3			1
Malus/pyrus	Apple/Pear																				
Malva neglecta	Dwarf mallow																				
Malva species	Mallow																				
Malva sylvestris	Common Mallow					1															
Marrubium vulgare	White Horehound																				
Matricaria recutita	Chamomile												8								
Mentha species	Mint													+							
Menyanthes trifoliata	Bog-bean													+							
Montia fontana	Blinks																				
Myosotis sp.	Forget-me-not																				
Myrica gale leaf/twig fragments	Bog myrtle																				
Myristica fragrans (aril)	Mace (Nutmeg)																				
Nepeta cataria	Catnip																				
Nuphar lutea	Yellow water-lily																				
Odontites verna	Red Bartsia																				
Oenanthe cf. aquatica	Fine-leafed water dropwort																				1
Oenanthe cf. lachenalii	Parsley Water-dropwort																				

Oenanthe crocata	Hemlock water dropwort																				
Oenanthe fistulosa	Tubular Water-dropwort																				
Oenanthe sp	Water dropwort																				
Onopordum acanthium	Cottom Thistle																				
Oxalis acetosella	Wood-sorrel																				
Papaver argemone	Prickly Poppy																				
Papaver dubium	Long-headed poppy																				
Papaver somniferum	Opium poppy							1				9						3			
Papaver species	Poppy																			1	
Pastinaca sativa	Parsnip																				
Pastinaca sativa/Heracleum sphondylium	Parsnip/Hogweed																				
Pedicularis palustris	Marsh Lousewort																				1
Persicaria hydropiper	Water pepper																				
Persicaria lapathifolia	Pale Persicaria																				
Persicaria maculosa	Redshank																		1	3	
Phoenix dactylifera	Dates															18					
Phragmites australis	Common Reed																				
Picris echioides	Bristly Oxtongue																				
Picris hieracioides	Hawkweed Oxtongue																				
Piper nigrum	Black Pepper																				
Pisum sativum	Garden pea																				
Pisum sativum hilum, parenchyma, epidermis	Garden pea																				
Pisum sp.	Garden pea																				
Plantago lanceolata L.	Ribwort plantain																				
Plantago major	Greater Plantain												8		*						
Plantago media	Hoary Plantain																				
Poa annua	Annual meadow grass																				
Poa trivialis	Rough bluegrass																				
Poaceae	indet grasses										1										
Polygonaceae	-								1		1										
Polygonum arenastrum	Common knotweed																				
Polygonum aviculare	Common Knotgrass							1							*						1
Polygonum hydropiper	Water pepper							1					16								2
Polygonum lapathifolium	Pale Persicaria						2	1					88					1			1
Polygonum persicaria	Redshank						2						32								
Populus species bud scales	Poplar																				1
Potamogeton species	Pondweed													+							
Potentilla anserina	Silverweed																				
Potentilla erecta	Tormentil							2													1
Potentilla palustris	Marsh cinquefoil						1														
Potentilla reptans	Creeping cinquefoil												32								
Potentilla species	Cinquefoils																				
Prunella vulgaris	Self-heal											9	56					1			
Prunus cerasifera												99	8								
Prunus cerasus	Morello cherry																				
Prunus cf. cerasus	Morello cherry																	68			
Prunus domestica	Plum																			3	
Prunus domestica cf.	?plum/bullace						+	1		+*								276			
Prunus insititia	Damson											99									
Prunus padus	Bird cherry																				
Prunus sp																					
Prunus sp. mesocarp																					

Prunus species epidermis																					
Prunus spinosa	Sloe					1													2	3	1
Pteridium aqualinum	Bracken																				1
Pyrus communis	Pear																				
Pyrus/Cydonia endocarp	Pear/Qunice																				
Pyrus/Cydonia stone cells	Pear/Qunice																				
Quercus sp. bud scales	Oak bud scales																				1
Ranunculus acris/ repens/ bulbosus	'buttercups'							1				9	80								
Ranunculus flammula	Lesser Spearwort											9	56								1
Ranunculus lingua	Greater Spearwort																				
Ranunculus sardous	Hairy buttercup																				
Ranunculus sceleratus	celery leaved crowfoot							1													
Ranunculus subgenus Batrachium																					
Ranunculus subgenus Ranunculus	Buttercup													+	*	*		1	2	2	1
Raphanus raphanistrum	Wild radish						1						24 (pod)	+				2 F.W.			1
Reseda luteola	Weld														*						
Reseda sp	Mignonettes																				
Rhinanthus minor	Yellow rattle												8								
Rhinanthus species	Rattle																				
Ribes uva-crispa	Gooseberry																				
Rosa sp.	Rose-hip																		1		
Rubia tinctorum	Common madder																				1
Rubus caesius	Dewberries																				
Rubus fruticosus	Blackberry	1	1	1	1	1	38	120				9	8					1			2
Rubus fruticosus/idaeus	blackberry/ raspberry								++*	++++*	+*								3	5	
Rubus idaeus	Raspberry						2												1	1	
Rubus species	Brambleberry																				
Rumex acetosa	Common sorrel												16								
Rumex acetosella	Sheep's sorrel						1					9	4*				1			1	1
Rumex conglomeratus	Sharp dock																				
Rumex crispus	Curled dock							2										2			
Rumex obtusifolius	Broad-leaved dock											1	56								
Rumex pseudoalpinus	Monk's rhubarb																				
Rumex sanguineus	Bloody dock																				
Rumex spp.	Docks			1															1	1	1
Salix species bud scale/leaf fragments	Willow bud scales																				
Sambucus cf. ebulus	Dwarg elder																				
Sambucus nigra	Elder	1	1	1	1				++++*	+++*	++++*		16					2	1	2	1
Satureja hortensis	Summer savoury																				1
Scandix pecten-veneris	Shepherd's-Needle																				
Scirpus maritimus/lacustris	Sea/Common Club-rush																				
Scirpus setaceus	Bristle Club-rush																				
Scirpus sylvaticus cf.	Wood Club-rush																				
Scleranthus annuus	Annual Knawel																				
Scrophularia nodosa	Figwort												8								
Senecio aquaticus	Marsh ragwort																				
Senecio cf. jacobea	Groundsel																				
Senecio species	Ragworts																				
Silene alba	White Campion																				
Silene sp	Campion																				
Silene vulgaris	Bladder Campion																				
Sinapis arvensis	Field Mustard																				

Sisymbrium officinale	Hedge mustard																				
Sisymbrium sophia/Descurainia sophia	Flixweed																				
Solanum dulcamara	Bittersweet																				
Solanum nigrum	Black nightshade																				
Solanum sp	Nightshades																				
Sonchus arvensis	Perennial Sowthistle																				
Sonchus asper	Spiney milk thistle						1									*				1	1
Sonchus oleraceus	Sowthistle																				
Sonchus sp.	Sowthistles																				
Sorbus aria	Whitebeam																				
Sorbus aucuparia	Rowan																				
Sorbus sp cf.	Service																32				
Sorbus torminalis	Wild Service-tree																				
Spergula arvensis	Corn spurry							1					8								2
Spherganium sp	Bur-reed																				
Stachys palustris	Marsh Woundwort																				
Stachys sp.	Woundwort																				
Stachys sylvatica	Hedge woundwort																				
Stellaria graminea	Lesser Stichwort												8*								
Stellaria holostea stem fragments	Greater Stichwort																				1
Stellaria media	Common chickweed											1	152			*		1			
Stellaria media/neglecta	C.mon/Greater Chickweed																				1
Stellaria palustris/graminea	Marsh/Lesser Stichwort																				
Stellaria sp.	Stichworts																				
Stellaria/Cerastium	Stichworts/Mouse-ears																				
Taraxacum officinale	Dandelion																	1			
Thalaspi arvense	Field penny cress							1													
Thalictrum flavum	Common Meadow-rue																				
Thalictrum sp.	Meadow-rues																				
Torilis japonica	Upright hedge parsley																				
Trifolium pratense	Red Clover																				
Trifolium repens	White clover																				
Trifolium species	Clover											9		+				1			
Triglochin maritima	Sea Arrowgrass																				
Tripleurospermum inodorum/Matricaria perforata	Scentless Mayweed												24								
Ulex	Gorse (leaf spine)	1			1																
Umbelliferae indet.	Umbellifore																	1			
Urtica dioica	Stinging nettle						3	1					8						1	3	
Urtica urens	Small nettle							2													1
Vaccinium myrtillus	Bilberry																				1
Vaccinium sp.	Bilberry																				
Vaccinium sp. pistil bases	Bilberry pistil bases																				
Valerianella dentata	Narrow-fruited cornsalad												80							1	
Veronica sp	Speedwell																				
Vica faba trachied bars	Broad bean trachied bars																				
Vicia cf. tetrasperma	Smooth Tare																				
Vicia faba	Broad bean																			1	1
Vicia faba epidermis	Broad bean spidermis																				
Vicia species	Vetch																				
Viola palustris	Violets																				
Viola species	Violet																	1		2	

Vitis vinifera L.	grape	2min	1			1min				3**									2			
Zannichellia palustris	Horned pondweed																				
Total quantified remains									7	4	15										
Seed density per litre (quantified charred remains)									0.3	0.1	0.5										
		A 4-point scale. 1=present (only a few). 2=abundant. 3= very abundant (less than 5%). 4=forms a major component of the residue.	A 4-point scale. 1=present (only a few). 2=abundant. 3= very abundant (less than 5%). 4=forms a major component of the residue.	A 4-point scale. 1=present (only a few). 2=abundant. 3= very abundant (less than 5%). 4=forms a major component of the residue.	A 4-point scale. 1=present (only a few). 2=abundant. 3= very abundant (less than 5%). 4=forms a major component of the residue.	A 4-point scale. 1=present (only a few). 2=abundant. 3= very abundant (less than 5%). 4=forms a major component of the residue.	Total counts	Total counts	Frequency: +=1-10 items; ++=11-50 items; +++=51-150 items; ++++=>151; *waterlogged; ** mineralised	Frequency: +=1-10 items; ++=11-50 items; +++=51-150 items; ++++=>151; *waterlogged; ** mineralised	Frequency: +=1-10 items; ++=11-50 items; +++=51-150 items; ++++=>151; *waterlogged; ** mineralised								Total counts. * Present; ** Present in large quantities; N nutshell; Frag. Fragments; F.W. Fruit Wall.	Relative abundance is based on a scale from 1 (lowest) to 5 (highest).	Relative abundance is based on a scale from 1 (lowest) to 5 (highest).	Relative abundance from 1 (one or a few individuals or fragments, or a small component of the matrix) to 4 (abundant remains, or a major component of the matrix).
		Kenward, H. and Hall, A. 2000. Technical Report: Plant and invertebrate remains from Anglo-Scandanavian deposits at the Queen's Hotel site, 1-9 Micklegate, York (site code 88-9.17). Reports from the Environmental Archaeology Unit, York, 2000/14.	Kenward, H. and Hall, A. 2000. Technical Report: Plant and invertebrate remains from Anglo-Scandanavian deposits at the Queen's Hotel site, 1-9 Micklegate, York (site code 88-9.17). Reports from the Environmental Archaeology Unit, York, 2000/14.	Kenward, H. and Hall, A. 2000. Technical Report: Plant and invertebrate remains from Anglo-Scandanavian deposits at the Queen's Hotel site, 1-9 Micklegate, York (site code 88-9.17). Reports from the Environmental Archaeology Unit, York, 2000/14.	Kenward, H. and Hall, A. 2000. Technical Report: Plant and invertebrate remains from Anglo-Scandanavian deposits at the Queen's Hotel site, 1-9 Micklegate, York (site code 88-9.17). Reports from the Environmental Archaeology Unit, York, 2000/14.	Kenward, H. and Hall, A. 2000. Technical Report: Plant and invertebrate remains from Anglo-Scandanavian deposits at the Queen's Hotel site, 1-9 Micklegate, York (site code 88-9.17). Reports from the Environmental Archaeology Unit, York, 2000/14.	Kenward, H. and Hall, A. 2000. Technical Report: Plant and invertebrate remains from Anglo-Scandanavian deposits at the Queen's Hotel site, 1-9 Micklegate, York (site code 88-9.17). Reports from the Environmental Archaeology Unit, York, 2000/14.	Kenward, H. and Hall, A. 2000. Technical Report: Plant and invertebrate remains from Anglo-Scandanavian deposits at the Queen's Hotel site, 1-9 Micklegate, York (site code 88-9.17). Reports from the Environmental Archaeology Unit, York, 2000/14.	Hall, A., Kenward, H., Jaxques, D., Carrott, J., and Rowland, S. Technical report: Biological remains from excavations at 41-9 Walmgate, York (site code: 1999.941). Palaeoecology Research Services. 2002/26.	Hall, A.R. and Kenward, H.K. 1990. Environmental Evidence from the Colonia. The Archaeology of York: The Environment 14/6. Council for British Archaeology. General Accident Site.	Hall, A.R. and Kenward, H.K. 1990. Environmental Evidence from the Colonia. The Archaeology of York: The Environment 14/6. Council for British Archaeology. General Accident Site.	Hall, A.R. and Kenward, H.K. 1990. Environmental Evidence from the Colonia. The Archaeology of York: The Environment 14/6. Council for British Archaeology. General Accident Site.	Hall, A.R. and Kenward, H.K. 1990. Environmental Evidence from the Colonia. The Archaeology of York: The Environment 14/6. Council for British Archaeology. General Accident Site.	Hall, A.R. and Kenward, H.K. 1990. Environmental Evidence from the Colonia. The Archaeology of York: The Environment 14/6. Council for British Archaeology. General Accident Site.	Hall, A.R. and Kenward, H.K. 1990. Environmental Evidence from the Colonia. The Archaeology of York: The Environment 14/6. Council for British Archaeology. 5 Rougier Street.	Hall, A.R. and Kenward, H.K. 1990. Environmental Evidence from the Colonia. The Archaeology of York: The Environment 14/6. Council for British Archaeology. 5 Rougier Street.	Hall, A.R. and Kenward, H.K. 1990. Environmental Evidence from the Colonia. The Archaeology of York: The Environment 14/6. Council for British Archaeology. 5 Rougier Street.	Hall, A.R. and Kenward, H.K. 1990. Environmental Evidence from the Colonia. The Archaeology of York: The Environment 14/6. Council for British Archaeology. 5 Rougier Street.	Carrott, J., Hall, A., Hughes, P., Jaques, D., Johnstone, C., Kenward, H. and Worthy, D. (1998). Assessment of biological remains from excavations at St Saviourgate, York (site code 1995.434). Reports from the Environmental Archaeology Unit, York 98/14, 39 pp.	Carrott, J., Hall, A., Hughes, P., Jaques, D., Johnstone, C., Kenward, H. and Worthy, D. (1998). Assessment of biological remains from excavations at St Saviourgate, York (site code 1995.434). Reports from the Environmental Archaeology Unit, York 98/14, 39 pp.	Carrott, J., Hall, A., Hughes, P., Jaques, D., Johnstone, C., Kenward, H. and Worthy, D. (1998). Assessment of biological remains from excavations at St Saviourgate, York (site code 1995.434). Reports from the Environmental Archaeology Unit, York 98/14, 39 pp.
	Town/City	York	York	York	York	York	York	York	York	York	York	York	York	York	York	York	York	York	York	York	York

	Period	9th-10th C	10th-11thC	10th-11thC	10th-11thC	10th-11thC	10th-11thC	10th-11thC	M/L 14th	11th-12th	11th-12th	11th-12th	12th-13th	12th-13th	12-13th	12-13th	12th-13th	12th-13th	12/13th	16th	16th
	Feature																				
		<463>	<2711>	<285>	<329>	<294>	<465>	<478>	<66>	<74>	<76>	<97>	<408>	<417>	<4>	<5>	<44>	<46>	<64>	<13>	<15>
	context	5030	4011	4022	4050	4032	5032	5040	2902	1172	1172	1255	4068	4088	1108	1109	1202	1202	2037	1053	1059
	vol.soil (l)	2	2	2	1	1	1	2	0.2	0.5	0.5	0.5	0.5	0.5	1	1				2	1
	flot vol (ml)	1600	<2000	1800	600	1100cm3		1500													
Cereal grains																					
Avena sativa	Cultivated oat spikelets																				
Avena sp(p).	oat	2	1w/l	1w/l	2w/l		1w/l	1min								1	1	1			
Avena strigosa	Bristle Oat																				
cf. *Avena* sp(p).	?oat																				
cf. *S. cereale*	?rye		w/l				1														
Hordeum (naked)	Barley; naked																				
Hordeum sativum	barley																				
Hordeum sp.	Barley													1			2incl spr	1			
Hordeum (twisted naked)																					
indeterminate cereals	indet. grains (est.)	4			2w/l						1		1	1	1						
Secale cereale	rye				1																
T. aestivum s.l.	free-threshing wheat																				
Triticum (hexapolid)	Bread wheat																				
Triticum aestivo-compactum	Bread wheat						1														
Triticum sp(p).	wheat				1					1							1				
Triticum spelta	Spelt wheat																3incl spr	1cole.glb			
Triticum/Secale	Wheat/Rye				1w/l	1w/l	1	1													
Cereal chaff																					
Cerealia indet culm fragments																					
Gramineae sect. Cerealia	Cereals, rhachis frag.		2	3w/lchaff																	
Indeterminate mineralised cereals																					
Cerealia bran							2w/l	1													
Triticum floret base																					
Avena sativa floret base	Cultivated oat																				
Triticum aestivum s.l.	6x wheat rachis																				
Triticum species rachis	Wheat rachis																				
Secale cereale L.	rye rachis																				
Avena glume fragment	Oat glume																				
Avena sp. bran fragments	Oat bran			1			1w/l	3													
Triticum/Secale bran	Wheat/Rye bran frag.	1	4	4	3	4	4	4	2	2	2	2	1	2		1	1		4	3	4
Hordeum species rachis	Barley rachis fragments																				
Hordeum sp 'bran' fragments	Barley bran			2																	
Other plants																					
(M) Anomobryum filiforme																					
(M) Anomodon viticulosus	Rambling Tail-moss																				
(M) Antitrichia curtipendula	Pendulous Wing-moss			1	2		1	2				1	1	1							
(M) Atrichum undulatum	Common Smoothcap																				
(M) Barbula cf. species	Beard-moss		1																		
(M) Brachythecium/Eurhynchium sp																					
(M) Bryum sp.	Thread-moss																				
(M) Calliergon cf. giganteum	Giant Spear-moss	1	1				1														

(M) Calliergon cuspidatum	Pointed spear-moss		1		1	1	1														
(M) Campylium elodes	Fine leaved feather moss																				
(M) Campylium stellatum (cf.)																					
(M) cf. Amblystegium sp(p).	Creeping feather-moss																				
(M) Cratoneuron commutatum	Curled hook-moss																				
(M) Cratoneuron filicinum	Fern-leaved Hook-moss	1																			
(M) Cratoneuron filicinum																					
(M) Dicramun sp.	Wind Bloon/Fork Moss																				
(M) Diphasium alpinium (D. complanatum)	Alpine Clubmoss		1	1	1			1			2										
(M) Drepanocladus aduncus	Knieff's Hook-moss																				
(M) Drepanocladus sp.		1					1														
(M) Eurhynchium praelongum		1	1	1	1		1														
(M) Eurhynchium sp	Feather-moss																				
(M) Eurhynchium speciosum																					
(M) Eurhynchium striatum	Common Striated Feather-moss		1	1	1		1	1									1				
(M) Homalia trichomanoides	Blunt Feather-moss																				
(M) Homalothcium nitens																					
(M) Homalothcium sericeum/lutescens		1		1	1		1						1								
(M) Homalothcium sp																					
(M) Hylocomium cf. brevirostre																					
(M) Hylocomium myosuroides				1																	
(M) Hylocomium splendens					1		1	1									1				
(M) Hypnum cf. cupressiforme	Cypress-leaved Plait-moss	1	1	2	1		1	1				1		1							
(M) Isothecium myosuroides	Mouse-tail Moss			1	1		1							1							
(M) Isothecium myurum					1		1														
(M) Leucobryum glaucum	Large White-moss																				
(M) Leucodon sciuroides	Squirrel-tail Moss	1		1				2									1				
(M) Lycopodium sp					1																
(M) Mnium hornum	Swan's-neck Thyme-moss																				
(M) Neckera complanata	Flat Neckera	2	1	3	1	1	1	1				1		1							
(M) Neckera crispa	Crisped Neckera																				
(M) Plagiomnium sp.																					
(M) Plagiomnium undulatum	Hart's-tongue Thyme-moss							1													
(M) Pleurozium schreberi																					
(M) Polytrichum formosum																					
(M) Polytrichum species																					
(M) Pseudoscleropodium purum	Neat Feather-moss						1	1													
(M) Racomitrium canescens	Hoary Fringe-moss																				
(M) Racomitrium sp.	Fringe-moss																				
(M) Rhynchostegiella tenella (cf.)	Tender Feather-moss																				
(M) Rhynchostegium sp	Feather-moss																				
(M) Rhytidiadelphus sp.	Turf-moss	1					1														
(M) Rhytidiadelphus squarrosus	Springy Turf-moss						1														
(M) Rhytidiadelphus triquetrus																					
(M) Scorpidium scorpioides	Hooked Scorpion-moss		1		1																
(M) Sphagnum imbricatum																					
(M) Sphagnum Section Acutifolia																				1	
(M) Sphagnum Section Sphagnum																					
(M) Sphagnum sp.																					
(M) Thamnobryum alopecurum	Fox-tail Feather-moss																				
(M) Thuidium cf. tamariscinum			1	1	1	1	1	1									1				

(M) Ulota crispa	Crisped pincushion						1														
(M) Ulota species		2	1	1	1			1					1	1							
Achillea millefolium	Yarrow				1			1													
Achillea ptarmica	Sneezewort																				
Achillea sp	Yarrow species																				
Acinos arvensis	Basil thyme																				
Aegopodium podagraria	Ground elder												1								
Aethusa cynapium	Fool's parsley		1					1	1		1			1			1	1			
Agrimonia eupatoria	Agrimonies																				
Agrostemma githago	Corn cockle	2	2	3	2	3	3	3	2	2	2	3	3	2	1			1	3	2	3
Agrostis species	Bent grass																				
Alchemilla vulgaris	Ladies mantle																				
Alisma species	Water plantains				1																
Allium porrum	Leek					3															
Allium porrum leaf fragment	Leek		3	3	2			2			2		3						1	2	
Allium sp.	Leek/Onion/Garlic?																				
Allium sp. leaf fragment	Leek/Onion/Garlic?																				
Alnus glutinosa (cone)	Alder	1																			
Alnus sp fca																					
Alopecurus species	Foxtail grass																				
Anagallis arvensis	Scatlet Pimpernel			1																	
Anethum graveolens	Dill		1					1 (cf)													
Anthemis cotula	Stinking mayweed	1	2	2	2	3	1	1			2		1	1							
Anthriscus caucalis	Burr-chervil																				
Anthriscus sylvestris	Cow Parsley	1		2	3	1															
Aphanes microcarpa	Slender Parsley-piert																				
Apium graveolens	Celery			1	1	2	1														
Arctium lappa/minus	Greater/Lesser Burdock																				
Arctium species	Burdock				1																
Armorica rusticana	Horseradish																				
Aster tripolium (cf.)	Sea aster																				
Asteraceae	Daisy Family											1									
Asteraceae/Compositae (inv fgts)																					
Atriplex hastata	Orache																				
Atriplex patula/prostrata	Common Orache																				
Atriplex sp.	Orache	1		1	2	2	2	1			1	1	2	1			1		1		1
Atropa belladonna	Deadly nightshade						1														
Baldellia ranunculoides	Lesser Water-plantain																				
Barberea vulgaris	Bittercress																				
Bellis perennis	Common daisy				1																
Beta vulgaris	Beet													1							
Betula pubescens	White birch																				
Betula species	Birch				1																
Bidens sp.	Bur-marigolds																				
Boraginaceae	Borage Family																				
Brassica campestris	Wild turnip																				
Brassica cf. oleracea/napus	Cabbage/rape/swede																				
Brassica nigra	Black mustard																				
Brassica rapa	Turnip		1	1	1		1		1				1	1						1	
Brassica sp./Sinapis arvensis	Brassica/Charlock							1					1				1	1			
Brassica species	Brassica species	1	1	1			1			1	1		2			1					1
Brassicaceae seed	Brassicaceae species																				
Brassicaceae/Cruciferae	Brassicaceae species																				

Brassicaceae/Cruciferae (pedicles)	Brassicaceae species																				
Bromus sp.	Brome grass									1		1bran						1			
Bryonia cretica ssp. Dioica	White bryony																				
Buglossoides arvensis	Field Gromwell				1																
Bupleurum falcatum	Sickle-leaved Hare's-Ear																				
Bupleurum rotundifolium	Thorow-wax												1cf.						1		
C. leucanthemum	Ox-eye daisy																				
Calendula officinalis	Pot marigold			1																	
Calluna vulgaris flower/leaf fragments	Ling				1			1													
Caltha palustris	Marsh-marigold																				
Cannabis sativa	Hemp	1		2	3		1	1						1							
Capsella bursa-pastoris	Shepherd's-purse																				
Cardus/Cirsium species	Thistle family				1	1		1					1								
Carduus sp.	Thistle family																				
Carex (lenticular)	Sedges																				
Carex (trigonus)	Sedges																				
Carex elata	Tufted sedge																				
Carex flacca	Glaucous sedge																				
Carex hostiana	Tawny sedge																				
Carex leporina (C. ovalis)	Oval sedge																				
Carex nigra cf.	Common sedge																				
Carex oederi (Carex viridula)	Small fruited yellow sedge																				
Carex panicea	Carnation sedge																				
Carex remota	Remota sedge																				
Carex riparia/hirta	pond/hairy sedge																				
Carex rostrata cf.	Bottle sedge																				
Carex species	Sedge	1		1	2			1			1	1		1			1	1		1	
Carex sylvatica	Wood-sedge																				
Caryophyllaceae	Pink Family																				
Centaurea cf. scabiosa	Greater Knapweed																	2			
Centaurea cyanus	Cornflower								1									1		2	
Centaurea nigra	Common knapweed																				
Centaurea species	Knapweeds								1	2	2		1	1					1		
Cerastium fontanum	Common mouse-ear																				
Cerastium sp.	Mouse-ear chickweed																				
Chaerophyllum sp cf.	Chervil																				
Chelidonium majus	Greater Celandine																				
Chenopodium album	Fat hen	2	1	1	2		2				2	1	1	1			1				
Chenopodium bonus-henricus	Good King-Henry																				
Chenopodium ficifolium	Fig-leaved goosefoot																				
Chenopodium murale	Nettle-leaved goosefoot															1					
Chenopodium Section Pseudoblitum							1											1			
Chenopodium species	Goosefoots																				
Chenopodium/Atriplex spp.	goosefoots etc. oraches															1					
Chrysanthemum segetum	(Corn marigold)										3		2	2						1	1
Circaea lutetiana	Enchanters nightshade			1?																	
Cirsium species	Thistle			1													1	1			
Cladium mariscus (epidermus fragments)	Saw sedge																				
Conium maculatum	Hemlock	1		1			1				1		1	1							
Coriandrum sativum	Coriander																				
Corylus avellana	Hazel nut	1	1	1	2	1	1	2		1				1			1	1			1
Crataegus cf. laevigata	Midland Hawthorn																				

Crataegus monogyna fruitstone	Hawthorn			2				1			1										
Crepis species	Hawksbeard																				
Cyperaceae	Sedge Family															1					
Danthonia decumbens	Common heath grass			1	1																
Daucus carota	Wild carrot	1			2		1														
Dipsacus sativus/fullonum	Teasel																				
Dryopteris sp	Wood/Male/Buckler Fern																				
Eleocharis multicaulis	Many-stalked spike-rush																				
Eleocharis palustris	Common Spike-rush	1		1	1		1					1	1				1	1			
Eleocharis sp.	Spike-rush																				
Elymus/Agropyron	Couches																				
Empetrum nigrum	Black crowberry																				
Epilobium sp	Willowherbs																				
Equisetum sp nodel sheath fragments	Horsetails																				
Erica tetralix	Cross-leaved Heath																				1
Eriophorum vaginatum	Hare's-Tail Cottongrass																1				
Euphorbia helioscopia	Sun spurge																				
Euphorbia lathyris	Caper spurge																				
Euphrasia/Odontities sp.	Eyebrights												1								
Fabaceae indet.	indet. legumes																				
Fallopia convolvulus	Black-bindweed	1	1	1	1*	1	2	1		2	1	1				1					
Ficus carica L.	Fig																1		1	2	
Filipendula ulmaria	Meadowsweet	*1*			1																
Foeniculum vulgare	Fennel												2cf.								
Fragaria vesca	Wild Strawberry															1			2	1	
Fumaria species	Fumitory													2			1				
Galeopsis species	Hemp-nettle	1		1																	
Galeopsis subgenus Galeopsis	Hempnettle			1	1	1	1	1						1			1	1			1
Galeopsis subgenus Ladanum	Red hempnettle																				
Galeopsis tetrahit	Common hemp nettle																				
Galium aparine L.	cleavers		1 (epicarp)	1	1	1												1			
Galium cf. spurium	False cleavers																				
Galium saxatile	Heath bedstraw																				
Galium species	Bedstraw																				
Genista tinctoria leaf frags	Dyer's Greenweed		1	1				1			1										
Genista tinctoria stem fragments	Dyer's Greenweed		1	2	1		2 (+twig)	1			2										
Geum rivale/urbanum	Avens																				
Geum urbanum	Wood avens																				
Glyceria fluitans	Floating Sweet-Grass																				
Glyceria species	Sweet Grasses																				
Graminae			1	1	1			1		1		1				1				1	1
Heracleum sphondylium	Hogweed																				
Humulus lupus	Hops	2		2	2			1													
Hydrocotyle vulgaris	Marsh Pennywort																				
Hyoscyamus niger L.	henbane	1			1	1					1	1					1	1			
Hypericum sp	St. John's-worts																				
Hypochaeris radicata	Common cat's ear																				
Hypochoeris sp.	Cat's Ear						1							1							
Ilex aquifolium (leaf fragments)	Holly		1			1 (lef)															
Iris pseudacorus	Yellow flag				1																
Isatis tinctora (pod fragments)	Woad				1																
Isolepis setacea	Bristleleaf bulrush																				

Juglans regia	Walnut																	1			
Juncus acutiflorus/articulatus	Sharp flowered rush				1																
Juncus bufonius	Toad rush															1					
Juncus conglomeratus	Compact rush																				
Juncus gerardi	Saltmarsh Rush															1					
Juncus inflexus/effusus/conglomeratus	Hard/Soft/Compact Rush				1																
Juncus maritimus	Sea Rush																				
Juncus sp.	Rush																1				1
Juncus squarrosus	Heath rush																				
Juncus subnodulosus	Blunt-flowered Rush																				
Knautia arvensis	Field Scabious																				
Labiatae species indeterminate	Dead-Nettle Family																				
Lamium section Lamiopsis													2								
Lamium sp	Dead-Nettles																				
Lapsana communis	Nipplewort	1	2	2	2	1	1	2		2	2	2	2	1			1				
Legume >4mm																					
Leguminosae flowers/petals				1	1			1													
Leguminosae pods/frags					1		1			1						1					
Leguminosae tracheid bars						1	1														
Leontodon autumnalis	Autumn hawkbit																				
Leontodon autumnalis/hispidus	Autumn/Rough Hawkbit																				
Leontodon hispidus	Rough Hawkbit																				
Leontodon sp.	Hawkbit		1	1							1		2								
Leontodon taraxacoides	Lesser Hawkbit																				
Lepedium coronopus (Coronopus squamatus)	Swine-cress																				
Leucanthemum vulgare	Oxeye daisy		1			1															
Linum catharticum	Fairy Flax																				
Linum sp. cf.	?flax																				
Linum usitatissimum	Flax		2	1	2	1	1	2		1	1			1				1			
Lithospermum arvense L.	corn gromwell																				
Luzula campestris	Sweep's brush																				
Luzula multiflora	Heath woodrush																				
Luzula species	Wood-rush																				
Lychnis flos-cuculi	Ragged robin																				
Lycopus europaeus	Gypsywort																				
Lythrum salicaria	Purple loosestrife																				
Malus sylvestris endocarp	Apple core		3	3	2	3	2	2	1		1		3	1					1	2	1
Malus sylvestris seed base cups	Apple seed base cups		1	1	1		1	2													
Malus sylvestris/domesticus	Apple	1	2	2	2	3	2	2			1		3	1			1				
Malus/pyrus	Apple/Pear																				
Malva neglecta	Dwarf mallow																				
Malva species	Mallow																				
Malva sylvestris	Common Mallow																				
Marrubium vulgare	White Horehound																				
Matricaria recutita	Chamomile																				
Mentha species	Mint																			1	
Menyanthes trifoliata	Bog-bean																	1			
Montia fontana	Blinks																				
Myosotis sp.	Forget-me-not												1								
Myrica gale leaf/twig fragments	Bog myrtle																				
Myristica fragrans (aril)	Mace (Nutmeg)																				
Nepeta cataria	Catnip																				

Nuphar lutea	Yellow water-lily																				
Odontites verna	Red Bartsia																				
Oenanthe cf. aquatica	Fine-leafed water dropwort							1													
Oenanthe cf. lachenalii	Parsley Water-dropwort																				
Oenanthe crocata	Hemlock water dropwort																				
Oenanthe fistulosa	Tubular Water-dropwort																				
Oenanthe sp	Water dropwort				1																
Onopordum acanthium	Cottom Thistle																				
Oxalis acetosella	Wood-sorrel																				
Papaver argemone	Prickly Poppy										1					1					
Papaver dubium	Long-headed poppy																				
Papaver somniferum	Opium poppy			1				1			1										
Papaver species	Poppy																				
Pastinaca sativa	Parsnip																				
Pastinaca sativa/Heracleum sphondylium	Parsnip/Hogweed																				
Pedicularis palustris	Marsh Lousewort																				
Persicaria hydropiper	Water pepper																				
Persicaria lapathifolia	Pale Persicaria																				
Persicaria maculosa	Redshank																				
Phoenix dactylifera	Dates																				
Phragmites australis	Common Reed																				
Picris echioides	Bristly Oxtongue																				
Picris hieracioides	Hawkweed Oxtongue			1									1								
Piper nigrum	Black Pepper																				
Pisum sativum	Garden pea																				
Pisum sativum hilum, parenchyma, epidermis	Garden pea		1	1?	1	1															
Pisum sp.	Garden pea															1					
Plantago lanceolata L.	Ribwort plantain							1 (ch and min)													
Plantago major	Greater Plantain																				
Plantago media	Hoary Plantain			1																	
Poa annua	Annual meadow grass																				
Poa trivialis	Rough bluegrass																				
Poaceae	indet grasses																				
Polygonaceae	-															1					
Polygonum arenastrum	Common knotweed																				
Polygonum aviculare	Common Knotgrass	1		1	1		1	1						1			1			1	
Polygonum hydropiper	Water pepper	1	1	1	2		1				1	1	1	1							
Polygonum lapathifolium	Pale Persicaria	2	1	1	1	1	1	1			1		2	1			1	1			
Polygonum persicaria	Redshank	1		1	1		1	1						1			1	1			
Populus species bud scales	Poplar																				
Potamogeton species	Pondweed																				
Potentilla anserina	Silverweed													1							
Potentilla erecta	Tormentil				1																
Potentilla palustris	Marsh cinquefoil																				
Potentilla reptans	Creeping cinquefoil																				
Potentilla species	Cinquefoils																	1			
Prunella vulgaris	Self-heal			1	1						1			1					1	1	
Prunus cerasifera																					
Prunus cerasus	Morello cherry																				
Prunus cf. cerasus	Morello cherry									1	1			1			1				
Prunus domestica	Plum		1	2						1	1						1	1			

Prunus domestica cf.	?plum/bullace	1																			
Prunus insititia	Damson			2				1						1			1	1			
Prunus padus	Bird cherry																				
Prunus sp																					
Prunus sp. mesocarp																					
Prunus species epidermis																					
Prunus spinosa	Sloe	2	1	3	1	2	1	2		1	1						1	1			
Pteridium aqualinum	Bracken	1	1			1 pinn frag	1							1							
Pyrus communis	Pear																				
Pyrus/Cydonia endocarp	Pear/Qunice																				
Pyrus/Cydonia stone cells	Pear/Qunice																				
Quercus sp. bud scales	Oak bud scales										1										
Ranunculus acris/ repens/ bulbosus	'buttercups'																				
Ranunculus flammula	Lesser Spearwort							1			1			1			1				1
Ranunculus lingua	Greater Spearwort																				
Ranunculus sardous	Hairy buttercup																				
Ranunculus sceleratus	celery leaved crowfoot																			1	
Ranunculus subgenus Batrachium																					
Ranunculus subgenus Ranunculus	Buttercup		1	1	2		1	1			1						1	2			
Raphanus raphanistrum	Wild radish	1	1	1	1	1	1	1		1	1			1			1				
Reseda luteola	Weld			1	2															3	2
Reseda sp	Mignonettes																				
Rhinanthus minor	Yellow rattle																				
Rhinanthus species	Rattle				*1*		1			1											
Ribes uva-crispa	Gooseberry																				
Rosa sp.	Rose-hip			2			1	1													
Rubia tinctorum	Common madder																				
Rubus caesius	Dewberries			3							1										
Rubus fruticosus	Blackberry	1	1	3	2		3	2		2	2			1			3	2		1	
Rubus fruticosus/idaeus	blackberry/ raspberry																				
Rubus idaeus	Raspberry																		1		
Rubus species	Brambleberry			1?																	
Rumex acetosa	Common sorrel																				
Rumex acetosella	Sheep's sorrel				1						1			1					1	1	
Rumex conglomeratus	Sharp dock																				
Rumex crispus	Curled dock																				
Rumex obtusifolius	Broad-leaved dock																				
Rumex pseudoalpinus	Monk's rhubarb																				
Rumex sanguineus	Bloody dock																				
Rumex spp.	Docks		1	1	1	1	1			1				1			1			1	1
Salix species bud scale/leaf fragments	Willow bud scales			1	1								1	1			1	1			
Sambucus cf. ebulus	Dwarg elder																				
Sambucus nigra	Elder				1		1			1	1			1	1	1	1	1		1	
Satureja hortensis	Summer savoury			1	1	1															
Scandix pecten-veneris	Shepherd's-Needle												1	1						1	
Scirpus maritimus/lacustris	Sea/Common Club-rush																1				
Scirpus setaceus	Bristle Club-rush																				
Scirpus sylvaticus cf.	Wood Club-rush											1									
Scleranthus annuus	Annual Knawel																				
Scrophularia nodosa	Figwort																				
Senecio aquaticus	Marsh ragwort																				
Senecio cf. jacobea	Groundsel																				

Senecio species	Ragworts			1							1										
Silene alba	White Campion																				
Silene sp	Campion																				
Silene vulgaris	Bladder Campion																				
Sinapis arvensis	Field Mustard												1								
Sisymbrium officinale	Hedge mustard																				
Sisymbrium sophia/Descurainia sophia	Flixweed																				
Solanum dulcamara	Bittersweet																				
Solanum nigrum	Black nightshade																1				
Solanum sp	Nightshades																				
Sonchus arvensis	Perennial Sowthistle											1									
Sonchus asper	Spiney milk thistle	1		1	1		1	1				1	1			1	1				
Sonchus oleraceus	Sowthistle												1								1
Sonchus sp.	Sowthistles																				
Sorbus aria	Whitebeam																				
Sorbus aucuparia	Rowan																				
Sorbus sp cf.	Service																				
Sorbus torminalis	Wild Service-tree																				
Spergula arvensis	Corn spurry	1					1	1													
Spherganium sp	Bur-reed																				
Stachys palustris	Marsh Woundwort																				
Stachys sp.	Woundwort	1														1	1				
Stachys sylvatica	Hedge woundwort																				
Stellaria graminea	Lesser Stichwort																				
Stellaria holostea stem fragments	Greater Stichwort																				
Stellaria media	Common chickweed				1	1	1				1	1		2							
Stellaria media/neglecta	C.mon/Greater Chickweed	1		1							1										
Stellaria palustris/graminea	Marsh/Lesser Stichwort						1														
Stellaria sp.	Stichworts																				
Stellaria/Cerastium	Stichworts/Mouse-ears																				
Taraxacum officinale	Dandelion																				
Thalaspi arvense	Field penny cress						1				1						1				1
Thalictrum flavum	Common Meadow-rue																				
Thalictrum sp.	Meadow-rues																				
Torilis japonica	Upright hedge parsley																				
Trifolium pratense	Red Clover															2					
Trifolium repens	White clover																				
Trifolium species	Clover																				
Triglochin maritima	Sea Arrowgrass																				
Tripleurospermum inodorum/Matricaria perforata	Scentless Mayweed																				
Ulex	Gorse (leaf spine)																				
Umbelliferae indet.	Umbellifore																				
Urtica dioica	Stinging nettle			1		1	1						2	1			1		1	2	1
Urtica urens	Small nettle	1		1	1		1	1		1	1		2	3		1	1			1	
Vaccinium myrtillus	Bilberry																				
Vaccinium sp.	Bilberry											1								1	1
Vaccinium sp. pistil bases	Bilberry pistil bases						1														
Valerianella dentata	Narrow-fruited cornsalad		1	1	1	1															
Veronica sp	Speedwell																				
Vica faba trachied bars	Broad bean trachied bars		1	1				2													
Vicia cf. tetrasperma	Smooth Tare																				

Vicia faba	Broad bean			1testa frag		1 min hila		1 min hila							1						
Vicia faba epidermis	Broad bean spidermis																				
Vicia species	Vetch																	1			
Viola palustris	Violets																				
Viola species	Violet				1		1							1			1			1	
Vitis vinifera L.	grape																1				
Zannichellia palustris	Horned pondweed																				
Total quantified remains																					
Seed density per litre (quantified charred remains)																					
		Relative abundance from 1 (one or a few individuals or fragments, or a small component of the matrix) to 4 (abundant remains, or a major component of the matrix).	Relative abundance from 1 (one or a few individuals or fragments, or a small component of the matrix) to 4 (abundant remains, or a major component of the matrix).	Relative abundance from 1 (one or a few individuals or fragments, or a small component of the matrix) to 4 (abundant remains, or a major component of the matrix).	Relative abundance from 1 (one or a few individuals or fragments, or a small component of the matrix) to 4 (abundant remains, or a major component of the matrix).	Relative abundance from 1 (one or a few individuals or fragments, or a small component of the matrix) to 4 (abundant remains, or a major component of the matrix).	Relative abundance from 1 (one or a few individuals or fragments, or a small component of the matrix) to 4 (abundant remains, or a major component of the matrix).	Relative abundance from 1 (one or a few individuals or fragments, or a small component of the matrix) to 4 (abundant remains, or a major component of the matrix).	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume

		Carrott, J., Hall, A., Hughes, P., Jaques, D., Johnstone, C., Kenward, H. and Worthy, D. (1998). Assessment of biological remains from excavations at St Saviourgate, York (site code 1995.434). Reports from the Environmental Archaeology Unit, York 98/14, 39 pp.	Carrott, J., Hall, A., Hughes, P., Jaques, D., Johnstone, C., Kenward, H. and Worthy, D. (1998). Assessment of biological remains from excavations at St Saviourgate, York (site code 1995.434). Reports from the Environmental Archaeology Unit, York 98/14, 39 pp.	Jaques D, Hall A, Kenward H and Carrott J. 2002. Assessment of biological remains from excavations at St Andrewgate, York (site code: 1995.89). Palaeoecology Research Services Report 2002/12. 12pp.	Jaques D, Hall A, Kenward H and Carrott J. 2002. Assessment of biological remains from excavations at St Andrewgate, York (site code: 1995.89). Palaeoecology Research Services Report 2002/12. 12pp.	Carrott, J., Dobney, K., Hall, A., Jaques, D., Kenward, H., Lancaster, S. and Milles, A. (1994). Assessment of biological remains from excavations at 12-18 Swinegate, 8 Grape Lane, and 14, 18, 20 and 22 Back Swinegate/Little Stonegate, York (YAT/Yorkshire Museum sitecodes 1989-90.28 and 1990.1). Reports from the Environmental Archaeology Unit, York 94/13, 17 pp. + 63 pp. Appendices (two parts: A, B).
	Town/City	York	York	York	York	York
	Period	16th	16th	L15-E16	M-L 13th	Late Med
	Feature	<17>	<20>	<5012>	<5056>	<659>
	context	1064	1066	1150	1528	1172
	vol.soil (l)	1	2		3	
	flot vol (ml)					
Cereal grains						
Avena sativa	Cultivated oat spikelets					
Avena sp(p).	oat					
Avena strigosa	Bristle Oat					
cf. *Avena* sp(p).	?oat					
cf. *S. cereale*	?rye					
Hordeum (naked)	Barley; naked					
Hordeum sativum	barley					
Hordeum sp.	Barley					
Hordeum (twisted naked)						
indeterminate cereals	indet. grains (est.)					1
Secale cereale	rye					
T. aestivum s.l.	free-threshing wheat					
Triticum (hexapolid)	Bread wheat					
Triticum aestivo-compactum	Bread wheat					
Triticum sp(p).	wheat					

		Carrott, J., Dobney, K., Hall, A., Jaques, D., Kenward, H., Lancaster, S. and Milles, A. (1994). Assessment of biological remains from excavations at 12-18 Swinegate, 8 Grape Lane, and 14, 18, 20 and 22 Back Swinegate/Little Stonegate, York (YAT/Yorkshire Museum sitecodes 1989-90.28 and 1990.1). Reports from the Environmental Archaeology Unit, York 94/13, 17 pp. + 63 pp. Appendices (two parts: A, B).	Carrott, J., Dobney, K., Hall, A., Jaques, D., Kenward, H., Lancaster, S. and Milles, A. (1994). Assessment of biological remains from excavations at 12-18 Swinegate, 8 Grape Lane, and 14, 18, 20 and 22 Back Swinegate/Little Stonegate, York (YAT/Yorkshire Museum sitecodes 1989-90.28 and 1990.1). Reports from the Environmental Archaeology Unit, York 94/13, 17 pp. + 63 pp. Appendices (two parts: A, B).	Assessment of biological remains from excavations at 12-18 Swinegate, 8 Grape Lane, and 14, 18, 20 and 22 Back Swinegate/Little Stonegate, York (YAT/Yorkshire Museum sitecodes 1989-90.28 and 1990.1). Reports from the Environmental Archaeology Unit, York 94/13, 17 pp. + 63 pp. Appendices (two parts: A, B).	Kenward, H. and Hall, A. (2000). Technical report: Plant and invertebrate remains from Anglo-Scandinavian deposits at 118-26 Walmgate, York (site code 78-9.8). Reports from the Environmental Archaeology Unit, York 2000/20	Kenward, H and Hall, A. 2000. Technical Report: Plant and Invertebrate remains from Anglo-Scandavian deposits at 118-26 Walmgate, York (site code 78-9.8). Reports from the Environmental Archaeology Unit, York 2000/20, 69pp.
	Town/City	York	York	York	York	York
	Period	11th C	9th C	9th C	950-1070	950-1070
	Feature	<149>	<284>	<297>	<157>	<144>
	context	3170	3279	3323	3459	3433
	vol.soil (l)					1
	flot vol (ml)					
Cereal grains						
Avena sativa	Cultivated oat spikelets					3
Avena sp(p).	oat				2	
Avena strigosa	Bristle Oat					
cf. *Avena* sp(p).	?oat					
cf. *S. cereale*	?rye	1				
Hordeum (naked)	Barley; naked					
Hordeum sativum	barley					
Hordeum sp.	Barley					
Hordeum (twisted naked)						
indeterminate cereals	indet. grains (est.)				1culm	
Secale cereale	rye					
T. aestivum s.l.	free-threshing wheat					
Triticum (hexapolid)	Bread wheat					
Triticum aestivo-compactum	Bread wheat					
Triticum sp(p).	wheat					

		Kenward, H and Hall, A. 2000. Technical Report: Plant and Invertebrate remains from Anglo-Scandavian deposits at 118-26 Walmgate, York (site code 78-9.8). Reports from the Environmental Archaeology Unit, York 2000/20, 69pp.	Kenward, H and Hall, A. 2000. Technical Report: Plant and Invertebrate remains from Anglo-Scandavian deposits at 118-26 Walmgate, York (site code 78-9.8). Reports from the Environmental Archaeology Unit, York 2000/20, 69pp.	Hall, A. and Kenward, H. (1999). Plant and invertebrate remains from Anglo-Scandinavian deposits at 16-22 Coppergate, York: technical report. Part 1: period 3. Reports from the Environmental Archaeology Unit, York 99/30, 79 pp.	Hall, A. and Kenward, H. (1999). Plant and invertebrate remains from Anglo-Scandinavian deposits at 16-22 Coppergate, York: technical report. Part 1: period 3. Reports from the Environmental Archaeology Unit, York 99/30, 79 pp.	Hall, A. and Kenward, H. (1999). Plant and invertebrate remains from Anglo-Scandinavian deposits at 16-22 Coppergate, York: technical report. Part 1: period 3. Reports from the Environmental Archaeology Unit, York 99/30, 79 pp.
	Town/City	York	York	York	York	York
	Period	950-1070	950-1070	M/L9-E10	M/L9-E10	M/L9-E10
	Feature	<167>	<172>	<1739>	<1736>	<1732>
	context	3450	3477	26732	26721	26721
	vol.soil (l)	1	1			
	flot vol (ml)					
Cereal grains						
Avena sativa	Cultivated oat spikelets				1	
Avena sp(p).	oat	1	1	1		
Avena strigosa	Bristle Oat					
cf. *Avena* sp(p).	?oat					
cf. *S. cereale*	?rye					
Hordeum (naked)	Barley; naked					
Hordeum sativum	barley					
Hordeum sp.	Barley			1	1	
Hordeum (twisted naked)						
indeterminate cereals	indet. grains (est.)					1
Secale cereale	rye			1	1	
T. aestivum s.l.	free-threshing wheat					
Triticum (hexapolid)	Bread wheat					
Triticum aestivo-compactum	Bread wheat			1	1	
Triticum sp(p).	wheat					

		Hall, A. and Kenward, H. (1999). Plant and invertebrate remains from Anglo-Scandinavian deposits at 16-22 Coppergate, York: technical report. Part 1: period 3. Reports from the Environmental Archaeology Unit, York 99/30, 79 pp.	Hall, A. and Kenward, H. (1999). Plant and invertebrate remains from Anglo-Scandinavian deposits at 16-22 Coppergate, York: technical report. Part 1: period 3. Reports from the Environmental Archaeology Unit, York 99/30, 79 pp.	Hall, A. and Kenward, H. (1999). Plant and invertebrate remains from Anglo-Scandinavian deposits at 16-22 Coppergate, York: technical report. Part 1: period 3. Reports from the Environmental Archaeology Unit, York 99/30, 79 pp.	Hall, A. and Kenward, H. (1999). Plant and invertebrate remains from Anglo-Scandinavian deposits at 16-22 Coppergate, York: technical report. Part 1: period 3. Reports from the Environmental Archaeology Unit, York 99/30, 79 pp.	Hall, A. and Kenward, H. (1999). Plant and invertebrate remains from Anglo-Scandinavian deposits at 16-22 Coppergate, York: technical report. Part 1: period 3. Reports from the Environmental Archaeology Unit, York 99/30, 79 pp.
	Town/City	York	York	York	York	York
	Period	M/L9-E10	M/L9-E10	M/L9-E10	M/L9-E10	M/L9-E10
	Feature	<1744>	<1733>	<1731>	<1730>	<1735>
	context	26721	26718	26718	26716	26715
	vol.soil (l)				0.1	
	flot vol (ml)					
Cereal grains						
Avena sativa	Cultivated oat spikelets					1
Avena sp(p).	oat		1			1
Avena strigosa	Bristle Oat					
cf. *Avena* sp(p).	?oat					
cf. *S. cereale*	?rye					
Hordeum (naked)	Barley; naked					
Hordeum sativum	barley					
Hordeum sp.	Barley		1			1
Hordeum (twisted naked)						
indeterminate cereals	indet. grains (est.)					
Secale cereale	rye					
T. aestivum s.l.	free-threshing wheat					
Triticum (hexapolid)	Bread wheat					
Triticum aestivo-compactum	Bread wheat		1			1
Triticum sp(p).	wheat				1	

Triticum spelta	Spelt wheat																				
Triticum/Secale	Wheat/Rye																		1		
Cereal chaff																					
Cerealia indet culm fragments											3										
Gramineae sect. Cerealia	Cereals, rhachis frag.																				
Indeterminate mineralised cereals																					
Cerealia bran																					
Triticum floret base																					
Avena sativa floret base	Cultivated oat																				
Triticum aestivum s.l.	6x wheat rachis																				
Triticum species rachis	Wheat rachis				1																
Secale cereale L.	rye rachis				1																
Avena glume fragment	Oat glume									1	1										
Avena sp. bran fragments	Oat bran									3	1	2									
Triticum/Secale bran	Wheat/Rye bran frag.	4	4	1			2	1	1	3	2	2		1	2	3	2	3	3	3	2
Hordeum species rachis	Barley rachis fragments				1																
Hordeum sp 'bran' fragments	Barley bran																				
Other plants																					
(M) Anomobryum filiforme									1			?1									
(M) Anomodon viticulosus	Rambling Tail-moss																				
(M) Antitrichia curtipendula	Pendulous Wing-moss						1		1							1		1			1
(M) Atrichum undulatum	Common Smoothcap																				
(M) Barbula cf. species	Beard-moss																				
(M) Brachythecium/Eurhynchium sp																					
(M) Bryum sp.	Thread-moss																				
(M) Calliergon cf. giganteum	Giant Spear-moss										1	3									
(M) Calliergon cuspidatum	Pointed spear-moss									1		2				1		1			
(M) Campylium elodes	Fine leaved feather moss																				
(M) Campylium stellatum (cf.)									1												
(M) cf. Amblystegium sp(p).	Creeping feather-moss																				
(M) Cratoneuron commutatum	Curled hook-moss								1												
(M) Cratoneuron filicinum	Fern-leaved Hook-moss																				
(M) Cratoneuron filicinum																					
(M) Dicramun sp.	Wind Bloon/Fork Moss																	1			
(M) Diphasium alpinium (D. complanatum)	Alpine Clubmoss																				1
(M) Drepanocladus aduncus	Knieff's Hook-moss																				
(M) Drepanocladus sp.												1				1					
(M) Eurhynchium praelongum																					
(M) Eurhynchium sp	Feather-moss																				
(M) Eurhynchium speciosum																					
(M) Eurhynchium striatum	Common Striated Feather-moss																				
(M) Homalia trichomanoides	Blunt Feather-moss															1					
(M) Homalothcium nitens																					
(M) Homalothcium sericeum/lutescens							1		1												1
(M) Homalothcium sp																					
(M) Hylocomium cf. brevirostre																					
(M) Hylocomium myosuroides																					
(M) Hylocomium splendens									1		1										
(M) Hypnum cf. cupressiforme	Cypress-leaved Plait-moss	1									1			1		1		1			1
(M) Isothecium myosuroides	Mouse-tail Moss																				
(M) Isothecium myurum											1										1
(M) Leucobryum glaucum	Large White-moss									1	1										

(M) Leucodon sciuroides	Squirrel-tail Moss								1						1			1			
(M) Lycopodium sp																					
(M) Mnium hornum	Swan's-neck Thyme-moss																				
(M) Neckera complanata	Flat Neckera								1	1	1			1	1	1		1	1		1
(M) Neckera crispa	Crisped Neckera															1		1			
(M) Plagiomnium sp.																					
(M) Plagiomnium undulatum	Hart's-tongue Thyme-moss																				
(M) Pleurozium schreberi																					
(M) Polytrichum formosum											1										
(M) Polytrichum species					1																
(M) Pseudoscleropodium purum	Neat Feather-moss						1		1												
(M) Racomitrium canescens	Hoary Fringe-moss																				
(M) Racomitrium sp.	Fringe-moss																				
(M) Rhynchostegiella tenella (cf.)	Tender Feather-moss																				
(M) Rhynchostegium sp	Feather-moss																				
(M) Rhytidiadelphus sp.	Turf-moss																				
(M) Rhytidiadelphus squarrosus	Springy Turf-moss									1		1									
(M) Rhytidiadelphus triquetrus																					
(M) Scorpidium scorpioides	Hooked Scorpion-moss								1		1	2									
(M) Sphagnum imbricatum			1																		
(M) Sphagnum Section Acutifolia		1																			
(M) Sphagnum Section Sphagnum		1																			
(M) Sphagnum sp.																					
(M) Thamnobryum alopecurum	Fox-tail Feather-moss													1							
(M) Thuidium cf. tamariscinum																			1		
(M) Ulota crispa	Crisped pincushion																				
(M) Ulota species											1										1
Achillea millefolium	Yarrow																				
Achillea ptarmica	Sneezewort																				
Achillea sp	Yarrow species											1									
Acinos arvensis	Basil thyme																				
Aegopodium podagraria	Ground elder																				
Aethusa cynapium	Fool's parsley						1			2	1		1	1	1			1			
Agrimonia eupatoria	Agrimonies																				1
Agrostemma githago	Corn cockle	3	3		1		2	2	1	2	1	2	2	1	1	2	2	1	3	2	2
Agrostis species	Bent grass																				
Alchemilla vulgaris	Ladies mantle																				
Alisma species	Water plantains																				
Allium porrum	Leek																				
Allium porrum leaf fragment	Leek		1									1			1			1			1
Allium sp.	Leek/Onion/Garlic?										1 lef										
Allium sp. leaf fragment	Leek/Onion/Garlic?																				
Alnus glutinosa (cone)	Alder																				
Alnus sp fca																					
Alopecurus species	Foxtail grass																				
Anagallis arvensis	Scatlet Pimpernel												2								
Anethum graveolens	Dill									2		2		1	1	1	1		1		1
Anthemis cotula	Stinking mayweed		1					1	1	3	2/1c	3	3	1	1	1	1	1	1	1	1
Anthriscus caucalis	Burr-chervil																				
Anthriscus sylvestris	Cow Parsley							1		1	1		2	1							
Aphanes microcarpa	Slender Parsley-piert												1								
Apium graveolens	Celery										1	1	2	1	1	2	1	1	1		2

Arctium lappa/minus	Greater/Lesser Burdock																				
Arctium species	Burdock												2								
Armorica rusticana	Horseradish																				
Aster tripolium (cf.)	Sea aster																				
Asteraceae	Daisy Family																				
Asteraceae/Compositae (inv fgts)																					
Atriplex hastata	Orache																				
Atriplex patula/prostrata	Common Orache																				
Atriplex sp.	Orache		1					1		2	2	2	3	2	1	1	1	1		1	1
Atropa belladonna	Deadly nightshade																				
Baldellia ranunculoides	Lesser Water-plantain																				
Barberea vulgaris	Bittercress																				
Bellis perennis	Common daisy								1	1											
Beta vulgaris	Beet				1																
Betula pubescens	White birch																				
Betula species	Birch										1										1
Bidens sp.	Bur-marigolds																				
Boraginaceae	Borage Family																1				
Brassica campestris	Wild turnip																				
Brassica cf. oleracea/napus	Cabbage/rape/swede																				
Brassica nigra	Black mustard									1											
Brassica rapa	Turnip				1		1			2	1	1		1	1						
Brassica sp./Sinapis arvensis	Brassica/Charlock							1			1	1		1			1		1		
Brassica species	Brassica species	1	1							1	1	2	2			1		1		1	
Brassicaceae seed	Brassicaceae species																				
Brassicaceae/Cruciferae	Brassicaceae species																				
Brassicaceae/Cruciferae (pedicles)	Brassicaceae species				1																
Bromus sp.	Brome grass									2bran	1	1									
Bryonia cretica ssp. Dioica	White bryony										1										
Buglossoides arvensis	Field Gromwell																				
Bupleurum falcatum	Sickle-leaved Hare's-Ear																				
Bupleurum rotundifolium	Thorow-wax																				
C. leucanthemum	Ox-eye daisy																				
Calendula officinalis	Pot marigold																				
Calluna vulgaris flower/leaf fragments	Ling									1	2	1									
Caltha palustris	Marsh-marigold									1											
Cannabis sativa	Hemp											1		1							1
Capsella bursa-pastoris	Shepherd's-purse																				
Cardus/Cirsium species	Thistle family						1		1	1		1		1		1					
Carduus sp.	Thistle family																				
Carex (lenticular)	Sedges																				
Carex (trigonus)	Sedges																				
Carex elata	Tufted sedge																				
Carex flacca	Glaucous sedge																				
Carex hostiana	Tawny sedge																				
Carex leporina (C. ovalis)	Oval sedge																				
Carex nigra cf.	Common sedge																				
Carex oederi (Carex viridula)	Small fruited yellow sedge																				
Carex panicea	Carnation sedge																				
Carex remota	Remota sedge																				
Carex riparia/hirta	pond/hairy sedge																				
Carex rostrata cf.	Bottle sedge																				

Carex species	Sedge		1					1	?1	2	1	2	2	2		1					1
Carex sylvatica	Wood-sedge																				
Caryophyllaceae	Pink Family																				
Centaurea cf. scabiosa	Greater Knapweed																				
Centaurea cyanus	Cornflower	1	1		2																
Centaurea nigra	Common knapweed																				
Centaurea species	Knapweeds	1					1			1		1									
Cerastium fontanum	Common mouse-ear																				
Cerastium sp.	Mouse-ear chickweed									2			2								
Chaerophyllum sp cf.	Chervil																				
Chelidonium majus	Greater Celandine																				
Chenopodium album	Fat hen		1					1	1	3	1	2	3	2	1	1		1		1	1
Chenopodium bonus-henricus	Good King-Henry																				
Chenopodium ficifolium	Fig-leaved goosefoot												1								
Chenopodium murale	Nettle-leaved goosefoot																				
Chenopodium Section Pseudoblitum			1		2								2								
Chenopodium species	Goosefoots																				
Chenopodium/Atriplex spp.	goosefoots etc. oraches																				
Chrysanthemum segetum	(Corn marigold)						1	1													
Circaea lutetiana	Enchanters nightshade																				
Cirsium species	Thistle																				
Cladium mariscus (epidermus fragments)	Saw sedge										1	2									
Conium maculatum	Hemlock		1																		1
Coriandrum sativum	Coriander													1	1						1
Corylus avellana	Hazel nut				1	1	1		1		1	1		1	1	1		1		1	1
Crataegus cf. laevigata	Midland Hawthorn																				
Crataegus monogyna fruitstone	Hawthorn											1									1
Crepis species	Hawksbeard												1								
Cyperaceae	Sedge Family										1pap lef										
Danthonia decumbens	Common heath grass									1							1				
Daucus carota	Wild carrot									1			2								
Dipsacus sativus/fullonum	Teasel														1	1	1		1		
Dryopteris sp	Wood/Male/Buckler Fern																				
Eleocharis multicaulis	Many-stalked spike-rush											1									
Eleocharis palustris	Common Spike-rush		1							1		1	1								
Eleocharis sp.	Spike-rush																				
Elymus/Agropyron	Couches																				
Empetrum nigrum	Black crowberry																				
Epilobium sp	Willowherbs																				
Equisetum sp nodel sheath fragments	Horsetails										1										
Erica tetralix	Cross-leaved Heath								1		2										
Eriophorum vaginatum	Hare's-Tail Cottongrass																				
Euphorbia helioscopia	Sun spurge																				
Euphorbia lathyris	Caper spurge																				
Euphrasia/Odontities sp.	Eyebrights																				
Fabaceae indet.	indet. legumes																				
Fallopia convolvulus	Black-bindweed								1	1		1	2	1	1	1	1	1		1	1
Ficus carica L.	Fig	2	1			1	1					2									
Filipendula ulmaria	Meadowsweet									1		1									
Foeniculum vulgare	Fennel						1														
Fragaria vesca	Wild Strawberry	1					1														
Fumaria species	Fumitory																				

Galeopsis species	Hemp-nettle																				
Galeopsis subgenus Galeopsis	Hempnettle								1	1	1	1		1	1	1		1			1
Galeopsis subgenus Ladanum	Red hempnettle				1						1										
Galeopsis tetrahit	Common hemp nettle																				
Galium aparine L.	cleavers																	2			1
Galium cf. spurium	False cleavers																				
Galium saxatile	Heath bedstraw																				
Galium species	Bedstraw										1										
Genista tinctoria leaf frags	Dyer's Greenweed																				
Genista tinctoria stem fragments	Dyer's Greenweed																				
Geum rivale/urbanum	Avens																				
Geum urbanum	Wood avens																				
Glyceria fluitans	Floating Sweet-Grass									1											
Glyceria species	Sweet Grasses																				
Graminae					2				1	1	1	3	2		1	1	1	1			1
Heracleum sphondylium	Hogweed										1										
Humulus lupus	Hops												1					1			1
Hydrocotyle vulgaris	Marsh Pennywort																				
Hyoscyamus niger L.	henbane								1					1		1					
Hypericum sp	St. John's-worts																				
Hypochaeris radicata	Common cat's ear																				
Hypochoeris sp.	Cat's Ear										1	1			1						
Ilex aquifolium (leaf fragments)	Holly																				
Iris pseudacorus	Yellow flag													1							
Isatis tinctora (pod fragments)	Woad																				1
Isolepis setacea	Bristleleaf bulrush																				
Juglans regia	Walnut																				
Juncus acutiflorus/articulatus	Sharp flowered rush												2								
Juncus bufonius	Toad rush								1				1								
Juncus conglomeratus	Compact rush																				
Juncus gerardi	Saltmarsh Rush																				
Juncus inflexus/effusus/conglomeratus	Hard/Soft/Compact Rush																				
Juncus maritimus	Sea Rush															1					
Juncus sp.	Rush	1	1								1					1					
Juncus squarrosus	Heath rush																				
Juncus subnodulosus	Blunt-flowered Rush																				
Knautia arvensis	Field Scabious						1	1	1												
Labiatae species indeterminate	Dead-Nettle Family				1																
Lamium section Lamiopsis			1				1				1		1		1						1
Lamium sp	Dead-Nettles																				
Lapsana communis	Nipplewort	1	1						1	2	1	2	2		1				1		
Legume >4mm																					
Leguminosae flowers/petals							1		1												
Leguminosae pods/frags					1																
Leguminosae tracheid bars																					
Leontodon autumnalis	Autumn hawkbit																				
Leontodon autumnalis/hispidus	Autumn/Rough Hawkbit																				
Leontodon hispidus	Rough Hawkbit																				
Leontodon sp.	Hawkbit	1							1	1	1	1									
Leontodon taraxacoides	Lesser Hawkbit																				
Lepedium coronopus (Coronopus squamatus)	Swine-cress								1												
Leucanthemum vulgare	Oxeye daisy																				

Linum catharticum	Fairy Flax						1			1											
Linum sp. cf.	?flax																				
Linum usitatissimum	Flax	1	1						1	2	2	2	2			1		1	1		1
Lithospermum arvense L.	corn gromwell																				
Luzula campestris	Sweep's brush																				
Luzula multiflora	Heath woodrush																				
Luzula species	Wood-rush									1											
Lychnis flos-cuculi	Ragged robin																				
Lycopus europaeus	Gypsywort																				
Lythrum salicaria	Purple loosestrife															1					
Malus sylvestris endocarp	Apple core	1	1				1	1	1	1	1	2	1	1	1	1	1	1	1		1
Malus sylvestris seed base cups	Apple seed base cups											1									
Malus sylvestris/domesticus	Apple	1	1				1			1	1	2	2	1	1	1		1	1		1
Malus/pyrus	Apple/Pear																				
Malva neglecta	Dwarf mallow																				
Malva species	Mallow																				
Malva sylvestris	Common Mallow																				
Marrubium vulgare	White Horehound											1									
Matricaria recutita	Chamomile																				
Mentha species	Mint									1		1									
Menyanthes trifoliata	Bog-bean											1									1
Montia fontana	Blinks																			1	
Myosotis sp.	Forget-me-not																				
Myrica gale leaf/twig fragments	Bog myrtle				1				1												
Myristica fragrans (aril)	Mace (Nutmeg)																				
Nepeta cataria	Catnip																1				
Nuphar lutea	Yellow water-lily																				
Odontites verna	Red Bartsia															1					
Oenanthe cf. aquatica	Fine-leafed water dropwort									1		1									
Oenanthe cf. lachenalii	Parsley Water-dropwort																				
Oenanthe crocata	Hemlock water dropwort																				
Oenanthe fistulosa	Tubular Water-dropwort																				
Oenanthe sp	Water dropwort									1											
Onopordum acanthium	Cottom Thistle																				
Oxalis acetosella	Wood-sorrel																				
Papaver argemone	Prickly Poppy									1			2								
Papaver dubium	Long-headed poppy																				
Papaver somniferum	Opium poppy									1	1		2								
Papaver species	Poppy																				
Pastinaca sativa	Parsnip																				
Pastinaca sativa/Heracleum sphondylium	Parsnip/Hogweed																				
Pedicularis palustris	Marsh Lousewort								1			1								1	
Persicaria hydropiper	Water pepper																				
Persicaria lapathifolia	Pale Persicaria																				
Persicaria maculosa	Redshank																				
Phoenix dactylifera	Dates																				
Phragmites australis	Common Reed	1												1							
Picris echioides	Bristly Oxtongue																				
Picris hieracioides	Hawkweed Oxtongue									1		1									
Piper nigrum	Black Pepper																				
Pisum sativum	Garden pea																				
Pisum sativum hilum, parenchyma, epidermis	Garden pea									1											

Pisum sp.	Garden pea																				
Plantago lanceolata L.	Ribwort plantain																				
Plantago major	Greater Plantain											1									
Plantago media	Hoary Plantain																				
Poa annua	Annual meadow grass									1											
Poa trivialis	Rough bluegrass																				
Poaceae	indet grasses																				
Polygonaceae	-		1																		
Polygonum arenastrum	Common knotweed																				
Polygonum aviculare	Common Knotgrass				1					1	1	1	3		1	1				1	1
Polygonum hydropiper	Water pepper									1			1						1		
Polygonum lapathifolium	Pale Persicaria				1					2		1	2	1		1		1			1
Polygonum persicaria	Redshank								1	1	1	2	2	1	1	1		1	1		
Populus species bud scales	Poplar																				
Potamogeton species	Pondweed																				
Potentilla anserina	Silverweed									1											
Potentilla erecta	Tormentil		1							1	1										
Potentilla palustris	Marsh cinquefoil									1	1	1	1	1							
Potentilla reptans	Creeping cinquefoil								1												
Potentilla species	Cinquefoils									2				1							
Prunella vulgaris	Self-heal								1	1	1	1	2		1		1				
Prunus cerasifera																					
Prunus cerasus	Morello cherry						1	1													
Prunus cf. cerasus	Morello cherry																				
Prunus domestica	Plum						1											1			1
Prunus domestica cf.	?plum/bullace														1	1					
Prunus insititia	Damson		1				1														
Prunus padus	Bird cherry																				
Prunus sp																					
Prunus sp. mesocarp																					
Prunus species epidermis																					
Prunus spinosa	Sloe		1				1				1	1	2	1		1		2			2
Pteridium aqualinum	Bracken				1							1		1	1	1		1			1
Pyrus communis	Pear																				
Pyrus/Cydonia endocarp	Pear/Qunice																				
Pyrus/Cydonia stone cells	Pear/Qunice																				
Quercus sp. bud scales	Oak bud scales		1									1									
Ranunculus acris/ repens/ bulbosus	'buttercups'																				
Ranunculus flammula	Lesser Spearwort								1			1	2			1					
Ranunculus lingua	Greater Spearwort		1																		
Ranunculus sardous	Hairy buttercup							1		1		1	2								
Ranunculus sceleratus	celery leaved crowfoot		1				1		1								1				
Ranunculus subgenus Batrachium																					
Ranunculus subgenus Ranunculus	Buttercup	1	1		1		1	1	1	1	2	1	2	1	1	1		1			1
Raphanus raphanistrum	Wild radish								1	1		2	2	1		1		1			1
Reseda luteola	Weld	1	3		1																
Reseda sp	Mignonettes																				
Rhinanthus minor	Yellow rattle																				
Rhinanthus species	Rattle									1			1								
Ribes uva-crispa	Gooseberry																				
Rosa sp.	Rose-hip	1										1									
Rubia tinctorum	Common madder																				
Rubus caesius	Dewberries										1										

Rubus fruticosus	Blackberry									1	1		2		1			1	1		1
Rubus fruticosus/idaeus	blackberry/ raspberry															1					
Rubus idaeus	Raspberry							1		1			1								
Rubus species	Brambleberry																1				
Rumex acetosa	Common sorrel																				
Rumex acetosella	Sheep's sorrel	1							1		1	1	2								
Rumex conglomeratus	Sharp dock																				
Rumex crispus	Curled dock																				
Rumex obtusifolius	Broad-leaved dock																				
Rumex pseudoalpinus	Monk's rhubarb																				
Rumex sanguineus	Bloody dock																				
Rumex spp.	Docks	1	1		1		1	1	1	1	1	1	2	1		1	1			1	1
Salix species bud scale/leaf fragments	Willow bud scales		1							1	1										
Sambucus cf. ebulus	Dwarg elder								1												
Sambucus nigra	Elder		1				1	1	1		1	2	1	1	1	1		1		1	1
Satureja hortensis	Summer savoury									2		1	3		1	1		1			1
Scandix pecten-veneris	Shepherd's-Needle				1																
Scirpus maritimus/lacustris	Sea/Common Club-rush																				
Scirpus setaceus	Bristle Club-rush												1								
Scirpus sylvaticus cf.	Wood Club-rush																				
Scleranthus annuus	Annual Knawel									1											
Scrophularia nodosa	Figwort																				
Senecio aquaticus	Marsh ragwort																				
Senecio cf. jacobea	Groundsel																				
Senecio species	Ragworts										1		1								
Silene alba	White Campion																				
Silene sp	Campion																				
Silene vulgaris	Bladder Campion	1																			
Sinapis arvensis	Field Mustard																				
Sisymbrium officinale	Hedge mustard																				
Sisymbrium sophia/Descurainia sophia	Flixweed																				
Solanum dulcamara	Bittersweet																				
Solanum nigrum	Black nightshade																				
Solanum sp	Nightshades																				
Sonchus arvensis	Perennial Sowthistle										1		2								
Sonchus asper	Spiney milk thistle									1	1	1	1	1		1		1			1
Sonchus oleraceus	Sowthistle												1								
Sonchus sp.	Sowthistles												1								
Sorbus aria	Whitebeam																				
Sorbus aucuparia	Rowan									1											
Sorbus sp cf.	Service																				
Sorbus torminalis	Wild Service-tree																				
Spergula arvensis	Corn spurry								1		1		2			1					
Spherganium sp	Bur-reed																				
Stachys palustris	Marsh Woundwort																				
Stachys sp.	Woundwort									1											
Stachys sylvatica	Hedge woundwort																				
Stellaria graminea	Lesser Stichwort															1					
Stellaria holostea stem fragments	Greater Stichwort																				
Stellaria media	Common chickweed				1		1				2	1	3	1	1	1	1	1		1	1
Stellaria media/neglecta	C.mon/Greater Chickweed																				
Stellaria palustris/graminea	Marsh/Lesser Stichwort																				

Stellaria sp.	Stichworts																				
Stellaria/Cerastium	Stichworts/Mouse-ears											1									
Taraxacum officinale	Dandelion		1																		
Thalaspi arvense	Field penny cress									1				1	1						
Thalictrum flavum	Common Meadow-rue											1									
Thalictrum sp.	Meadow-rues																				
Torilis japonica	Upright hedge parsley											1		1	1						
Trifolium pratense	Red Clover																				
Trifolium repens	White clover																				
Trifolium species	Clover																				
Triglochin maritima	Sea Arrowgrass															1					
Tripleurospermum inodorum/Matricaria perforata	Scentless Mayweed									1											
Ulex	Gorse (leaf spine)																				
Umbelliferae indet.	Umbellifore				1					2	1		1								
Urtica dioica	Stinging nettle		1			1	1		1	2	1	2	2			1	1				
Urtica urens	Small nettle		1					1	1	2	2	2	3	1	1	1	1	1		1	1
Vaccinium myrtillus	Bilberry																				
Vaccinium sp.	Bilberry									2	1		2			1					
Vaccinium sp. pistil bases	Bilberry pistil bases																				
Valerianella dentata	Narrow-fruited cornsalad									1	1	1				1					1
Veronica sp	Speedwell																				
Vica faba trachied bars	Broad bean trachied bars																				
Vicia cf. tetrasperma	Smooth Tare																1				
Vicia faba	Broad bean									1	1		2		1						1
Vicia faba epidermis	Broad bean spidermis																				
Vicia species	Vetch				1													1			
Viola palustris	Violets																				
Viola species	Violet								1				1	1							
Vitis vinifera L.	grape																				
Zannichellia palustris	Horned pondweed					1															
Total quantified remains																					
Seed density per litre (quantified charred remains)																					
		3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume

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	Town/City	York	York	York	York	York	York	York	York	York	York	York	York	York	York	York	York	York	York	York	York
	Period	M/L9-E10	M/L9-E10	M/L9-E10	M/L9-E10	M/L9-E10	M/L9-E10	M/L9-E10	M/L9-E10	M/L9-E10	M/L9-E10	M/L9-E10	M/L9-E10	M/L9-E10	M/L9-E10	M/L9-E10	M/L9-E10	M/L9-E10	M/L9-E10	M/L9-E10	M/L9-E10
	Feature	<1729>	<1721>	<1714>	<1734>	<1911>	<1908>	<1900>	<1893>	<1900>	<2023>	<2137>	<2135>	<2136>	<2066>	<2072>	<2082>	<2081>	<2084>	<2083>	<2142>
	context	26715	26631	26631	26630	27872	27868	27813	27813	27813	31595	31696	31696	31695	30549	30629	30653	30652	30648	30642	30836
	vol.soil (l)	0.1																			
	flot vol (ml)																				
Cereal grains																					
Avena sativa	Cultivated oat spikelets		1		1										1				1		
Avena sp(p).	oat														1	1				1	1
Avena strigosa	Bristle Oat																				
cf. *Avena* sp(p).	?oat																				
cf. *S. cereale*	?rye														1	1					
Hordeum (naked)	Barley; naked																				
Hordeum sativum	barley																				
Hordeum sp.	Barley		1		1			1		1	1				1	1			1	2	1
Hordeum (twisted naked)																					
indeterminate cereals	indet. grains (est.)					1			1			1									
Secale cereale	rye		1		1															1	
T. aestivum s.l.	free-threshing wheat																				

Triticum (hexapolid)	Bread wheat																				
Triticum aestivo-compactum	Bread wheat		1	1	1							1			2*				1	1	
Triticum sp(p).	wheat															1					
Triticum spelta	Spelt wheat																				
Triticum/Secale	Wheat/Rye																				
Cereal chaff																					
Cerealia indet culm fragments																					
Gramineae sect. Cerealia	Cereals, rhachis frag.																				
Indeterminate mineralised cereals																					
Cerealia bran																					
Triticum floret base																					
Avena sativa floret base	Cultivated oat																				
Triticum aestivum s.l.	6x wheat rachis																				
Triticum species rachis	Wheat rachis																				
Secale cereale L.	rye rachis																				
Avena glume fragment	Oat glume																				
Avena sp. bran fragments	Oat bran																				
Triticum/Secale bran	Wheat/Rye bran frag.	3		2		3	2		3								3	2			3
Hordeum species rachis	Barley rachis fragments																				
Hordeum sp 'bran' fragments	Barley bran																				
Other plants																					
(M) Anomobryum filiforme																					1
(M) Anomodon viticulosus	Rambling Tail-moss																				
(M) Antitrichia curtipendula	Pendulous Wing-moss		1					1		1						1	1		1		
(M) Atrichum undulatum	Common Smoothcap																				
(M) Barbula cf. species	Beard-moss																				
(M) Brachythecium/Eurhynchium sp						1															
(M) Bryum sp.	Thread-moss																				
(M) Calliergon cf. giganteum	Giant Spear-moss																				1
(M) Calliergon cuspidatum	Pointed spear-moss						1		1							1					1
(M) Campylium elodes	Fine leaved feather moss																				
(M) Campylium stellatum (cf.)																					1
(M) cf. Amblystegium sp(p).	Creeping feather-moss																				
(M) Cratoneuron commutatum	Curled hook-moss																				
(M) Cratoneuron filicinum	Fern-leaved Hook-moss																				
(M) Cratoneuron filicinum																					
(M) Dicramun sp.	Wind Bloon/Fork Moss																				
(M) Diphasium alpinium (D. complanatum)	Alpine Clubmoss																				
(M) Drepanocladus aduncus	Knieff's Hook-moss																				
(M) Drepanocladus sp.																					
(M) Eurhynchium praelongum																	1		1		
(M) Eurhynchium sp	Feather-moss																				
(M) Eurhynchium speciosum																					
(M) Eurhynchium striatum	Common Striated Feather-moss			1													1		1		1
(M) Homalia trichomanoides	Blunt Feather-moss																				
(M) Homalothcium nitens																					
(M) Homalothcium sericeum/lutescens			1													1					
(M) Homalothcium sp																					
(M) Hylocomium cf. brevirostre																					
(M) Hylocomium myosuroides																					
(M) Hylocomium splendens																					1
(M) Hypnum cf. cupressiforme	Cypress-leaved Plait-moss	1		1																	1

(M) Isothecium myosuroides	Mouse-tail Moss																				
(M) Isothecium myurum																			1		1
(M) Leucobryum glaucum	Large White-moss																				
(M) Leucodon sciuroides	Squirrel-tail Moss																				
(M) Lycopodium sp																					
(M) Mnium hornum	Swan's-neck Thyme-moss																				
(M) Neckera complanata	Flat Neckera			1		1	1		1							1	1	1	1	2	1
(M) Neckera crispa	Crisped Neckera	1		1																	
(M) Plagiomnium sp.																					
(M) Plagiomnium undulatum	Hart's-tongue Thyme-moss										1										
(M) Pleurozium schreberi																					
(M) Polytrichum formosum																					
(M) Polytrichum species																					
(M) Pseudoscleropodium purum	Neat Feather-moss																				
(M) Racomitrium canescens	Hoary Fringe-moss																				
(M) Racomitrium sp.	Fringe-moss																				
(M) Rhynchostegiella tenella (cf.)	Tender Feather-moss																				
(M) Rhynchostegium sp	Feather-moss																				
(M) Rhytidiadelphus sp.	Turf-moss																				
(M) Rhytidiadelphus squarrosus	Springy Turf-moss			1																	1
(M) Rhytidiadelphus triquetrus																					
(M) Scorpidium scorpioides	Hooked Scorpion-moss																				1
(M) Sphagnum imbricatum																					
(M) Sphagnum Section Acutifolia																					
(M) Sphagnum Section Sphagnum																					
(M) Sphagnum sp.																					
(M) Thamnobryum alopecurum	Fox-tail Feather-moss																1				
(M) Thuidium cf. tamariscinum			1	1			1				1					1		1			2
(M) Ulota crispa	Crisped pincushion																				
(M) Ulota species																					1
Achillea millefolium	Yarrow					1															
Achillea ptarmica	Sneezewort																				
Achillea sp	Yarrow species																				
Acinos arvensis	Basil thyme																				
Aegopodium podagraria	Ground elder																				
Aethusa cynapium	Fool's parsley		1		1			1		1	1	1	1		1		1		1		
Agrimonia eupatoria	Agrimonies															1					
Agrostemma githago	Corn cockle	2	1	1	1				1		1				1	1	1	2		1	2
Agrostis species	Bent grass																				
Alchemilla vulgaris	Ladies mantle																				
Alisma species	Water plantains																				
Allium porrum	Leek																				
Allium porrum leaf fragment	Leek																				
Allium sp.	Leek/Onion/Garlic?																				
Allium sp. leaf fragment	Leek/Onion/Garlic?																				
Alnus glutinosa (cone)	Alder			1																	
Alnus sp fca																					
Alopecurus species	Foxtail grass																				
Anagallis arvensis	Scatlet Pimpernel				1	1			1		1	1					1				
Anethum graveolens	Dill		1	1	1	1	1	1	1	1		1				1	1	1	1		
Anthemis cotula	Stinking mayweed			1		1			1								1	1			1
Anthriscus caucalis	Burr-chervil																				

Anthriscus sylvestris	Cow Parsley							1		1											1
Aphanes microcarpa	Slender Parsley-piert																				
Apium graveolens	Celery	1	1	1	1				1			1					1	1	1		1
Arctium lappa/minus	Greater/Lesser Burdock																				
Arctium species	Burdock														1						
Armorica rusticana	Horseradish																				
Aster tripolium (cf.)	Sea aster																				
Asteraceae	Daisy Family																				
Asteraceae/Compositae (inv fgts)																					
Atriplex hastata	Orache																				
Atriplex patula/prostrata	Common Orache																				
Atriplex sp.	Orache	1	2	1	1	1	1	1	1	1		1	1	1	2	1	1	1	1		1
Atropa belladonna	Deadly nightshade			1							1										
Baldellia ranunculoides	Lesser Water-plantain																				
Barberea vulgaris	Bittercress																				
Bellis perennis	Common daisy																				
Beta vulgaris	Beet																				
Betula pubescens	White birch																				
Betula species	Birch																				1
Bidens sp.	Bur-marigolds															1	1				
Boraginaceae	Borage Family																				
Brassica campestris	Wild turnip																				
Brassica cf. oleracea/napus	Cabbage/rape/swede																				
Brassica nigra	Black mustard																				
Brassica rapa	Turnip		1	1	1						1						1	1			
Brassica sp./Sinapis arvensis	Brassica/Charlock					1	1										1				
Brassica species	Brassica species			1		1	1	1	1	1		1								1	
Brassicaceae seed	Brassicaceae species																				
Brassicaceae/Cruciferae	Brassicaceae species																				
Brassicaceae/Cruciferae (pedicles)	Brassicaceae species																				
Bromus sp.	Brome grass																				1
Bryonia cretica ssp. Dioica	White bryony																				
Buglossoides arvensis	Field Gromwell																				
Bupleurum falcatum	Sickle-leaved Hare's-Ear																				
Bupleurum rotundifolium	Thorow-wax																				
C. leucanthemum	Ox-eye daisy																				
Calendula officinalis	Pot marigold																				
Calluna vulgaris flower/leaf fragments	Ling																1		1		
Caltha palustris	Marsh-marigold																				
Cannabis sativa	Hemp		1		1											1		1	1	1	1
Capsella bursa-pastoris	Shepherd's-purse			1		1															
Cardus/Cirsium species	Thistle family						1	1	1	1							1				1
Carduus sp.	Thistle family																				
Carex (lenticular)	Sedges																				
Carex (trigonus)	Sedges																				
Carex elata	Tufted sedge																				
Carex flacca	Glaucous sedge																				
Carex hostiana	Tawny sedge																				
Carex leporina (C. ovalis)	Oval sedge																				
Carex nigra cf.	Common sedge																				
Carex oederi (Carex viridula)	Small fruited yellow sedge																				
Carex panicea	Carnation sedge																				

Carex remota	Remota sedge																				
Carex riparia/hirta	pond/hairy sedge																				
Carex rostrata cf.	Bottle sedge																				
Carex species	Sedge	1	1	1	1		1		1		1	1	1	1				1	1		1
Carex sylvatica	Wood-sedge																				
Caryophyllaceae	Pink Family																				
Centaurea cf. scabiosa	Greater Knapweed																				
Centaurea cyanus	Cornflower																				
Centaurea nigra	Common knapweed																				
Centaurea species	Knapweeds						1									1					
Cerastium fontanum	Common mouse-ear																				
Cerastium sp.	Mouse-ear chickweed								1												1
Chaerophyllum sp cf.	Chervil																				
Chelidonium majus	Greater Celandine																				
Chenopodium album	Fat hen	1	2	1	1	1		1	1	1	1	1	1	1	1		2	1	1		1
Chenopodium bonus-henricus	Good King-Henry																				
Chenopodium ficifolium	Fig-leaved goosefoot											1									
Chenopodium murale	Nettle-leaved goosefoot												1	1							
Chenopodium Section Pseudoblitum				1		1			1								1				
Chenopodium species	Goosefoots					1															
Chenopodium/Atriplex spp.	goosefoots etc. oraches																				
Chrysanthemum segetum	(Corn marigold)																				
Circaea lutetiana	Enchanters nightshade																				
Cirsium species	Thistle																				
Cladium mariscus (epidermus fragments)	Saw sedge																				
Conium maculatum	Hemlock				1											1	1		1	1	
Coriandrum sativum	Coriander														1	1			1		
Corylus avellana	Hazel nut		1	1	1		2	1		1	1				2	1	1	1		2	
Crataegus cf. laevigata	Midland Hawthorn																				
Crataegus monogyna fruitstone	Hawthorn				1		1	1		1								1			
Crepis species	Hawksbeard																				
Cyperaceae	Sedge Family																				
Danthonia decumbens	Common heath grass																				
Daucus carota	Wild carrot								1												
Dipsacus sativus/fullonum	Teasel																				
Dryopteris sp	Wood/Male/Buckler Fern																				
Eleocharis multicaulis	Many-stalked spike-rush																				
Eleocharis palustris	Common Spike-rush			1	1	1		1	1	1	1			1			1				1
Eleocharis sp.	Spike-rush											1									
Elymus/Agropyron	Couches																				
Empetrum nigrum	Black crowberry																				
Epilobium sp	Willowherbs																				
Equisetum sp nodel sheath fragments	Horsetails																				
Erica tetralix	Cross-leaved Heath																				
Eriophorum vaginatum	Hare's-Tail Cottongrass																				
Euphorbia helioscopia	Sun spurge																				
Euphorbia lathyris	Caper spurge																				
Euphrasia/Odontities sp.	Eyebrights																				
Fabaceae indet.	indet. legumes																				
Fallopia convolvulus	Black-bindweed	1	1	1	1	1	1	1	1	1				1		1	1	1	1	1	
Ficus carica L.	Fig																				
Filipendula ulmaria	Meadowsweet																1				

Foeniculum vulgare	Fennel																				
Fragaria vesca	Wild Strawberry																				
Fumaria species	Fumitory																				
Galeopsis species	Hemp-nettle																				
Galeopsis subgenus Galeopsis	Hempnettle		1		1		1	1	1	1	1				1	1	1	1	1	1	
Galeopsis subgenus Ladanum	Red hempnettle																				
Galeopsis tetrahit	Common hemp nettle																				
Galium aparine L.	cleavers																				
Galium cf. spurium	False cleavers																				
Galium saxatile	Heath bedstraw																				
Galium species	Bedstraw								1												
Genista tinctoria leaf frags	Dyer's Greenweed																				
Genista tinctoria stem fragments	Dyer's Greenweed						1														
Geum rivale/urbanum	Avens																				
Geum urbanum	Wood avens																				
Glyceria fluitans	Floating Sweet-Grass																				
Glyceria species	Sweet Grasses																				
Graminae				1		1			1							1	1				1
Heracleum sphondylium	Hogweed						1	1		1											
Humulus lupus	Hops		1		1															1	1
Hydrocotyle vulgaris	Marsh Pennywort																				
Hyoscyamus niger L.	henbane				1			1	1	1	1	1	1	1			1		1		1
Hypericum sp	St. John's-worts					1															
Hypochaeris radicata	Common cat's ear																				
Hypochoeris sp.	Cat's Ear																				
Ilex aquifolium (leaf fragments)	Holly				1																
Iris pseudacorus	Yellow flag										1								1		
Isatis tinctora (pod fragments)	Woad																				
Isolepis setacea	Bristleleaf bulrush																				
Juglans regia	Walnut																				
Juncus acutiflorus/articulatus	Sharp flowered rush					1															1
Juncus bufonius	Toad rush			1		1			1			1		1			1				
Juncus conglomeratus	Compact rush																				
Juncus gerardi	Saltmarsh Rush																				
Juncus inflexus/effusus/conglomeratus	Hard/Soft/Compact Rush			1		1															
Juncus maritimus	Sea Rush																				
Juncus sp.	Rush																				
Juncus squarrosus	Heath rush																				
Juncus subnodulosus	Blunt-flowered Rush												1								
Knautia arvensis	Field Scabious																				
Labiatae species indeterminate	Dead-Nettle Family																				
Lamium section Lamiopsis								1	1	1									1		
Lamium sp	Dead-Nettles																				
Lapsana communis	Nipplewort			1	1	1			1								2	1	1		1
Legume >4mm																					
Leguminosae flowers/petals						1										1					
Leguminosae pods/frags																	1				
Leguminosae tracheid bars																					
Leontodon autumnalis	Autumn hawkbit																				
Leontodon autumnalis/hispidus	Autumn/Rough Hawkbit																				
Leontodon hispidus	Rough Hawkbit																				
Leontodon sp.	Hawkbit																				

Leontodon taraxacoides	Lesser Hawkbit																				
Lepedium coronopus (Coronopus squamatus)	Swine-cress																				
Leucanthemum vulgare	Oxeye daisy																				
Linum catharticum	Fairy Flax								1												
Linum sp. cf.	?flax																				
Linum usitatissimum	Flax				1	1	1		1												
Lithospermum arvense L.	corn gromwell																				
Luzula campestris	Sweep's brush																				
Luzula multiflora	Heath woodrush																				
Luzula species	Wood-rush					1															
Lychnis flos-cuculi	Ragged robin																1				
Lycopus europaeus	Gypsywort																				
Lythrum salicaria	Purple loosestrife																				
Malus sylvestris endocarp	Apple core		1	1		1	1	1	1	1	1					1	2	2			1
Malus sylvestris seed base cups	Apple seed base cups																				
Malus sylvestris/domesticus	Apple		1	1	1		1	1	1	1	3					1	2	3	1	1	
Malus/pyrus	Apple/Pear																				
Malva neglecta	Dwarf mallow																				
Malva species	Mallow																				
Malva sylvestris	Common Mallow																				
Marrubium vulgare	White Horehound																				
Matricaria recutita	Chamomile																				
Mentha species	Mint																				
Menyanthes trifoliata	Bog-bean	1	1		1										1				1		
Montia fontana	Blinks																				
Myosotis sp.	Forget-me-not																1				
Myrica gale leaf/twig fragments	Bog myrtle																				
Myristica fragrans (aril)	Mace (Nutmeg)																				
Nepeta cataria	Catnip				1																
Nuphar lutea	Yellow water-lily																				
Odontites verna	Red Bartsia																1				
Oenanthe cf. aquatica	Fine-leafed water dropwort																				
Oenanthe cf. lachenalii	Parsley Water-dropwort																				
Oenanthe crocata	Hemlock water dropwort																				
Oenanthe fistulosa	Tubular Water-dropwort																				
Oenanthe sp	Water dropwort				1			1		1	1										
Onopordum acanthium	Cottom Thistle														1						
Oxalis acetosella	Wood-sorrel																				
Papaver argemone	Prickly Poppy																				
Papaver dubium	Long-headed poppy																				
Papaver somniferum	Opium poppy																1				
Papaver species	Poppy																				
Pastinaca sativa	Parsnip				1																
Pastinaca sativa/Heracleum sphondylium	Parsnip/Hogweed																				
Pedicularis palustris	Marsh Lousewort										1										
Persicaria hydropiper	Water pepper																				
Persicaria lapathifolia	Pale Persicaria																				
Persicaria maculosa	Redshank																				
Phoenix dactylifera	Dates																				
Phragmites australis	Common Reed					1		1		1						1					
Picris echioides	Bristly Oxtongue																				
Picris hieracioides	Hawkweed Oxtongue																1		1		

Piper nigrum	Black Pepper																				
Pisum sativum	Garden pea																				
Pisum sativum hilum, parenchyma, epidermis	Garden pea																				1
Pisum sp.	Garden pea																				
Plantago lanceolata L.	Ribwort plantain																				
Plantago major	Greater Plantain			1		1															
Plantago media	Hoary Plantain																				
Poa annua	Annual meadow grass					1															
Poa trivialis	Rough bluegrass																				
Poaceae	indet grasses																				
Polygonaceae	-																				
Polygonum arenastrum	Common knotweed																				
Polygonum aviculare	Common Knotgrass	1	1	1		1	1	1		1							1	1	1		1
Polygonum hydropiper	Water pepper		1														1				1
Polygonum lapathifolium	Pale Persicaria		1	1		1			1								1	1	1		1
Polygonum persicaria	Redshank	1		1	1				1						1		1	1	1	1	
Populus species bud scales	Poplar																				
Potamogeton species	Pondweed																				
Potentilla anserina	Silverweed																				
Potentilla erecta	Tormentil			1																	
Potentilla palustris	Marsh cinquefoil																				
Potentilla reptans	Creeping cinquefoil																				
Potentilla species	Cinquefoils										1										
Prunella vulgaris	Self-heal					1	1		1								1				
Prunus cerasifera																					
Prunus cerasus	Morello cherry																				
Prunus cf. cerasus	Morello cherry																				
Prunus domestica	Plum		1	1																	
Prunus domestica cf.	?plum/bullace				1		1				1										
Prunus insititia	Damson																				
Prunus padus	Bird cherry																				
Prunus sp											1	1	1								
Prunus sp. mesocarp																					
Prunus species epidermis																					
Prunus spinosa	Sloe	1	2		1		2	1	1	1	1				1	1	1	1	1	2	
Pteridium aquilinum	Bracken		1				1				1					1	1	1	1		2
Pyrus communis	Pear																				
Pyrus/Cydonia endocarp	Pear/Qunice																				
Pyrus/Cydonia stone cells	Pear/Qunice																				
Quercus sp. bud scales	Oak bud scales			1																	1
Ranunculus acris/ repens/ bulbosus	'buttercups'																				
Ranunculus flammula	Lesser Spearwort																				
Ranunculus lingua	Greater Spearwort																				
Ranunculus sardous	Hairy buttercup																1		1		
Ranunculus sceleratus	celery leaved crowfoot				1				1									1	1		
Ranunculus subgenus Batrachium																					
Ranunculus subgenus Ranunculus	Buttercup	1	1		1		1	1		1	1								1		1
Raphanus raphanistrum	Wild radish		1		1					1	1				1	1	1		1	1	
Reseda luteola	Weld																				
Reseda sp	Mignonettes																				
Rhinanthus minor	Yellow rattle																				
Rhinanthus species	Rattle					1															1

Ribes uva-crispa	Gooseberry																				
Rosa sp.	Rose-hip										1							1			
Rubia tinctorum	Common madder						1									1				1	
Rubus caesius	Dewberries																				
Rubus fruticosus	Blackberry		1					1		1	1	1	1	2			1	1	1		
Rubus fruticosus/idaeus	blackberry/ raspberry																				
Rubus idaeus	Raspberry								1				1	1							
Rubus species	Brambleberry			1																	
Rumex acetosa	Common sorrel																				
Rumex acetosella	Sheep's sorrel								1					1					1		1
Rumex conglomeratus	Sharp dock																				
Rumex crispus	Curled dock																				
Rumex obtusifolius	Broad-leaved dock																				
Rumex pseudoalpinus	Monk's rhubarb																				
Rumex sanguineus	Bloody dock																				
Rumex spp.	Docks				1	1	1		1	1			1				1				1
Salix species bud scale/leaf fragments	Willow bud scales										1										
Sambucus cf. ebulus	Dwarg elder																				
Sambucus nigra	Elder	1	1	1	1		1	1		1	2	1		1			1		1	1	1
Satureja hortensis	Summer savoury						1										1	1	1		
Scandix pecten-veneris	Shepherd's-Needle																				
Scirpus maritimus/lacustris	Sea/Common Club-rush																				
Scirpus setaceus	Bristle Club-rush			1								1									
Scirpus sylvaticus cf.	Wood Club-rush																				
Scleranthus annuus	Annual Knawel																				
Scrophularia nodosa	Figwort																				
Senecio aquaticus	Marsh ragwort																				
Senecio cf. jacobea	Groundsel																				
Senecio species	Ragworts																				1
Silene alba	White Campion																				
Silene sp	Campion																				
Silene vulgaris	Bladder Campion																				
Sinapis arvensis	Field Mustard																				
Sisymbrium officinale	Hedge mustard																				
Sisymbrium sophia/Descurainia sophia	Flixweed																				
Solanum dulcamara	Bittersweet																				
Solanum nigrum	Black nightshade																				
Solanum sp	Nightshades																				
Sonchus arvensis	Perennial Sowthistle																				
Sonchus asper	Spiney milk thistle				1		1		1								1				1
Sonchus oleraceus	Sowthistle					1			1												
Sonchus sp.	Sowthistles																				
Sorbus aria	Whitebeam																				
Sorbus aucuparia	Rowan																				
Sorbus sp cf.	Service																				
Sorbus torminalis	Wild Service-tree																				
Spergula arvensis	Corn spurry					1			1												
Spherganium sp	Bur-reed																				
Stachys palustris	Marsh Woundwort																				
Stachys sp.	Woundwort																				
Stachys sylvatica	Hedge woundwort																				
Stellaria graminea	Lesser Stichwort					1															

Stellaria holostea stem fragments	Greater Stichwort																				
Stellaria media	Common chickweed	1	1	1	1		1										1				1
Stellaria media/neglecta	C.mon/Greater Chickweed																				
Stellaria palustris/graminea	Marsh/Lesser Stichwort																				
Stellaria sp.	Stichworts					1						1							1		
Stellaria/Cerastium	Stichworts/Mouse-ears																				
Taraxacum officinale	Dandelion																				
Thalaspi arvense	Field penny cress							1		1	1								1		1
Thalictrum flavum	Common Meadow-rue																				
Thalictrum sp.	Meadow-rues							1		1											
Torilis japonica	Upright hedge parsley																				
Trifolium pratense	Red Clover																				
Trifolium repens	White clover																				
Trifolium species	Clover																				
Triglochin maritima	Sea Arrowgrass																				
Tripleurospermum inodorum/Matricaria perforata	Scentless Mayweed					1															
Ulex	Gorse (leaf spine)																				
Umbelliferae indet.	Umbellifore					1															
Urtica dioica	Stinging nettle	1		1		1			1		1	1	1	1			1		1		
Urtica urens	Small nettle	1	1	1	2	1	1	1	1	1	1	1	1	1			3	1	1		2
Vaccinium myrtillus	Bilberry																				
Vaccinium sp.	Bilberry										1										
Vaccinium sp. pistil bases	Bilberry pistil bases																				
Valerianella dentata	Narrow-fruited cornsalad		1		1												1				
Veronica sp	Speedwell																1				
Vica faba trachied bars	Broad bean trachied bars																				
Vicia cf. tetrasperma	Smooth Tare																				
Vicia faba	Broad bean					1			1									1			
Vicia faba epidermis	Broad bean spidermis																				
Vicia species	Vetch																				
Viola palustris	Violets																				
Viola species	Violet				1		1	1	1	1				1		1					
Vitis vinifera L.	grape																				
Zannichellia palustris	Horned pondweed																				
Total quantified remains																					
Seed density per litre (quantified charred remains)																					

Feature	Period	Town/City			
	M/L9-E10	York	Hall, A. and Kenward, H. (1999). Plant and invertebrate remains from Anglo-Scandinavian deposits at 16-22 Coppergate, York: technical report. Part 1: period 3. Reports from the Environmental Archaeology Unit, York 99/30, 79 pp.		3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume
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	L9-E10	York	Hall, A. and Kenward, H. (1999). Plant and invertebrate remains from Anglo-Scandinavian deposits at 16-22 Coppergate, York: technical report. Part 2: Periods 4A and 4B. Reports from the Environmental Archaeology Unit, York 99/38, 138 pp.		3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume
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	context	30835	30826	30808	33094	33072	34789	34882	36154	26946	28033	28403	28384	28557	28557	27943	18529	26597	28987	22574	26249
	vol.soil (l)																				
	flot vol (ml)																				
Cereal grains																					
Avena sativa	Cultivated oat spikelets																1				
Avena sp(p).	oat			1	1			1	1			1			1						
Avena strigosa	Bristle Oat																				
cf. *Avena* sp(p).	?oat																				
cf. *S. cereale*	?rye						1			1	1										
Hordeum (naked)	Barley; naked																				
Hordeum sativum	barley																				
Hordeum sp.	Barley			1	1	1		1		1			1								
Hordeum (twisted naked)																				1	
indeterminate cereals	indet. grains (est.)	1			1				1		1										
Secale cereale	rye			1					1								1				
T. aestivum s.l.	free-threshing wheat				1																
Triticum (hexapolid)	Bread wheat																				
Triticum aestivo-compactum	Bread wheat		1			1	1			1							1			1	
Triticum sp(p).	wheat																				
Triticum spelta	Spelt wheat																				
Triticum/Secale	Wheat/Rye														1		1				
Cereal chaff																					
Cerealia indet culm fragments																					
Gramineae sect. Cerealia	Cereals, rhachis frag.																				
Indeterminate mineralised cereals																					
Cerealia bran																					
Cerealia bran																					
Triticum floret base																					
Avena sativa floret base	Cultivated oat																				
Triticum aestivum s.l.	6x wheat rachis																				
Triticum species rachis	Wheat rachis																				
Secale cereale L.	rye rachis																				
Avena glume fragment	Oat glume																				
Avena sp. bran fragments	Oat bran																				
Triticum/Secale bran	Wheat/Rye bran frag.		2	1			1	3	3		1			3	3	2	3	2	1		3
Hordeum species rachis	Barley rachis fragments																				
Hordeum sp 'bran' fragments	Barley bran																				
Other plants																					
(M) Anomobryum filiforme																					
(M) Anomodon viticulosus	Rambling Tail-moss																1				
(M) Antitrichia curtipendula	Pendulous Wing-moss			1			1	1			1						1				
(M) Atrichum undulatum	Common Smoothcap		1																		
(M) Barbula cf. species	Beard-moss																				
(M) Brachythecium/Eurhynchium sp																					
(M) Bryum sp.	Thread-moss																				
(M) Calliergon cf. giganteum	Giant Spear-moss																				1
(M) Calliergon cuspidatum	Pointed spear-moss				1									1	1					1	1
(M) Campylium elodes	Fine leaved feather moss																				
(M) Campylium stellatum (cf.)																					
(M) cf. Amblystegium sp(p).	Creeping feather-moss																				
(M) Cratoneuron commutatum	Curled hook-moss																				
(M) Cratoneuron filicinum	Fern-leaved Hook-moss																				

(M) Cratoneuron filicinum																					
(M) Dicramun sp.	Wind Bloon/Fork Moss										1					1					
(M) Diphasium alpinium (D. complanatum)	Alpine Clubmoss		1		1		1				1					1	1		1	2	
(M) Drepanocladus aduncus	Knieff's Hook-moss																				
(M) Drepanocladus sp.			1																1		1
(M) Eurhynchium praelongum			1														1				
(M) Eurhynchium sp	Feather-moss																				
(M) Eurhynchium speciosum																					
(M) Eurhynchium striatum	Common Striated Feather-moss														1		1			1	
(M) Homalia trichomanoides	Blunt Feather-moss							1									1			1	
(M) Homalothcium nitens																					
(M) Homalothcium sericeum/lutescens			1		1											1					
(M) Homalothcium sp																					
(M) Hylocomium cf. brevirostre																					
(M) Hylocomium myosuroides																					
(M) Hylocomium splendens		1					1				1						1		1	1	
(M) Hypnum cf. cupressiforme	Cypress-leaved Plait-moss	1														1	1				1
(M) Isothecium myosuroides	Mouse-tail Moss	1						1							1		1				
(M) Isothecium myurum							1	1			1					1	2				
(M) Leucobryum glaucum	Large White-moss																				
(M) Leucodon sciuroides	Squirrel-tail Moss		1														1		1	1	
(M) Lycopodium sp																					
(M) Mnium hornum	Swan's-neck Thyme-moss																				
(M) Neckera complanata	Flat Neckera	1	1	2			1				1			1		2	2		1	1	2
(M) Neckera crispa	Crisped Neckera																1				
(M) Plagiomnium sp.																					
(M) Plagiomnium undulatum	Hart's-tongue Thyme-moss																				
(M) Pleurozium schreberi																					
(M) Polytrichum formosum																					
(M) Polytrichum species																1					
(M) Pseudoscleropodium purum	Neat Feather-moss	1																1		1	
(M) Racomitrium canescens	Hoary Fringe-moss																				
(M) Racomitrium sp.	Fringe-moss																				
(M) Rhynchostegiella tenella (cf.)	Tender Feather-moss																				
(M) Rhynchostegium sp	Feather-moss															1					
(M) Rhytidiadelphus sp.	Turf-moss	1					1									1			1	1	1
(M) Rhytidiadelphus squarrosus	Springy Turf-moss																				
(M) Rhytidiadelphus triquetrus																					
(M) Scorpidium scorpioides	Hooked Scorpion-moss	1																			
(M) Sphagnum imbricatum																					
(M) Sphagnum Section Acutifolia																					
(M) Sphagnum Section Sphagnum																					
(M) Sphagnum sp.																					
(M) Thamnobryum alopecurum	Fox-tail Feather-moss																				
(M) Thuidium cf. tamariscinum		1	1				1			1	1					2	1	1	1	1	1
(M) Ulota crispa	Crisped pincushion																				
(M) Ulota species		1													1		1		1		
Achillea millefolium	Yarrow																				
Achillea ptarmica	Sneezewort																				
Achillea sp	Yarrow species																				
Acinos arvensis	Basil thyme																				

Aegopodium podagraria	Ground elder																				
Aethusa cynapium	Fool's parsley	1	1		1	1				1	1		1			1	1		1	1	1
Agrimonia eupatoria	Agrimonies			1				1												1	
Agrostemma githago	Corn cockle	3	2	1			1	2	2		1			1	2	1	1	2	1	1	2
Agrostis species	Bent grass								1												
Alchemilla vulgaris	Ladies mantle																				
Alisma species	Water plantains																	1			
Allium porrum	Leek																				
Allium porrum leaf fragment	Leek	1	1												2	1					1
Allium sp.	Leek/Onion/Garlic?																				
Allium sp. leaf fragment	Leek/Onion/Garlic?								1												
Alnus glutinosa (cone)	Alder																				
Alnus sp fca							1	1										1		1	
Alopecurus species	Foxtail grass																				
Anagallis arvensis	Scatlet Pimpernel												1								
Anethum graveolens	Dill	2		1				1	1			1	1		1	1	1	1	1		
Anthemis cotula	Stinking mayweed	1			1				1	1	1			1	1	1	1	1	1		1
Anthriscus caucalis	Burr-chervil																				
Anthriscus sylvestris	Cow Parsley								1												
Aphanes microcarpa	Slender Parsley-piert																				
Apium graveolens	Celery	2	1					1	2										1		
Arctium lappa/minus	Greater/Lesser Burdock																				
Arctium species	Burdock				1														1		
Armorica rusticana	Horseradish																				
Aster tripolium (cf.)	Sea aster																				
Asteraceae	Daisy Family																				
Asteraceae/Compositae (inv fgts)																					
Atriplex hastata	Orache																				
Atriplex patula/prostrata	Common Orache																				
Atriplex sp.	Orache	1	1	1	1	1			1	1	1	1	1	1	1	1		1	1		1
Atropa belladonna	Deadly nightshade				1																
Baldellia ranunculoides	Lesser Water-plantain				1																
Barberea vulgaris	Bittercress																				
Bellis perennis	Common daisy																				
Beta vulgaris	Beet																				
Betula pubescens	White birch																				
Betula species	Birch																				
Bidens sp.	Bur-marigolds							1											1		
Boraginaceae	Borage Family																				
Brassica campestris	Wild turnip																				
Brassica cf. oleracea/napus	Cabbage/rape/swede																				
Brassica nigra	Black mustard				1																
Brassica rapa	Turnip	1	1	1							1					1	1	1	1		1
Brassica sp./Sinapis arvensis	Brassica/Charlock				1	1				1		1			1					1	1
Brassica species	Brassica species	1			1												1		1		1
Brassicaceae seed	Brassicaceae species																				
Brassicaceae/Cruciferae	Brassicaceae species																				
Brassicaceae/Cruciferae (pedicles)	Brassicaceae species																				
Bromus sp.	Brome grass				1																1
Bryonia cretica ssp. Dioica	White bryony																		1		1
Buglossoides arvensis	Field Gromwell																				
Bupleurum falcatum	Sickle-leaved Hare's-Ear																				

Bupleurum rotundifolium	Thorow-wax																				
C. leucanthemum	Ox-eye daisy																				
Calendula officinalis	Pot marigold																				
Calluna vulgaris flower/leaf fragments	Ling										1					1	1	1	1	2	
Caltha palustris	Marsh-marigold															1	1				
Cannabis sativa	Hemp			1	1		1									1					1
Capsella bursa-pastoris	Shepherd's-purse																				
Cardus/Cirsium species	Thistle family				1				1	1	1	1							1	1	
Carduus sp.	Thistle family																				
Carex (lenticular)	Sedges																				
Carex (trigonus)	Sedges																				
Carex elata	Tufted sedge																				
Carex flacca	Glaucous sedge																				
Carex hostiana	Tawny sedge																				
Carex leporina (C. ovalis)	Oval sedge																				
Carex nigra cf.	Common sedge																				
Carex oederi (Carex viridula)	Small fruited yellow sedge																				
Carex panicea	Carnation sedge																				
Carex remota	Remota sedge																				
Carex riparia/hirta	pond/hairy sedge																				
Carex rostrata cf.	Bottle sedge																				
Carex species	Sedge	1		1	1	1			1	1	1		1			1	1	1	1		1
Carex sylvatica	Wood-sedge																				
Caryophyllaceae	Pink Family																				
Centaurea cf. scabiosa	Greater Knapweed																				
Centaurea cyanus	Cornflower																				
Centaurea nigra	Common knapweed																				
Centaurea species	Knapweeds							1													
Cerastium fontanum	Common mouse-ear																				
Cerastium sp.	Mouse-ear chickweed																				
Chaerophyllum sp cf.	Chervil																				
Chelidonium majus	Greater Celandine																				
Chenopodium album	Fat hen	1		1	2	1		1	1	1	1	1	2	1	2	2	1		1	1	1
Chenopodium bonus-henricus	Good King-Henry																				
Chenopodium ficifolium	Fig-leaved goosefoot									1											1
Chenopodium murale	Nettle-leaved goosefoot																				
Chenopodium Section Pseudoblitum												1									2
Chenopodium species	Goosefoots		1																		
Chenopodium/Atriplex spp.	goosefoots etc. oraches																				
Chrysanthemum segetum	(Corn marigold)																				
Circaea lutetiana	Enchanters nightshade																				
Cirsium species	Thistle																				
Cladium mariscus (epidermus fragments)	Saw sedge				1										1						
Conium maculatum	Hemlock			1	1	1										1			1		
Coriandrum sativum	Coriander		1	2				1				1				1					
Corylus avellana	Hazel nut	1	1	3	1	1	1		1		1				1	1	1		1	2	
Crataegus cf. laevigata	Midland Hawthorn																				
Crataegus monogyna fruitstone	Hawthorn		1	1				1		1						1	2		1		
Crepis species	Hawksbeard																				
Cyperaceae	Sedge Family																				
Danthonia decumbens	Common heath grass																				
Daucus carota	Wild carrot	1			1														1		

Dipsacus sativus/fullonum	Teasel																				
Dryopteris sp	Wood/Male/Buckler Fern						1														
Eleocharis multicaulis	Many-stalked spike-rush																				
Eleocharis palustris	Common Spike-rush			1	1	1			1	1	1			1	1	1	1				1
Eleocharis sp.	Spike-rush																				
Elymus/Agropyron	Couches																				
Empetrum nigrum	Black crowberry																				
Epilobium sp	Willowherbs																				
Equisetum sp nodel sheath fragments	Horsetails																				
Erica tetralix	Cross-leaved Heath																				
Eriophorum vaginatum	Hare's-Tail Cottongrass																				
Euphorbia helioscopia	Sun spurge					1													1		
Euphorbia lathyris	Caper spurge																				
Euphrasia/Odontities sp.	Eyebrights																				
Fabaceae indet.	indet. legumes																				
Fallopia convolvulus	Black-bindweed	1		1	1		1		1		1				1	1		1	1	1	1
Ficus carica L.	Fig				1																
Filipendula ulmaria	Meadowsweet																				
Foeniculum vulgare	Fennel																				
Fragaria vesca	Wild Strawberry																				
Fumaria species	Fumitory																		1		
Galeopsis species	Hemp-nettle																				
Galeopsis subgenus Galeopsis	Hempnettle		1	1			1	1	1	1	1		1	1		1			1	1	1
Galeopsis subgenus Ladanum	Red hempnettle				1																
Galeopsis tetrahit	Common hemp nettle																				
Galium aparine L.	cleavers		1							1					1	1	1				
Galium cf. spurium	False cleavers																				
Galium saxatile	Heath bedstraw																				
Galium species	Bedstraw																				1
Genista tinctoria leaf frags	Dyer's Greenweed						1				1										
Genista tinctoria stem fragments	Dyer's Greenweed										1						1		1	2	
Geum rivale/urbanum	Avens																				
Geum urbanum	Wood avens																				
Glyceria fluitans	Floating Sweet-Grass																				
Glyceria species	Sweet Grasses																				
Graminae			1											1		1	1		1	1	1
Heracleum sphondylium	Hogweed				1															1	
Humulus lupus	Hops					1			1		1					2	1		1	2	
Hydrocotyle vulgaris	Marsh Pennywort																				
Hyoscyamus niger L.	henbane			1	1	1		1				1	1						1		
Hypericum sp	St. John's-worts																				
Hypochaeris radicata	Common cat's ear																				
Hypochoeris sp.	Cat's Ear																				
Ilex aquifolium (leaf fragments)	Holly										1						1lef		1	1	
Iris pseudacorus	Yellow flag				1															1	
Isatis tinctora (pod fragments)	Woad							1											1	1	1
Isolepis setacea	Bristleleaf bulrush																				
Juglans regia	Walnut										1						1			1	
Juncus acutiflorus/articulatus	Sharp flowered rush												1								1
Juncus bufonius	Toad rush				1							1	3				1			1	1
Juncus conglomeratus	Compact rush																				
Juncus gerardi	Saltmarsh Rush													1							

Juncus inflexus/effusus/conglomeratus	Hard/Soft/Compact Rush											1									
Juncus maritimus	Sea Rush																				
Juncus sp.	Rush																				
Juncus squarrosus	Heath rush																				
Juncus subnodulosus	Blunt-flowered Rush																				1
Knautia arvensis	Field Scabious																				
Labiatae species indeterminate	Dead-Nettle Family																				
Lamium section Lamiopsis		1			1					1	1	1				1			1		
Lamium sp	Dead-Nettles																				
Lapsana communis	Nipplewort	2	1					1	1	1		1	1		1	1	1		1		1
Legume >4mm																					
Leguminosae flowers/petals			1												1						
Leguminosae pods/frags																					
Leguminosae tracheid bars																					
Leontodon autumnalis	Autumn hawkbit																				
Leontodon autumnalis/hispidus	Autumn/Rough Hawkbit																				
Leontodon hispidus	Rough Hawkbit																				
Leontodon sp.	Hawkbit																				
Leontodon taraxacoides	Lesser Hawkbit																				
Lepedium coronopus (Coronopus squamatus)	Swine-cress																				
Leucanthemum vulgare	Oxeye daisy																				
Linum catharticum	Fairy Flax																				
Linum sp. cf.	?flax																				
Linum usitatissimum	Flax	1	1					1			1				1	1	1		1	1	1
Lithospermum arvense L.	corn gromwell																				
Luzula campestris	Sweep's brush																				
Luzula multiflora	Heath woodrush																				
Luzula species	Wood-rush				1															1	
Lychnis flos-cuculi	Ragged robin																				
Lycopus europaeus	Gypsywort																				
Lythrum salicaria	Purple loosestrife																				
Malus sylvestris endocarp	Apple core	2	2	1				2	2		1			1	2	2	1		1		2
Malus sylvestris seed base cups	Apple seed base cups																				
Malus sylvestris/domesticus	Apple	2	2	2	1		1	1	1	1	1	1		1	2	2	2		2	1	2
Malus/pyrus	Apple/Pear																				
Malva neglecta	Dwarf mallow																				
Malva species	Mallow																				
Malva sylvestris	Common Mallow																				
Marrubium vulgare	White Horehound				1																
Matricaria recutita	Chamomile																				
Mentha species	Mint							1													
Menyanthes trifoliata	Bog-bean				1											1					
Montia fontana	Blinks																				
Myosotis sp.	Forget-me-not	1																			
Myrica gale leaf/twig fragments	Bog myrtle				1																
Myristica fragrans (aril)	Mace (Nutmeg)																				
Nepeta cataria	Catnip								1												
Nuphar lutea	Yellow water-lily																				
Odontites verna	Red Bartsia								1												
Oenanthe cf. aquatica	Fine-leafed water dropwort																				
Oenanthe cf. lachenalii	Parsley Water-dropwort				1																
Oenanthe crocata	Hemlock water																				

	dropwort																				
Oenanthe fistulosa	Tubular Water-dropwort																				
Oenanthe sp	Water dropwort									1											
Onopordum acanthium	Cottom Thistle																				
Oxalis acetosella	Wood-sorrel																		1		
Papaver argemone	Prickly Poppy																				
Papaver dubium	Long-headed poppy																				
Papaver somniferum	Opium poppy		1				1		1								1				1
Papaver species	Poppy																				
Pastinaca sativa	Parsnip														1		1				
Pastinaca sativa/Heracleum sphondylium	Parsnip/Hogweed																				
Pedicularis palustris	Marsh Lousewort												2						1		
Persicaria hydropiper	Water pepper																				
Persicaria lapathifolia	Pale Persicaria																				
Persicaria maculosa	Redshank																				
Phoenix dactylifera	Dates																				
Phragmites australis	Common Reed								1							1					
Picris echioides	Bristly Oxtongue																				
Picris hieracioides	Hawkweed Oxtongue																1	1			
Piper nigrum	Black Pepper																				
Pisum sativum	Garden pea																			1	
Pisum sativum hilum, parenchyma, epidermis	Garden pea								1												
Pisum sp.	Garden pea																				
Plantago lanceolata L.	Ribwort plantain								1												
Plantago major	Greater Plantain																				
Plantago media	Hoary Plantain																				
Poa annua	Annual meadow grass																				
Poa trivialis	Rough bluegrass																				
Poaceae	indet grasses																				
Polygonaceae	-																				
Polygonum arenastrum	Common knotweed																				
Polygonum aviculare	Common Knotgrass	1	1		1						1			1	1		1	1			1
Polygonum hydropiper	Water pepper				1				1		1					1	1				
Polygonum lapathifolium	Pale Persicaria	1	1				1					1	1				1	1		1	1
Polygonum persicaria	Redshank		1		1			1		1	1					1	1	1	1		
Populus species bud scales	Poplar																1				
Potamogeton species	Pondweed																				
Potentilla anserina	Silverweed				1																
Potentilla erecta	Tormentil				1																
Potentilla palustris	Marsh cinquefoil				1											1			1		
Potentilla reptans	Creeping cinquefoil				1				1												
Potentilla species	Cinquefoils										1						1		1	1	
Prunella vulgaris	Self-heal	1			1						1								1		1
Prunus cerasifera																					
Prunus cerasus	Morello cherry																				1
Prunus cf. cerasus	Morello cherry					1															
Prunus domestica	Plum		1	1				1		1	1					1	3	1		1	
Prunus domestica cf.	?plum/bullace																				
Prunus insititia	Damson	1			1														1		
Prunus padus	Bird cherry																1				
Prunus sp																					
Prunus sp. mesocarp									1												1

Prunus species epidermis																					
Prunus spinosa	Sloe		2	3	1		1	1	1	1	1	1	1	1	2	2	3	2	2	1	1
Pteridium aquilinum	Bracken	3	2	1	1		1	1	1						1					1	1
Pyrus communis	Pear																				
Pyrus/Cydonia endocarp	Pear/Qunice																				
Pyrus/Cydonia stone cells	Pear/Qunice																				
Quercus sp. bud scales	Oak bud scales																1				
Ranunculus acris/ repens/ bulbosus	'buttercups'																				
Ranunculus flammula	Lesser Spearwort				2					1			1								1
Ranunculus lingua	Greater Spearwort																				
Ranunculus sardous	Hairy buttercup																				
Ranunculus sceleratus	celery leaved crowfoot					1				1	1										1
Ranunculus subgenus Batrachium																					
Ranunculus subgenus Ranunculus	Buttercup				1			1	1	1	1	1	1			1	1	1	1		
Raphanus raphanistrum	Wild radish			1	1		1		1	1			1			1	1	1	1	1	1
Reseda luteola	Weld																				
Reseda sp	Mignonettes																				
Rhinanthus minor	Yellow rattle																				
Rhinanthus species	Rattle	1																			
Ribes uva-crispa	Gooseberry																				
Rosa sp.	Rose-hip	1									1	1		2			1	1			1
Rubia tinctorum	Common madder				1		1	1			1					1	1	1	1	2	
Rubus caesius	Dewberries												1				1	1			
Rubus fruticosus	Blackberry		1	2	1	1		1	1	2	1	1	2	3	2	1	2	1	1		1
Rubus fruticosus/idaeus	blackberry/ raspberry																				
Rubus idaeus	Raspberry																1	1			
Rubus species	Brambleberry																				
Rumex acetosa	Common sorrel																				
Rumex acetosella	Sheep's sorrel				1				1							1					
Rumex conglomeratus	Sharp dock																				
Rumex crispus	Curled dock																				
Rumex obtusifolius	Broad-leaved dock																				
Rumex pseudoalpinus	Monk's rhubarb																				
Rumex sanguineus	Bloody dock																				
Rumex spp.	Docks	1		1	1			1	1					1	1	1		1	1		1
Salix species bud scale/leaf fragments	Willow bud scales								1										1		
Sambucus cf. ebulus	Dwarg elder																				
Sambucus nigra	Elder	1		1	1	1		1	1	1	1		1			1	1	1	1		1
Satureja hortensis	Summer savoury	1						1	1		1					1	1	1			
Scandix pecten-veneris	Shepherd's-Needle																				
Scirpus maritimus/lacustris	Sea/Common Club-rush				1																
Scirpus setaceus	Bristle Club-rush																				
Scirpus sylvaticus cf.	Wood Club-rush																				
Scleranthus annuus	Annual Knawel																				
Scrophularia nodosa	Figwort																				
Senecio aquaticus	Marsh ragwort																				
Senecio cf. jacobea	Groundsel																				
Senecio species	Ragworts																				
Silene alba	White Campion					1										1	1				
Silene sp	Campion																				
Silene vulgaris	Bladder Campion																				
Sinapis arvensis	Field Mustard																				

Sisymbrium officinale	Hedge mustard																				
Sisymbrium sophia/Descurainia sophia	Flixweed																				
Solanum dulcamara	Bittersweet																				
Solanum nigrum	Black nightshade				1												1				
Solanum sp	Nightshades																				
Sonchus arvensis	Perennial Sowthistle																				
Sonchus asper	Spiney milk thistle				1				1							1	1	1	1		1
Sonchus oleraceus	Sowthistle								1		1				1		1				1
Sonchus sp.	Sowthistles																				
Sorbus aria	Whitebeam																				
Sorbus aucuparia	Rowan												3	1		1		1			
Sorbus sp cf.	Service																				
Sorbus torminalis	Wild Service-tree																				
Spergula arvensis	Corn spurry												1			1					1
Spherganium sp	Bur-reed				1																
Stachys palustris	Marsh Woundwort																				
Stachys sp.	Woundwort																				1
Stachys sylvatica	Hedge woundwort																				
Stellaria graminea	Lesser Stichwort											1									
Stellaria holostea stem fragments	Greater Stichwort																				
Stellaria media	Common chickweed				1				1		1					1	1	1	1		1
Stellaria media/neglecta	C.mon/Greater Chickweed																				
Stellaria palustris/graminea	Marsh/Lesser Stichwort																				
Stellaria sp.	Stichworts													1							
Stellaria/Cerastium	Stichworts/Mouse-ears																				
Taraxacum officinale	Dandelion																				
Thalaspi arvense	Field penny cress				1						1					1			1		
Thalictrum flavum	Common Meadow-rue																				
Thalictrum sp.	Meadow-rues																				
Torilis japonica	Upright hedge parsley																				
Trifolium pratense	Red Clover																				
Trifolium repens	White clover																				
Trifolium species	Clover								1												
Triglochin maritima	Sea Arrowgrass																				
Tripleurospermum inodorum/Matricaria perforata	Scentless Mayweed																				
Ulex	Gorse (leaf spine)																				
Umbelliferae indet.	Umbellifore										1										
Urtica dioica	Stinging nettle			1	1			1	1	1									1		1
Urtica urens	Small nettle	1		1	1			1	1	1	1	1	1			1	1	1	1		1
Vaccinium myrtillus	Bilberry																				
Vaccinium sp.	Bilberry												3	2	1	1	1	1			
Vaccinium sp. pistil bases	Bilberry pistil bases												1								
Valerianella dentata	Narrow-fruited cornsalad													1							
Veronica sp	Speedwell																				
Vica faba trachied bars	Broad bean trachied bars																				
Vicia cf. tetrasperma	Smooth Tare				1					1			1					1			
Vicia faba	Broad bean			1					1							1	1*				
Vicia faba epidermis	Broad bean spidermis											1									1
Vicia species	Vetch	1																			
Viola palustris	Violets																				
Viola species	Violet				1					1			1			1			1		

Vitis vinifera L.	grape																				
Zannichellia palustris	Horned pondweed																				
Total quantified remains																					
Seed density per litre (quantified charred remains)																					
		3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume
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	Town/City	York	York	York	York	York	York	York	York	York	York	York	York	York	York	York	York	York	York	York
	Period	L9-E10	L9-E10	L9-E10	L9-E10	L9-E10	L9-E10	L9-E10	c.975	c.975	c.975	975-E/M11	975-E/M11	975-E/M11	975-E/M11	975-E/M11	975-E/M11	975-E/M11	975-E/M11	975-E/M11
	Feature																			
		<1782>	<1663>	<1824>	<1807>	<1822>	<1805>	<1804>	<1352>	<1353>	<1424>	<1797>	<1855>	<1296>	<1062>	<1058>	<1057>	<1055>	<1157>	<1207>	<1789>
	context	26949	26012	27368	27018	27229	27017	27017	20990	20990	22376	26888	28084	6947	6535	6532	6532	6531	20231	20289	21674
	vol.soil (l)																				
	flot vol (ml)																				
Cereal grains																					
Avena sativa	Cultivated oat spikelets															1	1				
Avena sp(p).	oat					1							1	1				1		1 (min)	
Avena strigosa	Bristle Oat																				
cf. *Avena* sp(p).	?oat																				
cf. *S. cereale*	?rye																				
Hordeum (naked)	Barley; naked																				
Hordeum sativum	barley																				
Hordeum sp.	Barley								1					1	1			1	1		
Hordeum (twisted naked)																					
indeterminate cereals	indet. grains (est.)				1				1												
Secale cereale	rye						1		1						1			2			
T. aestivum s.l.	free-threshing wheat																				
Triticum (hexapolid)	Bread wheat																				
Triticum aestivo-compactum	Bread wheat		1						1									1	1		1
Triticum sp(p).	wheat									1											
Triticum spelta	Spelt wheat																				
Triticum/Secale	Wheat/Rye																				
Cereal chaff																					
Cerealia indet culm fragments										1		1									
Gramineae sect. Cerealia	Cereals, rhachis frag.																	3			
Indeterminate mineralised cereals																					
Cerealia bran								1													
Triticum floret base																					
Avena sativa floret base	Cultivated oat																				
Triticum aestivum s.l.	6x wheat rachis																				
Triticum species rachis	Wheat rachis																				
Secale cereale L.	rye rachis																				
Avena glume fragment	Oat glume																1				
Avena sp. bran fragments	Oat bran																1				
Triticum/Secale bran	Wheat/Rye bran frag.	1		2	2	2	3	3	1	3	2	3	3	2	2	2	3	3	1	1	2
Hordeum species rachis	Barley rachis fragments																				
Hordeum sp 'bran' fragments	Barley bran																				
Other plants																					
(M) Anomobryum filiforme																					
(M) Anomodon viticulosus	Rambling Tail-moss																				1
(M) Antitrichia curtipendula	Pendulous Wing-moss		1								1					1	1		1	1	1
(M) Atrichum undulatum	Common Smoothcap																				
(M) Barbula cf. species	Beard-moss																				
(M) Brachythecium/Eurhynchium sp								1													

(M) Bryum sp.	Thread-moss							1												
(M) Calliergon cf. giganteum	Giant Spear-moss					1		1												
(M) Calliergon cuspidatum	Pointed spear-moss		1	1		1		1								1		1	1	1	
(M) Campylium elodes	Fine leaved feather moss							1													
(M) Campylium stellatum (cf.)								1													
(M) cf. Amblystegium sp(p).	Creeping feather-moss																				
(M) Cratoneuron commutatum	Curled hook-moss																				
(M) Cratoneuron filicinum	Fern-leaved Hook-moss																				
(M) Cratoneuron filicinum																					
(M) Dicramun sp.	Wind Bloon/Fork Moss																				1
(M) Diphasium alpinium (D. complanatum)	Alpine Clubmoss	1							1	1	1			1	1	1	1	1		1	1
(M) Drepanocladus aduncus	Knieff's Hook-moss											1									
(M) Drepanocladus sp.				1				1											1		
(M) Eurhynchium praelongum										1											
(M) Eurhynchium sp	Feather-moss		1																	1	
(M) Eurhynchium speciosum																					
(M) Eurhynchium striatum	Common Striated Feather-moss	1						1								1	1				
(M) Homalia trichomanoides	Blunt Feather-moss									1						1					
(M) Homalothcium nitens								2													
(M) Homalothcium sericeum/lutescens			1			1		1													
(M) Homalothcium sp									1									1		1	
(M) Hylocomium cf. brevirostre																					
(M) Hylocomium myosuroides																					
(M) Hylocomium splendens			1			1		1					1		1		1	1			
(M) Hypnum cf. cupressiforme	Cypress-leaved Plait-moss	1							1	1				1							
(M) Isothecium myosuroides	Mouse-tail Moss												1								
(M) Isothecium myurum		1	1												1	1	1		1		1
(M) Leucobryum glaucum	Large White-moss																				
(M) Leucodon sciuroides	Squirrel-tail Moss		1						1		1					1	1		1		
(M) Lycopodium sp																					
(M) Mnium hornum	Swan's-neck Thyme-moss									1											
(M) Neckera complanata	Flat Neckera	1	2	1		1		1	1	1	1		1	1	1	1	1	1	1	1	1
(M) Neckera crispa	Crisped Neckera								1												
(M) Plagiomnium sp.																		1		1	
(M) Plagiomnium undulatum	Hart's-tongue Thyme-moss	1																			
(M) Pleurozium schreberi										1											
(M) Polytrichum formosum																					
(M) Polytrichum species																		1			
(M) Pseudoscleropodium purum	Neat Feather-moss								1							1					1
(M) Racomitrium canescens	Hoary Fringe-moss									1											
(M) Racomitrium sp.	Fringe-moss																				
(M) Rhynchostegiella tenella (cf.)	Tender Feather-moss												1								
(M) Rhynchostegium sp	Feather-moss							1													
(M) Rhytidiadelphus sp.	Turf-moss	1						1													
(M) Rhytidiadelphus squarrosus	Springy Turf-moss				1															1	
(M) Rhytidiadelphus triquetrus															1			1			
(M) Scorpidium scorpioides	Hooked Scorpion-moss																				
(M) Sphagnum imbricatum																					
(M) Sphagnum Section Acutifolia																					
(M) Sphagnum Section Sphagnum																					
(M) Sphagnum sp.																					

(M) Thamnobryum alopecurum	Fox-tail Feather-moss								1												
(M) Thuidium cf. tamariscinum		1	1				2	2		1	1	1			1	1	1	1		1	1
(M) Ulota crispa	Crisped pincushion																				
(M) Ulota species									1				1				1				
Achillea millefolium	Yarrow							1													
Achillea ptarmica	Sneezewort																				
Achillea sp	Yarrow species																				
Acinos arvensis	Basil thyme			1																	
Aegopodium podagraria	Ground elder																				
Aethusa cynapium	Fool's parsley	1							1	1			1	1		1	1		1		1
Agrimonia eupatoria	Agrimonies		1													1					
Agrostemma githago	Corn cockle	1		1	2	1	1	2	1	2	1	2	3	2	1	2	2	1	2		2
Agrostis species	Bent grass			1											1						
Alchemilla vulgaris	Ladies mantle																				
Alisma species	Water plantains																1				
Allium porrum	Leek											1									
Allium porrum leaf fragment	Leek							1					1								
Allium sp.	Leek/Onion/Garlic?																				
Allium sp. leaf fragment	Leek/Onion/Garlic?																				
Alnus glutinosa (cone)	Alder																				
Alnus sp fca		1									1										
Alopecurus species	Foxtail grass																				
Anagallis arvensis	Scatlet Pimpernel														1						
Anethum graveolens	Dill	1								1	1	1			1					1	1
Anthemis cotula	Stinking mayweed		1		1	1		1	1			1	1	2	1		1	1		1	1
Anthriscus caucalis	Burr-chervil																				
Anthriscus sylvestris	Cow Parsley																				
Aphanes microcarpa	Slender Parsley-piert																				
Apium graveolens	Celery		1	1					1							1	1			1	1
Arctium lappa/minus	Greater/Lesser Burdock																				
Arctium species	Burdock			1																	
Armorica rusticana	Horseradish																				
Aster tripolium (cf.)	Sea aster													1							
Asteraceae	Daisy Family																				
Asteraceae/Compositae (inv fgts)		1						1					1						1	1	
Atriplex hastata	Orache																				
Atriplex patula/prostrata	Common Orache																				
Atriplex sp.	Orache	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1		1	1
Atropa belladonna	Deadly nightshade																				
Baldellia ranunculoides	Lesser Water-plantain																				
Barberea vulgaris	Bittercress																				
Bellis perennis	Common daisy																				
Beta vulgaris	Beet																				
Betula pubescens	White birch																				
Betula species	Birch									1											
Bidens sp.	Bur-marigolds																	1			
Boraginaceae	Borage Family																				
Brassica campestris	Wild turnip																				
Brassica cf. oleracea/napus	Cabbage/rape/swede																				
Brassica nigra	Black mustard																				
Brassica rapa	Turnip	1			1			1					1	1	1	1	1	1	1	1	1
Brassica sp./Sinapis arvensis	Brassica/Charlock		1						1	1		2	1	1		1			1	1	
Brassica species	Brassica species			1	1	1		1		1				1							1

Brassicaceae seed	Brassicaceae species																				
Brassicaceae/Cruciferae	Brassicaceae species												1								
Brassicaceae/Cruciferae (pedicles)	Brassicaceae species																				
Bromus sp.	Brome grass			1				1				1					1				
Bryonia cretica ssp. Dioica	White bryony			1	1	1	2	1										1			
Buglossoides arvensis	Field Gromwell																				
Bupleurum falcatum	Sickle-leaved Hare's-Ear																				
Bupleurum rotundifolium	Thorow-wax																				
C. leucanthemum	Ox-eye daisy																				
Calendula officinalis	Pot marigold																				
Calluna vulgaris flower/leaf fragments	Ling		1							1	1				1		1	2			
Caltha palustris	Marsh-marigold									1			1								
Cannabis sativa	Hemp								1									1			
Capsella bursa-pastoris	Shepherd's-purse			1	2	1		1													
Cardus/Cirsium species	Thistle family											1					1				
Carduus sp.	Thistle family																				
Carex (lenticular)	Sedges																				
Carex (trigonus)	Sedges																				
Carex elata	Tufted sedge																				
Carex flacca	Glaucous sedge																				
Carex hostiana	Tawny sedge																				
Carex leporina (C. ovalis)	Oval sedge																				
Carex nigra cf.	Common sedge																				
Carex oederi (Carex viridula)	Small fruited yellow sedge																				
Carex panicea	Carnation sedge																				
Carex remota	Remota sedge																				
Carex riparia/hirta	pond/hairy sedge																				
Carex rostrata cf.	Bottle sedge																				
Carex species	Sedge		1	1	1	1		1	1	1	1		1		1	1	1		1		
Carex sylvatica	Wood-sedge																				
Caryophyllaceae	Pink Family																				
Centaurea cf. scabiosa	Greater Knapweed																				
Centaurea cyanus	Cornflower											1									
Centaurea nigra	Common knapweed					1											1				1
Centaurea species	Knapweeds							1					1			1			1		
Cerastium fontanum	Common mouse-ear																				
Cerastium sp.	Mouse-ear chickweed									1											
Chaerophyllum sp cf.	Chervil																				
Chelidonium majus	Greater Celandine																				
Chenopodium album	Fat hen		1	1	1			1	1	1	1	1	1	1	1	2	1		1	2	1
Chenopodium bonus-henricus	Good King-Henry							1													
Chenopodium ficifolium	Fig-leaved goosefoot																				
Chenopodium murale	Nettle-leaved goosefoot					1															
Chenopodium Section Pseudoblitum				3	3	3		1		1					1						
Chenopodium species	Goosefoots																				
Chenopodium/Atriplex spp.	goosefoots etc. oraches																				
Chrysanthemum segetum	(Corn marigold)												1						1		
Circaea lutetiana	Enchanters nightshade																				
Cirsium species	Thistle																				
Cladium mariscus (epidermus fragments)	Saw sedge																				
Conium maculatum	Hemlock												1								
Coriandrum sativum	Coriander																				

Corylus avellana	Hazel nut		1		1	1	1		1	1	1			1	1	1	1	1			1
Crataegus cf. laevigata	Midland Hawthorn																				
Crataegus monogyna fruitstone	Hawthorn	1							1					1	1	1					1
Crepis species	Hawksbeard																				
Cyperaceae	Sedge Family																				
Danthonia decumbens	Common heath grass														1		1	1		1	
Daucus carota	Wild carrot															1	1				
Dipsacus sativus/fullonum	Teasel																				
Dryopteris sp	Wood/Male/Buckler Fern																				
Eleocharis multicaulis	Many-stalked spike-rush																				
Eleocharis palustris	Common Spike-rush			1	1			1	1	1			1	1	1				1	1	1
Eleocharis sp.	Spike-rush																				
Elymus/Agropyron	Couches											1									
Empetrum nigrum	Black crowberry																				
Epilobium sp	Willowherbs																	1			
Equisetum sp nodel sheath fragments	Horsetails																				
Erica tetralix	Cross-leaved Heath																				
Eriophorum vaginatum	Hare's-Tail Cottongrass																				
Euphorbia helioscopia	Sun spurge														1	1				1	
Euphorbia lathyris	Caper spurge																		1		
Euphrasia/Odontities sp.	Eyebrights																				
Fabaceae indet.	indet. legumes																				
Fallopia convolvulus	Black-bindweed						1	1	1	1		1	1	1	1	1	1		1	1	
Ficus carica L.	Fig																				
Filipendula ulmaria	Meadowsweet																				
Foeniculum vulgare	Fennel																				
Fragaria vesca	Wild Strawberry																				
Fumaria species	Fumitory															1					
Galeopsis species	Hemp-nettle																				
Galeopsis subgenus Galeopsis	Hempnettle				1			1				1		1		1	1			1	1
Galeopsis subgenus Ladanum	Red hempnettle																				
Galeopsis tetrahit	Common hemp nettle																				
Galium aparine L.	cleavers						1										1				
Galium cf. spurium	False cleavers																				
Galium saxatile	Heath bedstraw																				
Galium species	Bedstraw																				
Genista tinctoria leaf frags	Dyer's Greenweed																				
Genista tinctoria stem fragments	Dyer's Greenweed	1	1					1	1	1	1			1	1	1	1	1	1	1	1
Geum rivale/urbanum	Avens																				
Geum urbanum	Wood avens																				
Glyceria fluitans	Floating Sweet-Grass																				
Glyceria species	Sweet Grasses																1				
Graminae		1							1	1		1			1					1	1
Heracleum sphondylium	Hogweed																				
Humulus lupus	Hops	1		1				1	1	1	1			1		1	1	1		1	
Hydrocotyle vulgaris	Marsh Pennywort																				
Hyoscyamus niger L.	henbane							1													
Hypericum sp	St. John's-worts																				
Hypochaeris radicata	Common cat's ear																				
Hypochoeris sp.	Cat's Ear							1													
Ilex aquifolium (leaf fragments)	Holly		1						1						1	1		1			1
Iris pseudacorus	Yellow flag																				

Isatis tinctora (pod fragments)	Woad																				
Isolepis setacea	Bristleleaf bulrush																				
Juglans regia	Walnut		1																		
Juncus acutiflorus/articulatus	Sharp flowered rush														1			1		1	
Juncus bufonius	Toad rush			1						1		1			1		1	1			
Juncus conglomeratus	Compact rush																				
Juncus gerardi	Saltmarsh Rush																			1	
Juncus inflexus/effusus/conglomeratus	Hard/Soft/Compact Rush									1					1					1	
Juncus maritimus	Sea Rush																				
Juncus sp.	Rush																				
Juncus squarrosus	Heath rush																				
Juncus subnodulosus	Blunt-flowered Rush																				
Knautia arvensis	Field Scabious																				
Labiatae species indeterminate	Dead-Nettle Family									1											
Lamium section Lamiopsis				1	1	1				1					1	1	1				
Lamium sp	Dead-Nettles																				
Lapsana communis	Nipplewort		1			1		1	1	1		1	1	2		1	1	1	1	2	1
Legume >4mm																					
Leguminosae flowers/petals						1				1								1			
Leguminosae pods/frags																	1			1	
Leguminosae tracheid bars																					
Leontodon autumnalis	Autumn hawkbit																				
Leontodon autumnalis/hispidus	Autumn/Rough Hawkbit																				
Leontodon hispidus	Rough Hawkbit																				
Leontodon sp.	Hawkbit			1				1		1										1	
Leontodon taraxacoides	Lesser Hawkbit																				
Lepedium coronopus (Coronopus squamatus)	Swine-cress																				
Leucanthemum vulgare	Oxeye daisy																				
Linum catharticum	Fairy Flax														1						
Linum sp. cf.	?flax																				
Linum usitatissimum	Flax	1		1	1	1	2	2	1	1	1	2	1	2	1	2	2	1	1	1	2
Lithospermum arvense L.	corn gromwell																				
Luzula campestris	Sweep's brush																				
Luzula multiflora	Heath woodrush																				
Luzula species	Wood-rush																			1	
Lychnis flos-cuculi	Ragged robin																				
Lycopus europaeus	Gypsywort																				
Lythrum salicaria	Purple loosestrife																				
Malus sylvestris endocarp	Apple core	2	1	1			1	1	2	1	1	2	2	1	1	1					2
Malus sylvestris seed base cups	Apple seed base cups																				
Malus sylvestris/domesticus	Apple	2	1		1	1		1	2	1	1	2	1	1	1	1	1		1		2
Malus/pyrus	Apple/Pear																				
Malva neglecta	Dwarf mallow							1													
Malva species	Mallow				1																
Malva sylvestris	Common Mallow																				
Marrubium vulgare	White Horehound																				
Matricaria recutita	Chamomile																				
Mentha species	Mint																				
Menyanthes trifoliata	Bog-bean																				1
Montia fontana	Blinks																				
Myosotis sp.	Forget-me-not												1								
Myrica gale leaf/twig fragments	Bog myrtle			1																	

Myristica fragrans (aril)	Mace (Nutmeg)																				
Nepeta cataria	Catnip								1												
Nuphar lutea	Yellow water-lily																				
Odontites verna	Red Bartsia																				
Oenanthe cf. aquatica	Fine-leafed water dropwort																				
Oenanthe cf. lachenalii	Parsley Water-dropwort																				
Oenanthe crocata	Hemlock water dropwort																				
Oenanthe fistulosa	Tubular Water-dropwort																			1	
Oenanthe sp	Water dropwort																				
Onopordum acanthium	Cottom Thistle																				
Oxalis acetosella	Wood-sorrel									1											
Papaver argemone	Prickly Poppy									1											
Papaver dubium	Long-headed poppy																				
Papaver somniferum	Opium poppy							1		1				1			1				
Papaver species	Poppy																				
Pastinaca sativa	Parsnip																				
Pastinaca sativa/Heracleum sphondylium	Parsnip/Hogweed																				1
Pedicularis palustris	Marsh Lousewort									1		1									
Persicaria hydropiper	Water pepper																				1
Persicaria lapathifolia	Pale Persicaria																				1
Persicaria maculosa	Redshank																				
Phoenix dactylifera	Dates																				
Phragmites australis	Common Reed							1													
Picris echioides	Bristly Oxtongue																				
Picris hieracioides	Hawkweed Oxtongue																				
Piper nigrum	Black Pepper																				
Pisum sativum	Garden pea																				
Pisum sativum hilum, parenchyma, epidermis	Garden pea												1				1				
Pisum sp.	Garden pea																				
Plantago lanceolata L.	Ribwort plantain																				
Plantago major	Greater Plantain			1	1					1							1				
Plantago media	Hoary Plantain																				
Poa annua	Annual meadow grass					1								1							
Poa trivialis	Rough bluegrass																				
Poaceae	indet grasses																				
Polygonaceae	-																				
Polygonum arenastrum	Common knotweed																				
Polygonum aviculare	Common Knotgrass	1	1	1	1	2		1	1	11	1			1	1	1		1	1	1	
Polygonum hydropiper	Water pepper	1		1		1		1				1	1						1	1	1
Polygonum lapathifolium	Pale Persicaria			1	1	1		1		1	1		1	1		1	1	1		2	1
Polygonum persicaria	Redshank	1						1	1		1	1	1	1				1	1	2	
Populus species bud scales	Poplar																				
Potamogeton species	Pondweed																				
Potentilla anserina	Silverweed															1					
Potentilla erecta	Tormentil														1		1	1		1	
Potentilla palustris	Marsh cinquefoil																				
Potentilla reptans	Creeping cinquefoil					1												1			
Potentilla species	Cinquefoils								1							1			1		1
Prunella vulgaris	Self-heal							1	1								1			1	
Prunus cerasifera																					
Prunus cerasus	Morello cherry																		1		
Prunus cf. cerasus	Morello cherry												1								

Prunus domestica	Plum	1	1				1		1		1					1			1		1
Prunus domestica cf.	?plum/bullace																				
Prunus insititia	Damson												1								
Prunus padus	Bird cherry																				
Prunus sp																					
Prunus sp. mesocarp																					
Prunus species epidermis																					
Prunus spinosa	Sloe	2	2	1	1		1	1	1		1	2		3	1	1			2		2
Pteridium aqualinum	Bracken					1				1			1	1	1					1	1
Pyrus communis	Pear																				
Pyrus/Cydonia endocarp	Pear/Qunice																				
Pyrus/Cydonia stone cells	Pear/Qunice																				
Quercus sp. bud scales	Oak bud scales									1										1	
Ranunculus acris/ repens/ bulbosus	'buttercups'																				
Ranunculus flammula	Lesser Spearwort											1						1		1	
Ranunculus lingua	Greater Spearwort																				
Ranunculus sardous	Hairy buttercup												1				1				
Ranunculus sceleratus	celery leaved crowfoot											1				1	1				1
Ranunculus subgenus Batrachium				1																	
Ranunculus subgenus Ranunculus	Buttercup		1		1				1	1	1	1	1			1	1		1	1	1
Raphanus raphanistrum	Wild radish	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	2	1
Reseda luteola	Weld																				
Reseda sp	Mignonettes																				
Rhinanthus minor	Yellow rattle																				
Rhinanthus species	Rattle																				
Ribes uva-crispa	Gooseberry																				
Rosa sp.	Rose-hip								1												1
Rubia tinctorum	Common madder	1	1					1	1	2	1				1	1	1	1			1
Rubus caesius	Dewberries															1					
Rubus fruticosus	Blackberry		1	1	1		1		1	1	1		1	1	1	1	1		2		1
Rubus fruticosus/idaeus	blackberry/ raspberry							1													
Rubus idaeus	Raspberry		1		1			1		1											
Rubus species	Brambleberry																				
Rumex acetosa	Common sorrel																				
Rumex acetosella	Sheep's sorrel		1						1	1			1				1				
Rumex conglomeratus	Sharp dock																				
Rumex crispus	Curled dock																				
Rumex obtusifolius	Broad-leaved dock																				
Rumex pseudoalpinus	Monk's rhubarb																				
Rumex sanguineus	Bloody dock																				
Rumex spp.	Docks	1	1	1		1		1		1	1			1		1		1		1	1
Salix species bud scale/leaf fragments	Willow bud scales							1													
Sambucus cf. ebulus	Dwarg elder							1													
Sambucus nigra	Elder			2	1	2	1	1	1	1		1	1	1	1	1	1	1	2	1	1
Satureja hortensis	Summer savoury								1		1					1					1
Scandix pecten-veneris	Shepherd's-Needle																			1	
Scirpus maritimus/lacustris	Sea/Common Club-rush								1												1
Scirpus setaceus	Bristle Club-rush																				
Scirpus sylvaticus cf.	Wood Club-rush																				
Scleranthus annuus	Annual Knawel																				
Scrophularia nodosa	Figwort																				
Senecio aquaticus	Marsh ragwort																				

Senecio cf. jacobea	Groundsel																			
Senecio species	Ragworts					1														
Silene alba	White Campion																			
Silene sp	Campion																			
Silene vulgaris	Bladder Campion																1			
Sinapis arvensis	Field Mustard																			
Sisymbrium officinale	Hedge mustard																			
Sisymbrium sophia/Descurainia sophia	Flixweed			1	1	1		1												
Solanum dulcamara	Bittersweet																			1
Solanum nigrum	Black nightshade			1	1							1	2	1			1			
Solanum sp	Nightshades							1												
Sonchus arvensis	Perennial Sowthistle																		1	
Sonchus asper	Spiney milk thistle						1		1	1	1	1	1	1		1	1		1	
Sonchus oleraceus	Sowthistle							1	1					1		1				
Sonchus sp.	Sowthistles																			
Sorbus aria	Whitebeam																			
Sorbus aucuparia	Rowan								1								1			
Sorbus sp cf.	Service																			
Sorbus torminalis	Wild Service-tree																			
Spergula arvensis	Corn spurry									1			1	1	1		1			1	1
Sphergranium sp	Bur-reed																			
Stachys palustris	Marsh Woundwort																			
Stachys sp.	Woundwort																			
Stachys sylvatica	Hedge woundwort																			
Stellaria graminea	Lesser Stichwort																			
Stellaria holostea stem fragments	Greater Stichwort																			
Stellaria media	Common chickweed	1	1	1	1	1	1	1	1	1	1	1			1	1	1	1	1	1	1
Stellaria media/neglecta	C.mon/Greater Chickweed																			
Stellaria palustris/graminea	Marsh/Lesser Stichwort																			
Stellaria sp.	Stichworts																			
Stellaria/Cerastium	Stichworts/Mouse-ears																			
Taraxacum officinale	Dandelion																			
Thalaspi arvense	Field penny cress			1		1				1	1		1							
Thalictrum flavum	Common Meadow-rue																			
Thalictrum sp.	Meadow-rues																			
Torilis japonica	Upright hedge parsley											1				1				1	
Trifolium pratense	Red Clover																			
Trifolium repens	White clover																			
Trifolium species	Clover																1			
Triglochin maritima	Sea Arrowgrass																			
Tripleurospermum inodorum/Matricaria perforata	Scentless Mayweed																			
Ulex	Gorse (leaf spine)																			
Umbelliferae indet.	Umbellifore							1								1				
Urtica dioica	Stinging nettle		1	1	1			1		1			2	1	1	1		1	1	1	1
Urtica urens	Small nettle	1	1	1	2	2	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1
Vaccinium myrtillus	Bilberry																				
Vaccinium sp.	Bilberry	1			1				2	2	1		1	1		1	1				1
Vaccinium sp. pistil bases	Bilberry pistil bases								1				1								
Valerianella dentata	Narrow-fruited cornsalad							1												1	
Veronica sp	Speedwell																				
Vica faba trachied bars	Broad bean trachied bars																				

Vicia cf. tetrasperma											3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume
Smooth Tare					1						3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume
Broad bean						1					3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume
Broad bean spidermis											3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume
Vetch											3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume
Violets					1						3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume
Violet											3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume
grape											3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume
Horned pondweed					1						3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume
Total quantified remains											
Seed density per litre (quantified charred remains)											

	Town/City	York	York	York	York	York	York	York	York	York
	Period	975-E/M11	M/L 11C	M/L 11C	M/L 11C	M/L 11C	M/L 11C	M/L 11C	M/L 11C	M/L 11C
	Feature									
		<1746>	<1073>	<1321>	<1315>	<1215>	<1323>	<1120>	<1119>	<1150>
	context	21510	6570	21141	21088	6926	6909	6795	6795	6795
	vol.soil (l)									
	flot vol (ml)									
Cereal grains										
Avena sativa	Cultivated oat spikelets									
Avena sp(p).	oat	1	1					1		
Avena strigosa	Bristle Oat									
cf. *Avena* sp(p).	?oat									
cf. *S. cereale*	?rye									
Hordeum (naked)	Barley; naked									
Hordeum sativum	barley									
Hordeum sp.	Barley									
Hordeum (twisted naked)										
indeterminate cereals	indet. grains (est.)									1
Secale cereale	rye					1				
T. aestivum s.l.	free-threshing wheat									
Triticum (hexapolid)	Bread wheat									
Triticum aestivo-compactum	Bread wheat				1			1		
Triticum sp(p).	wheat									

Triticum spelta	Spelt wheat									
Triticum/Secale	Wheat/Rye	1								
Cereal chaff										
Cerealia indet culm fragments										1
Gramineae sect. Cerealia	Cereals, rhachis frag.									
Indeterminate mineralised cereals										
Cerealia bran		2							1	
Triticum floret base										
Avena sativa floret base	Cultivated oat									
Triticum aestivum s.l.	6x wheat rachis									
Triticum species rachis	Wheat rachis									
Secale cereale L.	rye rachis									
Avena glume fragment	Oat glume									
Avena sp. bran fragments	Oat bran									
Triticum/Secale bran	Wheat/Rye bran frag.	3		1	1		3	2	3	3
Hordeum species rachis	Barley rachis fragments									
Hordeum sp 'bran' fragments	Barley bran									
Other plants										
(M) Anomobryum filiforme										
(M) Anomodon viticulosus	Rambling Tail-moss					1	1			
(M) Antitrichia curtipendula	Pendulous Wing-moss	1			1					
(M) Atrichum undulatum	Common Smoothcap									
(M) Barbula cf. species	Beard-moss									
(M) Brachythecium/Eurhynchium sp							1			
(M) Bryum sp.	Thread-moss								1	
(M) Calliergon cf. giganteum	Giant Spear-moss					1		1	1	1
(M) Calliergon cuspidatum	Pointed spear-moss	1	1			1	1	1	1	1
(M) Campylium elodes	Fine leaved feather moss							1		
(M) Campylium stellatum (cf.)										
(M) cf. Amblystegium sp(p).	Creeping feather-moss								1	
(M) Cratoneuron commutatum	Curled hook-moss									
(M) Cratoneuron filicinum	Fern-leaved Hook-moss									
(M) Cratoneuron filicinum										1
(M) Dicramun sp.	Wind Bloon/Fork Moss	1								
(M) Diphasium alpinium (D. complanatum)	Alpine Clubmoss	1	1	1	1	1	1			
(M) Drepanocladus aduncus	Knieff's Hook-moss								1	
(M) Drepanocladus sp.								1		
(M) Eurhynchium praelongum			1					1		
(M) Eurhynchium sp	Feather-moss									
(M) Eurhynchium speciosum								1		
(M) Eurhynchium striatum	Common Striated Feather-moss	1			1					
(M) Homalia trichomanoides	Blunt Feather-moss				1					
(M) Homalothcium nitens										
(M) Homalothcium sericeum/lutescens		1								1
(M) Homalothcium sp						1				
(M) Hylocomium cf. brevirostre										
(M) Hylocomium myosuroides										
(M) Hylocomium splendens		1	1				1			
(M) Hypnum cf. cupressiforme	Cypress-leaved Plait-moss	1						1		
(M) Isothecium myosuroides	Mouse-tail Moss					1	1	1		
(M) Isothecium myurum		1								
(M) Leucobryum glaucum	Large White-moss									

(M) Leucodon sciuroides	Squirrel-tail Moss	1			1			2		
(M) Lycopodium sp										
(M) Mnium hornum	Swan's-neck Thyme-moss									
(M) Neckera complanata	Flat Neckera	2	1	1	1	1	1	1	1	
(M) Neckera crispa	Crisped Neckera									
(M) Plagiomnium sp.										
(M) Plagiomnium undulatum	Hart's-tongue Thyme-moss									
(M) Pleurozium schreberi										
(M) Polytrichum formosum										
(M) Polytrichum species										
(M) Pseudoscleropodium purum	Neat Feather-moss	1								
(M) Racomitrium canescens	Hoary Fringe-moss	1								
(M) Racomitrium sp.	Fringe-moss									
(M) Rhynchostegiella tenella (cf.)	Tender Feather-moss									
(M) Rhynchostegium sp	Feather-moss									
(M) Rhytidiadelphus sp.	Turf-moss									
(M) Rhytidiadelphus squarrosus	Springy Turf-moss							1		
(M) Rhytidiadelphus triquetrus										
(M) Scorpidium scorpioides	Hooked Scorpion-moss	1			1	1		1		
(M) Sphagnum imbricatum										
(M) Sphagnum Section Acutifolia										
(M) Sphagnum Section Sphagnum										
(M) Sphagnum sp.										
(M) Thamnobryum alopecurum	Fox-tail Feather-moss									
(M) Thuidium cf. tamariscinum				1	1	1		1	1	
(M) Ulota crispa	Crisped pincushion									
(M) Ulota species		1			1			1		
Achillea millefolium	Yarrow									
Achillea ptarmica	Sneezewort									
Achillea sp	Yarrow species									
Acinos arvensis	Basil thyme									
Aegopodium podagraria	Ground elder									
Aethusa cynapium	Fool's parsley		1	1			1			
Agrimonia eupatoria	Agrimonies									
Agrostemma githago	Corn cockle	2	1	1	1	2	3	2	2	2
Agrostis species	Bent grass									
Alchemilla vulgaris	Ladies mantle									
Alisma species	Water plantains									
Allium porrum	Leek								1	
Allium porrum leaf fragment	Leek									
Allium sp.	Leek/Onion/Garlic?									
Allium sp. leaf fragment	Leek/Onion/Garlic?						1			
Alnus glutinosa (cone)	Alder									
Alnus sp fca										
Alopecurus species	Foxtail grass									
Anagallis arvensis	Scatlet Pimpernel				1					
Anethum graveolens	Dill	1								
Anthemis cotula	Stinking mayweed	2		1	1	1	1	1	1	
Anthriscus caucalis	Burr-chervil									
Anthriscus sylvestris	Cow Parsley								1	
Aphanes microcarpa	Slender Parsley-piert									
Apium graveolens	Celery	1	1	1	1		1			

Arctium lappa/minus	Greater/Lesser Burdock									
Arctium species	Burdock		1							
Armorica rusticana	Horseradish									
Aster tripolium (cf.)	Sea aster									
Asteraceae	Daisy Family									
Asteraceae/Compositae (inv fgts)									1	
Atriplex hastata	Orache									
Atriplex patula/prostrata	Common Orache									
Atriplex sp.	Orache	1	1	1	1	1	1	1	1	1
Atropa belladonna	Deadly nightshade									
Baldellia ranunculoides	Lesser Water-plantain									
Barberea vulgaris	Bittercress									
Bellis perennis	Common daisy									
Beta vulgaris	Beet									
Betula pubescens	White birch									
Betula species	Birch	1								
Bidens sp.	Bur-marigolds							1		
Boraginaceae	Borage Family									
Brassica campestris	Wild turnip									
Brassica cf. oleracea/napus	Cabbage/rape/swede									
Brassica nigra	Black mustard									1
Brassica rapa	Turnip	1	1	1	1	1	1	1	1	1
Brassica sp./Sinapis arvensis	Brassica/Charlock	1	1			1	1	1		1
Brassica species	Brassica species			1	1			1		
Brassicaceae seed	Brassicaceae species									
Brassicaceae/Cruciferae	Brassicaceae species									
Brassicaceae/Cruciferae (pedicles)	Brassicaceae species									
Bromus sp.	Brome grass	1			1		1		1	1
Bryonia cretica ssp. Dioica	White bryony		1							
Buglossoides arvensis	Field Gromwell									
Bupleurum falcatum	Sickle-leaved Hare's-Ear								1	
Bupleurum rotundifolium	Thorow-wax									
C. leucanthemum	Ox-eye daisy									
Calendula officinalis	Pot marigold									
Calluna vulgaris flower/leaf fragments	Ling	1					1			
Caltha palustris	Marsh-marigold								1	
Cannabis sativa	Hemp		1					1		
Capsella bursa-pastoris	Shepherd's-purse									
Cardus/Cirsium species	Thistle family	1					1	1	1	1
Carduus sp.	Thistle family									
Carex (lenticular)	Sedges									
Carex (trigonus)	Sedges									
Carex elata	Tufted sedge									
Carex flacca	Glaucous sedge									
Carex hostiana	Tawny sedge									
Carex leporina (C. ovalis)	Oval sedge									
Carex nigra cf.	Common sedge									
Carex oederi (Carex viridula)	Small fruited yellow sedge									
Carex panicea	Carnation sedge									
Carex remota	Remota sedge									
Carex riparia/hirta	pond/hairy sedge									
Carex rostrata cf.	Bottle sedge									

Carex species	Sedge	1	1			1	1	1		1
Carex sylvatica	Wood-sedge									
Caryophyllaceae	Pink Family									
Centaurea cf. scabiosa	Greater Knapweed									
Centaurea cyanus	Cornflower									
Centaurea nigra	Common knapweed							1		
Centaurea species	Knapweeds									1
Cerastium fontanum	Common mouse-ear									
Cerastium sp.	Mouse-ear chickweed									
Chaerophyllum sp cf.	Chervil									
Chelidonium majus	Greater Celandine									
Chenopodium album	Fat hen	1	2	1	1	1	1	1	1	1
Chenopodium bonus-henricus	Good King-Henry									
Chenopodium ficifolium	Fig-leaved goosefoot									
Chenopodium murale	Nettle-leaved goosefoot		1					1	1	
Chenopodium Section Pseudoblitum			1						1	1
Chenopodium species	Goosefoots		1							
Chenopodium/Atriplex spp.	goosefoots etc. oraches									
Chrysanthemum segetum	(Corn marigold)							1	1	1
Circaea lutetiana	Enchanters nightshade									
Cirsium species	Thistle									
Cladium mariscus (epidermus fragments)	Saw sedge									
Conium maculatum	Hemlock			1						
Coriandrum sativum	Coriander									
Corylus avellana	Hazel nut		1			1		1		
Crataegus cf. laevigata	Midland Hawthorn							1		
Crataegus monogyna fruitstone	Hawthorn		1	1		1		1		
Crepis species	Hawksbeard									
Cyperaceae	Sedge Family									
Danthonia decumbens	Common heath grass									
Daucus carota	Wild carrot								1	
Dipsacus sativus/fullonum	Teasel									
Dryopteris sp	Wood/Male/Buckler Fern								1	
Eleocharis multicaulis	Many-stalked spike-rush									
Eleocharis palustris	Common Spike-rush	1	1		1	1	1	1	1	1
Eleocharis sp.	Spike-rush									
Elymus/Agropyron	Couches									
Empetrum nigrum	Black crowberry									
Epilobium sp	Willowherbs									
Equisetum sp nodel sheath fragments	Horsetails									
Erica tetralix	Cross-leaved Heath									
Eriophorum vaginatum	Hare's-Tail Cottongrass									
Euphorbia helioscopia	Sun spurge									
Euphorbia lathyris	Caper spurge									
Euphrasia/Odontities sp.	Eyebrights									
Fabaceae indet.	indet. legumes									
Fallopia convolvulus	Black-bindweed	1	1	1			1	1	1	
Ficus carica L.	Fig									
Filipendula ulmaria	Meadowsweet									
Foeniculum vulgare	Fennel									
Fragaria vesca	Wild Strawberry									
Fumaria species	Fumitory									

Galeopsis species	Hemp-nettle									
Galeopsis subgenus Galeopsis	Hempnettle	1	1		1	1				
Galeopsis subgenus Ladanum	Red hempnettle									
Galeopsis tetrahit	Common hemp nettle									
Galium aparine L.	cleavers							1		
Galium cf. spurium	False cleavers									
Galium saxatile	Heath bedstraw									
Galium species	Bedstraw									1
Genista tinctoria leaf frags	Dyer's Greenweed								1	
Genista tinctoria stem fragments	Dyer's Greenweed	1					1			
Geum rivale/urbanum	Avens									
Geum urbanum	Wood avens									
Glyceria fluitans	Floating Sweet-Grass									
Glyceria species	Sweet Grasses									
Graminae			1				1	1		
Heracleum sphondylium	Hogweed									
Humulus lupus	Hops	1	1	1	1	1				1
Hydrocotyle vulgaris	Marsh Pennywort									
Hyoscyamus niger L.	henbane	1	1					1		
Hypericum sp	St. John's-worts									
Hypochaeris radicata	Common cat's ear									
Hypochoeris sp.	Cat's Ear	1							1	
Ilex aquifolium (leaf fragments)	Holly		1							
Iris pseudacorus	Yellow flag									
Isatis tinctora (pod fragments)	Woad									
Isolepis setacea	Bristleleaf bulrush									
Juglans regia	Walnut									
Juncus acutiflorus/articulatus	Sharp flowered rush									
Juncus bufonius	Toad rush	1								
Juncus conglomeratus	Compact rush									
Juncus gerardi	Saltmarsh Rush						1			
Juncus inflexus/effusus/conglomeratus	Hard/Soft/Compact Rush									
Juncus maritimus	Sea Rush									
Juncus sp.	Rush									
Juncus squarrosus	Heath rush									
Juncus subnodulosus	Blunt-flowered Rush									
Knautia arvensis	Field Scabious									
Labiatae species indeterminate	Dead-Nettle Family							1		
Lamium section Lamiopsis								1	1	
Lamium sp	Dead-Nettles									
Lapsana communis	Nipplewort	2	1	1	1	1	1		1	1
Legume >4mm										
Leguminosae flowers/petals										
Leguminosae pods/frags		1								
Leguminosae tracheid bars										
Leontodon autumnalis	Autumn hawkbit									
Leontodon autumnalis/hispidus	Autumn/Rough Hawkbit									
Leontodon hispidus	Rough Hawkbit									
Leontodon sp.	Hawkbit	1							1	
Leontodon taraxacoides	Lesser Hawkbit									
Lepedium coronopus (Coronopus squamatus)	Swine-cress									
Leucanthemum vulgare	Oxeye daisy									

Linum catharticum	Fairy Flax									
Linum sp. cf.	?flax									
Linum usitatissimum	Flax	2	1	1	1	2	2	1	1	1
Lithospermum arvense L.	corn gromwell									
Luzula campestris	Sweep's brush									
Luzula multiflora	Heath woodrush									
Luzula species	Wood-rush									
Lychnis flos-cuculi	Ragged robin									
Lycopus europaeus	Gypsywort									1
Lythrum salicaria	Purple loosestrife									1
Malus sylvestris endocarp	Apple core	2	1	1	1	1	2	2	1	2
Malus sylvestris seed base cups	Apple seed base cups									
Malus sylvestris/domesticus	Apple	1	1	1	1	1		2	1	1
Malus/pyrus	Apple/Pear									
Malva neglecta	Dwarf mallow									1
Malva species	Mallow									1
Malva sylvestris	Common Mallow							1		
Marrubium vulgare	White Horehound									
Matricaria recutita	Chamomile									
Mentha species	Mint									
Menyanthes trifoliata	Bog-bean									
Montia fontana	Blinks									
Myosotis sp.	Forget-me-not									
Myrica gale leaf/twig fragments	Bog myrtle							1	1	1
Myristica fragrans (aril)	Mace (Nutmeg)									
Nepeta cataria	Catnip						1			
Nuphar lutea	Yellow water-lily									
Odontites verna	Red Bartsia									
Oenanthe cf. aquatica	Fine-leafed water dropwort									
Oenanthe cf. lachenalii	Parsley Water-dropwort									
Oenanthe crocata	Hemlock water dropwort									
Oenanthe fistulosa	Tubular Water-dropwort									
Oenanthe sp	Water dropwort		1							
Onopordum acanthium	Cottom Thistle									
Oxalis acetosella	Wood-sorrel									
Papaver argemone	Prickly Poppy									
Papaver dubium	Long-headed poppy									
Papaver somniferum	Opium poppy	1			1	1	1			
Papaver species	Poppy									
Pastinaca sativa	Parsnip									
Pastinaca sativa/Heracleum sphondylium	Parsnip/Hogweed									
Pedicularis palustris	Marsh Lousewort							1	1	1
Persicaria hydropiper	Water pepper									
Persicaria lapathifolia	Pale Persicaria									
Persicaria maculosa	Redshank									
Phoenix dactylifera	Dates									
Phragmites australis	Common Reed									
Picris echioides	Bristly Oxtongue									
Picris hieracioides	Hawkweed Oxtongue						1			1
Piper nigrum	Black Pepper									
Pisum sativum	Garden pea									
Pisum sativum hilum, parenchyma, epidermis	Garden pea								1	1

Pisum sp.	Garden pea									
Plantago lanceolata L.	Ribwort plantain									
Plantago major	Greater Plantain									
Plantago media	Hoary Plantain									
Poa annua	Annual meadow grass									
Poa trivialis	Rough bluegrass									
Poaceae	indet grasses									
Polygonaceae	-									
Polygonum arenastrum	Common knotweed									
Polygonum aviculare	Common Knotgrass	1						1	1	1
Polygonum hydropiper	Water pepper	1				1				
Polygonum lapathifolium	Pale Persicaria	1		1						1
Polygonum persicaria	Redshank	1			1	1	1			1
Populus species bud scales	Poplar			1						
Potamogeton species	Pondweed									
Potentilla anserina	Silverweed		1							
Potentilla erecta	Tormentil									
Potentilla palustris	Marsh cinquefoil							1	1	
Potentilla reptans	Creeping cinquefoil									
Potentilla species	Cinquefoils		1	1				1		
Prunella vulgaris	Self-heal		1					1		1
Prunus cerasifera										
Prunus cerasus	Morello cherry		1					2		
Prunus cf. cerasus	Morello cherry									1
Prunus domestica	Plum		2	1	1	1				
Prunus domestica cf.	?plum/bullace							1		
Prunus insititia	Damson	1					1			1
Prunus padus	Bird cherry									
Prunus sp										
Prunus sp. mesocarp										1
Prunus species epidermis										
Prunus spinosa	Sloe	1	2	2	2	1	1	1		1
Pteridium aqualinum	Bracken									1
Pyrus communis	Pear									
Pyrus/Cydonia endocarp	Pear/Qunice									
Pyrus/Cydonia stone cells	Pear/Qunice									
Quercus sp. bud scales	Oak bud scales							1	1	
Ranunculus acris/ repens/ bulbosus	'buttercups'									
Ranunculus flammula	Lesser Spearwort							1	1	
Ranunculus lingua	Greater Spearwort									
Ranunculus sardous	Hairy buttercup		1	1				1		
Ranunculus sceleratus	celery leaved crowfoot		1					1		
Ranunculus subgenus Batrachium										
Ranunculus subgenus Ranunculus	Buttercup	1		1	1	1	1		1	1
Raphanus raphanistrum	Wild radish	1	1	1		1	1	1		
Reseda luteola	Weld									
Reseda sp	Mignonettes									
Rhinanthus minor	Yellow rattle									
Rhinanthus species	Rattle									
Ribes uva-crispa	Gooseberry									
Rosa sp.	Rose-hip			1		1		1		
Rubia tinctorum	Common madder		1	1	1	1	1	1		
Rubus caesius	Dewberries					1		1		

Rubus fruticosus	Blackberry	2	1	1	1	2	1	1		1
Rubus fruticosus/idaeus	blackberry/ raspberry									
Rubus idaeus	Raspberry				1				1	
Rubus species	Brambleberry									
Rumex acetosa	Common sorrel									
Rumex acetosella	Sheep's sorrel					1				
Rumex conglomeratus	Sharp dock									
Rumex crispus	Curled dock							1		
Rumex obtusifolius	Broad-leaved dock									
Rumex pseudoalpinus	Monk's rhubarb									
Rumex sanguineus	Bloody dock									
Rumex spp.	Docks	1					1		1	1
Salix species bud scale/leaf fragments	Willow bud scales							1		
Sambucus cf. ebulus	Dwarg elder								1	
Sambucus nigra	Elder	1	1	1	1	1		1	1	1
Satureja hortensis	Summer savoury	1		1	1	1	1	1		
Scandix pecten-veneris	Shepherd's-Needle									
Scirpus maritimus/lacustris	Sea/Common Club-rush									
Scirpus setaceus	Bristle Club-rush									
Scirpus sylvaticus cf.	Wood Club-rush									
Scleranthus annuus	Annual Knawel									
Scrophularia nodosa	Figwort									
Senecio aquaticus	Marsh ragwort									
Senecio cf. jacobea	Groundsel									
Senecio species	Ragworts									
Silene alba	White Campion					1	1		1	
Silene sp	Campion									
Silene vulgaris	Bladder Campion									
Sinapis arvensis	Field Mustard						1			
Sisymbrium officinale	Hedge mustard									
Sisymbrium sophia/Descurainia sophia	Flixweed									1
Solanum dulcamara	Bittersweet									
Solanum nigrum	Black nightshade		1			1				
Solanum sp	Nightshades									
Sonchus arvensis	Perennial Sowthistle									
Sonchus asper	Spiney milk thistle	1						1		1
Sonchus oleraceus	Sowthistle		1	1	1			1	1	1
Sonchus sp.	Sowthistles									
Sorbus aria	Whitebeam									
Sorbus aucuparia	Rowan			1						
Sorbus sp cf.	Service									
Sorbus torminalis	Wild Service-tree									
Spergula arvensis	Corn spurry	1						1		
Spherganium sp	Bur-reed									
Stachys palustris	Marsh Woundwort									
Stachys sp.	Woundwort							1		
Stachys sylvatica	Hedge woundwort									
Stellaria graminea	Lesser Stichwort									
Stellaria holostea stem fragments	Greater Stichwort									
Stellaria media	Common chickweed	1	1	1	1	1	1	2	1	1
Stellaria media/neglecta	C.mon/Greater Chickweed								1	
Stellaria palustris/graminea	Marsh/Lesser Stichwort									

Stellaria sp.	Stichworts									
Stellaria/Cerastium	Stichworts/Mouse-ears									
Taraxacum officinale	Dandelion									
Thalaspi arvense	Field penny cress	1								
Thalictrum flavum	Common Meadow-rue									
Thalictrum sp.	Meadow-rues									
Torilis japonica	Upright hedge parsley									
Trifolium pratense	Red Clover									
Trifolium repens	White clover									
Trifolium species	Clover									
Triglochin maritima	Sea Arrowgrass									
Tripleurospermum inodorum/Matricaria perforata	Scentless Mayweed									
Ulex	Gorse (leaf spine)									
Umbelliferae indet.	Umbellifore									
Urtica dioica	Stinging nettle					1	1	1	1	1
Urtica urens	Small nettle	1	1	1		1	1	1	2	1
Vaccinium myrtillus	Bilberry									
Vaccinium sp.	Bilberry	1		1	1	1		1	1	
Vaccinium sp. pistil bases	Bilberry pistil bases						1			
Valerianella dentata	Narrow-fruited cornsalad			1		1		1		
Veronica sp	Speedwell									
Vica faba trachied bars	Broad bean trachied bars									
Vicia cf. tetrasperma	Smooth Tare	1								
Vicia faba	Broad bean									
Vicia faba epidermis	Broad bean spidermis									
Vicia species	Vetch									
Viola palustris	Violets									
Viola species	Violet					1				
Vitis vinifera L.	grape		1							
Zannichellia palustris	Horned pondweed									
Total quantified remains										
Seed density per litre (quantified charred remains)										
		3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume	3-point scale 1=one or a few remains, 2—moderately frequent remains, 1-10% by volume of the original sample, 3—abundant remains, more than 10% of the original sample volume