5.3 Bone or antler

Sfs 5-9, all from context 1000, appear to be part of the same object, possibly a comb case. Also from the same context is sf10 which is a composite comb fragment. Also from the same context, sf11 is a very interesting tubular object, possibly a knife handle, and apparently containing some metal (this object requires X-raying to provide a more accurate identification). It appears to be decorated with incised interlace – again, further conservation treatment would clarify the decorative style.

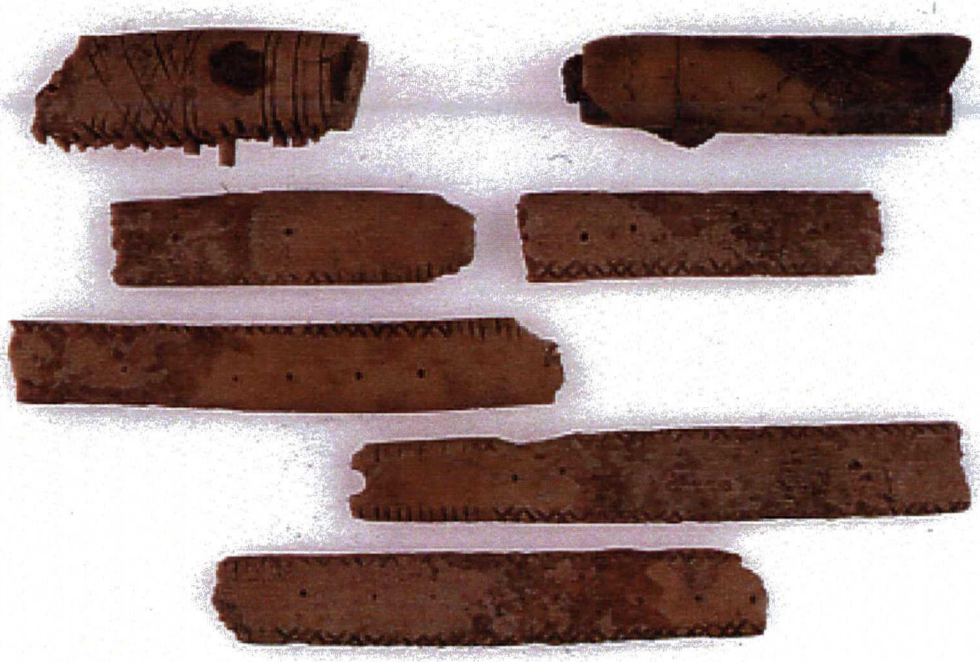

Plate 1. Decorated bone comb and comb case fragments and possible knife handle

5.4 Summary

This is a fascinating little group of material; in particular, the objects made of skeletal material suggest the possibility of a comb, comb case and decorated ?knife handle, all of a similar date, perhaps Anglo-Scandinavian. In the light of the previous recovery of burials containing combs dated to the 9th – 11th centuries (ref Section 2 in the Archaeological Report), I would suggest that these finds may come from the same phase of burials, particularly as they also appear to be associated with human bones. The tubular possible knife handle (sf11) in particular should be thoroughly investigated by conservators and more detailed research to identify its decorative style would provide a useful date.

At least 300 years later in date, and possibly 500-600 years later, is the wire wound pin (sf1). The remaining finds are undatable.

6. CONSERVATION ASSESSMENT REPORT

6.1 Objectives

This report aims to meet the requirements of MAP2, Phase 3, Assessment of Potential for Analysis, (English Heritage, 1991). The work carried out has involved an X-radiographic investigation of selected finds, and an assessment of their condition, stability and packaging. This report includes an evaluation of the potential of each group of material for further investigative conservation and research. There are recommendations for long term stabilisation, packaging and analytical or specialist support required

6.2 Procedures

All iron (including two bone finds with iron elements) and copper alloy was X-rayed using standard Y.A.T. procedures and equipment. Two sheets of film were placed in the cassette to produce duplicates for archive purposes. The plates were laid out in small find number order as far as possible. The X-ray plate number was written on each bag. Each image on the X-ray was labelled with its small find number. The plates were packaged in an acid-free archival envelope and given a reference number in the Online Photo Archive. This was linked through to the CIFR record for each find. The archival copy is stored in Conservation and the duplicate is with the Finds Administration at the ARC.

All categories of material were examined under a binocular microscope at X20 magnification. The material identifications were checked and observations made about the condition and stability of the finds. The wet-packed finds were dried out, repacked, and photographed. Any technological information deduced from the X-rays and/or microscope examination and details of treatment were recorded on CIFR in the Work Record area, and printed below in section 5.

6.3. Quantification

A total of 11 finds were assessed and 2 duplicated X-ray plate produced. The number of objects in each material category is listed below:

Iron	3
Copper alloy	1
Bone(Wet packed)	7

6.4. Condition

6.4.1 Iron

The ironwork was generally covered in silt, sand and bulky mixed orange-brown iron corrosion with inclusions. There was no sign of active corrosion, and as long as the RH is maintained below 15% the objects should remain stable for the long term.

6.4.2 Non-ferrous Metals

6.4.2.1 Copper alloy: the copper alloy pin was covered with a thin layer of soil/silt overlying green corrosion products. Non-ferrous white metal coating was visible through this corrosion. The pin should remain stable if held below 35% RH.

6.4.3 Bone

The bone was sent wet, with silt/soil adhering, and double bagged with water in the inner bag. Objects were rinsed in tap water to remove external bulky silt/soil deposits. They were then gently brushed in reverse osmosis water, under binocular microscope at x10 magnification to

remove deposits from the incised decoration. Controlled air-drying was carried out over 24 hours. The finds were packed in perforated mini-grip bags with jiffy foam support, within an archival cardboard box. A slide of this group (sf nos 5-11) was taken by Simon Hill, and a copy is filed in the Conservation Lab collection: Osseous Materials 267. The bone is now dry, stable and ready for long term storage, although those objects with iron elements should be monitored for signs of corrosion.

6.5. Assessment:

The finds were viewed to determine the potential for further research and investigative conservation in the light of the microscope examination and X-radiographic results. N. Rogers selected some for further investigation. Details are highlighted in bold.

6.5.1 IRON Store dry at less than 15%RH.

FIND	CONTEXT	MATERIAL	ASSESSMENT
SF00002	1001	IRON	Assessment: Two nails in similar condition, both incomplete, with tips broken and missing. X-ray shows that the shorter one has non-ferrous plating on the head (perhaps tin or lead, white corrosion visible here). Sand and silt over bulky mixed brown iron corrosion, with mineralised wood remains below the head. No sign of active corrosion. **Proposed treatment:** Partial investigative cleaning to expose surfaces to allow specialist work (2 hours): MPO identify wood remains XRF non-ferrous plating.
SF00003	2001	IRON	Assessment: Object, one piece. Sand and silt over bulky mixed brown iron corrosion and inclusions(unusual fibrous white deposit at narrow end). No sign of active corrosion. X-ray shows possible tang with collar, and one edge possibly bent. **Proposed treatment:** Partial investigative cleaning to expose a cross-section and to clarify shape of tang, collar(?)and presence/absence of possible perforation(NR). (estimate 5 hours)
SF00004	1000	IRON	Assessment: Fe nail, one piece, incomplete, tip broken and missing (not new break). X-ray shows a few non-ferrous inclusions in the corrosion, but no surface plating. Sand and silt over bulky mixed brown iron corrosion and inclusions. No sign of active corrosion. No further treatment required (NR).

6.5.2 COPPER ALLOY Store dry at less than 35%RH.

FIND	CONTEXT	MATERIAL	ASSESSMENT
SF00001	1001	COPPER ALLOY	Assessment: Cu alloy pin with wound wire head. One piece, complete. Sand and silt over thin green corrosion products, excellent condition. No sign of active corrosion. Striations visible along length of shank indicate drawn wire. White metal coating visible. Recommend XRF to identify plating only as part of larger research project.

6.5.3 BONE Store at 50-55%RH, and maximum of 150 lux.

FIND	CONTEXT	MATERIAL	ASSESSMENT
SF00005	1000	BONE	Assessment: Fragment of decorated bone, possibly comb case, both ends broken and missing. Half of the bone has degraded and lost its surface. The underside of the fragment is cancellous tissue, and some silt is retained within the deeper channels. The upper, convex face has been decorated with a scheme of central inscribed dots (3 complete, 4th visible at broken end). There is a series of incised Xs along one edge, changing to parallel lines about 1.5cm from the best preserved end. This fragment joins sf6, giving a length of at least 8.2cm to the original object. **Proposed treatment:** Join the two fragments and repack if this is required for drawing or display.
SF00006	1000	BONE	Assessment: Fragment of decorated bone, possibly comb case, both ends broken and missing. Half of the bone has degraded and lost its surface. The

			underside of the fragment is cancellous tissue, and some silt is retained within the deeper channels. The upper, convex face has been decorated with a scheme of central inscribed dots (7 complete, 2 more visible at broken ends). There is a series of incised Xs along one edge. This fragment joins sf5, giving a length of at least 8.2cm to the original object. **Proposed treatment:** Join the two fragments and repack if this is required for drawing or display
SF00007	1000	BONE	Assessment: Fragment of decorated bone, possibly comb case, both ends broken and missing. Roughly 3/4 of the bone has degraded and lost its surface. The underside of the fragment is cancellous tissue, and some silt is retained within the deeper channels. The upper, convex face has been decorated with a scheme of central inscribed dots (2 complete followed by 1 deteriorated, then an area of deeper surface loss with 2 further deteriorated dots at the far end). There is a series of incised Xs along both edges, changing to parallel lines about 1.5cm from the narrow end. There is a large perforation that has fractured at this narrow end.
SF00008	1000	BONE	Assessment: Fragment of decorated bone, possibly comb case, slightly curved, and with both ends broken and missing. Roughly 2cm at the narrow end has degraded and lost its surface, but the rest is robust. The underside of the fragment is cancellous tissue, and some silt is retained within the deeper channels. The upper, convex face has been decorated with a scheme of central inscribed dots (5 complete). There is a series of incised Xs along one edge, changing to parallel lines about 1.3cm from the wider end.
SF00009	1000	BONE	Assessment: Fragment of decorated bone, possibly comb case, both ends broken and missing. Roughly 2cm of the central section of the fragment has degraded and lost its surface. The underside of the fragment is cancellous tissue, and some silt is retained within the deeper channels. The upper, convex face has been decorated with a scheme of central inscribed dots (4 complete, with 1 or 2 in the degraded area, then 3 further complete dots). There is a series of incised Xs along both edges, changing to parallel lines about 0.5cm from one end. One edge is very worn, perhaps this was the outside plate, most exposed to wear.
SF00010	1000	BONE IRON	Assessment: Fragment of bone comb, both ends broken (at rivet points) and now missing. The outer transverse bar is decorated with cross-hatching and parallel incised lines. It is attached to two tooth plates by an iron rivet at the point where these plates meet. There are remains of the second transverse retaining bar mineralised around the other end of this rivet, but the rest is missing. The teeth (15) are broken and missing. There are clear cutting marks on the exposed faces of the tooth plates. X-rayed this in two planes whilst still damp, to investigate the construction and the extent of corrosion on the rivet. The iron rivet appears from the radiograph to have a square cross-section. It still has a substantial metal core remaining, which is a potential source of physical damage to the surrounding bone if this corrodes and expands. RH<15%, which would prevent renewed iron corrosion, would dry out the bone and cause cracking. Instead, the object will need to be monitored. If the bone begins to split, or the iron displays orange powder or shiny weeping corrosion, the object should be stored with a corrosion inhibitor or perhaps an oxygen scavenger.
SF00011	1000	BONE, IRON	Assessment: Decorated cylindrical bone handle, one piece, with fragment of an iron tang in situ. There is an elaborate incised motif, interlaced foliage decoration within diamond-shaped fields, with small, incised triangles forming borders at each end. The bone is stained green (suggesting contact with copper) at the wider end, with areas of reddish-brown iron staining over parts of the exterior. The bone has deteriorated and lost its surface in this iron-stained region. The handle is cracked and there are areas missing on both ends. The wider end contains the original soil deposit, with a small fragment of mineralised wood and some pebbles.

The narrow end contains bulky reddish-brown iron corrosion and inclusions, the shape of the original Fe object (?knife) is unclear. There is a deposit of iron corrosion products on the exterior, possibly a rivet?

X-rayed this handle in two planes whilst still damp, to investigate its construction and the extent of corrosion of the iron. The iron appears from the radiograph to consist of a very thin pointed tang expanding at the shoulder. The deposit of corrosion on the side does not look like a rivet, but rather like corrosion that has penetrated the bone in this area. The iron tang is heavily mineralised, but is still a potential source of physical damage to the surrounding bone if it corrodes and expands.
An RH<15%, which would prevent renewed iron corrosion, would dry out the bone and cause cracking. Instead, the object will need to be monitored. If the bone begins to split, or the iron displays orange powder or shiny weeping corrosion, the object should be stored with a corrosion inhibitor or perhaps an oxygen scavenger.

Proposed treatment: Investigative cleaning of the narrow end of the handle could perhaps reveal the shape of the Fe implement. How was this iron secured within the handle? (estimate 3 hours).

6.6. Statement of Potential

6.6.1. The finds are now stable for the long term. Investigative conservation can proceed as required to meet the research objectives in the analysis phase.

6.7. Recommendations

Recommendations for further work are highlighted in bold in the tables. These are summarised below:

6.7.1 Further investigative conservation

I have recommended further investigative cleaning of 2 iron objects and joining of 2 bone fragments. The investigative work on the metals would involve selective, partial removal of corrosion crusts for the purposes of research. Total removal of the corrosion crusts should be undertaken if illustration/photography is required for publication.

6.7.2 Analysis and specialist support

In line with the research requirements, suggestions for further analysis and specialist support have been made, but the costs are not included below. This should be arranged after conservation has been completed.

6.7.2.1 XRF: of the plated iron nail, sf2.

6.7.2.2 Osseous materials, identification: the bone objects should be referred to a specialist if species identification is required.

6.7.3.3 MPO: It may be possible to identify features of the mineralised wood under the head of sf2, if required.

6.7.3 Storage

6.7.3.1 Packaging:

The finds have been packaged appropriately for long-term storage. All materials used are archive stable and acid-free. Plastic bags have been pierced to allow airflow within microclimates, reducing the risk of condensation and mould growth. 'Jiffy', (polythene) foam inserts have been added to the bags to provide additional support and protect against mechanical damage during transit. Any replacement of packaging materials should be carried out in consultation with a conservator.

6.7.3.2 Storage environment: Metals are packaged in a polythene 'Stewart' box with silica gel to provide a dry microclimate of less than 15% Relative Humidity which will halt any further corrosion, (Knight, 1990). The box of metalwork contained 2x100g silica gel bags and an indicator strip; it is necessary to monitor the indicator strips; **if any part of the strip turns pink the gel will need to be regenerated.**

7. ASSESSMENT OF HUMAN REMAINS

7.1 Summary

An assemblage of nearly 800 disarticulated and badly damaged human bone fragments from two contexts was examined.

The contexts also contained a small amount of non-human bone representing caprovid, pig, bird and large mammal.

The human material is likely to have derived from either a charnel deposit or from disturbed burials redeposited in the wake of past building activity. Bones were identified to element, where possible measurements were taken, and notes made of pathologies and other distinctive features. In all there were at least eleven individuals: eight adults, two children and a baby. The adults were tentatively sexed as five men and three women. Adult ages ranged from 18 to 45 plus and pathology was restricted to osteoarthritis and osteochondritis, and a single ossified haematoma.

7.2 Introduction

An archaeological watching brief was carried out by York Archaeological Trust during pavement works at St Marygate, Ripon, North Yorkshire (NGR SE 3155 7120) in May 2001.

Three boxes of human remains, with a total volume of approximately 60 litres, were subjected to a detailed examination in order to ascertain the number of individuals represented, any evidence of age and sex, and the presence of pathological lesions or other anomalies. The human remains derived from two contexts. Context 1000 consisted of spoil deposited by builders during the paving renovations (prior to the instigation of the archaeological watching brief), and yielded the vast majority of the bones (759 fragments). These had been recovered through retrospective sieving. Context 2001 was a makeup layer underlying the pavement from which a small assemblage of bones (22 fragments) was recovered. The bones were ascribed a medieval date, but could have been deposited at any time between the 9th and 16th centuries. The Anglo-Scandinavian finds recovered with the bones might suggest that they derived from the earlier part of this date range and, as such, likely to be associated with a nearby church of that period.

7.3 Methods

From the condition of the material and from the information provided by the excavators, it was apparent that the assemblage did not represent articulated human burials. It would, therefore, have been inappropriate to attempt to record the bones as complete skeletons and, instead, elements were recorded as individual fragments in a manner similar to animal bones. With the aid of reference material, Grays Anatomy (29th ed. 1946), and Bass (1995), notes were made of the type, portion and condition of each element.

Each bone was checked for the state of epiphyseal fusion, presence of pathologies or other anomalies, and, where appropriate, metrical data were recorded following Buikstra and Ubelaker (1994). The same manual provided the schemes for the complete recording of mandibles and maxillae. Careful attention was paid to pelvis and skull morphology in order to determine the gender of the recovered human remains. Metrical variation of the more dimorphic long bones (the femur, tibia and humerus) was also used to this end, but must be considered less reliable.

7.4 Results

7.4.1 Context 1000

Material from this context was very fragmentary indeed. There were only four complete major long bones and the vast majority of the material had suffered fresh breakages. This was presumably a direct result of the excavation techniques employed by the labourers prior to the implementation of archaeological monitoring. It is also likely that some material was not collected for analysis, as most of the freshly broken fragments could not be reconstructed into larger elements.

Preservation was generally good, with the bone fragments being well mineralised. There was an occasional fragment with excellent organic preservation and thus a slightly greasy texture. Colour was fairly uniform, usually a shade of pale fawn, although some less well preserved fragments tended towards buff and the better preserved were more yellow or brownish. Angularity was more varied, but most bones were moderately 'spiky' or slightly rounded. Others were distinctly rounded or decidedly battered with a rather weathered appearance. It was also apparent that most of this material had been damaged in antiquity, but as the bones could have been disturbed on a number of occasions owing to graveyard activities, 16th century construction work, and Victorian paving, it was not possible to assign this damage to any particular episode. A possible exception might be a maxilla fragment with traces of coarse mortar attached to it, which may relate to the construction of Abbot Huby's wall in the 16th century.

7.4.2 Skeletal Representation

Examination of Appendix 1 will show that all elements, with the exception of the carpals, were present, but that this representation was not particularly even.

There was a distinct preponderance of the major long bones, particularly the humerus and femur, while smaller elements, especially phalanges, tarsals and vertebrae were less common. In the case of the more delicate vertebrae this under-representation could relate to the high degree of fragmentation, but small dense bones such as phalanges are generally more resistant. The absence of the latter is unlikely to have been caused by recovery bias, as all of the workmen's spoil was sieved. Instead, the representational bias is likely to relate to the origin of the remains. If the bones represent charnel material collected during re-cutting of graves and the disturbance of earlier burials, it is likely that only the major bones will have been removed, while smaller elements, such as distal phalanges could have been completely missed. Others, such as carpals and tarsals, may have been confused with stones and thus ignored.

The small amount of skull bones may relate to a separate form of curatorial behaviour with these elements, but the high degree of reworking likely to have affected this assemblage may also explain the lower proportions of skulls, vertebrae and pelves.

7.4.3 Ageing

Determination of the age at death of human remains is based upon two main features, the development and amount of wear of the teeth, and the state of epiphyseal fusion, the final stage of which marks the cessation of bone growth in an individual. In both techniques, it is always much easier to determine a more accurate age for immature individuals as growth and development follows a clear and defined pattern. After full skeletal maturation only tooth-wear is useful for age determination. A third technique, the state of the pubic symphysis, can also be useful, but seems to be somewhat variable, and rather hard to apply. Ordinarily, a combination of these techniques would be used, but this is not possible with disarticulated material.

In all, there were three mandibles with the remains of tooth rows. Bone 210 had all teeth erupted and in wear and, according to the Brothwell scheme (1965, 69), was likely to have been from someone between the ages of 25 and 35. Bone 211 had the third molar erupting through the bone, not yet in occlusion, and was likely to have been from an individual in the region of 18 years old. A third mandible fragment (Bone 212) had no remaining teeth, but the permanent molars had all been lost a considerable time before death as the alveolar bone of their root sockets had been completely resorbed and remodelled. The state of preservation of this mandible was very similar to maxilla fragment 214. In this case the root sockets of the first and second molars were again considerably resorbed and remodelled, and the remaining incisor, canine and premolar were extremely heavily worn. The Brothwell scheme would place this individual at well over the age of 45. A second maxilla fragment, Bone 215, is likely to have been from an individual aged between 25 and 35.

In the case of epiphyseal fusion, the vast majority of the bones were fused and thus described as adult. These included the medial epicondyle of the clavicle, which normally completely fuses by the age of 30 years. In addition, there were a number of smaller unfused bones. These included the femoral and tibial fragments of at least two children—the lengths of the remains suggesting ages of around 5 and 10 years—and a single unfused lumber vertebra. There was also a tiny ulna that must have belonged to a newborn baby.

There were three pubic symphysial fragments. The Todd and the Bedford systems for ageing by definition of surface morphology (outlined in Buikstra and Ubelaker (1994)) were employed. The Todd system indicated two individuals aged around 25-26 years, and a third between 27 and 30. The Bedford system indicated two individuals between the ages of 25 and 29 and a third between 30 and 34.

7.4.4 Sexing

The pelvis and skull display considerable sexual dimorphism in the adult skeleton, and as such are most useful for gender differentiation. Unfortunately, these are also some of the more delicate elements and, in the case of the current material, had suffered particularly badly from the depredations of past and more modern activities.

Several pieces of skull with distinctive morphology had survived, but it should be remembered that skulls are normally sexed on the basis of a combination of these features, rather than any one on its own, and the following should therefore be viewed with some caution.

The skull fragments included four from the ventral aspect of the frontal on which are found the orbits and brow ridges. Three bore particularly prominent brow ridges, a more masculine feature,

while the fourth was more smooth and feminine in appearance. A fifth frontal fragment had a distinct ridge for the temporal muscle, again a more masculine trait. The degree of nuchal muscle attachment prominence on the occipital bone is another useful sex indicator. A single badly damaged fragment was recovered which appeared more masculine. The size of the mastoid process is also sexually dimorphic, and in the case of the St Marygate material, there were two appropriate fragments. Both of these appeared fairly robust and masculine, but one was severely damaged.

Features useful for the sexing of the pelvis are the angles of the sciatic notch and the sub-pubic area, the size of the acetabulum and, less reliably, the presence of the pre-auricular sulcus. Unfortunately, there were no undamaged pelves. The most complete bore a very large acetabulum, no pre-auricular sulcus and the remains of a narrow sciatic notch. Another ilium fragment again had the remains of a narrow sciatic notch and no pre-auricular sulcus. It is probable that both of these bones were from males. Two pubis fragments were sufficiently complete to retain a narrow, and therefore masculine, sub-pubic angle. An immature ilium had a wide sciatic notch, but no pre-auricular sulcus. Immature bones are hard to sex on the basis that they have not developed full dimorphic traits, and as such the wide sciatic notch, a female characteristic in adults, could be due to immaturity. The absence of the pre-auricular sulcus is more masculine, but has also been observed in females.

A less reliable technique for sexing post-cranial bones is on the basis of relative size. Whilst male bones are generally more massive and robust than those of females, there is obviously some degree of overlap. From examination of the bones, it was possible to note the general size and robustness of elements. Wherever possible this was supported by measurements and comparison with the standard size ranges published in Bass (1995). The most dimorphic elements are the femur, humerus and tibia (see Appendix 5). Measurements of the femoral head indicated that four rights and three lefts were likely to belong to males, while a fourth left was of intermediate size. In the case of the humerus two lefts and five rights fell into the male size range, while a third left was possibly also male (on the basis of the width of the distal epicondyle). Measurements of the tibia displayed a more even distribution, three bones falling into masculine size ranges, two into female, another possible female, and a seventh which was intermediate in dimensions.

Overall, the available sexing evidence, which should admittedly be viewed with some measure of caution, indicates that while both sexes were represented among the St Marygate material, there was a preponderance of male remains.

7.4.5 Minimum number of individuals

Using the ageing, sexing and element representation information it is possible to estimate the minimum number of individuals in the St Marygate assemblage. The number of humeri indicated a minimum of eight adults. Of these five were probably male, and there were at least three female tibiae. In addition, there were the remains of at least two children and one newborn baby. A minimum number of eleven individuals can thus be obtained.

7.4.6 Pathology

Most of the bones examined bore no pathological lesions. There was no evidence of violence, infectious conditions or dietary diseases. Pathologies were largely restricted to osteoarthritis and osteochondritis. The marginal lipping of joints associated with osteoarthritis was most common

in the spine, the joints of the knee (particularly the distal femur) and the joints of the elbow. In the case of the knee and elbow, the degree of lipping was generally mild, and there was no associated eburnation that might indicate destruction of the joint cartilage. Osteoarthritis was far more common and more severe in the spine, particularly in the lower thoracic and lumber vertebrae. Schmorl's nodes, the result of traumatic injuries to the vertebral column, were also common, affecting eight out of fourteen thoracic and four out of twelve lumber vertebrae. Osteochondritis, the equivalent of Schmorl's nodes in non-vertebral joints, was present in two cases, affecting the scapula and first metatarsal. In addition, there was a single case of an ossified haematoma on the ventral surface of tibia 53.

7.4.7 Non-human remains

Five fragments of non-human bone were recovered. These included caprovid and pig ulnae, large mammal long bone shaft and butchered vertebral fragment, a piece of unidentified mammal and a bird tibio-tarsus. In addition, there was a very small oyster shell fragment.

7.5 Context 2001

A small assemblage of 22 bones was recovered from this context, all of which could be identified as human. The condition and colour of the material was similar to the majority of bones from Context 1000. Elements of the head, arm, leg, spine and foot were present, and it is likely that two adult individuals, a male and a female, were represented.

7.6 Discussion and statement of potential

From the variable state of preservation, the fragmented condition and the elemental bias of the assemblage, it is clear that the bones of this deposit have been removed from their original place of burial, and may have been further reworked on a number of occasions. Some of the bones were particularly battered in appearance, while others seemed slightly weathered.

It is possible that the origin of the bones may have been from a charnel deposit. This would have involved the accidental damage and removal of bones from their initial context of burial, after they had been cut by later grave digging activities. The lack of grave markers and the concentrated use of urban cemeteries made the disturbance of previous burials a constant problem, a remedy for which was often found in charnel houses or ossuaries. In other circumstances, bones may have been deposited in more secluded corners of the graveyard and this may have been the case with the St Marygate assemblage, where more deliberate relocation of skeletal remains might otherwise have formed a larger and more complete assemblage. However, judging from the variable state of preservation, it is possible that bones entered the charnel deposit over a long period of time.

An alternative explanation might be that more complete burials were disturbed (e.g. during the building of Abbot Huby's wall, or Victorian paving activity), a process that involved their fragmentation, intermingling, and redeposition in backfill. Such activity could have cut through several burials of varying dates and states of preservation.

Little can be deduced from such incomplete skeletal remains, and, with at least eleven individuals represented, it would not be sensible to try and reconstruct complete skeletons. Again we should be cautious when inferring too much from any one feature of the skeletal remains

when we do not have complete, ageable and sexable bodies. The age range of the individuals and the wear on their teeth seem fairly typical of medieval assemblages.

What little ageing information is available for the current assemblage suggests that, with perhaps one older exception, these people, whilst appearing healthy and well nourished, died as children, or in the prime of their lives.

7.7 Recommendations

An assemblage of charnel material is of limited value for further analysis. However, it may be worth curating some skeletal elements for possible scientific work such as isotope analysis and dating.

7.8 Retention and disposal

All of the current material should be retained for the present.

7.9 Archive

All material is currently stored in the Environmental Archaeology Unit, University of York, along with paper and electronic records pertaining to the work described here.

7.10 Acknowledgements

The author is grateful to Mark Johnson of York Archaeological Trust for providing the material and the archaeological information.

Appendix 1. Elements recorded from Context 1000.

Key to abbreviations: w/ = with, ad. = adult, im. = immature, juve. = juvenile, L = left, R = right, cran. = cranial, caud. = caudal, dors. = dorsal, vent. = ventral, med. = medial, lat. = lateral, frag. = fragment(s), prox. = proximal, dist. = distal, artic. = articulation, surf. = surface, vert. = vertebra, NB = Newborn, PM = postmortem, AM = antemortem.

Element	Fragments	Total	MNI
Cranium	1x frontal w/ orbits; 3x frontal w/ L orbit; 1x frontal w/ R orbit; 2x L zygomatic; 1x L temporal; 1x R temporal; 1x occipital; 63x skull frag.; 1x styloid; 1x foramen magnum	75	4
Maxilla	2x complete, 1x R	3	3
Mandible	2x complete, 1x R; 1x chin; 1x R condyle	5	3
Cervical vertebrae	1x atlas; 1x axis; 5x vert., all probably deposited in articulation; 1x im. atlas frag.	8	2
Thoracic vertebrae	14x vert.	14	2
Lumber vertebrae	12x ad. vert.; 1x spine; 1x juve vert.; 5x vert frag. .	19	4
Vertebrae	5 body frag.; 15x spine frag.	20	1
Sacrum	1x complete; 2x vert.; 6x frag.	9	2
Sternum	1x manubrium; 4x sternum frag.	4	2
Ribs	8x ad. vent. artic.; 34x ad. dors. artic.; 58x shaft frag.; 1x juve	101	3
Clavicle	2x ad. L; 1x ad. R; 2x ad. L proximals; 2x ad. L distals; 3x ad. R distals	9	4
Scapula	2x ad. L glenoid frag.; 2x ad. R glenoids; 1x ad. R glenoid frag.; 1x L ad. spine and acromion, 1x R spine; 2x L lat. margin; 1x frag.; 1x acromion frag.	11	4
Humerus	4x ad. L distals; 2x L dist. shaft; 4x L shaft frag.; 7x R ad. distals; 1x R ad. trochlea; 2x R shaft frag.; 1x ad. L proximal; 1x R ad. proximal; 1x head frag.; 2x shaft	25	8
Radius	1x ad. L complete; 2x L shaft frag.; 1x ad. L proximal; 1x ad. R proximal; 1x R prox shaft; 1x ad. R distal; 1x R dist. shaft, 3x shaft frag.; 1x juve. R prox; 1x juve. L distal	13	4
Ulna	2x ad. L complete; 2x ad. L proximals; 3x ad. R proximals; 1x R prox shaft frag.; 1x R shaft frag.; 2x ad. R distals; 2x R shaft frag.; 1x L shaft; 3x shaft frag.; 1x juve. R distal; 1x juve. L distal; 1x NB. R	20	7
Metacarpal 1	3x ad. L; 3x ad. R	6	3
Metacarpal 2	3x ad. L; 4x ad. R; 1x ad. R distal	8	5
Metacarpal 3	2x ad. L; 1x ad. L proximal; 2x ad. R; 1x ad. R proximal	6	3
Metacarpal 4	2x ad. L; 1x L proximal; 1x ad. R distal	4	3
Metacarpal 5	1x ad. R; 1x ad. R proximal; 1x im. R	3	3

Element	Fragments	Total	MNI
Phalanges	22x ad. firsts; 4x ad. seconds	26	2
Pelvis	7x acetabulum frag.; 1x juve ilium; 1x ad. R innominate; 24x frag.; 1x ad. L ilium; 3x R pubis	37	3
Femur	4 x L ad. proximals, 4 x R ad. proximals, 2 x R ad. caputs, 3 x R prox. shaft, 1 x im. caput; 1x im. L prox. shaft, 1 x im. L shaft; 1x R im. diaphysis; 5 x L ad. distals, 2x L ad. lat. condyles; 5x R ad. distals; 1x R im. dist. epiphysis; 10x shaft fragments; 5 condylar frag.; 1x caput frag.; 1x im. shaft frag.; 1x juve caput.	48	8
Patella	1x R, 1x L	2	1
Tibia	2x ad. L proximals; 3x ad. L prox. med.; 1x ad. L prox. lat.; 1x L shaft; 1x im. proximal; 1x complete R ad.; 2x ad. R proximals; 2x ad. R prox. med.; 1x ad. R prox. lat.; 2x R prox shaft; 3x ad. L distals; 1x ad. dist. frag.; 3x prox. frag.; 6x shaft frag.	29	9
Fibula	3x ad. L distals; 1x ad. R distals; 1x ad. L proximal; 1x ad. R proximal; 8x shaft frag.; 1x juve prox.	15	4
Calcaneus	1x ad. L; 1x ad. L frag.; 3x ad. R; 1x juve L	6	4
Talus	1x ad. L; 2x ad. R; 1x juve L	4	3
Tarsals	1x ad. L cuboid frag.	1	1
Metatarsal 1	1x ad. L; 1x im. L	2	1
Metatarsal 2	2x ad. L; 1x ad. R	3	2
Metatarsal 3	1x ad. L; 1x ad. R; 1x ad. R proximal	3	2
Metatarsal 4	1x ad. L proximal; 2x ad. L; 2x ad. R; 1x ad. R proximal	6	3
Metatarsal 5	2x ad. L;3x ad. R	5	3
Metatarsal	1x shaft frag., 1x juve. shaft	2	2
Metapodial	2x shafts, 1 prob. immature	2	2
Phalanges	2x ad. first	2	1
Subtotal		**556**	

Element	Fragments	Total	MNI
Major longbone	82x shaft frag.	82	
Minor longbone.	31 shaft frag.	31	
unid.	90 frag.	90	
Subtotal		**203**	
Total		**759**	

Appendix 2. Mandibles and maxillae (following Buikstra and Ubelaker 1994, pp. 47-68).

1. Wearstages for molars are represented by one number for each cusp, with the lateral cusps recorded towards the outside of the recording box and with the distal cusps on the top row of paired numbers (ibid, pp.52-53).
2. Calculus is recorded on the basis of 0=absent and then 1-3= present, ranging from slight to severe (ibid, p.56), position being recorded as L = lingual, B= buccal.
3. Hypoplasia records the type of hypoplastic lesion present on the tooth (ibid, pp. 56-57).
Position records the height of the hypolplastic lesion (in mm) above the cemento-enamel junction.
4. B-L and M-D are measurements of respectively the Buccal-Lingual width and Medio-Distal length of the teeth (ibid, p. 62).
5. Caries are recorded with a number representing the type and position, and a letter (B or L) indicating the tooth surface on which they are located (ibid, pp. 54-55).

Bone No. 210
Mandible **R** **L**

Tooth	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Presence	2	2	2	2	2	2	2	2	2	2	5	2	2	2	2	2
Wearstage	3 3 3 3	5 4 6 5	8 7 9 8	4	4	4	3	4	4	3		3	3	6 8 8 9	4 6 5 6	3 3 3 3
Calculus	0	0	0	0	0	0	1B	1B	1B	0		1B	1L	1L	1L	1L
Hypoplasia	0	0	0	1	1	1	0	0	0	1		1	1	0	1	0
Position				2.6	3.7	3.9				2.2 6.9		3.8	2.3		2.0	
B-L (mm)						7.3			5	5.7		7.1	7.1	10. 2	9.6	8.9
M-D(mm)						6.2			4.6	5.3		6.2	6.4	10. 2	9.4	9.7

Very heavy wear to the M1's, moderate alveolar recession but there are no caries or abscesses. Calculus is mainly between the teeth.

Bone No.214
Maxilla **R** **L**

Tooth	**8**	7	6	5	4	3	2	1	1	2	3	4	5	6	7	**8**
Presence	5	4	4	2	2	2	2	5	5	3	3	3	3	3	3	3
Wearstage				7	7	6	4									
Calculus						1B,1L	1B									
Hypoplasia						1										
Position						7.2										
B-L (mm)				9.3	8.9	8.5	6.1									
M-D (mm)				5.6	6.3	7.7	6.8									

May belong with mandible fragment 212. M1 and M2 lost AM, with almost complete resorption of root sockets. M3 possibly lost PM, but there is considerable recession of alveolar bone

Bone No.211

Mandible **R** **L**

Tooth	**8**	7	6	5	4	3	2	1	1	2	3	4	5	6	7	**8**
Presence	5	2	2	5	5	5	5	5	5	5	5	5	2	2	2	2
Wearstage		2 2 2 2	6 3 6 3										1	2 6 2 6	1 2 1 2	1 1 1 1
Calculus		L1	0										L1	L1	0	0
Hypoplasia		0	1										1	1	1	0
Position			4.2										4.9	1.8 5.3	3.1	
B-L (mm)													8.3	11.1	11.1	10
M-D (mm)													7.6	11.4	11.6	10.5
Caries		1B	0											1B 2B	0	0

Robust, probably male. M3 is erupting through bone, suggesting an age of ~18 years old. Five cusps on each of the M1's - Bass type >Y5'. All the caries were very small, almost 'pinpricks'.

Bone No. 212

Mandible **R** **L**

Tooth	**8**	7	6	5	4	3	2	1	1	2	3	4	5	6	7	**8**
Presence	4	4	4	5	5	5	3	3	3	3	3	3	3	3	3	3

M1, 2 and 3 all appear lost AM, with complete resorption of alveolar bone. That for M1 is so great that it may have been abscessed, but there is no related infectious reaction.

Bone No. 215

Maxilla **R** **L**

Tooth	**8**	7	6	5	4	3	2	1	1	2	3	4	5	6	7	**8**
Presence	2	2	2	2	2	5	5	5	2	2	2	2	2	2	2	2
Wearstage	33 33	45 44	57 56	4	4				2	3	3	3	4	75 65	54 44	33 33
Calculus	1B	1B	2B 1L							1B	3B	2B 1L	1B	2B 1L	1L	
Hypoplasia	0	0	0	1	1				0	1	x	0	0	1 , 5	1	1
Position				2.1	1.8					6.9				2.2 3.6	2.6	2.7
B-L (mm)									6.4	5.7	8.1	9.3	9.6	10.6	10.6	9.9
M-D (mm)									7.2	5.1	7.1	6.0	6.3	9.9	8.5	7.2

Appendix 3. Pathological Lesions from Context 1000 - see Appendix 1 for key to abbreviations.

Bone No.	Element	Pathology
5	Femur	Slight depression ~10 mm across on vent. surf. of caput. Doesn't penetrate cancellous bone, could be PM.
19	Femur	Slight osteophytes on ant. and post. margins of patella arctic. surf.
26	Femur	Very slight osteophytes at cranial margin of patella arctic. surf. and around the margin of the intercondylar fosse.
27	Femur	Moderate osteophytes around margins of the patella arctic. surf. and intercondylar fosse. Also some slightly raised and rugose areas of bone on the arctic. surfaces of the patella arctic. surf. and medial condyle.
42	Patella	Slight marginal osteophytes, particularly on the lat. surf.
53	Tibia	Raised lump of pitted and striated additional bone extending from 106 - 157 mm from the proximal arctic. of the medio-vent. aspect of the shaft. The whole bone surface around the lump is also slightly pitted and striated. Could be an ossified haematoma.
54	Tibia	Very slight osteophyte around ventral margin of prox. arctic.
61	Tibia	Semi-circular depressions approx. 1 mm wide and 30 mm long on lat. aspect of shaft. Could be blood vessel impressions.
92	Talus	Slight marginal osteophytes on the ant. caud. artic. surf.
93	Talus	Very slight osteophyte on post. margin of caud. arctic. surf.
94	Calcaneus	Slight osteophyte on margins of vent. aspect of sustentaculum tali
101	MT1	Osteochondritic lesion in volar portion of prox. arctic. surf.
132	Scapula	Osteochondritic lesion ~6 mm across in centre of glenoid arctic. surf.
133	Scapula	Moderate osteophytes round cranial aspect of glenoid margin.
156	Humerus	Linear osteochondritic lesion c. 12 mm long in groove between trochlea and capitulum. Area of slightly raised bone approx. 9 mm long on capitulum.
157	Humerus	Moderate osteophytes on medial margin of trochlea
169	Ulna	Slight osteophytes around prox. arctic. margins.
170	Ulna	Very slight osteophytes on med. margin of prox. arctic.
171	Ulna	Slight osteophytes around prox. arctic. surfs., particularly on internal margins.
173	Ulna	Very slight osteophytes around margin of radial notch.
206	MC4	Very slight osteophytes round proximal margins.
207	MC4	Very slight osteophytes round proximal margins.
351-4	Ribs	Moderate osteophyte development on ventral articular surfaces.
372-9	Ribs	Slight osteophyte development on dorsal articular surfaces.

380-6	Ribs	Moderate osteophyte development on dorsal articular surfaces.
387-9	Ribs	Severe osteophyte development on dorsal articular surfaces.
427	Phalanx	Slight marginal osteophytes around prox. arctic.
428	Phalanx	Ossified ligament attachments at distal end.
435	Axis	Slight osteophyte on vent. aspect of odontoid.
436	Atlas	Slight osteophyte on vent. margin, corresponding to 435 above.
442	Thoracic vert.	Very slight osteophytes around caud. and cran. margins.
443	Thoracic vert.	Slight osteophytes around caud. and cran. margins. Three small Schmorl's nodes, 1 cran. and 2 caud.
444	Thoracic vert.	Linear Schmorl's nodes on caud. surf.
445	Thoracic vert.	Large round Schmorl's node on caud. surf.
446	Thoracic vert.	Linear Schmorl's node on caud. surf. Very slight osteophytes around caud. margin.
447	Thoracic vert.	Linear Schmorl's node on caud. surf., moderate osteophyte development on ventral aspect of caud. margin, and very slight osteophyte on cran. margin.
448	Thoracic vert.	Med-lat linear Schmorl's nodes on caud. and cran. surfs.
449	Thoracic 12	Severe osteophytes on caudal margin, Schmorl's nodes on caud. and cran. surfs., ossified ligaments within neural arch.
450	Thoracic vert.	Moderate - severe osteophytes on caud. and cran. margins, slight dorso-vent. angulation of vertebral body. Possible Schmorl's on caud. surf., but damaged.
454	Vertebra	Slight cranial marginal lipping.
460	Lumber vert.	Small Schmorl's node on cran. surf., slight osteophyte development on the right caud. margin
461	Lumber vert.	Schmorl's node on cran. surf. Severe osteophytes on L cran. margin, more moderate on R cran. and L caud. margins.
468	Lumber vert.	Moderate - severe osteophytes on R cran. margin.
476	Lumber vert.	moderate osteophytes around caud. and cran. margins.
477	Lumber vert.	Schmorl's node on caud. surf., osteophytes - severe on R caud. and cran. margins, slight - moderate on L caud. and cran.
478	Lumber vert.	possible shallow Schmorl's node on caud. surf. Osteophytes - severe on remains of L cran. margin and on L caud. surf, becoming more slight towards the R side.
482	Sacral vert.	Slight osteophytes on R cran. margin.
483	Sacral vert.	Slight osteophytes on L caud. and cran. margins.
523	Pelvis	Slight marginal lipping of acetabulum.

Appendix 4. Elements recorded from Context 2001- see Appendix 1 for key to abbreviations.

Bone No.	**Element**
760	1x R ad. femur lat. condyle, slight osteophytes on lateral margin
761	1x ad. dist. L tibia
762	1x L temporal, small mastoid
763	1x ad. R complete MT1
764	1x ad. R talus
765	1x ad. R ulna
766	1x thoracic vertebra
767	1x vertebral frag.
768	1x metapodial frag.
769	1x L scapula frag. glenoid and part of coracoid
770-74	5x major long bone fragments
775	1x minor long bone fragments
776	1x incisor
777-81	5x other fragments
	Total fragments : 22

Appendix 5. Measurements (following Buikstra and Ubelaker 1994)

			Measurement (mm)								
Bone No.	Context	Element	25	26	27	28	30	31	32	33	biforaminal L
210	1000	Mand	31.9	29.4	10.2	96.7	28.7	43.8	49.5	63.1	40.7
211	1000	Mand	32	29.7	13.4	97.5	36	46.7	57.6	63.7	43.8

				Measurement (mm)						
Bone No.	Context	Element	Side	35	36	37	38	39	GlenL	GlenB
121	1000	Clavicle	R	149.3	15.7	14.7				
123	1000	Clavicle	L	150.7	13	9.5				
131	1000	Scapula	R							34
132	1000	Scapula	R					106.1	39.9	27.9
133	1000	Scapula	L						34.9	

				Measurement (mm)					
Bone No.	Context	Element	Side	40	41	42	43	44	Dimorphism
141	1000	Humerus	L		69.6				M
142	1000	Humerus	L		69.5				M
143	1000	Humerus	L		64				M?
151	1000	Humerus	R		65.8				M
153	1000	Humerus	R		64.2				M
154	1000	Humerus	R		67.6				M
155	1000	Humerus	R		66.6				M
157	1000	Humerus	R		68.3				M

				Measurements (mm)						
Bone No.	Context	Element	Side	69	70	71	72	73	74	Dimorphism
44	1000	Tib	L		75.9					
53	1000	Tib	R	362	81.1	53.3	40.5	29.7	115	M
54	1000	Tib	R		71.3		29.7	24.8	82	F
55	1000	Tib	R		68.2					F
58	1000	Tib	R				32.5	21.1	88	F?
60	1000	Tib	R				35	27.6	100	M
61	1000	Tib	R				34.1	21.7	90	~
62	1000	Tib	L			54.1				M

				Measurement (mm)									
Bone No.	Context	Element	Side	60	61	62	63	64	65	66	67	68	Dimorphism
1	1000	Fem	L				44						~
2	1000	Fem	L				54						M
3	1000	Fem	L				52						M
4	1000	Fem	L				50						M
5	1000	Fem	R				54	33	40				M
6	1000	Fem	R				51						M
7	1000	Fem	R				52	31	38				M
8	1000	Fem	R					29	35				
10	1000	Fem	R				54						M
11	1000	Fem	R					33	35				
17	1000	Fem	L			83							
25	1000	Fem	R			89							
27	1000	Fem	R			78							

				Measurement (mm)							
Bone No.	Context	Element	Side	45	46	47	48	49	50	51	52
163	1000	Radius	L	267	14	18					
169	1000	Ulna	L				298	18	15	257	
170	1000	Ulna	L				246	16	13	218	

				Measurement (mm)			
Bone No.	Context	Element	Side	77	78	GL	Notes
91	1000	Talus	L			53.3	
92	1000	Talus	R			62.4	
93	1000	Talus	R			49.2	
100	1000	Talus	L			30.6	juvenile
94	1000	Calcaneus	R	82.8	40.8		
95	1000	Calcaneus	R	86.9			
99	1000	Calcaneus	L	37.6			juvenile
101	1000	MT1	L			61.6	
763	2001	MT1	R			77.3	

8. DISCUSSION AND CONCLUSIONS (Figure 5)

Arguably the most significant aspect of the watching brief results was the discovery of human remains and the elucidation of the approximate spatial limits of the cemetery they occupy to both north and south along the axis of the pavement. Human remains do not appear to have been encountered in the large area south of Area 1 and were not present within Area 3. Such remains were restricted therefore to Areas 1 and 2. It is probable that the cemetery extends north of Area 2 into that part of the pavement occupied by the extant concrete slab, though for how far is not known. On the basis of these assumptions, the north - south distance across the cemetery at this point (and this point only) can be estimated as being in the region of 15m - 20m. It can also be reasonably deduced that the remains uncovered in the pavement works form a part of that cemetery uncovered in the Ladykirk excavations of 1955 and the St. Marygate excavation of 1974. It will be noted in Figure 5 that the areas in which human remains were uncovered in the watching brief bears some coincidence with the extents of burials revealed in the earlier excavations. As such the bone from Areas 1 and 2 would relate to burials east and south-east of the chancel of the simple two celled church apparently associated with this cemetery. The report of burials under St. Marygate (see Section 2 above), may also relate to this same cemetery. It has been stated in section 2, that datable artifacts associated with certain of the burials uncovered in 1955 cover the later 9th to early 11th centuries; though it is by no means certain that these dates span the entire active life of the cemetery. If one accepts the argument for a pre end of the 13th century date for the laying out of the road of St. Marygate then the burial ground would appear to be redundant by this time at least (Hall and Whyman 1996, 140). Unfortunately, no additional close dating evidence has been provided by the watching brief. All that can be said further in this respect is that human remains do extend under, and therefore may be assumed to be earlier than, Abbot Huby's Wall, which itself is considered to date to around 1505.

The human remains themselves have, despite their essentially unstratified and disarticulated nature, provided an amount of interesting information. The remains represent at least eleven individuals, eight adults, two children and a baby. Furthermore, these appear to be of both sexes. Their condition suggests the likelihood that the bones were disarticulated prior to their recent disturbance during the pavement works. Whether such disturbance(s) occurred during the creation of the street of St. Marygate and/or subsequent road/pavement works or during the construction of Abbot Huby's Wall is uncertain. Indeed it is possible that the remains have been disturbed on a number of occasions.

The observations of parts of the foundations of Abbot Huby's Wall were of some interest in that they highlighted apparent variations. These variations concerned depth, materials and presence or absence of projecting foundation offset. Given the above ground homogeneity of the wall in the areas examined this is of some note. It may be that this disparity reflects earlier origins for parts of the foundations?