SOUTH BANK DEVELOPMENT
Archaeological Test Pit Evaluation Peterborough

Duncan Mackay

CAMBRIDGE ARCHAEOLOGICAL UNIT
UNIVERSITY OF CAMBRIDGE

South Bank Development, Peterborough
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Duncan Mackay
with contributions by Andy Hall,
Quita Mould and Anne de Vareilles

Cambridge Archaeological Unit
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Summary

A programme of evaluation comprising a ground probing radar survey (GPR), followed by the excavation of seven 2m x 2m test pits was undertaken on the south bank of the River Nene, Peterborough, on the site of the proposed South Bank development.

Two of the test pits lay within the footprint of an 18th/19th century canal basin, and exposed deposits dating to the 19th century. One of the test pits could not be fully excavated. The remaining four holes produced a sequence of waterlogged river deposits, but no archaeology or artefacts were present.

Introduction

An archaeological test pit evaluation was carried out by the Cambridge Archaeological Unit (CAU) between 13th and 17th June 2005 on the site of the South Bank redevelopment in Peterborough (NGR 519400E 598100N) (Fig 1). The evaluation was preceded by a GPR survey undertaken by Utsi Electronics.

The site lies at an approximate height of 5m AOD. Much of the site is currently occupied by retail outlets and associated car parks.

Archaeological and Historical Background

The background to the site's history has been fully outlined in a desktop study (White 1998), and recently summarised with additional data (Bingham 2005). A brief outline only is included here.

The site lies on the south bank of the River Nene, to the south of the medieval town. Palaeolithic tools have been found in the local area, but none close to the site itself. A Bronze Age palstave was recovered from SW of the development area, and a piece of Bronze Age pot and an Iron Age canoe were found on the north bank of the Nene in river deposits by the bridge. Roman and early medieval settlement is known in the vicinity, but only stray finds have occurred near the development site. Medieval Peterborough was a thriving town centred on the cathedral. The town bridge marks the site of the medieval river crossing, and medieval and post medieval fairs were held on both sides of the bridge on the south bank. Most known medieval activity, however, was restricted to the northern side of the river. Maps dating to 1720, 1844 and 1860 show a large canal inlet on the site, but this had been infilled by the production of the 1888 OS map, the site being occupied by industrial buildings. Maps pre-dating the 18th century show the site as being open fields.

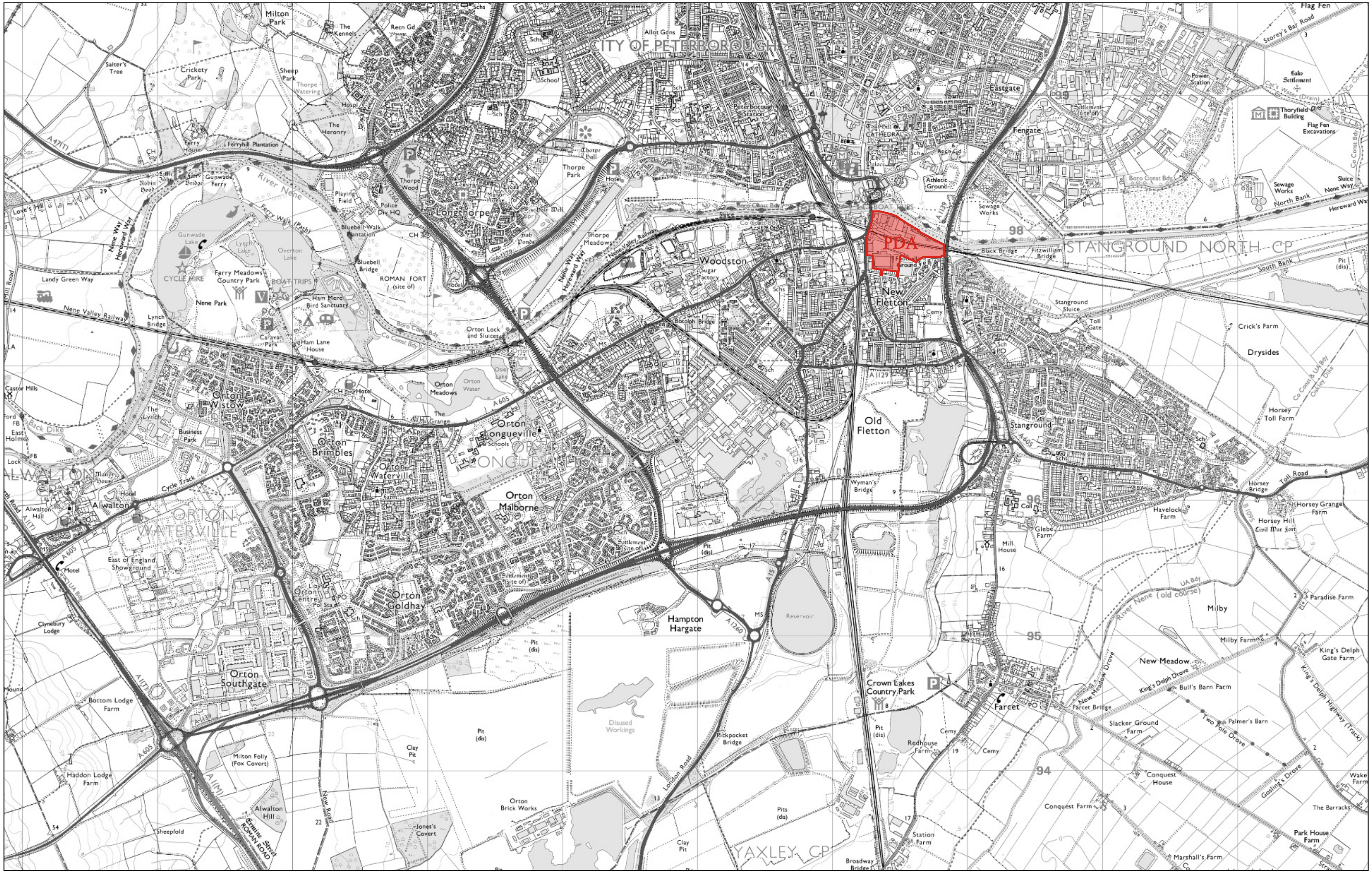
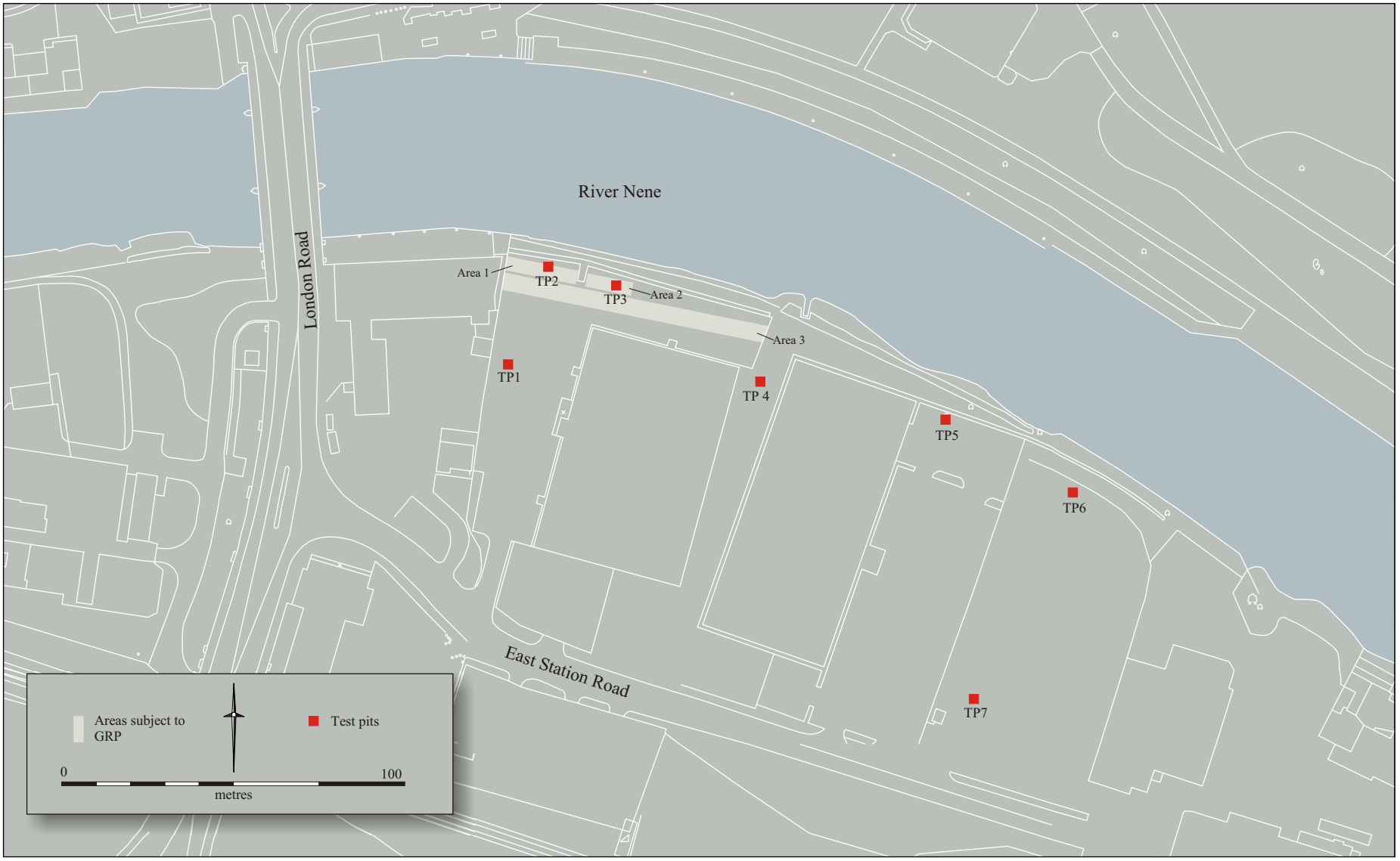


Figure 1: Location of the PDA within the City of Peterborough

X = 519197.1251 Y = 298214.0301



X = 519598.9856 Y = 297967.4437

Figure 2: Location of Test pits and Areas subjected to GPR

Aims and Objectives

The aims and objectives, as outlined in the Specification document (Bingham 2005), were:

to identify the presence/absence of buried archaeological remains

to determine (where possible) the nature, depth, extent, character and date of any archaeological deposits or features encountered

to determine the condition or state of preservation of any archaeological deposits or features encountered

to identify the depth/extent and complexity of stratigraphy present

to determine the likely range, quality and quantity of artefactual and palaeoenvironmental evidence present

to determine the significance of any archaeological remains present

to place the archaeology of the site within its local, regional and national context with reference to local, regional and national resource assessments and research frameworks

to provide information on the extent and date of modern disturbance, and the extent and date of made ground and levelling deposits

to produce a deposit model, characterising the depositional sequence across the investigation area

to make the results of the investigation available

Particular emphasis was placed on:

the location and characterisation of buried remains relating to canals and barge basins

the characterisation of prehistoric and historic activity set back from the river's wet margins

the environmental history of the river margins through the depth and dating of the deposit sequence

the identification of horizons which may be associated with human activity

Methodology

The evaluation strategy consisted of two stages, firstly a Ground Penetrating Radar (GPR) survey along the northern edge of the B&Q carpark, and the digging seven 2m x 2m test pits on the south bank of the River Nene to complement and expand upon data recovered from previous surveys (Fig 2).

The GPR survey, although slightly hampered by the presence of reinforced concrete beneath the tarmac surface of the carpark, was able to suggest the location of the edge of the known canal basin (the full report is included in Appendix 4).

The test pits, mostly over tarmac or concrete, or both, were sawn to the appropriate size and then broken out by a mechanical excavator. A *breaker* and a narrow, toothed bucket were used to excavate hard-standing and rubble, followed by a 2m wide toothless ditching bucket once non-rubble deposits were encountered. The pits were excavated either to the full reach of the mechanical excavator, or as far as deemed appropriate given the unique circumstances of each pit. The working area of each pit was fenced off from public access, and the spoil laid out on plastic sheeting. Because of the sheer quantity of spoil produced, a sample of each deposit was hand-sorted for artefacts, but metal detecting was hampered by the presence of iron reinforcements within the underlying concrete.

Access into the test pits was forbidden at all times, and all recording was conducted at the surface with reference to the spoil brought to the surface by the machine. While this imposed obvious limitations on the production of a detailed section, (particularly in severely flooded pits) it was more than adequate for recording a broad sequence of deposits and relevant depths. Each pit excavated was recorded by schematic section and photography (on both film and digital media). Relevant layers were environmentally sampled. Holes were backfilled immediately after recording was finished.

The designated CAU site code was STP05. The primary record is stored in the CAU archive.

Results

TP1

Test Pit 1 was located in the western-central area of the B & Q carpark. The water table was reached at a depth of 1.30m (3.67m AOD), beyond which it was very fast flowing. Subsequently, the lowest 2m of the pit was never actually seen in section due to the depth of standing water, and the sequence was recorded according to the deposits raised in the machine bucket (Fig 3). At a depth of 4m (0.97m AOD), where excavation ceased, late 19th century material was still being exposed in some quantity, suggesting that Test Pit 1 lay well within the cut of the canal basin. A representative sample of the 19th century domestic rubbish was collected, but no environmental sampling was conducted.

Context	Deposit depth	Deposit description	Actual depth from surface
[001]	0.14m	Tarmac	0-0.14m
	0.23m	Reinforced concrete	0.14-0.37m
	0.08m	Compacted bedding stone	0.37-0.45m
	0.21m	Compacted black clay-silt, coal and brick fragments	0.45-0.66m
	0.60m	Mid brown clay-silt, brick, coal, ash, slate	0.66-1.26m
[002]	0.84m	Stone (cornbrash) and broken red brick rubble 19th/20th century	1.26-2.10m
[003]	0.60m	Cornbrash and brick rubble within a black fine silt matrix, containing 19th century glass and ceramics	2.10-2.70m
[004]	0.90m	Black gravelly silt with cornbrash and brick rubble containing large amounts of 19th century domestic rubbish incl. glass, ceramic, leather shoe pieces, and a rubber over shoe	2.70-3.60m
[005]	0.40m+	Fine black silt, cornbrash and brick rubble, moderate gravel containing 19th century domestic rubbish incl. glass, ceramic, and leather shoes	3.60-4.00m

TP2

Test Pit 2 was located in the NW corner of the B & Q carpark. The water table was reached at a depth of 1.50m (3.34m AOD), beyond which it was very fast flowing. Approximately the lowest 1.50m of the pit was never actually seen in section due to the depth of standing water, and the sequence was recorded according to the deposits raised in the machine bucket. At a depth of 3.30m (1.54m AOD), where excavation ceased, 19th century material was still being exposed (Fig 3), suggesting that Test Pit 2 lay well within the cut of the canal basin. The quantity of water flooding into the test pit, combined with the slumping of material from the side, made further excavation unfeasible. A representative sample of the 19th century domestic rubbish was collected, but no environmental sampling was conducted.

Context	Deposit depth	Deposit description	Actual depth from surface
[006]	0.09m	Tarmac	0-0.09m
	0.18m	Compacted bedding stone	0.09-0.27m
	0.11m	Compacted gritty grey clay	0.27-0.38m
	0.09m	Reinforced concrete	0.38-0.47m
	0.05m	Compacted bedding stone	0.47-0.52m
	0.12m	Red brick rubble	0.52-0.64m
	0.06m	Compacted black clay-silt	0.64-0.70m
	0.07m	Red brick rubble	0.70-0.77m
	0.06m	Coal ash	0.77-0.83m
	0.07m	Compacted black silt	0.83-0.90m
[007]	0.52m	Mixed dirty dark brown silts, ashy with coal and brick fragments	0.90-1.42m
[008]	0.16m	Brick, cornbrash and slate rubble	1.42-1.58m
[009]	0.62m	Dark brown clay-silt, frequent slate and brick, and containing 19th century glass and ceramic	1.58-2.20m
[010]	0.50m	Iron-panned coarse gravel	2.20-2.70m
[011]	0.60m+	Black waterlogged fine silt, with preserved straw and large lumps of concreted coal ash, containing small amounts of glass and ceramic, and shoe leather	2.70-3.30m

TP3

Test Pit 3 was located on the northern edge of the B & Q carpark. The water table was reached at a depth of 2m (2.85m AOD), beyond which it was very fast flowing. Approximately the lowest 2m of the pit was not seen in section due to the depth of standing water, and the sequence was recorded according to the deposits raised in the machine bucket (Fig 4).

Although water-lain layers were exposed, relatively modern context [015] was perhaps the most intriguing, consisting of solid layers of concrete and large timbers. Within such a limited excavation area, and with the necessity of having to break through the timber and concrete to expose the earlier layers, it was impossible to develop an understanding of its structural makeup or character. The timbers gave off a powerful smell of turpentine, suggesting that they were made of spruce (from which turpentine is naturally exuded), and although differing greatly in size, some would have originally been 0.20 - 0.30m wide.

The timbers represented at least three uprights and several horizontal beams, but the concrete variously butted up against some pieces of timber, and surrounded others. Likewise, when the concrete was being broken, it was evident from the way some pieces sheered away from older faces, that several phases of concrete laying and filling were present. However complex this may have been, it seems likely that the structure was associated with the later phase of the canal basin, and may have formed some sort of revetment or crane footing along its edge for loading/unloading barges.

Below the revetment lay archaeologically sterile waterlogged deposits of peat, alluvium and silt. Excavation ceased at a depth of 4.10m (0.75m AOD).

Context	**Deposit depth**	**Deposit description**	**Actual depth from surface**
[012]	0.09m	Tarmac	0-0.09m
	0.16m	Compacted bedding stone	0.09-0.25m
	0.10m	Reinforced concrete	0.25-0.35m
	0.08	Compacted bedding stone	0.35-0.43m
	0.17	Red brick rubble	0.43-0.60m
[013]	0.18m	Compacted black ashy silt	0.60-0.78m
[014]	0.20m	Mixed lenses of mid brown silt and coal ash with slate fragments	0.78-0.98m
[015]	1.22m	Timber and concrete revetments/footings? (see above)	0.98-2.20m
[016]	0.10m	Broken slates	2.20-2.30m
	0.20m	Gravel	2.30-2.50m
[017]	1.10m	Dark brown peaty silt, some very organic with compressed leaves and straw	2.50-3.60m
[018]	0.30m	Blue-grey alluvium, very smooth texture, frequent small snails but rare organics	3.60-3.90m
[019]	0.20m+	Dark brown fine water lain silt, very smooth texture, organic feel to it, but very little actually visible	3.90-4.10m

TP4

Test Pit 4 was located at the northern end of the grass corridor lying between the B & Q and Matalan buildings. Deposits dating to the 20th century were removed to a depth of 2.30m (3.17m AOD), where both the water table and a strong smell of old oil were encountered (Fig 4).

The deposit smelling of oil also seemed to have an oily sheen to it, and the pit was backfilled with no further excavation, due to Health and Safety concerns

Context	Deposit depth	Deposit description	Actual depth from surface
[020]	0.25m	Turf and topsoil	0-0.25m
[021]	1.15m	20th century building rubble (19thC brick mixed with plastic sheets etc)	0.25-1.40m
[022]	0.70m	Bands of pale and dark brown silt-clay	1.40-2.10m
[023]	0.20m+	Wet, dark grey filthy ash mixed with small pieces of burnt and rusted iron, with a black oily sheen and strong diesel/oil smell.	2.10-2.30m

TP5

Test Pit 5 was located on the northern edge of the Matalan carpark. A large concrete beam 0.65m wide and 0.55m deep crossed the centre of the pit on a NNE-SSW alignment, running parallel to the wall of the Matalan building (8m away). Without any indication of its age, function, or potential for containing an unknown service pipe, it was deemed appropriate to leave the beam intact. This left a 0.75m wide section on the eastern side of the pit that was excavated to 4.10m deep (1.20m AOD).

Alluvium was encountered at approximately 2.36m below surface level (Fig 5). At its highest level, [026] was slightly contaminated from above by small pieces of coal and a slightly oily smell, but quickly became archaeologically sterile, as was peat [027] below it.

Although [027] was evidently waterlogged, feeling very moist and with many preserved organics, no ground water was encountered even at the very base of the test pit.

Context	Deposit depth	Deposit description	Actual depth from surface
[024]	0.21m	Reinforced concrete	0-0.21m
	0.13m	Compacted bedding stone	0.21-0.34m
	0.32m	80% red brick rubble with loose humic topsoil matrix	0.34-0.66m
	0.40m	Thin layers of very compacted ashy and gravelly silt	0.66-1.06m
[025]	1.30m	Layers of pale grey sandy silt with frequent cornbrash, red brick, coal, slate, and a small 19th/20th century stoneware jar	1.06-2.36m
[026]	0.85m	Blue-grey alluvium, smooth texture, with occasional small pieces of coal, and with a slight but distinct diesel/oil smell, becoming much cleaner and odourless to base	2.36-3.21m
[027]	0.90m+	Rich dark brown peat, almost entirely composed of leaves and straw	3.21-4.10m

TP6

Test Pit 6 was located on the northern edge of the Matalan overflow carpark. As in TP5, the deposits appeared to be waterlogged from a depth of 2m, but no ground water was encountered even at a depth 4.20m (0.65m AOD). The layers in the lower half of the pit were archaeologically sterile (Fig 5).

Context	Deposit depth	Deposit description	Actual depth from surface
[028]	0.20m	Reinforced concrete	0-0.20m
	0.85m	Black ashy, sandy silt, coal, plaster, brick etc	0.20-1.05m
	0.75m	Loose orange gravelly sand	1.05-1.80m
[029]	1.00m	Blue-grey alluvium with frequent small snails becoming cleaner to base	1.80-2.80m
[030]	0.40m	Dark brown peat – very fine lenses of fine silt with preserved leaves, straw etc	2.80-3.20m
[031]	0.60m	Black organic, peaty silt with frequent small snails	3.20-3.80m
[032]	0.40m+	Jet black fine, smooth water lain silt with few visible organics	3.80-4.20m

TP7

Test Pit 7 was located on the waste ground to the east of the Matalan carpark. In this pit the top of the alluvium was comparatively high when compared to those fronting the river, and the depth of river deposits relatively shallow, with natural cornbrash being encountered at only 3.00m depth (1.87m AOD, also the level of the water table).

None of the layers below topsoil [033] contained any archaeological material (Fig 6). Layer [036], composed of gravel in a grey clay matrix and immediately overlying the natural cornbrash rubble, could conceivably have been an older geological deposit, and if so, would raise the level of the natural to only 2.20m below the present ground surface (2.67m AOD).

Context	Deposit depth	Deposit description	Actual depth from surface
[033]	0.14m	Topsoil, weeds and rubble	0-0.14m
	0.10m	Rough broken concrete	0.14-0.24m
	0.21m	Cinders	0.24-0.45m
	0.18m	Fine brown silt, occasional coal	0.45-0.63m
	0.04m	Broken slates	0.63-0.67m
	0.53m	Orange-brown gravel	0.67-1.20m
[034]	0.55m	Grey-blue alluvium	1.20-1.75m
[035]	0.45m	Dark brown peaty alluvium, occasional organics, e.g. leaves	1.75-2.20m
[036]	0.80m	Gravel in a brown-grey sandy clay matrix	2.20-3.00m
[037]	0.30m+	Natural cornbrash rubble overlying solid bedrock	3.00-3.30m

Discussion

The current test pit survey has shed light on a number of areas where information was lacking and answered numerous questions. Whilst being bound by the restrictions inherent in any such 'keyhole' survey, the exercise has provided information about the type and depth of deposits that would be crucial to any future mitigation strategies.

Test Pits 1 and 2 have conclusively placed the canal basin within its assumed location. Perhaps more surprising was its depth – neither pit reached beyond the level of later 19th century deposits, despite TP1 being 4m deep. As well as providing information about a feature with its own inherent interest, such a large feature of this depth would undoubtedly have had a great impact on any earlier archaeology that might once have been present.

The infill of the canal basin itself may also be of some future interest, containing a wealth of domestic rubbish (albeit much smashed) within a waterlogged context. Exactly what type of deposition was taking place is difficult to determine. Whilst shoes (including a 19th century lady's rubber over-shoe) were well represented within the assemblage, clay tobacco pipe fragments were largely absent – three fragments of stem were recovered in total, all from TP1. Likewise, whilst a large quantity of broken bottle glass was brought to the surface, only two tiny bottles were recovered in one piece, and even one of these had some damage, suggesting a particularly harsh pre-deposition environment (unlike ceramics, which are invariably broken in contexts of domestic rubbish, bottles were discarded whole, with a relatively small number being broken during the actual process of dumping).

Infilling the canal can have been no easy task – not only was a huge quantity of material needed for the job, but preventing the ground from remaining boggy after the event would also have been a major consideration, undoubtedly explaining the large quantities of brick and cornbrash rubble mixed in with the soil, gravel and domestic rubbish in general, and the capping layer in TP1, [002], of pure brick and stone. Certainly the backfill material would have needed bringing to the site, and raises the question of whether a local rubbish tip was providing the appropriate mix of soil, rubble and rubbish for the task. A 19th century rubbish tip is supposedly located very close to the vicinity of the railway station (White 1998), and would have been ideally situated to supply the necessary materials.

With the canal having been completely levelled by 1888, a general date for the ceramics of the 1870s and 1880s would suggest that the rubbish was not being deposited for any great length of time before being dumped in the canal (see Appendix 1). In addition, during the huge operation of infilling, it is unlikely that some loads of rubbish, soil and rubble were not finding their way to the canal as the primary dumping site.

All of this, however, illustrates a key point in relation to the canal basin – that the layers so far tested are almost certainly the result of deliberate backfilling at the end of the canal's useful life, and therefore bear little reference to the actual use of the canal. Although the canal basin may have been dredged during the 19th century, it is

possible that well preserved 18th and earlier 19th century deposits still remain undisturbed. Presumably, the timber and concrete revetment/footing in TP3 was related to the canal, perhaps as a base for a small crane or some other waterside feature for the loading and unloading of barges, but the exposure was too small to identify a form.

Archaeologically, the 19th century material (or some 18th century material occurring residually in 19th century deposits) was the earliest identifiable activity. Other than TP4, which was abandoned due to the presence of an oily deposit, the remaining four test pits beyond the edge of the canal basin all reached archaeologically sterile riverine deposits. In Test Pits 5, 6 and 7, all located within, or adjacent to, the Matalan carpark, the first river deposit exposed was a blue-grey alluvium. In Test Pit 3, which was 100m west of Test Pits 5, 6 and 7, the first river deposit exposed was peat, with a thin layer of alluvium followed by black silt beneath it.

Also hampering the production of a coherent linking of layers between pits was that TP7 alone hit bedrock, and at a depth of only 3m (1.87m AOD). Having the highest level of alluvium (at a depth of 1.20m), and a thin layer of peaty alluvium overlying clayey gravel and bedrock, TP7 evidently overlies a natural ridge of higher ground, prone to waterlogging, but nonetheless distinct from the ground immediately to the north of it.

While it is tempting to try to link the layers of alluvium, silt and peat between holes, and to identify individual continuous layers, it must be done with a certain amount of caution, given the depositional variation between the test pits, and within such a potentially dynamic environment as a river channel. Accepting this, it is surely no coincidence that the uppermost layer in Test Pits 5, 6 and 7 was a very similar steely blue-grey alluvium overlying peat or peaty silt. This may also have been true in TP3, where the first riverine layer encountered was peat, but an upper alluvium layer could well have been removed by later 19th century activity that intruded to 2.50m below ground level.

Wherever exposed, the uppermost layers of alluvium were seemingly of no great age, at least their top levels being flecked with small pieces of coal and coal ash, although this could have been intrusive. Other than the coal fragments in the upper layers, the river deposits were devoid of artefacts.

Even if the lack of artefacts might suggest that no areas of major pre-modern activity (major wharfs, boatyards, settlement etc) are likely to lie concealed between the limited exposure of the test pits, at least within the 4m depth achieved, it is equally true that significant remains in the form of boats, smaller scale moorings, river bank management and individual dwellings could well be present without the test pit survey picking up any trace of them.

The environmental data recovered from the test pits confirmed the lack of identifiable human activity within the vicinity (see appendix 3). Perhaps the most intriguing aspect of the samples was that they suggested a relatively recent drying out of once waterlogged deposits, and this certainly fitted with the lack of groundwater in Test Pits 5 and 6. It is possible that the canal basin itself has caused this reduction in groundwater level, by acting as a sump for the surrounding ground (Ben Robinson,

pers. comm.). Such a draining mechanism would explain both the lack of expected groundwater in Test Pits 5 and 6 (as well as preventing any seasonal re-waterlogging that might otherwise be expected), and also the speed of percolation in Test Pits 1 and 2 within the footprint of the canal. The high water table encountered in Test Pits 3 and 4 can probably be accounted for by their proximity to the severely flooded canal basin.

Conclusion

Within the limited exposure of the test pits no artefacts predating the 18th cenury were recovered and this, together with the degree of truncation caused by the construction of the canal basin, suggest that the potential for widespread archaeological remains being present within the proposed development area is low to medium. However, the waterlogged environment does provide excellent conditions for the preservation of soft organics (wood, leather and bone), and if archaeological activity is detected, even on a relatively minor scale, the potential for recovering preserved organic material must be assumed to be high.

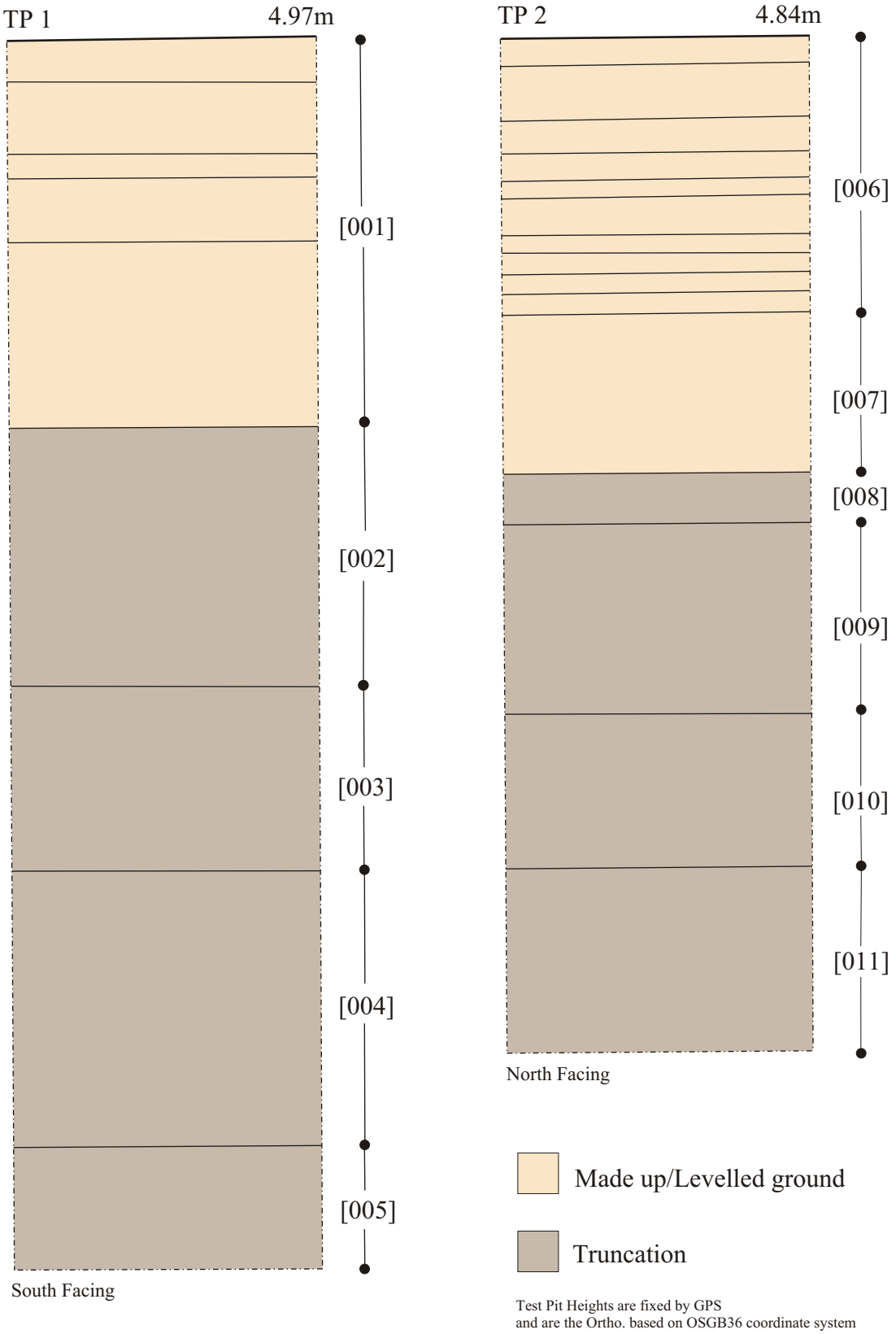


Figure 3: One metre representative sections of Test pits 1 and 2. Shown at a scale of 1:20

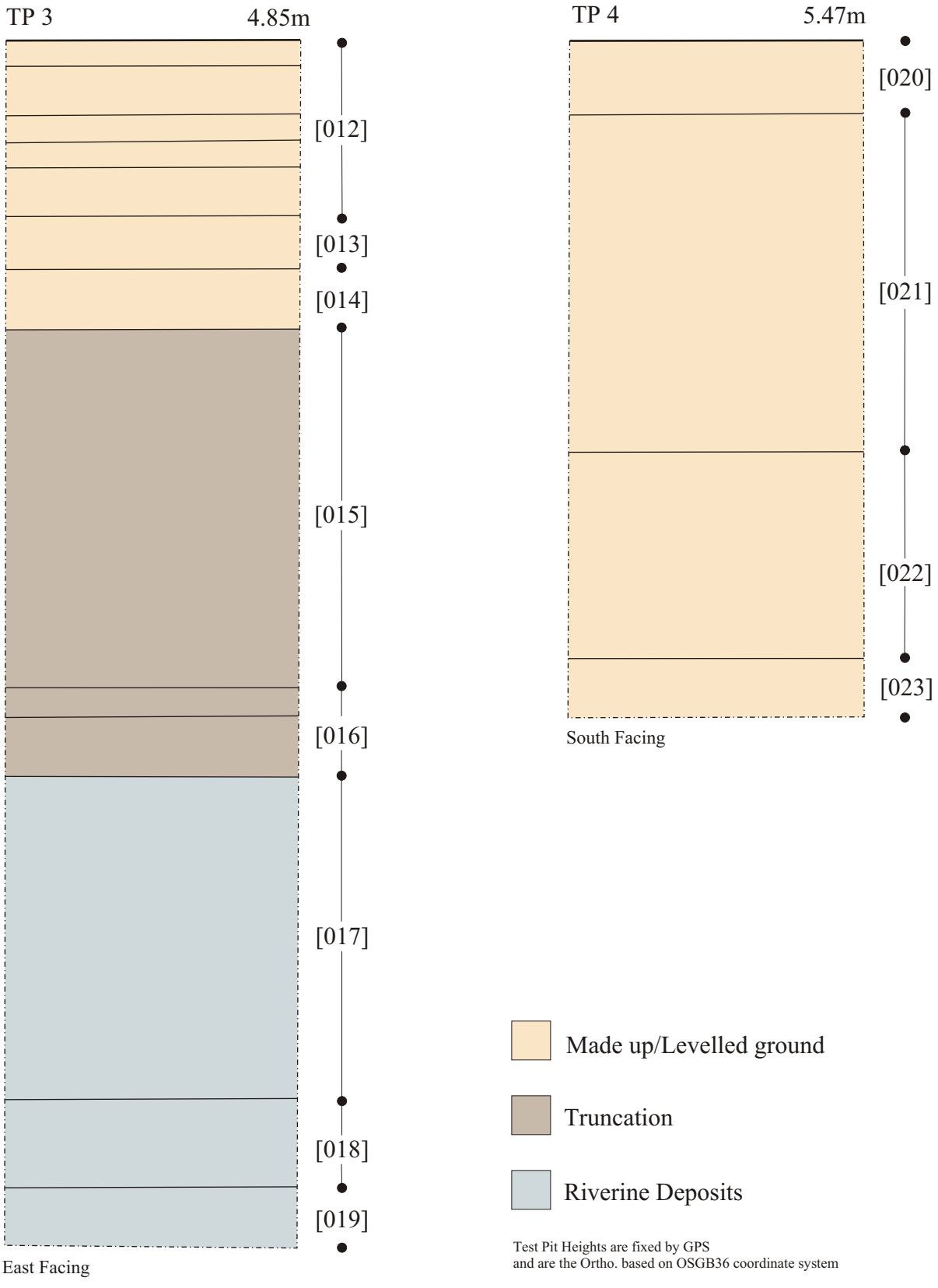


Figure 4: One metre representative sections of Test pits 3 and 4. Shown at a scale of 1:20

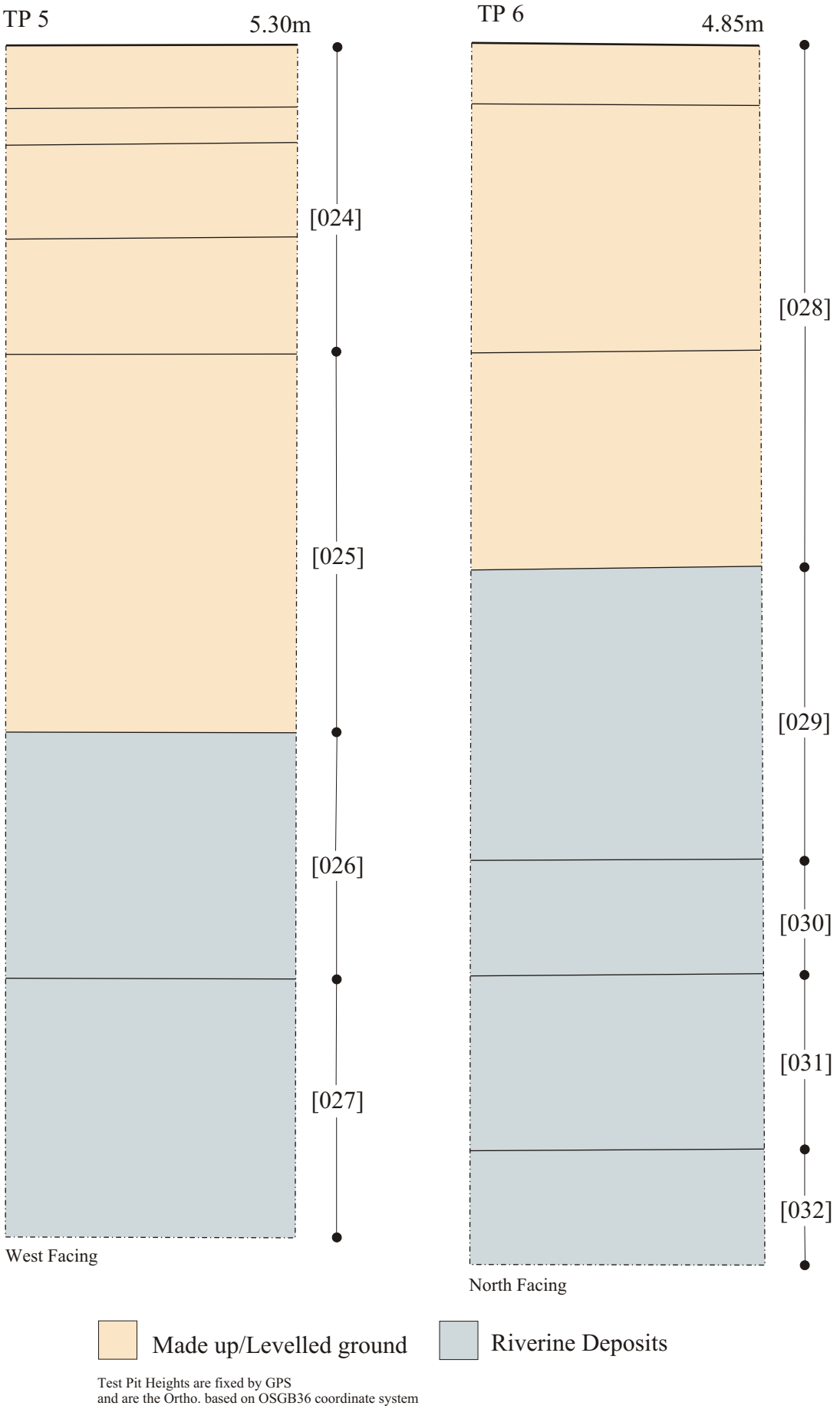


Figure 5: One metre representative sections of Test pits 5 and 6. Shown at a scale of 1:20

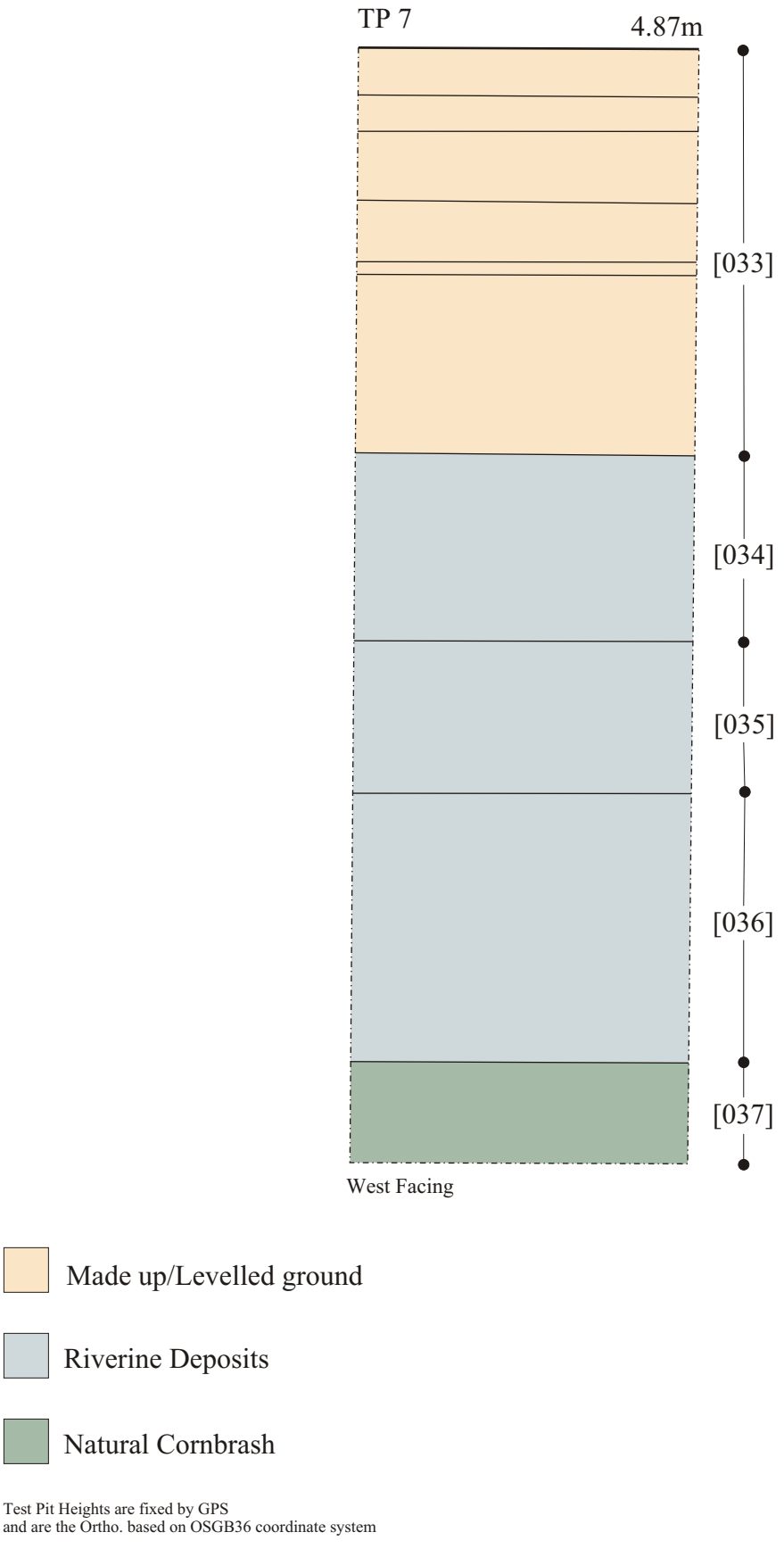


Figure 6: One metre representative sections of Test pit 7. Shown at a scale of 1:20

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Appendix 1: 19th century Ceramics

Andy Hall

Of the seven test pits excavated, two yielded quantities of mid to later 19th century ceramics in association with glass, clay pipe stems, animal bone and the group of shoes. The assemblage consists of 70 sherds of mainly factory mass-produced domestic wares split between six contexts ([003, 004, 005, 009, 011, 025]). The range of vessels across all contexts includes large meat plates and strainers, dinner plates, tea wares such as cups and saucers in addition to stoneware bottles (both for drink and ink), large storage vessels and the ubiquitous red earthenware flowerpots. The meat dishes and table wares are predominantly transfer printed with the willow pattern, a particularly enduring favourite throughout the 19th and 20th centuries. The presence of the Asiatic Pheasant pattern on oval dishes provides tighter dating evidence, in particular the back stamp of the Beech and Hancock Factory, Staffordshire, which produced this pattern between the years 1862-1876 (www.asiaticpheasants.co.uk). Other diagnostic forms of decorated vessels include a Sunderland lustre cup, wild rose pattern plates, a large blue sponge ware meat dish and an overglaze green enamel and gilt teacup. All were manufactured during the mid to later 19th century and all appear to be of domestic manufacture. A single sherd of a red earthenware large bowl with interior slip decoration may be of an eighteenth century date, however this remains the exception.

This group represents a small sample of large scale dumps within the canal. The limited size of the group withstanding, this assemblage more than likely represents domestic rubbish rather than wholesale clearance or commercial or institutional waste. The date of deposition is late 19th century, probably between 1870-1890.

Appendix 2: Preserved 19th Century Shoes

Quita Mould

Methodology

The leather was wet and washed when examined. It is currently packed in double self-sealing polythene bags from which the light has been excluded by wrapping in black plastic; the bags are stored in air-tight plastic storers.

Shoe sizing has been calculated according to the modern English Shoe-Size scale with the sole measurement rounded up to the nearest size as necessary, continental sizing is provided in brackets.

Leather species were identified by hair follicle pattern using low powered magnification. Where the grain surface of the leather was heavily worn identification was not always possible. The grain pattern of sheep and goat skins are difficult to distinguish and have been grouped together as sheep/goat when the distinction could not be made. The distinction between immature (calfskin) and mature cattle hides is not always easy to determine and the term bovine leather has been used when in doubt. Shoe soles and repairs are thought to be of cattle hide, unless stated otherwise.

Summary

A small group of footwear and a piece cut from a rigid case or bag <008> were found in waterlogged layers, 2m-4m below ground surface, deriving from the infill of an early 18th-late 19th century canal basin on the south side of the River Nene in Peterborough. These finds, and associated finds of various others materials, appear to derive from general domestic rubbish disposal of 19th century date. The footwear comprises leather shoes for adults <005>, <007>, <009>, and children <006>, along with a rubber galosh <004>, or overshoe, no larger than an Adult size 1 (33) for a small woman or adolescent. At least six shoes are represented. A button boot of black sheep/goatskin was of child size 8(26), worn by a young child. It fastened up the leg with six, black, domed metal buttons passing through buttonholes with a decorative scalloped edge. Button boots were popular for women and children in the second half of the 19th century and continued in popularity into the early part of the 20th century. India rubber galoshes were patented in 1842 (Swann 1984, 50). It is likely, therefore, that part of the footwear assemblage dates to the second half of the 19th century. The other shoes were less well preserved and few diagnostic upper parts remained. A long tongue from a second boot <001.2> and the remains of an indoor or dancing shoe <009>, both of adult size, were recognised. A man's shoe vamp of suede calfskin with a short tongue <005> differs from the others in being of a style likely to date earlier, to the beginning of the 19th century.

Catalogue

<001> context [004] TP1 STP05

Leather shoe parts

Sub-circular piece with cut edges, apparently cut from a shoe bottom unit component, pierced by two iron nail shanks. Split skin 2mm thick, no grain pattern present.

Length 78mm, width 63mm

Boot tongue. Tongue-shaped piece with a straight end with suggestion of fine stitching along the edge, a rounded end, and straight sides. The impression of three parallel lines present running vertically down the centre on the grain side, probably resulting from the impression of the two front edges of the boot quarters. Leather bovine (cattle hide) 2.5mm thick, iron staining present.
Length 182mm, width 50mm

<004> context [004] TP1 STP01
Rubber galosh.
Galosh made straight but wear suggests worn on the left foot. Comprising sole with integral heel, insole and one-piece upper. The sole has a square toe, narrow tread, medium waist and seat. The sole seat has a raised or thickened area imitating a low heel. A raised, moulded stamp in the form of a crude 'union jack' cross motif within a shield is present at the waist with a banner above with the legend 'the union overshoe' and stamped 452 beneath. Separate insole with textile impression on the upper face. Upper made in one piece with textile impression on the inner face and a mock seam up centre back. Upper is low cut, extending just above the line of the toes and running straight to lie just below the ankle. The top edge is decorated with an impressed border 8mm wide with a line of mock stitching above and below.
Sole length 220mm Adult size 1(33)
Width toe 50mm, tread 64mm, waist 38mm, seat 57mm

<005> context [005] TP1 STP05
Leather shoe vamp
Vamp for a left foot adult shoe, probably for a man. The lasting margin has widely spaced grain/flesh holes suggesting the shoe was of riveted (nailed) construction. The vamp has a square toe, short vamp wings with straight, closed seams and a straight-ended tongue. The tongue and top edge of the vamp wings are finished with a narrow, flat top band 5mm wide. Leather suede, flesh side outward, grain inward to the foot bovine (calfskin) 2 mm thick.
Length (toe to side seam) 145mm, height of side seam 65mm

<006> context [005] TP1 STP05
Leather button boot
Complete left foot child's ankle boot. Made nearly straight apparently of riveted construction. Comprising sole, middle, insole, vamp, toe cap, quarters, button piece and linings. Sole with square toe, long waist and low D-shaped stacked heel (5mm high) with one layer and a top piece. Middle and insole visible through the large hole worn through all the bottom unit components at the toe. Uppers comprise a vamp with straight vamp wings, straight toe cap and tall quarters with a straight seam at centre back. The button piece on the left front edge of the quarters has a scalloped edge and six button holes. Small, black, domed metal buttons, 10mm in diameter, present on the right side. Linings present on the button piece and along the top edge of the quarters. Upper leather sheep/goatskin 3mm thick (thickness includes lining).
Sole length 170mm, child size 8(26)

<007> context [009] TP2 STP05
Leather shoe bottom unit
Remains of welted shoe sole of adult size worn on the right foot. The lower tread, waist and seat of welted sole present, with the impression of a central shank on the upper surface of the sole to reinforce the bottom unit. Originally had a separate tread sole. Stacked D-shaped leather heel 18mm high comprising four layers and a top piece with iron nails present. Surviving length 175mm

<008> context [011] TP2 STP05
Leather panel cut from case.
Semi-circular piece with cut edges, broken in one small area, deliberately cut from a panel. The surviving piece has an original straight and a curved edge, the curved edge is peaked in the manner of a

front flap from a case or heavy bag. No stitching is present. The grain side has remains of a surface coating chestnut brown in colour: a paint or glaze (not polish). Leather 2.5mm thick, no grain pattern is preserved but likely to be bovine (cattle hide). Surviving length 158mm, width 110mm

<009> context [011] TP2 STP05
Leather shoe parts from indoor shoe/s
Bottom unit from left foot adult shoe for indoor wear. Sole, made nearly straight, toe torn off, narrow tread, slight waist and broad seat. The sole has a line of tunnel stitching on the flesh side running around the edge with the stitches aligned at right angles to it. Virtually unworn, very slight wear present at the seat. Leather 4mm thick. Sole length 244mm (incomplete), width tread 72mm, waist 53mm, seat 63mm.
Complete insole for the left foot with a square toe, petal-shaped tread, medium waist and wide seat. Grain/flesh seam around the edge, with thread impression on the upper (grain) surface, changing to more widely spaced holes probably for nailing at the seat. Worn grain upward to foot, no wear visible. Leather cattle hide 3mm thick. Appears to be of similar size and shape to the sole but could come from a different shoe.
Insole length 247mm. Adult size 4(37). Width toe 50mm, tread 75mm, waist 43mm, seat 57mm.
Shoe upper, toe cap with square toe and a finely scalloped edge with a double lapped seam of fine grain/flesh stitching and decorative border of a cable pattern behind comprising two rows of oval motifs of rouletted, pricked holes. Leather has no grain pattern and is ‘glazed’ and black in colour, patent leather. Toe cap length (toe to edge) 29mm

Appendix 3: Environmental Samples

Anne de Vareilles

Methodology

Four bulk environmental samples (Samples 1, 3, 4 and 5) were processed for charred plant remains and molluscs. Two samples comprising a peaty silt (Sample 2, TP3) and a more consistent peat (Sample 6, TP5) were retained for use in scientific dating.

Sample 1 was processed using an Ankara-type flotation machine; the flot was collected in a 300µm mesh. There was no remaining heavy residue as the sample consisted purely of alluvial clays. The flot was dried indoors and scanned for the presence of charred plant remains, molluscs and charcoal. Being waterlogged, 500ml of samples 3, 4 and 5 were wet-sieved in the Pitt Rivers Laboratory, University of Cambridge.

Sorting and identification of ecofacts were carried out under a low power microscope. Identifications were made using the reference collection at the Department of Archaeology, University of Cambridge. Nomenclature follows Stace (1997) for flora, and Beedham (1972) for mollusca. All environmental remains are listed in full in tables 1 and 2.

Preservation

As was to be expected from the excavation, all samples were archaeologically sterile, containing no charred plant remains or waterlogged cultivars. Sample 1 was the only one not waterlogged, though its mollusca assemblage indicates it once was before becoming more marsh like.

Scientific dating

Samples 3,4, and 5 contained a very low density of seeds, which were generally poorly preserved, and at the borderline size for use in AMS dating. The well developed peat from the lowest level of Sample 6 (context [027]), in TP5 has the highest potential for both Radiometric and AMS dates. Sample 2, a peaty silt from context [017] in TP3 also has the potential for dating, although it does not come from the basal layers of the test pit.

Results and Discussion

All four samples were taken from alluvial deposits with no heavy mineral fractions, indicating a slow flowing water regime. Indeed, the flora and mollusca identified all point to a slow, steady river or stream. The quantity of waterlogged wild plant seeds is negligible compared to waterlogged samples within soils. The frail nature and diversity of the waterlogged seeds present suggest they accumulated during alluviation, along with the sediments. It appears that even though the river was slow

flowing, it flooded regularly, prohibiting the formation of peat and soil – as is evident from the excavated stratigraphy.

As sample 1 from test pit 3 shows, the current level of the water table (2 metres below the surface) cannot always be used as marker for waterlogged sediments. With fluvial management, the water table is highly variable spatially as well as temporarily.

The fringed water-lily (*Nymphoides peltata*) was probably introduced into the British Isles in the Roman period (Stace 1997), which would suggest that context [032] of test pit 6 is of no earlier than Roman date.

Recommendations

Should any archaeology be found below 4 metres from the surface, there is a good potential for waterlogged environmental samples, including beetles. Monoliths for micromorphology should then also be taken to understand the river system in correlation with the archaeology.

Table1 –Mollusca from the non-waterlogged sample

Test Pit		**3**
Sample number		**<1>**
Context		[018]
Sample volume - litres		4.5
Flot fraction examined		1/1
	Habitat	
Bithynia tentaculata	Quite rivers and still hard water, not small ponds	++
Hydrobia ventrosa	Marshy shallow waters and mud flats	+++
Pseudamnicola confusa	Marshy shallow waters and mud flats	+++
Lymnaea truncatula	Marshy shallow waters, animals can live out of water in moist conditions	++
Lymnaea peregra	Commonest freshwater snail in the British Isles	+++
Planorbis leucostama	Ponds, resists drying	+++
Pisidium sp.	Hard, clear water, preferably flowing	+

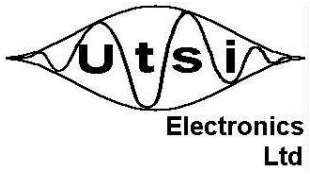
Key: '-' 1 or 2 items, '+' < 10 items, '++' 10 - 50 items, '+++' > 50 items

Table2 – Waterlogged plant remains, beetles and mollusca

Test Pit			**3**	**6**	**6**
Sample number			**<3>**	**<4>**	**<5>**
Context			[019]	[031]	[032]
Sample volume –millilitres			500	500	500
Flot fraction examined			1/2	1/4	1/4
		Habitat			
Ranunculus sceleratus	Celery-leaved Buttercup	Marshy fields and by streams	+++		
Ranunculus Subgen. *BETRACHIUM*	Crowfoot				
Ranunculus sp.	Large-seeded Buttercup				+
Rorripa mycrophyla	Narrow-fruited watercress	In and by streams, ditches and marshes		++	
Myriophylum verticillatum	Whorled water-milfoil	Slow flowing rivers			-
Cicuta virosa	Cowbane	Pond sides, marshy fields and ditches		-	
Nymphoides peltata	Fringed water-lily	Ponds and slow rivers			+
Mentha sp.	Mint		+++	-	+
Eupatorium cannabinum	Hemp-agrimony	Damp areas, by rivers			-
Sagittaria sagittifolia	Arrowhead	Slow flowing rivers			-
Alisma plantago-aquatica	Water plantain	Ponds, slow rivers	+		-
Lemna sp.	Duckweed	On or below slow flowing or still water	+	-	
Eliocharis palustris	Common spike-rush	Ponds, river sides			-
Eliocharis austriaca	Northern spike-rush	Marshes, in or by rivers			-
Eliocharis sp.	Spike-rush		++		
Carex elata	Tufted-sedge	Fens and by rivers		-	
Carex capillaries	Hair sedge	Calcareous flushes		-	
Carex sp. type 1	Sedge		++		
Carex sp. type 2	Sedge			-	
Indet wild plant seed				-	-
Indet wild plant seed seed-coat fragment			++	++	++
Beetle fragments			++	+++	+++
Mollusca					
Bithynia tentaculata		Quite rivers and still hard water, not small ponds		+	
Bithynia leachi		As above		+	
Valvata cristata		Slow-flowing muddy streams, amongst dense vegetation		+	++
Physa fontinalis		Streams, usually on weeds			-
Planorbis albus		All fresh waters, usually amongst vegetation		-	+
Ancylus fluviatilis		Adheres to stones in flowing water			-
Pisidium sp.		Flowing, hard, clear water			+

Key: '-' 1 or 2 items, '+' < 10 items, '++' 10 - 50 items, '+++' > 50 items

Appendix 4



TRIAL GROUND PENETRATING RADAR SURVEY

Of an AREA adjacent to

EAST STATION ROAD, PETERBOROUGH.

17th June 2005

CONTENTS

SURVEY OBJECTIVE

The objectives of this trial survey were 1) to see if it was possible to use Ground Penetrating Radar (GPR) on the survey area & 2) to attempt to identify the position of a former canal basin and any related structures from either the 2-dimensional or 3-dimensional GPR data.

SURVEY STRATEGY

Site Coverage

Two parking bays had been fenced off & selected for the trial. The first of these (Area 1), to the West, was surveyed in parallel transects running West/East, using Groundvue 1. The data obtained from this survey suggested that there was reinforcement present in the layer beneath the tarmac surface at a depth of c. 0.5m. This area was therefore re-surveyed using the higher frequency Groundvue 4. The second bay (Area 2) was surveyed in a similar manner to the first but using only Groundvue 1. The area between the parking bays was not surveyed.

Markers were used to indicate the start and end of each run. Marker 1 corresponds to the first line between parking spaces to the West of Area 1, Marker 2 is the last line between parking spaces to the East of Area 1. In Area 2, Marker 1 indicates the first line between parking spaces to the West of the area and Marker 2 indicates the fourth of the lines between parking spaces. Beyond this line, the area to the east of Areas 1 & 2 was occupied by parked cars. The position of all four lines has been marked on the ground for the positions to be recorded by the surveyor.

In case the area of investigation was too small an area to identify the outline of the former canal basin, a further six transects were completed using Groundvue 1. These transects are not as accurately positioned as those of Area 1 and Area 2, having been carried out on line of sight. They are approximately parallel to the transects completed in Areas 1 & 2, continuing at intervals of 50cm from those areas and each other, beginning 50cm to the south of Area 1 & 2. Each line was surveyed along the West/East direction and was 50cm to the south of the preceding transect.

The timesweep used was 80ns, roughly equivalent to 4m in depth and the sampling interval was 5cm for the runs completed using Groundvue 1 and 4cm for the runs completed using Groundvue 4. As the area was covered in tarmac, a speed of transmission of 0.1m/ns has been assumed. The water table is known to be relatively high and it is likely that the speed of transmission is somewhat slower than 0.1m/ns as a result. If so, the depths in metres (as opposed to nanoseconds time) will be slightly overstated.

Equipment

The equipment used for this survey was a) Groundvue 1, a medium resolution GPR with an effective maximum range of 5m and 400MHz central frequency and b) Groundvue 4, a high resolution GPR with an effective maximum range of 2m and 1GHz central frequency. Both radars use bow-tie antennas for close ground coupling and arrayed antennas for narrowed signal beam.

Site Conditions

The top surface of the site was tarmac making site conditions ideal for GPR investigation.

Radar Output

The radar output consists of individual 2-dimensional vertical plots of each transect showing depth of signal return against distance travelled by the radar. In addition, the output from Areas 1 & 2 were combined into a 3-dimensional data block in order to derive horizontal time slices. A similar exercise has been carried out separately for the data from Area 3 and the high frequency radar output from Area 1.

Radar output is only illustrated in this report where there is information of potential interest.

All 2-dimensional plots display the data from West to East i.e. from Marker 1 to Marker 2. Three dimensional data is displayed with North at the top of the page. The (0,0) position for all data sets lies at the position 0.5m south of the pavement to the north of the survey area on Marker 1, Area 1.

Date of Fieldwork

The survey was carried out on 13th June 2005.

SURVEY RESULTS

Data Processing

The processes applied to the data were:

- background removal;
- time based gain; and
- Bandpass Butterworth filtering.

No other processes were applied to the data.

Results: Areas 1 & 2 (400MHz)

In Area 1, the 2-dimensional data shows that there is a distinctive area of densely packed signals between c. 2m and 11m from Marker 1. This is continuous throughout the area. The irregularity of the signals suggests backfilling of varied material composition. The more or less straight lines of the areas before & after indicate the depth of homogeneous materials laid down on the surface existing at the time of deposition. The boundary of the disturbed area is more or less constant along the western edge but is more variable to the East.

The patterning in Area 2 is more varied. Figure 1 illustrates transects 2 and 9 from both areas. The blank area in between is the raised edge between the 2 parking bays which was not surveyed.

The soils underlying the tarmac are lossy. This is indicated by the fall off in signal strength with increasing depth. There is also evidence of reinforcement bars underlying the level of the tarmac at c. 0.5m depth (cf. Figure 1). This also diminishes signal strength significantly since a greater proportion of the signal will be reflected by metal reinforcement relatively close to the ground surface. The GPR method works in these soil conditions but attenuation (loss) of the signal is significant. There is no method of counteracting attenuation. The 1GHz survey was carried out in order to test whether information was being lost due to the positioning of the reinforcement bars.

Time slices have been extracted from the 3-dimensional data block at intervals of 25cm except where there was no change in the patterning of the time slice :see Figures 2 to 14 inclusive.

The primary patterning, as in the 2-dimensional output, occurs in Area 1. The well defined western edge to the anomalous area is visible as a dark patch of strong signal return. This indicates that the material in this area is very different from those adjacent & is likely to represent the remains of building materials &/or structures. Within the first 75cm of deposits, there are additional areas of strongly anomalous signals around 10m distance. These are less regular in shape. It seems likely in view of the relatively shallow depth that this is backfill although it should also be noted that there is a fainter but persistent linear feature visible down to a depth of 2m 25cm.

The patterning in Area 2 appears to be entirely random.

Results: Area 3

The results of Area 3 could not be incorporated into the same data set as Areas 1 & 2 due to the disparity in transect lengths although Area 3 is effectively the continuation of these 2 areas for c. 3m towards the South. Figures 15 to 27 are the relevant time slices.

The extreme southern end of the time slice is darkened by the presence of a series of manhole covers. The metal from the manhole covers produces echo effects on the data, known as ringing. These are surface effects but present as depth signals.

The western edge of Area 3 also suggests the presence of in-situ structures within the first 3m (along the x-axis) and at c. 8m distance. From 22m distance on (i.e. towards the East), the signal pattern although relatively dense, appears to be random.

Areas 1, 2 & 3 taken together therefore suggests the presence of one or more structures in situ along the western side of the survey area; a disturbed area between c. 3m and 22m distance which appears to contain backfill up to a depth of c. 75cm but below this contains mostly uniform deposits. Beyond 22m distance, there is no indication of potential archaeological remains (although this is not proof that such remains do not exist).

Results: Area 1 (1GHz)

Although the higher frequency antennas give sharper resolution of anomalies at shallower depths, the effect of attenuation are very clear when these traces are compared with those of the 400MHz antennas. This suggests that there is significant water content in the deposits beneath the tarmac.

The results broadly confirm those of the 400MHz antenna but the improved resolution visible in Figures 28 to 30 is offset by an obvious loss of signal strength. Below 75cm (Figure 30), there is little useful information. Figure 30 suggests linear features underlying the possible debris above.

CONCLUSIONS

The radar output shows that the soils, although lossy, are suited to GPR. The 1GHz antenna is not suitable: the results suggest the presence of water in the sub-tarmac deposits.

Area 1 shows signs of possible in-situ building materials as does its continuation in Area 3. Area 2 is largely free of patterning suggestive of in-situ building remains. If there is an eastern edge to the possible canal basin, the Area 3 results confirm that this is likely to lie beneath the area between the 2 parking bays which was not included in the survey because of the disparity in surface level.

It is not possible to conclude definitively that the patterning described reflects the position of the former canal. It may be possible to increase the level of certainty by comparing the patterning visible in the time slices with the results of trial excavation and any known historical information.

Further Enquiries

Any enquiries arising out of this report should be addressed in the first instance to Mrs Erica Utsi, Director, Utsi Electronics Ltd, 1 School Lane, Aldreth, Ely, Cambridgeshire, CB6 3PL.

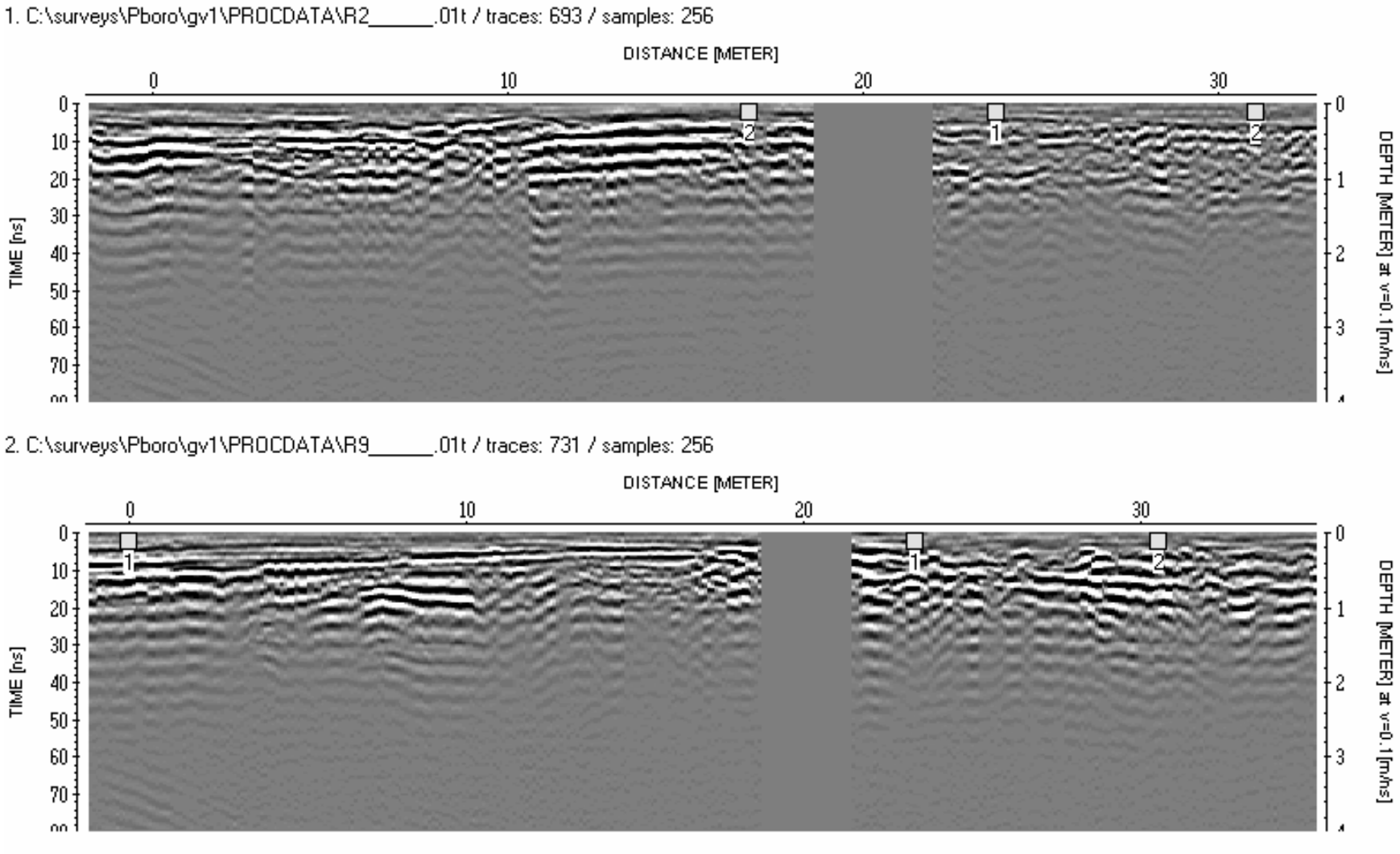


Figure 1: Areas 1 & 2, transects 2 & 9

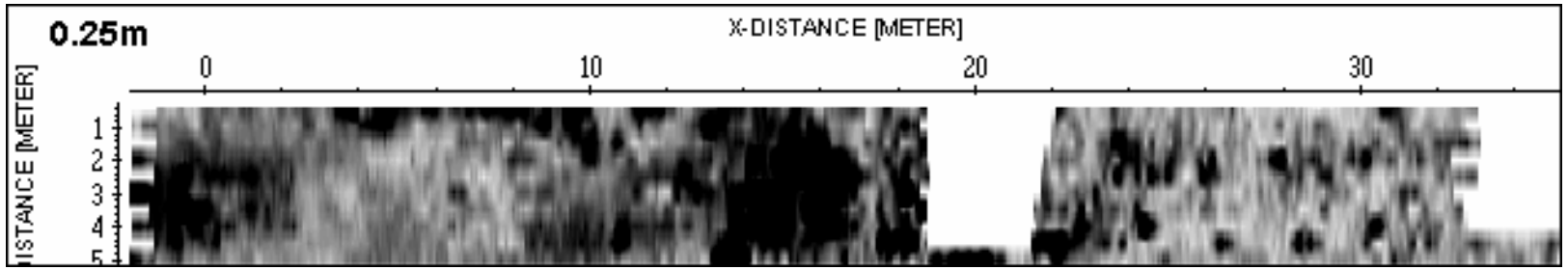


Figure 2: 25cm Depth, Areas 1 & 2

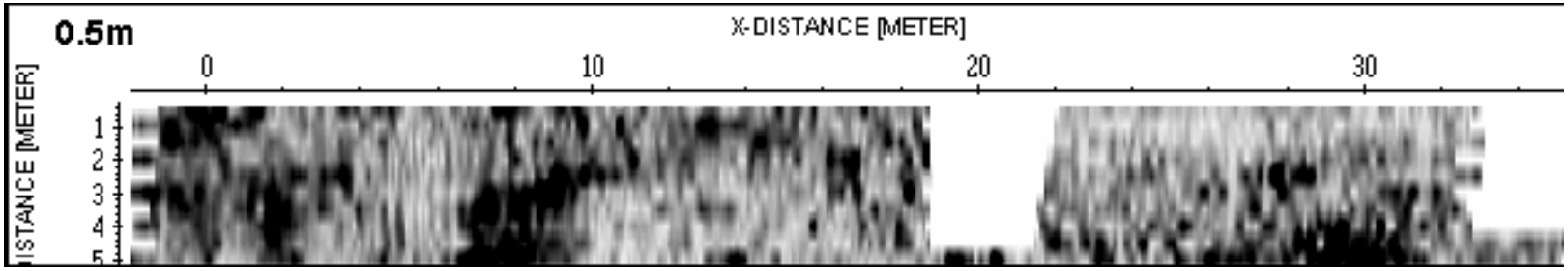


Figure 3: 50cm Depth, Areas 1 & 2

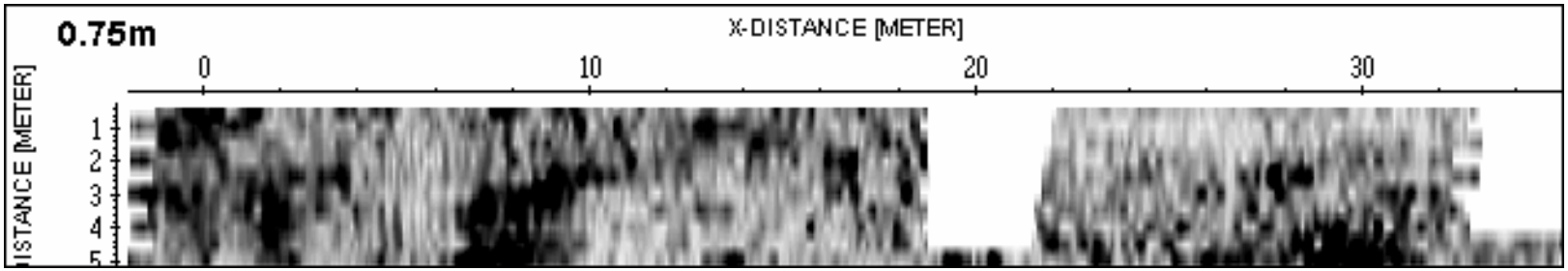


Figure 4: 75cm Depth, Areas 1 & 2

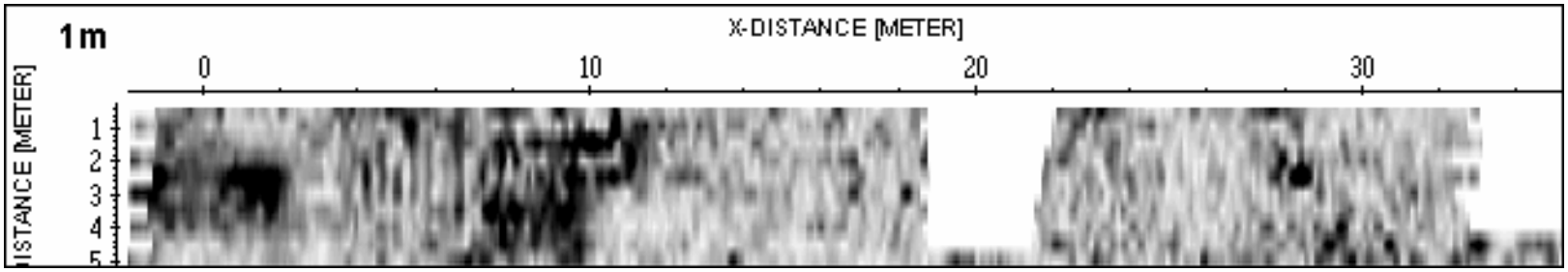


Figure 5: 1m Depth, Areas 1 & 2

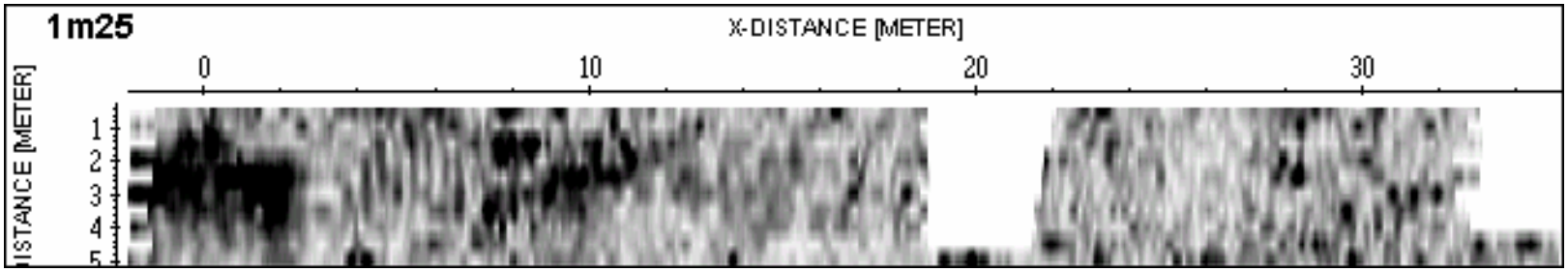


Figure 6: 1m25cm Depth, Areas 1 & 2

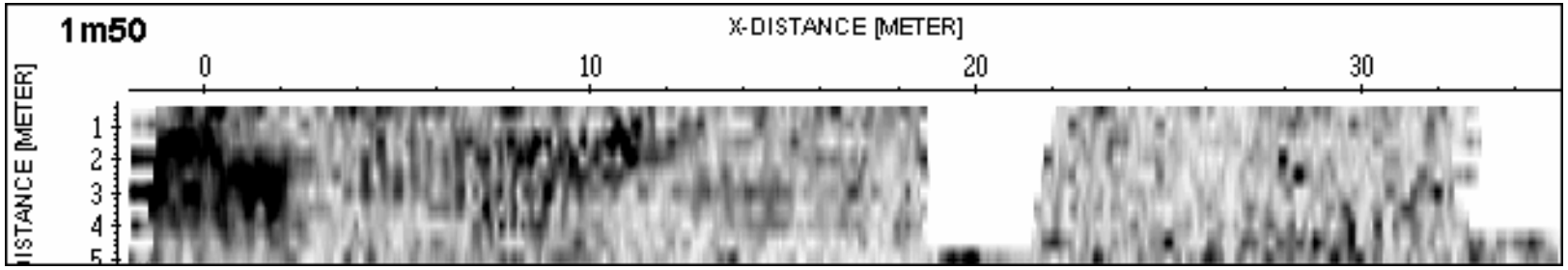


Figure 7: 1m50cm Depth, Areas 1 & 2

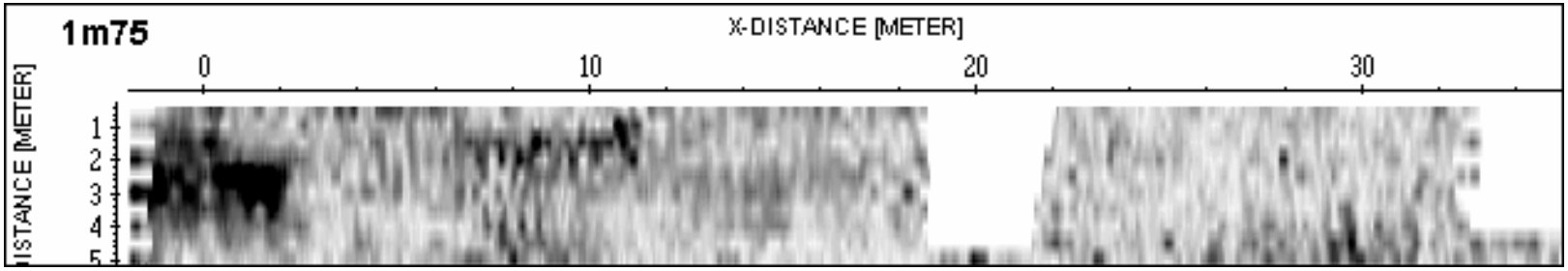


Figure 8: 1m75cm Depth, Areas 1 & 2

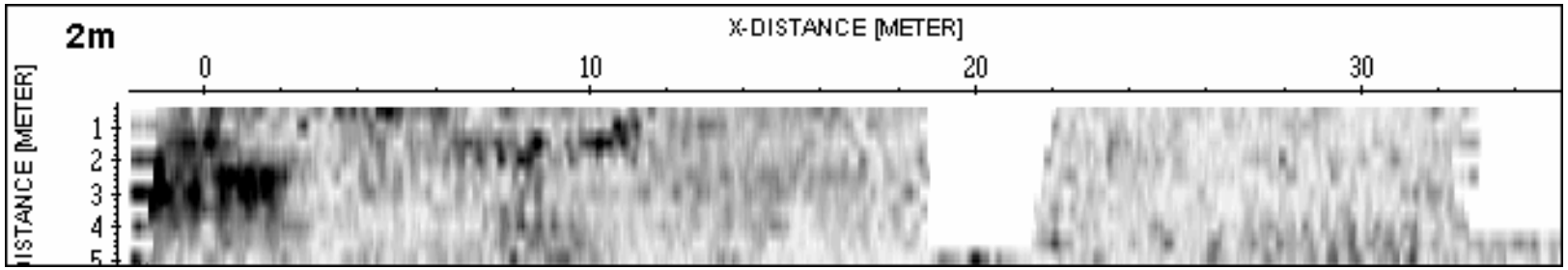


Figure 9: 2m Depth, Areas 1 & 2

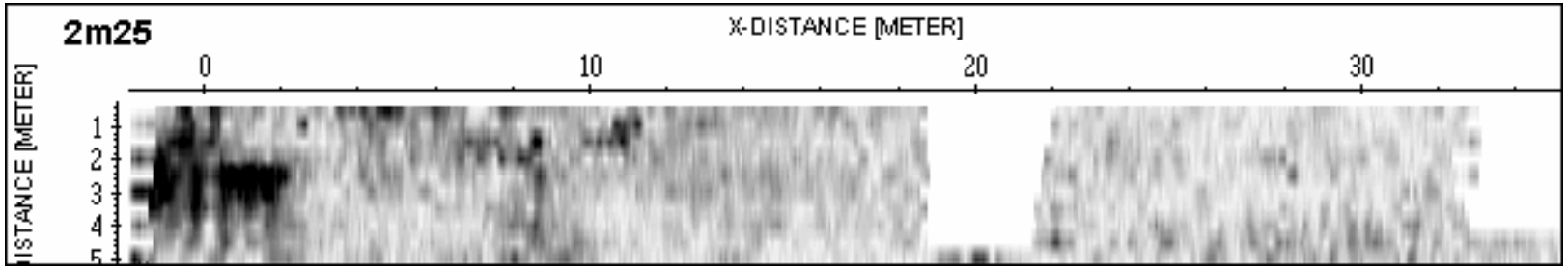


Figure 10: 2m25cm Depth, Areas 1 & 2

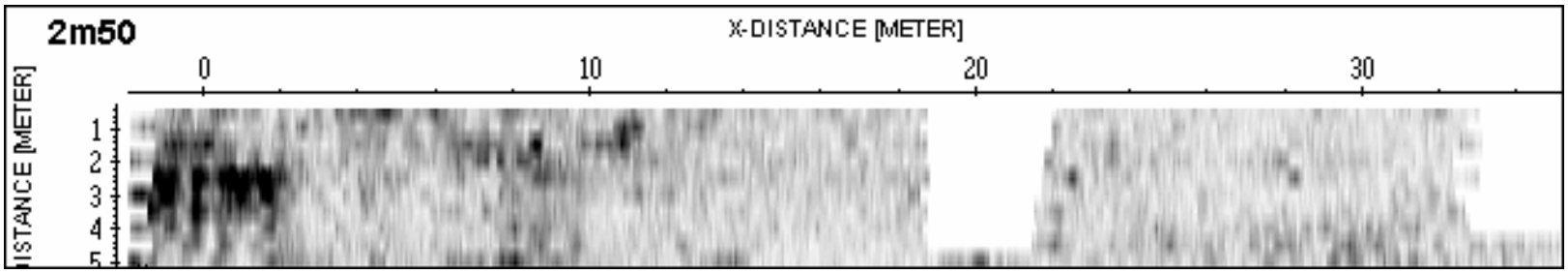


Figure 11: 2m50cm Depth, Areas 1 & 2

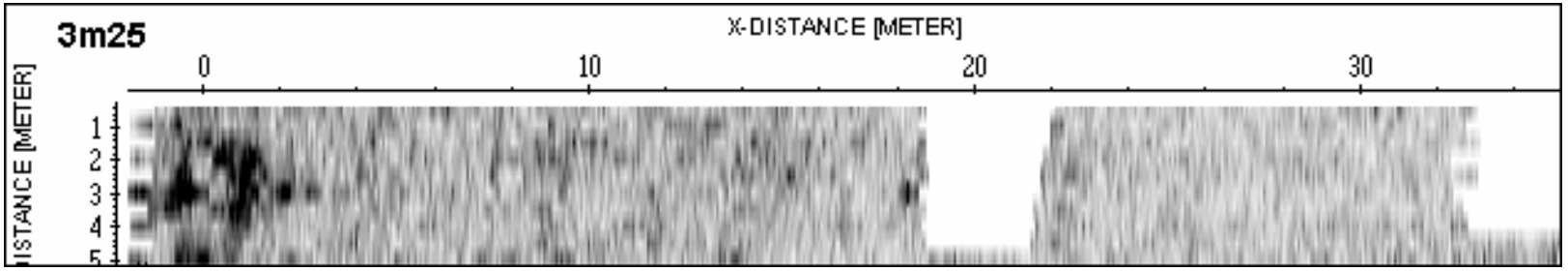


Figure 12: 3m25cm Depth, Areas 1 & 2

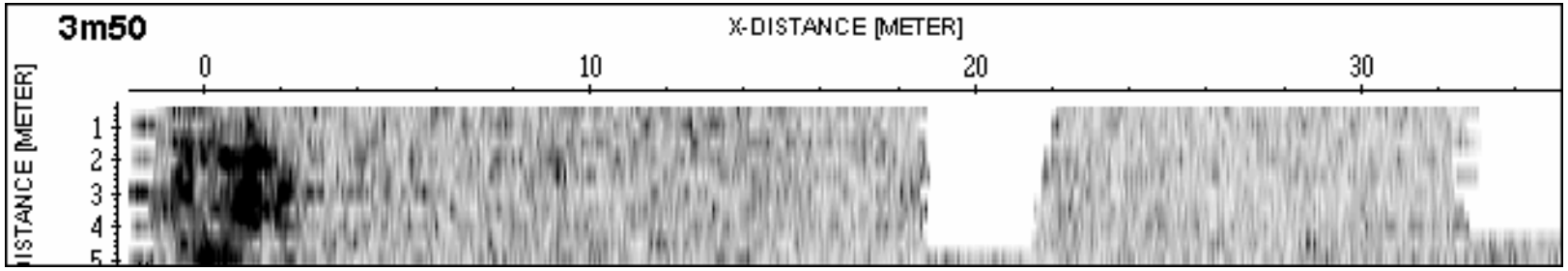


Figure 13: 3m50cm Depth, Areas 1 & 2

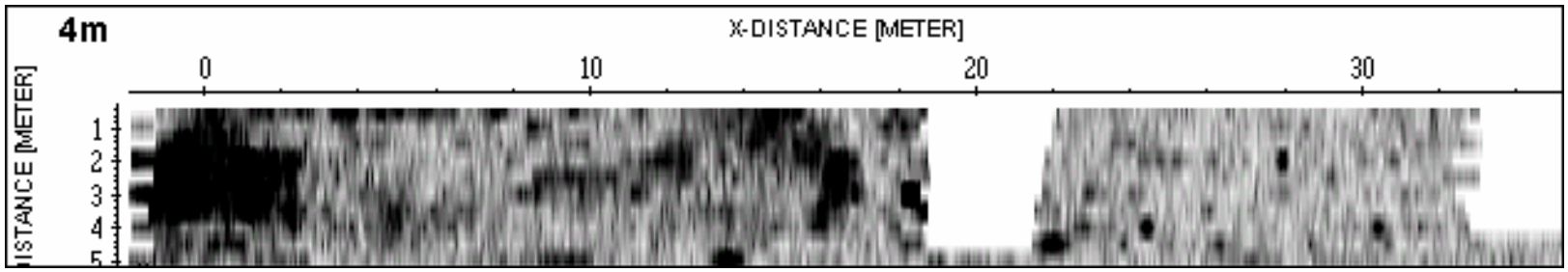


Figure 14: 4m Depth,. Areas 1 & 2

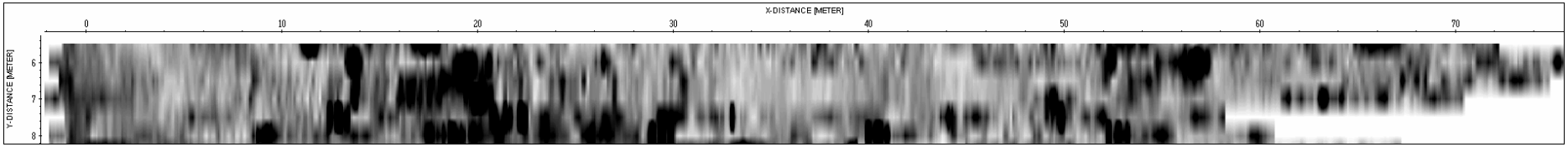


Figure 15: 25cm Depth, Area 3

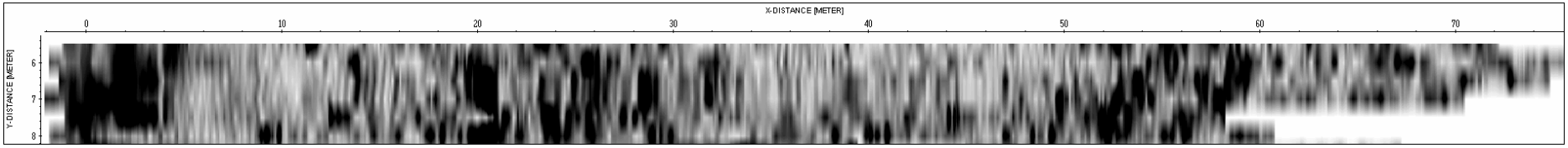


Figure 16: 50cm Depth, Area 3

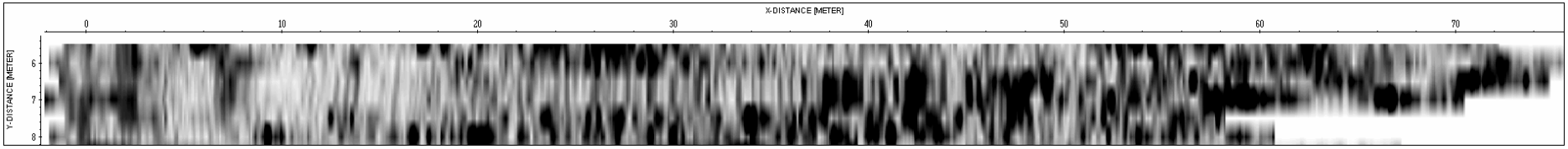


Figure 17: 75cm Depth, Area 3

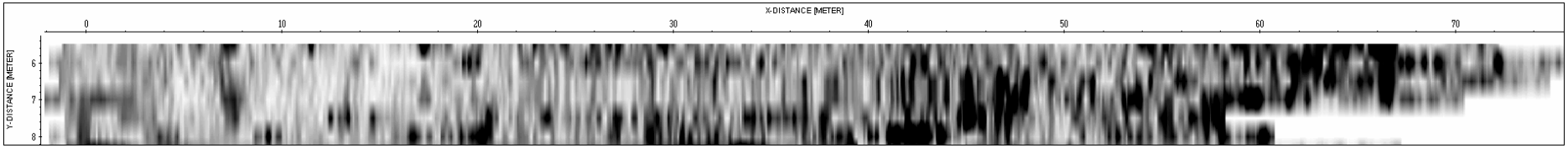


Figure 18: 1m Depth, Area 3

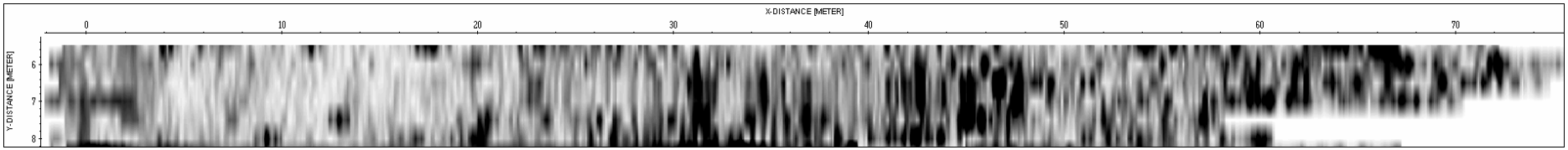


Figure 19: 1m25cm Depth, Area 3

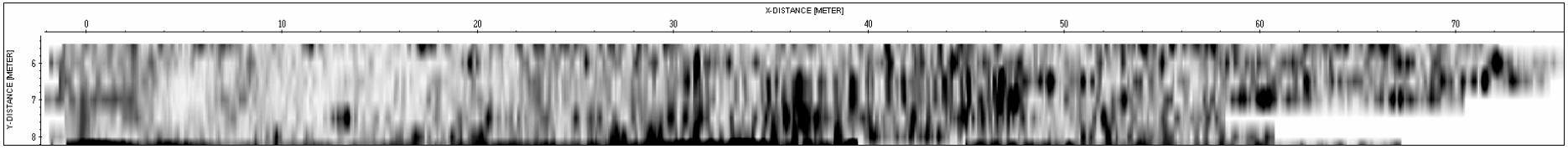


Figure 20: 1m 50cm Depth, Area 3

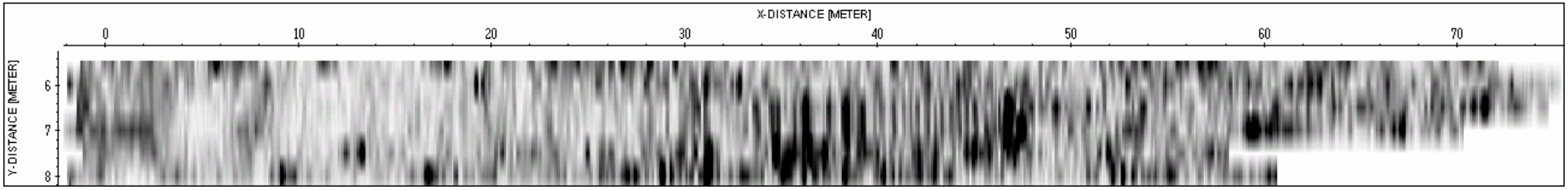


Figure 21: 1m 75cm Depth, Area 3

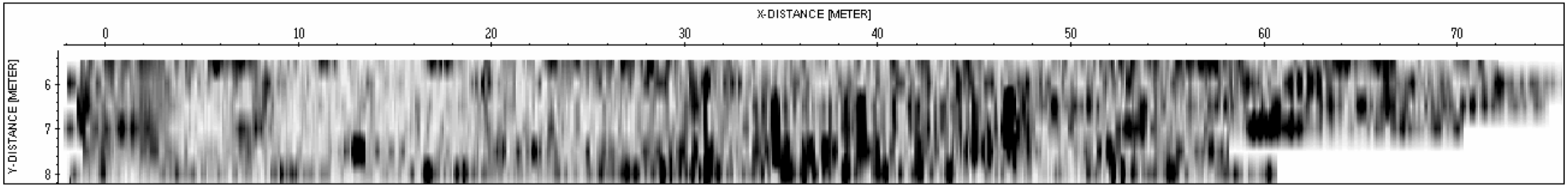


Figure 22: 2m Depth, Area 3

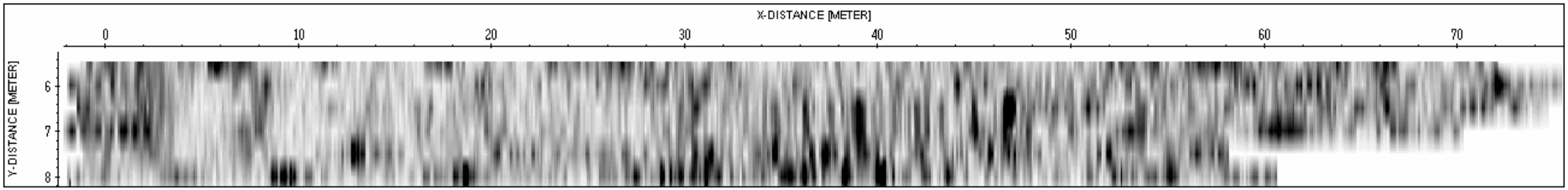


Figure 23: 2m 25cm Depth, Area 3

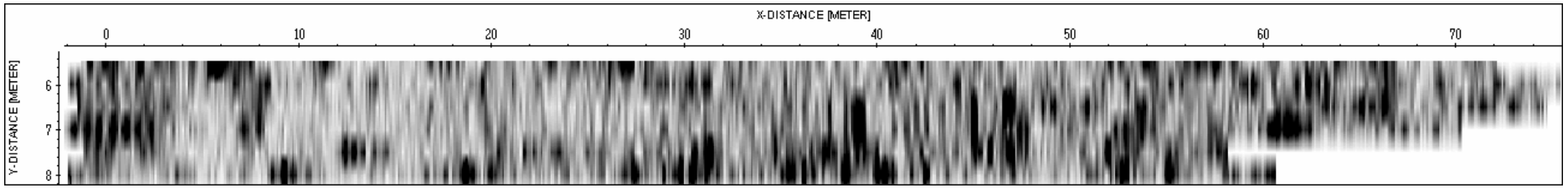


Figure 24: 2m 50cm Depth, Area 3

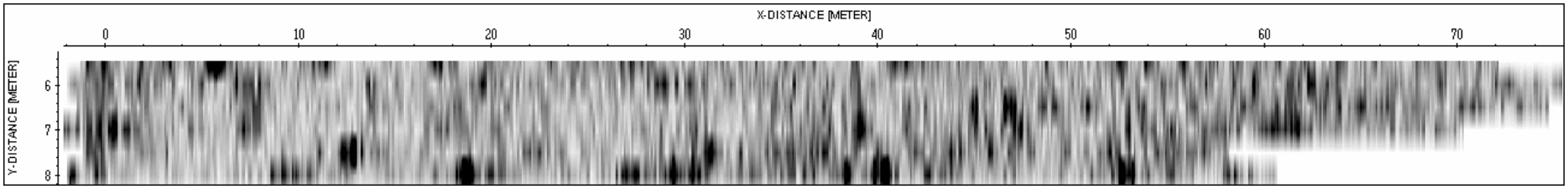


Figure 25: 2m75cm Depth, Area 3

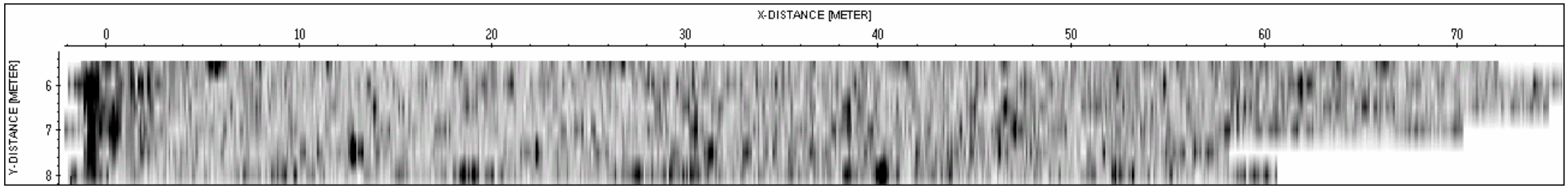


Figure 26: 3m Depth, Area 3

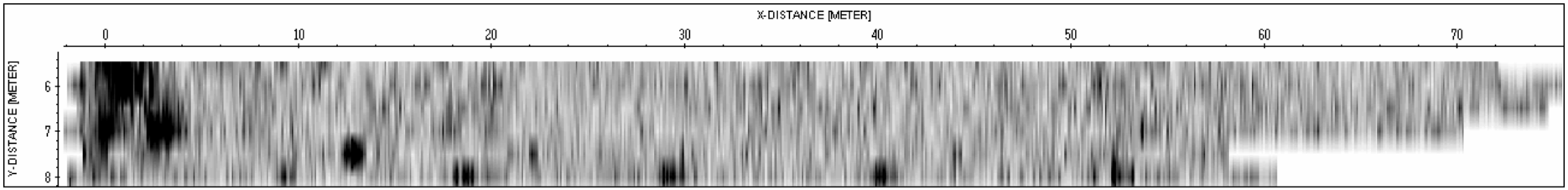


Figure 27: 3m 75cm Depth, Area 3

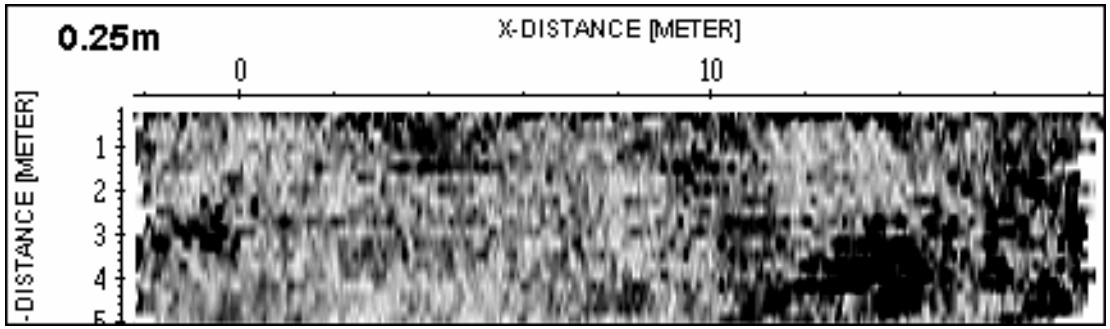


Figure 28: 25cm Depth, Area 1 (1GHz)

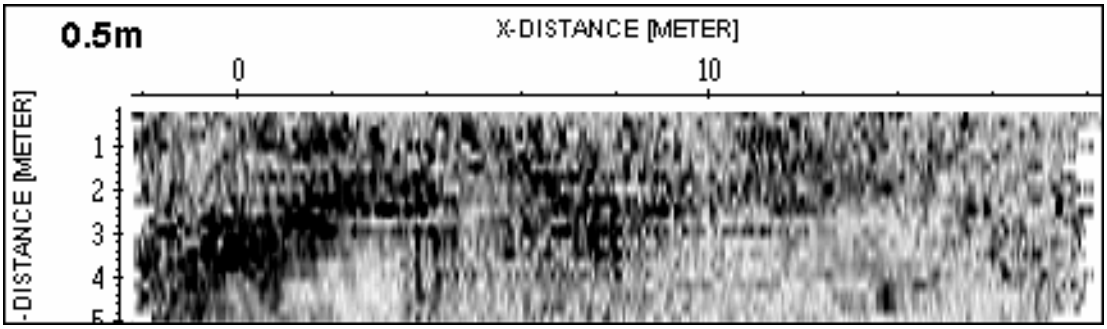


Figure 29: 50cm Depth, Area 1 (1GHz)

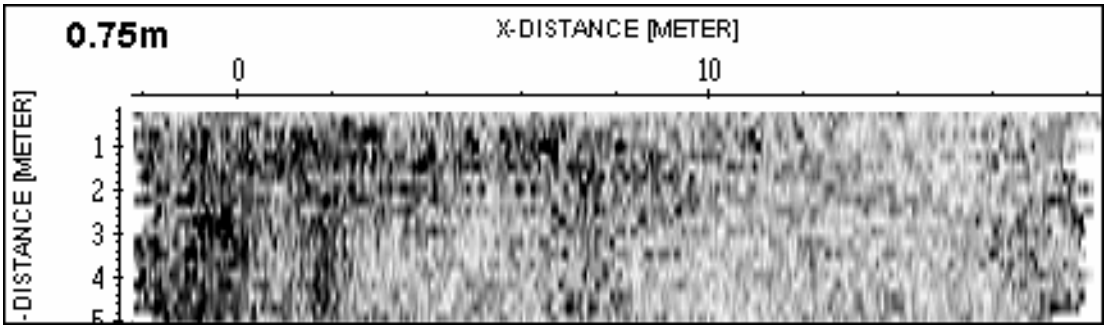


Figure 30: 75cm Depth, Area 1 (1GHz)

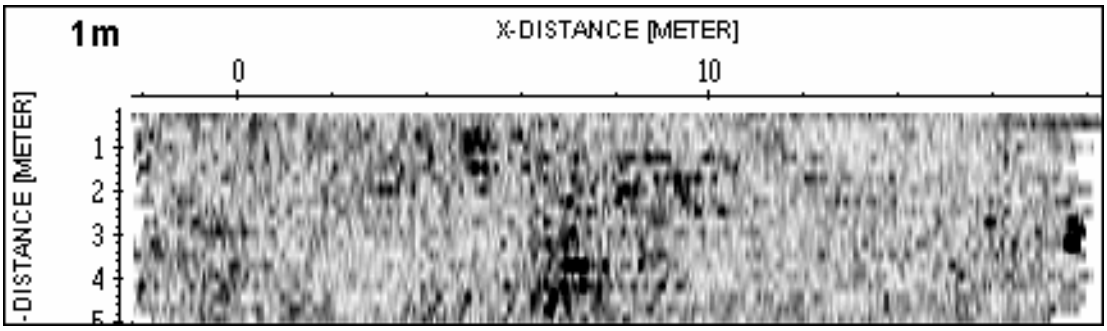


Figure 31: 1m Depth, Area 1 (1GHz)

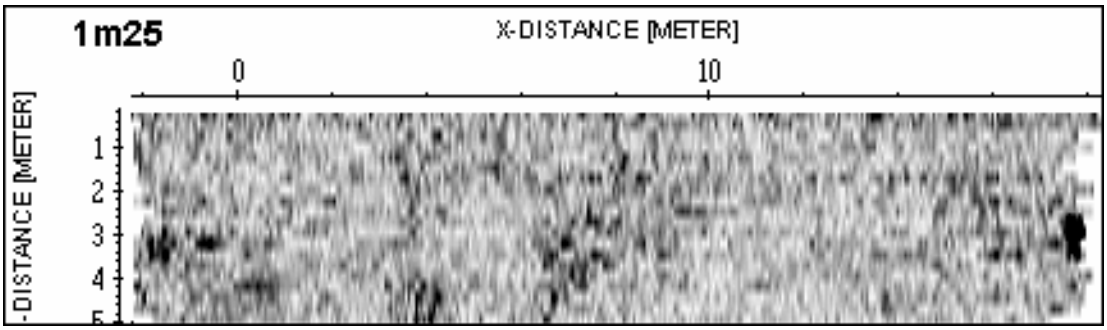


Figure 32: 1m 25cm Depth, Area 1 (1GHz)

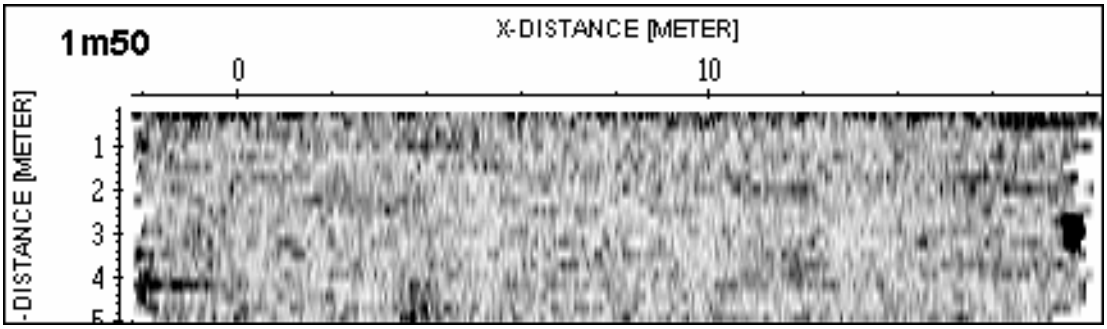


Figure 33: 1m 50cm Depth, Area 1 (1GHz)

Test Pit 1

Test Pit 2

Test Pit 3

Test Pit 4

Test Pit 5

Test Pit 6

Test Pit 7

Appendix 5: Figure7, photographs of the Test Pits

Plate 1

Plate 2

Plate 3

Plate 4

Appendix 6: Figure 8, e xamples of reinstated test pits.