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The Roman road west of Carmarthen

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The course of the Roman road running west from Carmarthen is described. Earthworks and cropmarks define the road, which can be traced for 38km to Wiston, in Pembrokeshire. The destination (or destinations) of the road is unknown. Also described is an excavation of the road undertaken during the construction of the Whitland bypass. As the road here crossed a small peat bog timber-lined drains were constructed prior to formation of the road surface. Two clear phases of road surface were present. Analyses of pollen, beetles and plant remains showed that the road had been constructed through a predominately grassland environment. It is likely that the road was built during the military campaigns of Frontinus, AD 73/4–77/8, and that it continued in use following the military conquest of the area and the withdrawal of troops in the early second century AD.

INTRODUCTION

The possible presence of a Roman road west of Carmarthenshire and its destination in Pembrokeshire has long been the subject of discussion. However, it was not until the early 1980s, when sections of a possible route were identified from aerial photographs, that it received general acceptance. Since then, the road has been traced westwards from Carmarthen for a distance of 38km (Fig. 1). Its destination (or destinations) is unknown. The investigation of the road comprised aerial photography, survey, evaluation, excavation and digital mapping. Although collected at various times through separate projects, the accumulated evidence has allowed an overview of the road line, the technical characteristics of the road and some assessment of its wider implications.

This report brings together evidence from the different strands of investigation to provide a discussion on the pre-Roman landscape. This includes evidence for route selection, ground preparations, construction methods, the significance of the road in the Roman conquest of south-west Wales and for the wider environment. A description of the route of the road, the topographical factors that determined its line, its present condition and a brief comment on route selection and marking out techniques is followed by a section describing excavation and earlier evaluation results, including palaeoecological analyses, before a discussion draws the information together.

The results described below are largely from three projects carried out between 1993 and 1995. The first was a two-year joint project between Dyfed Archaeological Trust and the Archaeology Department, Trinity College, Carmarthen, grant-aided by Cadw, to establish the line of the road on the ground, to assess the condition of any surviving sections and to investigate the structure of the road through the excavation of two trial trenches (Fenton-Thomas 1994; Fenton-Thomas and Drew 1997). Whilst the two-year project was being carried out the preferred route for the A40 Whitland Bypass was announced. This route crossed the Roman road to the north of the town, and therefore excavation on the section of the road affected by the bypass was undertaken in the early summer of 1995 in advance of construction.

This work was funded by Welsh Office Highways. In 1997, Dyfed Archaeological Trust identified new sections of the road west of Carmarthen during a programme of digitally mapping the Roman roads of Carmarthenshire, Ceredigion and Pembrokeshire from aerial photographs. This work was grant-aided by the Royal Commission on the Ancient and Historical Monuments of Wales (RCAHMW).

Heather James (2016) has described the rather curious story of the early nineteenth-century discovery of the Roman road west of Carmarthen based on a forged document and the subsequent dismissal of the discovery by later generations of archaeologists; this story is not repeated here. In the late 1980s Terry James identified, one might say rediscovered, the course of the Roman road on vertical aerial photographs (James 1990). Oblique aerial photographs taken by James in the early 1990s confirmed the route of the road, with detail added to the route by further aerial photographs taken by Chris Musson of the RCAHMW during the dry summers of the mid-1990s. Later aerial photographic evidence for the Roman road passing just north and west of Wiston has been identified and mapped by Driver (2007, figs 78 and 251). A synopsis of the route of the road and all other roads in Wales appeared in the *Roman Frontiers in Wales* (Burnham and Davies 2010, 91–7 and 215–332), since the publication of which a fort has been discovered at Wiston (Meek 2017).

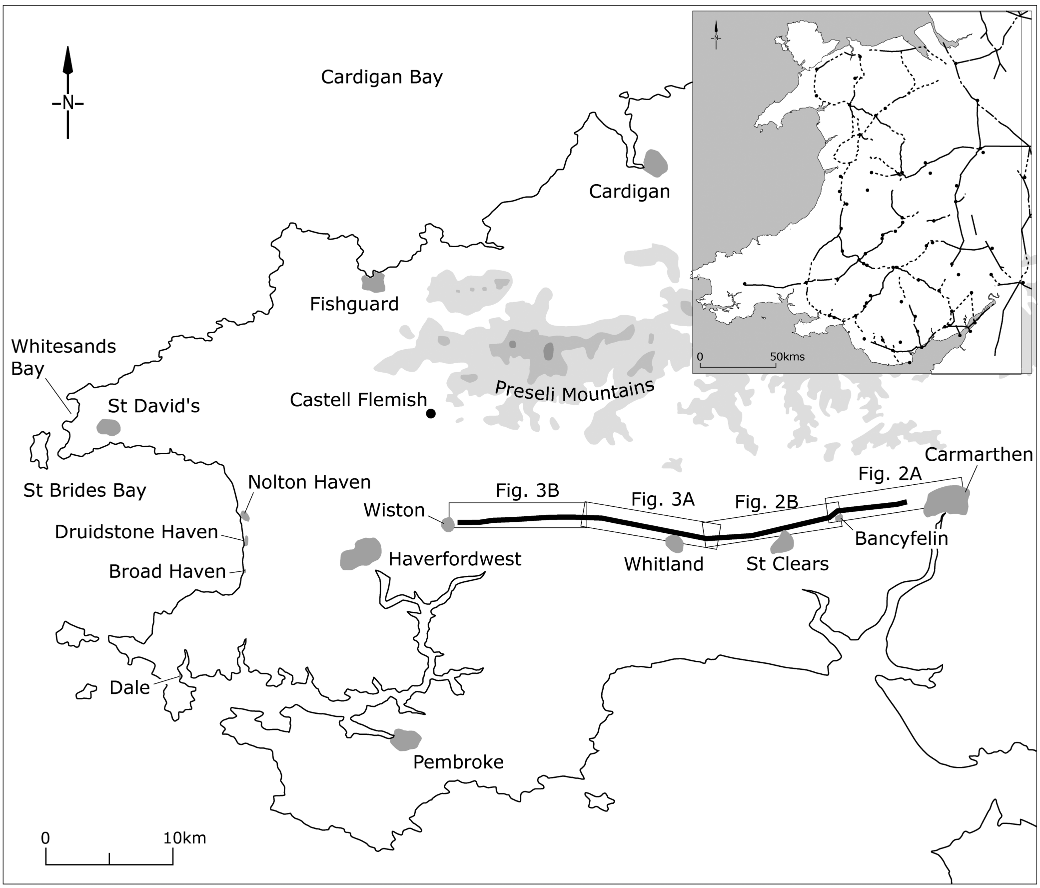


Fig. 1. Location map showing the line of the road and places mentioned in the text. The inset shows Roman forts in Wales and the Marches and the Roman road system.

THE COURSE OF THE ROMAN ROAD WEST OF CARMARTHEN

This section is largely based on the results of the 1997 programme of mapping the Roman roads of south-west Wales from aerial photographs, funded by RCAHMW, and the 1993–95 survey project (Fenton-Thomas 1994; Fenton-Thomas and Drew 1997).

The Roman road west of Carmarthen can be traced for more than 38km to close by the village of Wiston, Pembrokeshire (Figs 1–3). Its eastern starting point is the fort and town of *Moridunum* at Carmarthen. Its destination or destinations is unknown. The overall course of the road is 3–5 degrees south of due west. For the first 30km west of Carmarthen the road follows a route recognised as the most convenient by recent engineers — the Roman road is never more than one kilometre from the Carmarthen–Fishguard railway line or from the A40 trunk road. From Carmarthen to Bancyfelin, this natural route lies in a wide, open valley. From Bancyfelin to St Clears an interfluve comprising low hills divides this valley from that of the river Taf. The natural route corridor from St Clears now follows the course of the Taf valley until approximately 4–5km west of Whitland. From here no single natural route takes precedence; the Roman road was laid out over hilly terrain; the A40 road takes a route to the south across lower-lying land whilst the railway continues to follow the Taf valley and then the valleys of the Eastern and Western Cleddau and their tributaries.

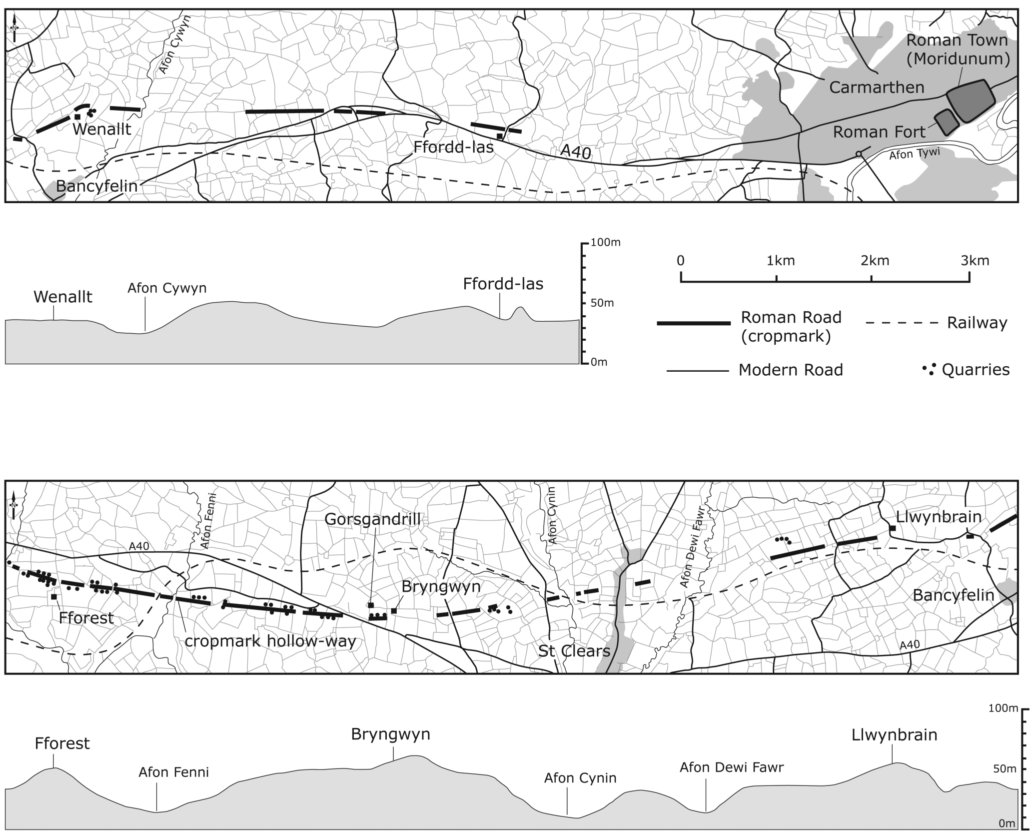


Fig. 2A (top) and 2B (bottom). The eastern section of the road showing known sections as a heavy line and quarries plotted from aerial photographs as circles.

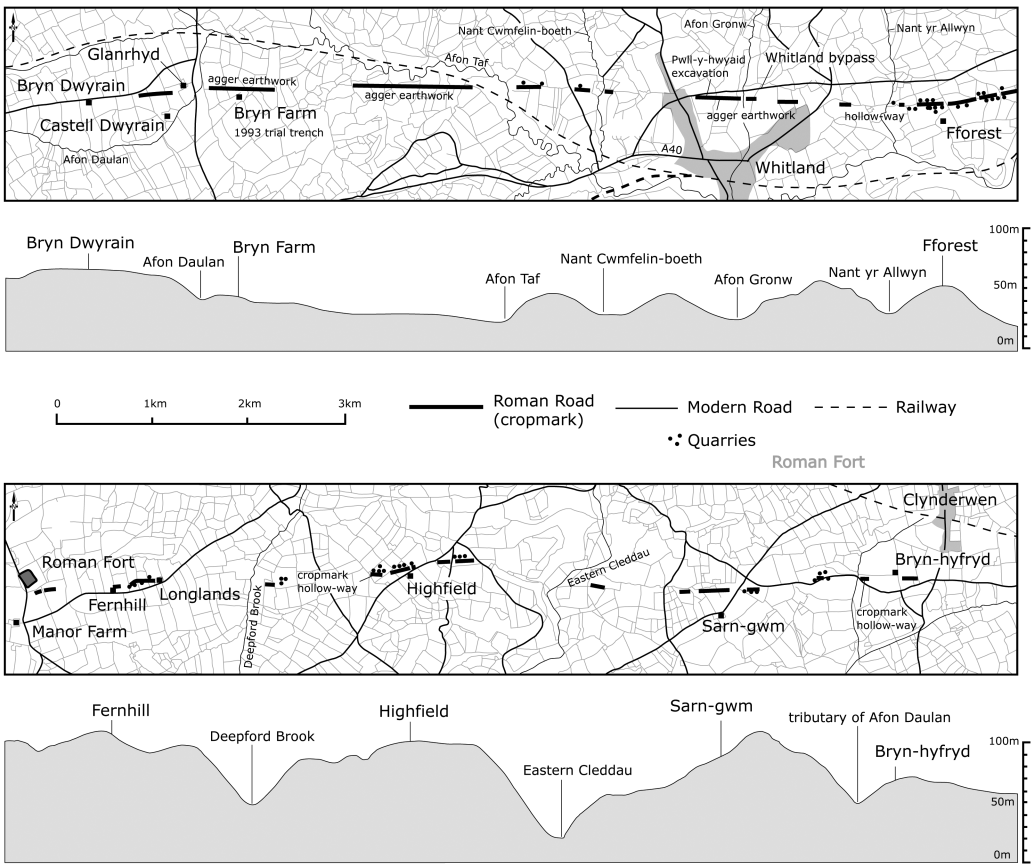


Fig. 3A (top) and 3B (bottom). The western section of the road showing known sections as a heavy line and quarries plotted from aerial photographs as circles.

The geology traversed by the road from Carmarthen to Whitland comprises Ordovician shales of the Arenig Series overlain by boulder clay on the valley sides. Valley bottoms are filled with alluvium (Geological Survey of Great Britain 1967). To the west of Whitland the geological sequence becomes more complex. Ordovician shales of the Llanviren Series lie to the north of Whitland with alluvium in the valley bottoms. From the river Taf to Bryn Farm (Fig. 3A) the road crosses Ordovician shales and mudstones of the Bala Series. To the west, the hill at Bryn Dwyrain is capped with glacial sands and gravels with boulder clay on the slopes (Geological Survey of Great Britain 1974). The hills crossed by the road to the west of Bryn Dwyrain are composed of Silurian Cethings Sandstone Black Shales and Conglomerates with Ordovican shales and mudstones of the Bala Series on lower slopes and boulder clay in some of the valley bottoms. Alluvium fills the valley floor of the Eastern Cleddau.

The road was laid out in a series of straight lengths of between 4km and 6km. Six of these lengths have been identified: Ffordd-las to Wenallt (Fig. 2A), Llwynbrain to Bryngwyn (Fig. 2B), Bryngwyn to Fforest (Fig. 2B and Fig. 4), Fforest to the Afon Taf (Fig. 3A), the Afon Taf to the Afon Daulan (Fig. 3A) and from the Afon Daulan to Sarn-gwm (Fig. 3A and B). The change of direction between lengths usually occurs on hill summits or on ridge crests — Llwynbrain, Bryngwyn, Fforest, Sarn-gwm — indicating that these were used as both forward- and backward-sighting positions. The 4–6km length of each section may be an indication that the road was laid out across a landscape cleared of most of its woodland and forest. This suggestion is supported by the palaeoecological evidence from the Whitland excavation which shows that the road was constructed across a landscape of open grassland with local stands of woodland.

The majority of the archaeological evidence for the road is in the form of cropmarks, of which parchmarks, representing the former agger, are the most common. In total, 14km of parchmark agger has been recorded. Cropmark evidence for roadside ditches is rare, though the location of many former quarries has been identified on aerial photographs. In some instances, these former quarries are evidenced by slight surface depressions in addition to the cropmarks. It is assumed that these quarries are of Roman date and provided stone and aggregate for the road's construction. At three locations where the road descends a steep slope before crossing a river or stream a possible silted hollow-way is visible on aerial photographs, and in one location an extant hollow-way is present. Earthworks form the second type of archaeological evidence for the road. In three lengths totaling 2.7km the agger survives as an earthwork up to 1m high. Historic elements of the landscape such as hedge-banks, tracks and roads comprise the remainder and less definite evidence for the line of the road.

For 5km to the west of Carmarthen the course of the road is not known, though it is suspected that at least some sections of it are overlain by the historic line of the A40 road, including Lammas Street which leads west out of Carmarthen town. The first clear evidence for the road, in the form of an agger parchmark, is obtained at Ffordd-las (Fig. 2A). This parchmark lies to the west of a low hillock. Projected eastwards, the road would seem to run over the summit or a high shoulder of this hillock, perhaps indicating that it was used as a sighting position. To the west the road follows a very slightly curving course evidenced by agger parchmarks and the lines of hedge-banks for 5.5km before curving sharply to the south at Wenallt. For these 5.5km the road lies low on the northern slopes of a wide, open valley. A valley which is now occupied by a misfit stream and is the natural route west out of Carmarthen. The road crosses several south-flowing streams, but it is not until 0.6km to the east of Wenallt that a river, the Afon Cywyn, is encountered. The modern and historic A40 road and the railway all bridge the Cywyn 1km downstream of the Roman road on a broad floodplain which is subjected to occasional flooding and may have been susceptible to infrequent tidal inundation in the Roman period. The Roman road crosses the Cywyn where the floodplain is only 400m wide.

The road's sharp turn of 30 degrees to the south-west at Wenallt seems to have been dictated by the decision to avoid climbing a steep, south-east-facing valley side. This is the only sudden change of course in the whole of the 38km. The curve here is around the base of a low hillock with presumed Roman road quarries in the form of cropmarks on its side. Following this new course, evidenced by an agger cropmark, for just 0.8km, the road then turns back through 26 degrees to pursue a route close to its previous direction; this was presumably engineered in order to return to the overall intended course after the 'diversion' at Wenallt to avoid too steep an ascent. To the west there are two stretches of over 1km each where there is no evidence for the road (Fig. 2B), but its general conjectured line is clear from the known sections of agger cropmark and from cropmark quarries. At Llwynbrain the projected line of the road runs over the crest of a spur whilst undergoing a slight change of course of 5 degrees to the south-west. This spur is a probable sighting point as the road then maintains a straight course for 6km to Bryngwyn, running across an undulating plateau dissected by south-flowing streams. The west–east aligned valley of the river Taf into which these streams flow lies between 1km and 2km to the south of the road. The Afon Dewi Fawr and the Afon Cynin are the only major watercourses in this 6km section. The road crosses them approximately 1.5km upstream from the modern high tide mark on the river Taf.

A low eminence at Bryngwyn signifies another sighting point, backward to Llwynbrain and forwards to Fforest; here the road undergoes another subtle change of course, 13 degrees to the north (Fig. 2B).

Between Bryngwyn and Fforest, a distance of 4km, the road maintains a straight course across a low plateau dissected by south-flowing streams — topography similar to that previously traversed to the east. Evidence for a cropmark agger is almost continuous in this stretch. Many cropmark quarries are also present (Fig. 4). All the quarries between Wenallt and Fforest are situated on high ground and seem to have been dug to obtain the Ordovician shale — boulder clay and alluvium overlie shale in lower-lying areas. To the south-east and south-west of Gorsgandrill, roadside ditches are visible on aerial photographs. On the descent onto the floodplain of the Afon Fenni, the road runs in a hollow-way, now silted, and showing on aerial photographs as a cropmark.

A gentle 12-degree curve of the road to the north over a low ridge at Fforest represents another sighting point, back to Bryngwyn. The next high point at Bryn Dwyrain (Fig. 3A) is not visible from Fforest, though the valley of the river Taf can be seen. The road now maintains a straight course for 5.2km, crossing a low plateau dissected by three south-flowing streams: the Nant Allwyn, the Afon Gronw and the Nant Cwmfelin-boeth. In addition to the six relatively short lengths of agger cropmark and three cropmark quarries, the road is evidenced in this stretch by a 400m section of agger earthwork. It was at the western end of this earthwork, where it is now crossed by the A40 Whitland bypass, that the 1995 excavations took place.

From here the road descends into the Taf valley necessitating a 2-degree adjustment of course to the south (Fig. 3A). This slight adjustment takes the road around the base of a steep-sided spur on the south side of the Taf valley. In the valley the road is manifest as an earthwork agger over first a 1.4km section and then at Bryn Farm over a 0.9km length. In both areas well-preserved cultivation ridges of medieval and/or post-medieval date are present. The presence of these would seem to indicate that no modern ploughing has taken place; this may be a factor in the

Fig. 4. Aerial photograph taken in 1995 looking west at Fforest, with the road showing as a parchmark and quarries as irregular, dark cropmarks surrounded by lighter coloured marks. *© Crown copyright. Image DI2006_1214 repro-duced with the permission of the Royal Commission on the Ancient and Historical Monuments of Wales under delegated authority from The Keeper of Public Records.*

preservation of the road as an earthwork. When projected, these two lengths of earthwork do not meet — there must be an as yet undetected kink in the road line. To the west of Bryn Farm the road crosses a minor river, the Afon Daulan, undergoes a 3-degree change of alignment to the south, and climbs a steep slope onto a ridge towards Bryn Dwyrain.

It is from this point, when the road climbs onto the Bryn Dwyrain ridge, that the natural east–west route corridor is lost. The railway begins to swing away to the north heading for Fishguard and the A40 road to the south, making for Haverfordwest. The terrain now traversed by the road until it is finally lost at Manor Farm, Wiston, a distance of 15km, is too broken to be termed a ridgeway. The road does, however, run across the summits of several low, broad hills, any or all of which could have served as sighting positions. Interspersed with the hills are descents and ascents of deeply incised valleys of south-flowing streams and rivers. Because of the greater and steeper relief of the landscape frequent changes of direction of the road were required to maintain its general westward trend. The archaeological evidence is also here more fragmented and dispersed than previously encountered. Quarries, presumably of Roman date, were dug on the crests or high slopes of many of the hills crossed by the road in order to exploit the Silurian sandstones, shales and conglomerates. Only at Bryn Dwyrain, a hill capped by glacial sands, gravels and boulder clay are quarries absent or undetectable by aerial photography.

Climbing up from the Afon Daulan (Fig. 3A), the road line is evidenced as an agger, then a cropmark and finally it is overlain by a modern, minor road. On the summit of the hill the road passes close by a Bronze Age burial mound[5] at Bryn Dwyrain. This is a good sighting point to the west and east, though the road does not change course at this point. Fragmented sections of cropmark agger, hedge-bank alignments and lengths of modern road indicate that the road maintains a fairly straight course for 4km from the Afon Daulan to the crossing of a small tributary stream of the Daulan. The descent to this stream is via a silted hollow-way. From the stream there is a change of direction of 8 degrees to the south. The road now follows a slightly curving course over the summit of a hill near Sarn-gwm before a steep descent into the valley of the Eastern Cleddau.

To the west of the Eastern Cleddau evidence in the form of agger cropmarks and quarry cropmarks becomes even more fragmented and dispersed. There are frequent minor changes of direction as the road seeks to find a route across hilly terrain whilst maintaining its course of 3–5 degrees south of due west. From the Eastern Cleddau the road ascends the steep valley side via a tributary valley. There is then good cropmark evidence for the road where it crosses a broad hill near to Highfield, including a cropmark hollow-way on the eastern descent. At Longlands Farm cropmark evidence for an agger, quarries and roadside ditches indicates that the road undergoes a sharp, dogleg kink. There is no apparent topographical reason for this. The dogleg does however ensure that the road runs over the crest of a hill at Fernhill, 250m to the west. The final western piece of agger cropmark is at Manor Farm, just to the north-east of the village of Wiston, in the field immediately south of Wiston Roman fort. Geophysical survey followed by trial excavation identified a vicus in this field and the adjacent field to the east, but no clear evidence for the road (Meek 2017). However, the geophysical survey (Meek 2017, figs 4 and 5) shows complex archaeology, possibly masking evidence for the course of the road. Meek (op. cit. fig. 1) suggests two possible routes of the road, in addition to the one visible on aerial photographs, both to the south of the fort and vicus. The course of the road west of Wiston has not been established.

THE EXCAVATIONS

In 1993, as part of the joint Dyed Archaeological Trust–Trinity College project two trenches were cut across the road in locations where the agger or causeway was most prominent. The first of these trenches was excavated at Bryn Farm, Llanddewi Velfrey (SN 1515 1822) and the second at Pwll-y-Hwyaid, Whitland (SN 1990 1734), the latter on the site of the Whitland bypass excavation. In both locations the road crossed localised peat bogs. Both trial trenches were 16m long and 2m wide and both exposed a narrow area of road which was totally excavated. A brief account of the Bryn Farm investigation is provided below, the trial work at Pwll-y-Hwyaid is incorporated in the bypass excavation report.

Bryn Farm

At Bryn Farm a simple single structural sequence was recorded. The agger was made up of a foundation layer of large boulders of various rock types. These would all have been locally available either as country rocks or glacially deposited material from the riverbed of the Taf, some 300m to the north. Above the boulders the agger was formed by a layer of shale chippings on top of which was the cobbled surface of the road itself. This lay 0.1–0.3m below the present-day field-surface. This uppermost surface had clearly been robbed out in places since there were areas where the shale was immediately encountered below the topsoil. However, sufficient of the uppermost surface of the road survived to preserve the traces of two gullies, probably wheel ruts, about 1m apart, running parallel to the line of the road. On either side of the shale/boulder causeway were flanking deposits of sand and silt that filled two small, ditches clearly seen in section on either side of the agger.

Pwll-y-Hwyaid – Whitland bypass

The larger-scale excavation at Pwll-y-Hwyaid, prior to the construction of the Whitland bypass, took place in April and May 1995. This was followed by limited excavation and recording during a watching-brief phase. The line of the new bypass ran obliquely across the line of the Roman road and in all a 150m length of it was destroyed by bypass construction. The excavation comprised machine stripping topsoil off a *c*.120m length of the road (Figs 5 and 6). This was effectively divided into two areas by a stream that crossed the road. The stream rose close to Pwll-y-Hwyaid farm and ran north-eastwards into a hollow area

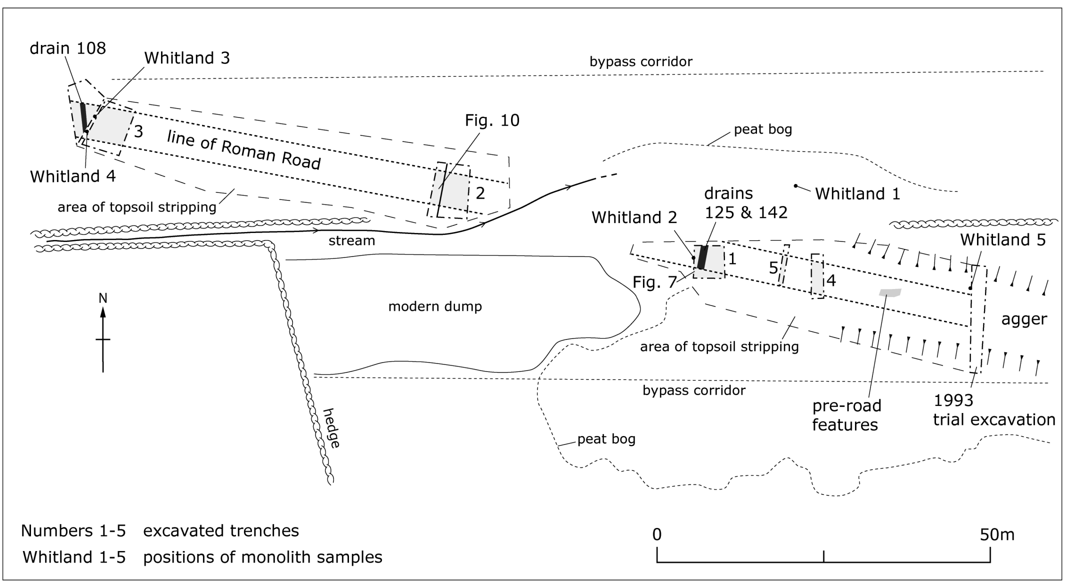


Fig. 5. Location of the Pwll-y-Hwyaid — Whitland bypass — excavation trenches.

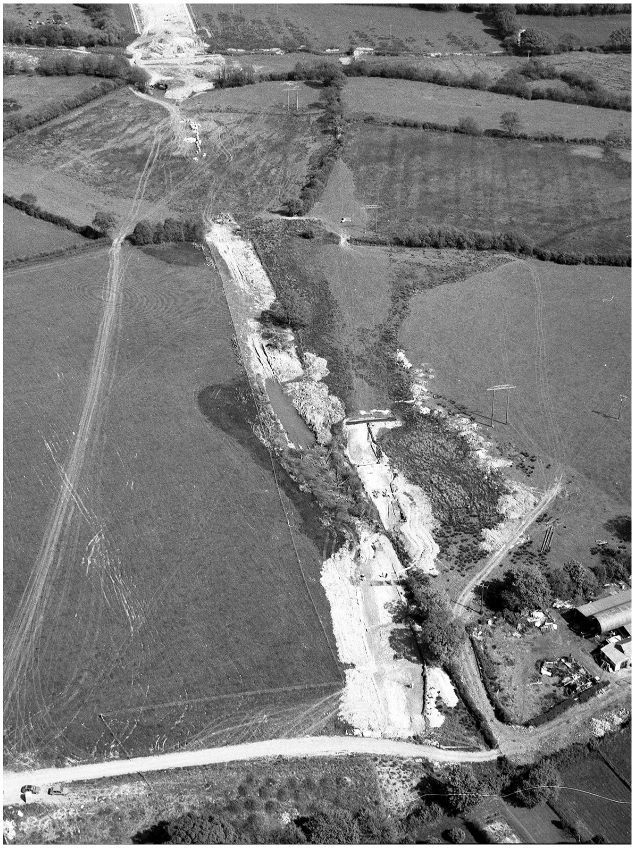


Fig. 6. Aerial photograph showing the site of the excavation (bottom), the Whitland bypass under construction and the Roman road.

within which a peat bog had formed — already present in Roman times. The portion of Roman road examined was bisected obliquely by a modern hedge-bank. Undoubtedly, despite attempts in the more recent past to drain the boggy area, the wet conditions that prevented ploughing and drainage had preserved the structure and line of the Roman road.

These circumstances meant that to the west of the stream the full width of the Roman road could be exposed along a 70m length. To the east of the stream 50m was exposed but not to the full width of the road throughout. Following machine stripping and then cleaning by hand to the surviving uppermost Roman road surfaces, a total of five trenches were selected for total excavation down through the road structure (Fig. 5, Trenches 1–5). Two of these (Trenches 4 and 5) were narrow, dug mainly for the sections they provided. Trench 4 had been overcut during machine stripping and Trench 5 originated as an earlier geotechnical test pit dug by the bypass engineers.

A number of monolith samples were taken for palaeoecological analysis (Fig. 5, Whitland 1–5). These were taken from beneath and to both sides of the road and spot samples were taken from underlying drain and ditch fills. The samples were analysed for pollen, plant macrofossils and fossil insect remains and produced valuable information on the pre-Roman- and Roman-environment.

The structure of the road

Summary of the sequence

Two phases of construction and use of the Roman road were revealed. The later phase of use was the most fully exposed. This was the uppermost surviving surface of the Roman road itself. Below this were extensive and deep deposits of clay, representing a leveling up of the whole area of the road as a preparation for the upper surface. Beneath the clay was a well-preserved lower road surface. Beneath the lower surface were timber structures, identified as drains — evidence for extensive and skilled site preparation for carrying the road surface across boggy ground.

The upper road surface

To the west of the stream a series of nineteenth-century field drains ran diagonally across the road in a herringbone pattern, and the extreme western end of the road was crossed by a modern water-main. Colluvial deposits and plough-wash lay against the northern side of the road. To the east of the stream, where the road survived as a well-defined agger, the uppermost structural elements were covered by a thick turf layer with little evidence of ploughing or other disturbance, at any rate in recent times.

The upper road surface (Fig. 7, 18; Fig. 8; Fig. 9 and Fig. 10, 52) was 5m wide, composed of angular sandstone blocks (varying in size from 0.1×0.1m to 0.3×0.2m) and rounded cobbles (up to 0.15×0.1m). The sandstone blocks were sparsely scattered across the uneven uppermost surviving surface. However, sufficient were present to suggest that the road surface had been paved with sandstone set onto a cobble base. It seems probable that these sandstone blocks were robbed for use as building material after this section of road went out of use in post-Roman times, but there were no artifacts to indicate when such robbing took place.

The cobbles and boulders together with the few surviving sandstone blocks of the latest road surface were set into a uniform matrix of yellow/grey silty clay (Fig. 7, 28) This layer extended out beyond the stone surface of the road and effectively formed a 'soft verge' either side of the exposed road surface to the west of the stream. It was not recorded to the same extent east of the stream where there was more shale in the material flanking the upper road surface.

There was a suggestion that this soft verge was preceded by shallow side ditches (Fig. 7, 123 and Fig. 10, 176). Both of these features appeared to reflect the position and profile of the underlying original side ditches relating to the lower road surface.

In Trench 3, this clay and stone foundation for the upper road surface was thinner and much more irregular. It was not clear whether the decrease in thickness of this foundation layer was because the later road was being feathered out at this point to merge with the original surface, or whether it was the result

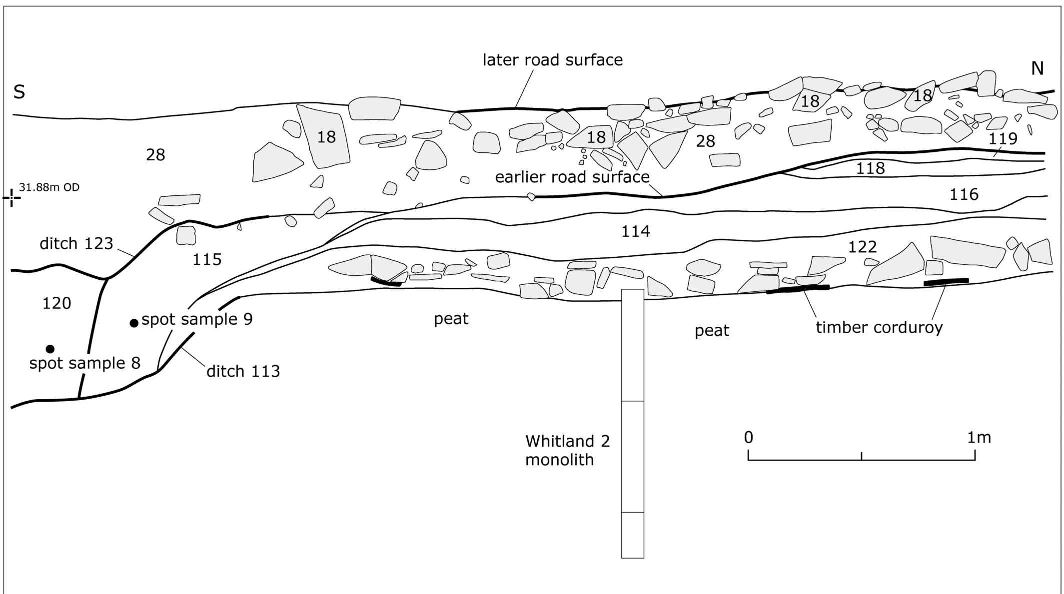


Fig. 7. East-facing section of Trench 1.

Fig. 8. General view of the upper surface of the Roman road looking east.

of post-abandonment disturbance. In Trenches 1 and 2, the upper road surface was almost half a metre higher than the earlier road. This resulted in the pronounced bank or agger across the wet ground.

The lower road surface

The upper road overlay an earlier, worn road surface made up of a variety of materials, from flat sub-angular stones, up to 0.4×0.4m, to small cobbles and gravel in a matrix of grey-orange shaley, silty-clay (Fig. 7, 119). The were some minor differences in the make-up for this earlier road surface across the trenches, as is shown on the sections of Trenches 1 and 2 (Figs 7 and 10) and in the following description. The differences in the size of the stones across the surface appeared to suggest widespread patching and repair and a number of longitudinal grooves in the surface have been interpreted as wheel ruts. This surface was laid on a layer of grey-orange clay (Fig. 7, 118), *c.* 0.15m, thick which contained some shale, and patches of mixed brown-grey clay. This in turn overlay a layer of yellow-grey clay (116), *c.* 0.15m thick. This clay layer overlay a deposit predominately made up of shale chippings and grey clay (Fig. 7, 114; Fig. 10, 54) up to 0.2m thick. Beneath this was a foundation layer, 0.15–0.25m thick, composed of sandstone blocks in a clay matrix (Fig. 7, 122; Fig. 10, 171).

Fig. 9. The upper surface of the Roman road showing the sandstone slabs and cobbles.

Although evidence for ditches flanking the primary road surface was encountered in all five trenches, and in the 1993 trial trench, the full profile of the road and both side ditches was only recorded in Trench 2 (Fig. 10). Here both ditches were *c*. 0.25m away from the edges of the road. The north ditch (178) measured *c*. 1m wide and 0.6m deep with gently sloping sides and a rounded base. The south ditch (173) was *c*. 1.4m wide and 0.5m deep with gently sloping sides and a flat base. In Trenches 1, 2 and 5, the south ditch showed evidence of having been recut several times.

The basal fills of both ditches in Section 2 were a clay with a high organic content (Fig. 10; 175 and 179/180). Similar deposits of grey-green silty-clay were also present in the south ditch (113) in Sections 5 and 1 (Fig. 7; 120). In Section 1 this layer (120) was a secondary fill, possibly filling a recut. The primary fill (115) was a dark grey silty-clay deposit. The plant macrofossil and insect remains from the fills of the south ditch in Section 1 (115 and 120) and from fills of the north ditch in Section 2 (179/180) showed that the ditches held standing water and that ditch-side plant communities had developed by the time these deposits were being laid down. A series of recuts (filled with clays and silty clays were recorded in Section 2 (Fig. 10) following the deposition of the primary fills (175 and 179/180).

The foundation of the lower road

Within all of the excavated sections, a wooden raft overlay the natural peat and organic clays and provided a foundation for the road (for example see Trench 2, Figs 10 and 11). This comprised a corduroy of brushwood and branches of alder, oak and hazel. There was no evidence to suggest that the original ground surface had been reduced prior to the laying down of the corduroy. By contrast, at Bryn Farm the peat surface immediately below was of a Bronze Age date, suggesting truncation and leveling (Caseldine 1997).

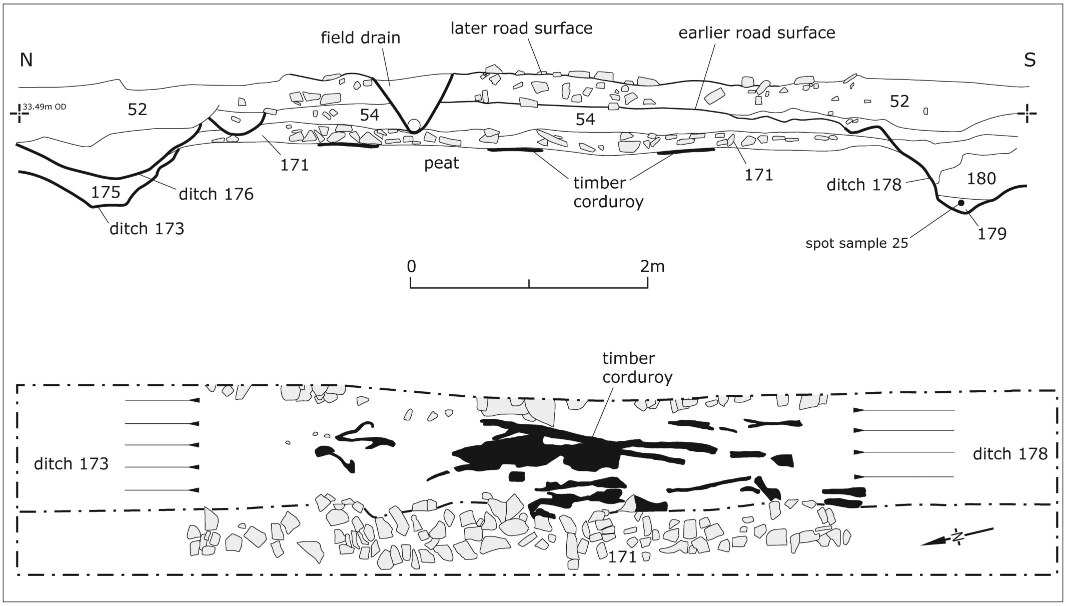


Fig. 10. The east-facing section of Trench 2 and plan showing the timber corduroy at the base of the road.

Timber drains

Three timber structures, one in Section 3 (198) and two in Section 1 (125 and 142), were revealed, all of which are interpreted as drains. It was a remarkable coincidence that these structures were encountered in two of the five sections excavated. The remainder of the road and underlying peat and clays were stripped during bypass construction and no traces of similar features were seen during a watching brief. A full analysis of the timbers of the drains and woodworking techniques employed is contained in the project archive (Nayling 1995).

Drain 198 in Trench 3 (Figs 12 and 13) was aligned obliquely across the road. It was constructed of longitudinal oak timbers laid on radially-split oak cross-bearers. These rested on the edges of a shallow ditch (197), 0.7m wide and 0.2–0.3m deep, dug into the underlying organic clay. The excavated section was 5m long. The base of the ditch was slightly irregular, but for the most part flat and sloped gently from north-west to south-east. Upright stakes had been driven along both sides of the ditch (Fig. 13).

The longitudinal timbers and the cross-bearers were too poorly preserved to be retained for further analysis. Of the six longitudinal timbers, five appeared to have been tangentially split from the outer part of relatively slow-grown oaks. The sixth was radially split from a fast-grown oak. The width of the structure was covered by four of the longitudinal timbers laid side-by-side. When excavated, there were gaps of up to 0.15m between the longitudinal timbers. Whether they were originally touching or not is unknown. However, the relatively large size of shale fragments (up to 50×30mm) present in the drain, apparently percolated down from the road structure above, suggests that the drain cover was never tight-fitting. All the cross-bearers were half- or radially-split oak with the exception of one which retained its bark. A radiocarbon date at two sigma calibration ranging from 363 cal. BC to cal. AD 72 (Beta-84187) was obtained from two of these timbers. The structure was retained by the two lines of driven, stake uprights (41 in all). These stakes were of split oak, with one exhibiting the only definite evidence in the

Fig. 11. Trench 2 showing the upper and lower road surfaces, with the lower road resting on the timber corduroy.

wood assemblage of the use of a saw. The stakes had been sharpened by a variety of methods: pencil-, wedge- and chisel-points.

The situation in Trench 1 was more complicated with one of the two drains (125) replacing the other (142). The excavation was further complicated in that some of the timbers from the earlier drain had apparently been reused in the later structure. However, it was possible to identify the principal elements of the two structures, although some of the lesser elements were not attributable to either structure with any degree of certainty. Both structures were aligned north-north-east/south-south-west, at roughly 90 degrees to the line of the road.

Drain 125 comprised a double line of uprights aligned along the edges of a ditch capped by longitudinal timbers supported on four cross-bearers (Figs 14 and 15). The ditch was 0.3–0.35m wide and 0.35m deep and sloped gently from north to south. A 4.5m long section was excavated. The cover consisted of poorly preserved longitudinal oak timbers, a tangentially split oak plank (W156), a half-split timber running parallel to it (W157) and a half-split branch (W159).

The tangential plank (W156) was sampled for dendrochronology but proved too poorly preserved for measurement. The regular surfaces of the plank suggested conversion by sawing rather than splitting. Some or all of the timbers used in this cover may have been reused from the earlier drain (142). As with the drain in Section 3, the sides of the structure were formed from driven uprights of mainly 10–20-year-old hazel round-woods and split oak, with remnants of associated wattling. The uprights had been sharpened with pencil-, chisel- and wedge-points. A group of larger uprights, recorded but not lifted, at the southern end of the drain may have been, along with other lost elements, some kind of outfall structure designed to stop erosion where the drain joined the southern roadside ditch.

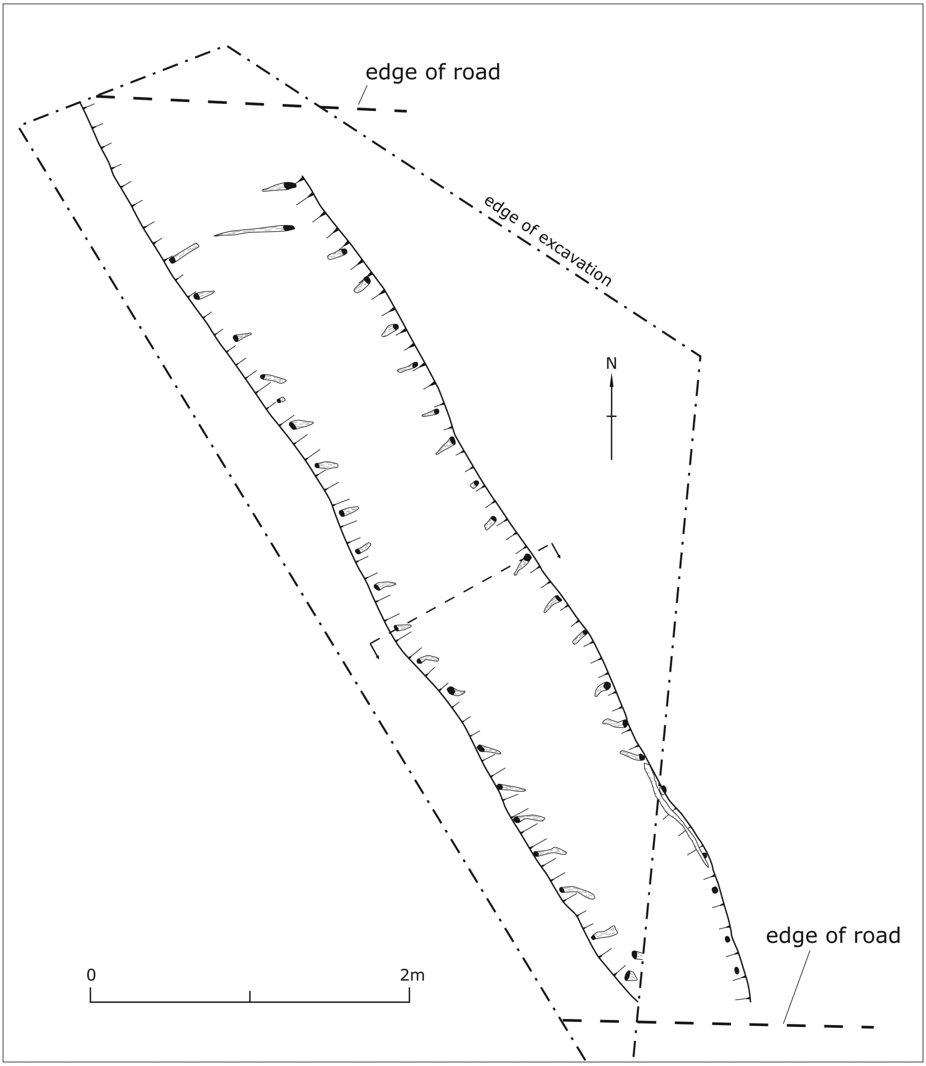


Fig. 12. Plan of drain 198 in Trench 3 after removal of the poorly preserved cross-bearers and longitudinal timbers, showing the stakes driven into the side of the ditch.

The most notable element recovered from the earlier drain (142) was a near horizontal oak plank (W152), *c*. 300cm long, 22.5cm wide and 4.5cm thick (Fig. 16), at least 75-years-old and with the underside worked with an adze and axe. This proved to be the sole remaining longitudinal timber from the drain cover. The overall construction of this earlier drain had similarities with both the other excavated features (198 and 125), with two lines of uprights and traces of associated wattling. Fig. 17 is a detail of one of a stake-point from one of the uprights. The uprights were driven along the edges of a shallow ditch and capped by a cover of cross-bearers that supported longitudinal timbers. A radiocarbon date at two sigma calibration ranging from 345 cal. BC to cal. AD 206 (Beta-84188) was obtained from one of these cross-bearers (W291), a 26-year-old summer-felled oak.

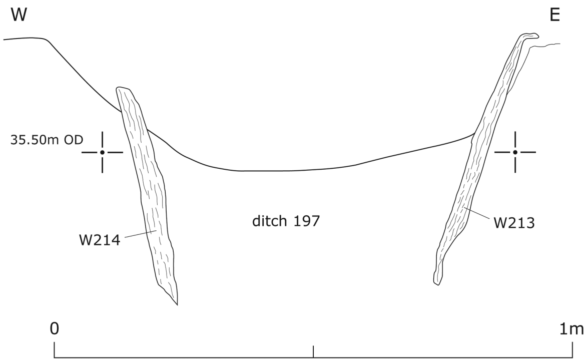


Fig. 13. Cross-section of drain 198.

Following the discovery of the structures, rapid investigations were carried out outside the road line to determine whether the drains were carrying small watercourses, or any other type of linear feature that extended beyond the limits of the road. In the event, no features were recorded outside the line of the road. Consequently, it is concluded that the drains were intended to act as culverts beneath the road. They were presumably designed to carry excess water from one ditch to the other in order to avoid rising water levels in one ditch causing problems of overflowing. Presumably, the drains 142 and 198 were part of the initial ground preparation works, but later problems necessitated the replacement of 142 with the later structure 125. It seems likely that this replacement happened immediately before the construction of the second phase road surface, but it was not possible to demonstrate this during excavation. A schematic profile showing the relationship between drains 142 and 125 is given in Figure 18.

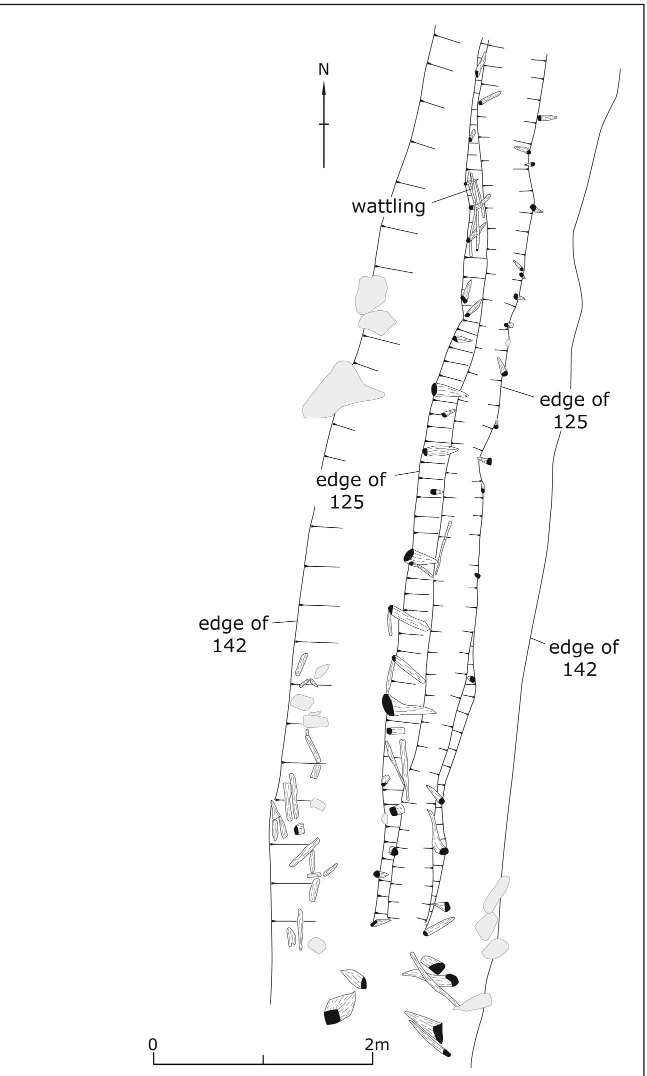
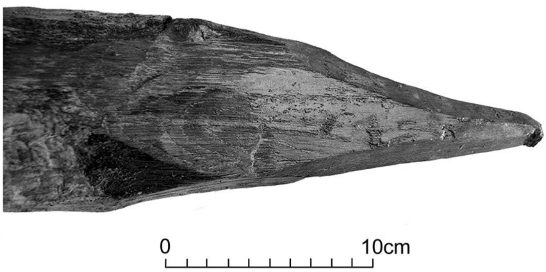


Fig. 14. Plan of drain 125 showing the covering planks and cross-bearers (***left***) and with the planks and cross-bearers removed (***centre***) and after removal planks showing upright stakes driven into the side of the ditch (***right***).



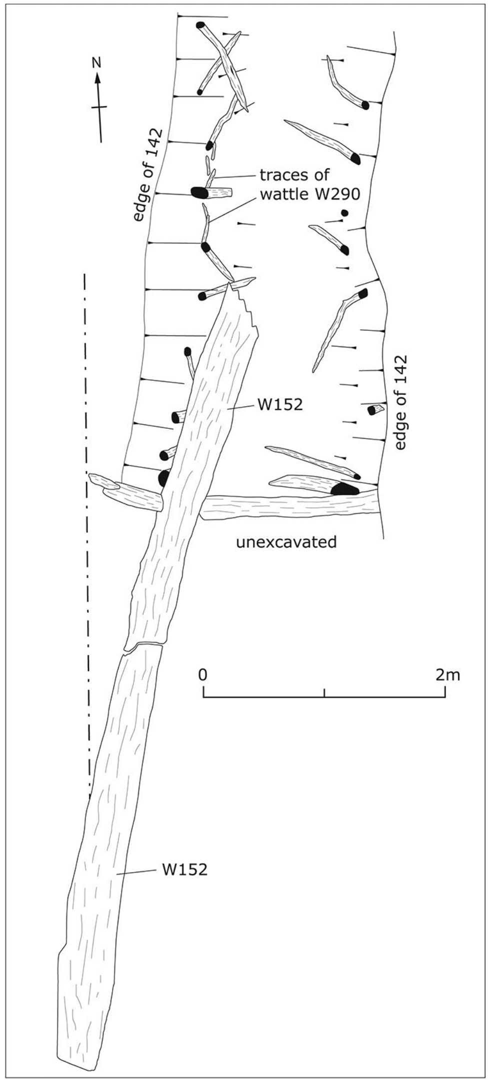


Fig. 15. ***Top left*** Photograph of drain 125 after removal of planks showing the ditch and upright stakes driven into its sides.

Fig. ***Right*** 16. Plan of drain 142.

Fig. 17. ***Bottom left*** Detail of a stake-point from an upright in drain 142.

Pre-road features

Six shallow hollows filled with grey clay and shale were noted in the peat surface below the corduroy at the eastern end of the site. It is likely that they were the truncated remains of pits or postholes, but no definite function could be ascribed to them.

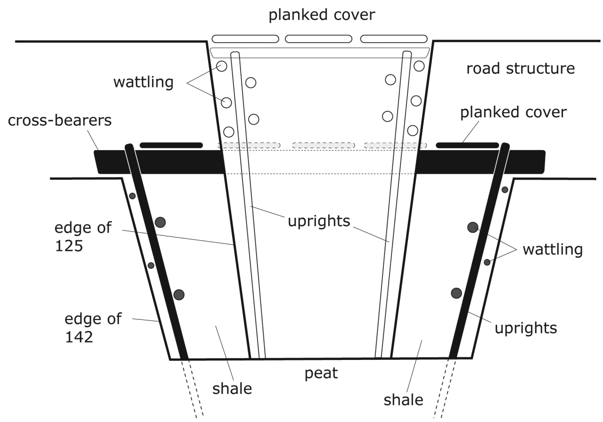


Fig. 18. Schematic section showing the relationship between drains 125 and 142.

elements of 125 shown as open
elements of 142 shown filled

The pre-road and road environment

Samples taken from the south roadside ditch in Trench 4, the north roadside ditch in the 1993 trial excavation and from drain 125 in Trench 2, are described in greater detail in the palaeoecological report. Analyses of them confirmed the wet, marshy conditions that the road builders had to contend with, and that there was some carr woodland locally throughout the time of road construction and use. However, a largely grassland environment was encountered by the road builders, suggesting a well-established pastoral economy operating in the area. This environment continued throughout the use of the road.

WOOD ASSEMBLAGE REPORT

By N. Nayling and R. Brunning

This short summary report synthesizes data gathered from site wood records, on-site assessment, detailed post-excavation recording and from information in the archive report (Nayling 1995).

Species selection

In the case of all three covers of drains 125, 142 and 198, oak was selected for the majority of large timbers with the occasional exception of a split piece of alder. Approximately half of the small uprights examined in drain 125, and the vast majority in drain 198 comprised split oak. The remaining *c*. 50% of uprights in drain 125 were predominantly hazel round-wood. The picture for drain 142 is more mixed: although the majority of uprights were unconverted round-wood, 63% of identified samples from these were oak, with lesser percentages of hazel, alder and Pomoideae.

Other small round-wood assemblages were also identified from drains 125 and 142. Species identified comprise oak, hazel, alder, spindle and willow. Hazel was dominant in the groups from drain 125 whilst oak formed 50% of the group from structure 142 along with lesser quantities of hazel and alder. Growth rates of this material is generally slow and ring counts are quite variable. The data is not consistent with exploitation of managed coppice and is more likely to reflect use of branch wood.

Conversion

No uprights assigned to drain 142 appear to have been split. In contrast, approximately half of the uprights in 125, and all those in 198 were made from split wood. Usually, the parent log has been half-, quarter- or radially-split. In a minority of cases, radials have been cross-split to provide tangential stakes. Tangential splitting also appears to have been employed to produce the longitudinal timbers for 198 (by splitting away the outer faces of slow grown oaks) and plank W152 from drain 142. Cross-bearers were often half-split.

Hewing

The majority of uprights had been carefully sharpened to ensure good penetration during driving, even into resistant substrates. Tool facets were usually very shallow, only just exceeding 20 degrees on some of the split uprights from drain 198. No definite carpentry joints were identified, although an apparent half lap and trimmed side-branch on a cross-bearer may have had a structural function either in drain 142, or an earlier structure.

Tool usage

Evidence for this was generally confined to tool facets, jam curves and tool signatures on worked points. Definite saw marks were observed on only one timber, a tangential stake from 198. The saw appears to have been used to guide tangential sub-splitting of a radial. Tool facets were almost universally flat and angled tool signatures point to the predominant use of axes rather than adzes. Jam curves on the worked points were rarely complete. Possibly complete blade widths with flat facets ranged from 18 to 47mm. Slightly concave jam curves of 71mm width, with associated signatures running at right- angles, found on two planks indicated the use of an adze to cut down the outer face of a tangentially split oak. A slightly concave jam curve of 69mm on a large upright might indicate use of an adze here but tool signatures ran at an oblique angle, more usually associated with use of an axe.

Dendrochronology

Several samples for dendrochronology were taken and analysed at Sheffield Chronological Laboratory. However, the tree-ring curves produced neither cross-matched with each other nor with dated regional or site chronologies (Hillam pers. comm.).

PALAEOECOLOGICAL INVESTIGATIONS

By A. E. Caseldine, M. J. C. Walker, J. H. James, S. Johnson and M. Robinson

Introduction

Monoliths were taken from five locations (Fig. 5). Whitland 1 was from a peat sequence immediately to the north of the road, while Whitland 2 (some 12m to the south-west) was obtained from a peat deposit that underlies the Roman road (Fig. 7, Trench 1). Whitland 3 and Whitland 4 were adjacent samples from Trench 3 at the western end of the site; column 3 underlies the road, while column 4 lies beneath drain 198. Finally, Whitland 5 was taken from a context at the eastern end of the excavation. In addition, five spot samples were taken for plant macrofossil and insect analyses from ditch fills and from deposits associated with drain 125.

Stratigraphy

The stratigraphy of the five monoliths is as follows:

Whitland 1 (section north of the road)

0–11.5cm	Well-humified fibrous dark brown peat containing monocotyledonous remains. Fairly compacted. *Juncus* seeds abundant.
11.5–65cm	Well-humified dark brown, woody peat with monocotyledonous remains. Bark, wood, roots, leaf scars and leaf fragments present. Quite compacted down to *c*. 25cm but becoming more fibrous with larger pieces of wood, especially between 30–44cm. Increasingly compacted from 49cm. *Betula*, *Viola*, *Carex* and *Juncus* seeds. *Betula* female cone scales. Moss.
65–99cm	Well-humified more compacted fibrous, woody peat. Wood, roots, bark and leaf fragments present. Monocotyledonous remains visible. *Betula*, *Alnus*, *Carex* and *Juncus* seeds. *Betula* cone scales. Bud scales.
99–123cm	Light grey silty-clay containing shaley stones. Orange-brown iron pan in top 1cm. *Juncus* seeds present.

Whitland 2 (under road and adjacent to drains 125 and 142 in Section 1)

0–4cm	Large stone.
4-6cm	Fibrous, dark brown peat. Monocotyledonous remains and wood present. *Sphagnum* moss abundant at 5cm.
6–7cm	Band of grey clay.
7–13cm	Greyish-brown clayey-peat becoming peatier with depth.
13–24cm	Fibrous, orange-brown peat with monocotyledonous remains. *Sphagnum* moss and occasional, twigs and leaf fragments present. *Carex*, *Ranunculus*, *Potamogeton*, *Lycopus europaeus*, *Hydrocotyle*, *Betula*, *Potentilla* and *Juncus* seeds.
24–35cm	Dark brown, very fibrous peat with wood and monocotyledonous remains. *Carex*, *Viola*, *Hydrocotyle vulgaris*, *Potamogeton*, *Juncus*, *Ranunculus*, *Alnus*, *Betula*, *Lycopus europaeus* and Poaceae seeds.
35–40cm	Orange-brown more compact peat. Fragment of *Alnus* wood at 37cm. *Potamogeton*, *Carex*, *Ranunculus*, *Betula* and *Juncus* seeds.
40–72cm	Dark brown, very fibrous peat with monocotyledonous and wood remains. Slightly clayey band at 54.5–56.5cm. *Alnus* wood fragment at 47cm. *Corylus* wood fragment at 64cm. *Carex*, *Bidens cernua*, *Oxalis acetosella*, *Lynchis flos-cuculi*, *Sagina*, *Viola*, *Alnus*, *Betula*, *Callitriche*, *Cirsium*, *Rubus* and *Juncus* seeds. *Betula* and *Alnus* cone scales and buds and bud scales. Moss present. Charcoal.
72–78cm	Brown peaty-clay still quite fibrous.
80–100cm	Greyish-brown very silty peaty-clay. Very fibrous with monocotyledonous remains. Wood, bark and leaf fragments. Stone present at *c*. 88cm. *Alnus*, *Carex*, *Ranunculus*, *Viola*, *Sagina* and *Juncus* seeds. *Betula* female cone scales. Charcoal.
100–110cm	Dark brown, slightly clayey woody peat. Still quite fibrous. Clay band at 105cm. Quartz present at 106cm. *Carex*, *Stellaria uliginosa*, *Betula* and *Juncus* seeds.
110–130cm	Light grey clay with small angular stones. Plant remains present, including wood, bark and leaf fragments. Bud scales frequent. *Carex*, *Ranunculus*, *Oxalis acetosella*, *Betula* and *Juncus* seeds. Moss.

Whitland 3 (under road in Section 3)

0–10cm	Light grey clay with iron staining. Contains stone fragments and large stone at *c*. 1–8cm. *Juncus* seeds abundant.
10–40cm	Light brownish-grey clay with plant remains. Slightly darker below 23cm, i.e. more organic. *Juncus* seeds abundant and *Carex*, *Hypericum*, *Ranunculus*, *Potentilla* and *Potamotegon* seeds present. Occasional *Sphagnum* leaf.
40–46cm	Brown organic clay with monocotyledonous remains. *Juncus* seeds frequent. Charcoal.
46–50.5cm	Brownish-grey clay. *Juncus* seeds frequent.
50.5–81cm	Yellowish-brown organic clay with monocotyledonous remains. Flecks of peaty material. Occasional woody root and bark. *Juncus* seeds. Charcoal.
81–105cm	Brown organic clay with plant remains. Small stones present, becoming grittier towards base. Wood, buds and bud-scales frequent. *Stellaria uliginosa*, *Ranunculus*, *Carex*, Poaceae and *Juncus* seeds. Moss present. Charcoal.
105–122cm	Crumbly shale bedrock with clay and iron staining.

Whitland 4 (under drain 198 in Section 3)

0–7cm	Grey-brown, sticky clay. Plant remains visible. *Juncus* seeds frequent. Charcoal present.
7–22cm	Dark yellowish-grey gritty-clay with small stones. Larger stones *c*. 18–22cm. Charcoal.
22–24cm	Orange-grey fine clay.
24–25.5cm	Dark yellowish-grey gritty-clay with small angular stones. *Juncus* seeds.
25.5–45cm	Yellowish-brown organic clay with plant remains. Occasional monocotyledon and woody remains. *Juncus* seeds.
45–84cm	Light yellowish-grey clay with plant remains. Flecks of peaty material. Iron staining *c*. 65.5–76.5cm. Wood remains frequent at 76.5–84cm. *Juncus* seeds. Charcoal.
84–86cm	Orange-grey gritty-silty-clay.

Whitland 5 (north roadside ditch)

0–20cm	Light grey silty-clay with orange flecks of iron. Very gritty at 14–18cm. *Juncus* seeds present, particularly abundant at *c*. 20cm.
20–28cm	Brownish-grey silty-clay with orange lenses of iron staining. *Juncus*, Poaceae, *Potamogeton* and *Stellaria uliginosa* seeds and macroscopic charcoal present.
28–40cm	Very gritty, grey silty-clay with layers of orange iron staining.
40–59cm	Grey silty-clay with dark- light-grey lenses becoming increasingly brown and organic downwards. Monocotyledon remains and *Juncus* seeds present.
59–66cm	Very gritty, grey silty-clay with quartz pebbles. Monocotyledon remains visible and Poaceae, *Ranunculus* subgenus *Batrachium*, *Stellarias uliginosa*, *Juncus* and *Potamogetom* seeds. *Pteridium aquilinum* leaf fragments.
66–72cm	Grey silty-clay with light–dark lenses. *Juncus* and *Ranunculus* subgenus *Batrachium* seeds present as well as monocotyledon remains.
72–80cm	Grey silty-clay with iron staining. Small quartz pebbles. *Pteridium* leaf and moss fragments.
80–91cm	Light grey, sticky-clay with darker lenses of peaty material. *Pteridium* leaf fragments, *Potentilla*, *Carex* and *Juncus* seeds, bud and deciduous leaf fragments. Occasional *Sphagnum* leaf.
91–101cm	Dark brown, fibrous woody-peat. *Juncus* and *Carex* seeds.

Methodology – laboratory work

Pollen analysis (MJCW and JHJ)
Sub-samples for pollen analysis were removed from the monoliths at 5cm intervals. These were treated using conventional procedures (Moore *et al*. 1991), including disaggregation in 10% KOH followed by Erdtman's acetolysis preceded, where necessary, by heating in 40% HF. The residues were mounted in safranin-stained glycerine jelly and counted on a Vickers MISC microscope at ×400 magnification, with critical identifications under oil at ×1000. The state of preservation of the pollen was generally good, and a sum of 300 grains was achieved for all levels.

The results of the pollen analyses are shown in Figs 19–23 in which nomenclature follows Stace (1991) and Bennet *et al.* (1984). The pollen diagrams from the five profiles, which have been prepared using TILIA,[6] have been divided into Local Pollen Assemblage Zones (LPAZs) on the basis of fluctuations in the curves for the principal pollen taxa. Inferred relationships between the LPAZs in the pollen diagrams is shown in Table 1.

Plant macrofossil analysis (AEC and SJ)
Sub-samples were extracted from the spot bulk samples taken from the ditch and drain 125 deposits. Initially 250g from each sample was processed. Following preliminary examination, the sample size of the two richest samples was increased by a further 250g to 500g. The samples were allowed to soak in water to which hydrogen peroxide was added, because of the minerogenic nature of the samples, prior to washing through a nest of sieves with 2mm, 1mm, 500µ and 250µ meshes. In addition to the sievings retained on the 108 micron mesh during the pollen preparations a few larger samples, removed separately from the pollen monoliths, were rapidly scanned for plant remains to supplement the stratigraphic and pollen data. Plant macrofossils were identified using a Wild M-5 stereo-microscope. Identification was by comparison with modern reference material and standard identification texts, including Berggren (1969, 1981) and Schlock *et al.* (1988). Nomenclature follows Stace (1991) and Smith (1978). The plant macrofossil results from the pollen monolith samples are incorporated into the stratigraphic descriptions.

Fossil insect analysis (MR)
Five samples of organic sediment from ditches and drain fills were analysed for insect remains. Sub-samples of 1kg each were washed onto a 0.2mm sieve, subjected to paraffin flotation and the flots scanned. Insect remains were recovered from four of the samples, but only the sample from the south roadside ditch, contained a sufficiently high concentration for more detailed analysis. A further 4kg of this sample was similarly processed and both flots from this sample were fully sorted. The results are given in Tables 3 and 4. The nomenclature of the Coleoptera follows Kloet and Hincks (1977).

Table 1. Correlation of local pollen zones

Whitland 1	Whitland 2	Whitland 3	Whitland 4	Whitland 5
W1-d	–	–	–	–
W1-c	W2-c	W3-c	W4-b	W5-b
W1-b	W2-b	W3-b	–	–
W1-a	W2-a	W3-a	W4-a	W5-a

Table 2. Plant macrofossil data

	southern roadside ditch	southern roadside ditch	northern roadside ditch	drain 125	drain 125
SAMPLE	8	9	25	26	27
CONTEXT	120	115	179	139	140
Ranunculus sp. (buttercup)	1	–	2	–	–
Ranunculus flammula type (lesser spearwort)	2	93	26	1	1
Ranunculus subgenus *Batrachium* (CD.) A. Gray (crowfoots)	1	3	14	–	–
Urtica dioica (common nettle)	–	1	4	–	–
Betula sp. (birch)	–	–	5	–	–
Alnus glutinosa (L.) Gaertner (alder)	–	4	1	–	–
Chenopodium album L. (fat–hen)	–	–	1	–	–
Stellaria media (L.) Villars (common chickweed)	–	2	–	–	–
Stellaria uliginosa Murray (bog stichwort)	–	13	39	1	–
Cerastium sp. (mouse ears)	1	5	6	–	–
Sagina sp. (pearlworts)	–	5	17	–	1
Lychnis flox–cuculi L. (ragged robin)	–	2	–	–	–
Persicaria lapathifolia (L.) Gray (pale persicaria)	–	–	–	–	1
Rumex acetosella L. (sheep's sorrel)	1	5	3	–	–
Hypericum sp. (St John's–worts)	2	47	7	2	3
Viola sp. (violets)	–	25	3	–	–
Cardmine flexuosa (wavy bitter–cress)	–	8	–	–	–
Erica textralix L. (cross–leaved heath)	–	1	–	–	–
Rubus fruticosus agg. (brambles)	–	2	–	–	–
Potentilla erecta (L.) Raeusch (tormentil)	1	20	6	–	1
Aphanes arvensis agg. (parsley piert)	–	–	3	–	1
Ulex sp. (Gorse) leaf frags	–	–	7	–	–
Epilobium hirsutum (great willowherb)	–	1	–	–	–
Myosotis sp. (forget–me–nots)	–	5	10	–	–
Prunella vulgaris L. (selfheal)	–	2	–	–	–
Lycopus europaeus L. (gypsywort)	–	4	–	–	–
Mentha sp. (mints)	–	3	–	–	–
Callitriche sp. (water–starworts)	1	138	1043	–	5
Veronica sp. (speedwells)	–	–	6	–	–
Cirsium spp. (thistles)	–	13	–	–	–
Hypochaeris radicata L. (cat's–ear)	–	–	1	–	–
Potamogeton spp. (pondweeds)	2	130	6	5	1
Juncus spp. (rushes)	172	1006	855	12	112
Juncus spp. capsules	5+7 frags	37	6	–	–
Luzula sp. (wood–rushes)	–	3	–	–	–
Isolepis setacea (L.) R. Br. (bristle club–rush)	–	5	1	–	–
Carex spp. – biconvex	1	142	6	2	–
Carex spp. – trigonous	–	76	3	1	1
Poaceae >2mm (grasses)	3	34	71	–	–
Poaceae <2mm	9	50	129	7	6
Poaceae glume frags	2	–	–	–	–
Tree buds	–	1	–	–	–
Pteridium aquilinum (L.) Kuhn (bracken)	40	3	–	–	–
Sphagnum sp.	–	5	–	–	–
Moss unidentified	–	+	–	–	+

Table 3: Coleoptera data from the southern roadside ditch (sample 9)
(minimum number of individuals)

Trechus obtusus Er. or *quadristriatus* (Schr.)	1
Pterostichus diligens (Sturm)	3
P. niger (Schal.)	1
P. nigrita (Pk.)	1
P. cupreus (L.) or *versicolor* (Sturm)	1
Calathus fuscipes (Gz.)	2
C. melancocephalus (L.)	1
Agonum muelleri (Hbst.)	1
Amara cf. *consularis* (Duft.)	1
Haliplus sp.	1
Hydroporus sp.	1
Agabus bipustulatus (L.)	1
Hydrochus sp.	2
Helophorus sp. (*brevipalpi*s size)	9
Coelostoma orbiculare (F.)	3
Cercyon ustulatus (Preys.)	2
Megasternum obscurum (Marsh.)	1
Hydrobius fuscipes (L.)	1
Anacaena globulus (Pk.)	4
Laccobius sp.	3
Enochrus sp.	1
Chaetarthria seminulum (Hbst.)	3
Limnebius cf. *papposus* Muls.	6
Silpha atrata L.	1
Olophrum fuscum (Grav.) or *piceum* (Gyl.)	1
Lesteva longoelytrata (Gz.)	3
Stenus spp.	2
Anotylus rugosus (F.)	1
Lathrobium sp.	1
Xantholinus linearis (Ol.) or *longiventris* Heer	1
Erichsonius sp.	1
Philonthus sp.	2
Tachyporus sp.	1
Aleocharinae indet.	1
Geotrupes sp.	1
Aphodius contaminatus (Hbst.)	10
A. cf. *sphacelatus* (Pz.)	4
Onthophagus nutans (F.)	1
Onthophagus sp. (not *nutans*, *ovatus* or *taurus*)	1
Phyllopertha horticol (L.)	1
Dascillus cervinus (L.)	1
Dryops sp.	1
Cidnopus aeruginosus (Ol.)	1
Agriotes sp.	1
Cantharis sp.	1
Brachypterus sp.	5
Corticariinae indet.	1
Plateumaris discolor (Pz.) or *sericea* (L.)	2
Gastrophysa viridula (Deg.)	1
Prasocuris phellandrii (L.)	1
Galerucella sp.	1
Phyllotreta vittula Redt.	1
Longitarsus sp.	1
Sitona sp.	1
Bagous sp.	1
Total	103

Table 4: Other insects from the southern roadside ditch (sample 9)
(minimum number of individuals)

Aphrophora sp.	1
Aphrodes sp.	2
Aphidoidea indet.	2
Homoptera indet.	3
Trichoptera indet., larva	5
Myrmica sp., worker	1
Lasius sp. (not *fuliginosus*), female	1
Lasius sp. (not *fuliginosus*), worker	1
Hymenoptera indet.	2
Chironomidae indet., larva	+
Diptera indet.	1

Radiocarbon dating (MJCW, JHJ and AEC)

After the pollen analytical work had been completed, six biostratigraphic horizons from the two most detailed pollen diagrams, Whitland 1 and Whitland 2, were selected for radiocarbon dating. At each level, a slice of sediment approximately 2cm in thickness was cut from the monolith and despatched to the radiocarbon dating laboratory at Beta Analytic in Miami, USA. In addition, two wood samples from drain contexts 198 and 142 were also submitted for radiocarbon dating.

The radiocarbon dates were calibrated using the radiocarbon calibration program CALIB 8.2html.[7] The radiocarbon ages are presented as calibrated age ranges at 2 sigma (95.4% probability) as indicated by the relative area shown under the probability distribution. The median probability values are also shown. The results of the radiocarbon assays are presented below and at the appropriate levels on the pollen diagrams.

Beta-98682

Sample and context: Peat from Whitland 1 at 0cm depth

Date: 1030±60 BP

Calibrated range at 2 sigma: cal. AD 889–1159 (relative area under probability distribution: 1.000)

Median probability: cal. AD 1015

Beta-98683

Sample and context: Peat from Whitland 1 at 15cm depth

Date: 2130±70 BP

Calibrated range at 2 sigma: 370 cal. BC–cal. AD 10 (relative area under probability distribution: 1.000)

Median probability: 161 cal. BC

Beta-98684

Sample and context: Peat from Whitland 1 at 77.5cm depth

Date: 4700±70 BP

Calibrated range at 2 sigma: 3633–3364 cal. BC (relative area under probability distribution: 1.00)

Median probability: 3480 cal. BC

Beta-98685

Sample and context: Peat from Whitland 2 at 5cm depth

Date: 1970±70 BP

Calibrated range at 2 sigma: 149–136 cal. BC and 111 cal. BC–cal. AD 231 (relative area under probability distribution: 0.991)

Median probability: cal. AD 51

Beta-98686

Sample and context: Peat from Whitland 2 at 71cm depth

Date: 2570±70 BP

Calibrated range at 2 sigma: 834–463 cal. BC (relative area under probability distribution: 0.980)

Median probability: 679 cal. BC

Beta-98687

Sample and context: Peat from Whitland 2 at 109cm depth

Date: 4080±70 BP

Calibrated range at 2 sigma: 2873–2797 cal. BC and 2783–2470 cal. BC (relative areas under probability distribution: 0.186 and 0.814 respectively)

Median probability: 2650 cal. BC

Beta-84187

Sample and context: Radially split oak cross-bearers from drain 198

Date: 2100±80 BP

Calibrated range at 2 sigma: 363 cal. BC–cal. AD 72 (relative area under probability distribution: 1.000)

Median probability: 123 cal. BC

Beta-84188

Sample and context: 26-year-old oak cross bearer from drain 142

Date: 2030±80 BP

Calibrated range at 2 sigma: 345–317 cal. BC to 203 cal. BC–cal. AD 206 (relative area under probability distribution: 0.975)

Median probability: 27 cal. BC

The pollen data (MJCW and JHJ)

Whitland 1 (Fig. 19)

LPAZ W1-a	*Alnus-Quercus-Corylus* (below 77.5cm).
Characteristics	A biozone dominated by *Alnus*, with significant counts for *Quercus* and *Corylus avellana* type.
Vegetation	An alder scrub, probably on wetter substrates, with hazel and oak on drier areas nearby.
Chronology	Base of paz: 4700±70 BP (Beta-98684: median probability age: 3480 cal. BC). Top of paz: *c*. 4065 BP (interpolated).

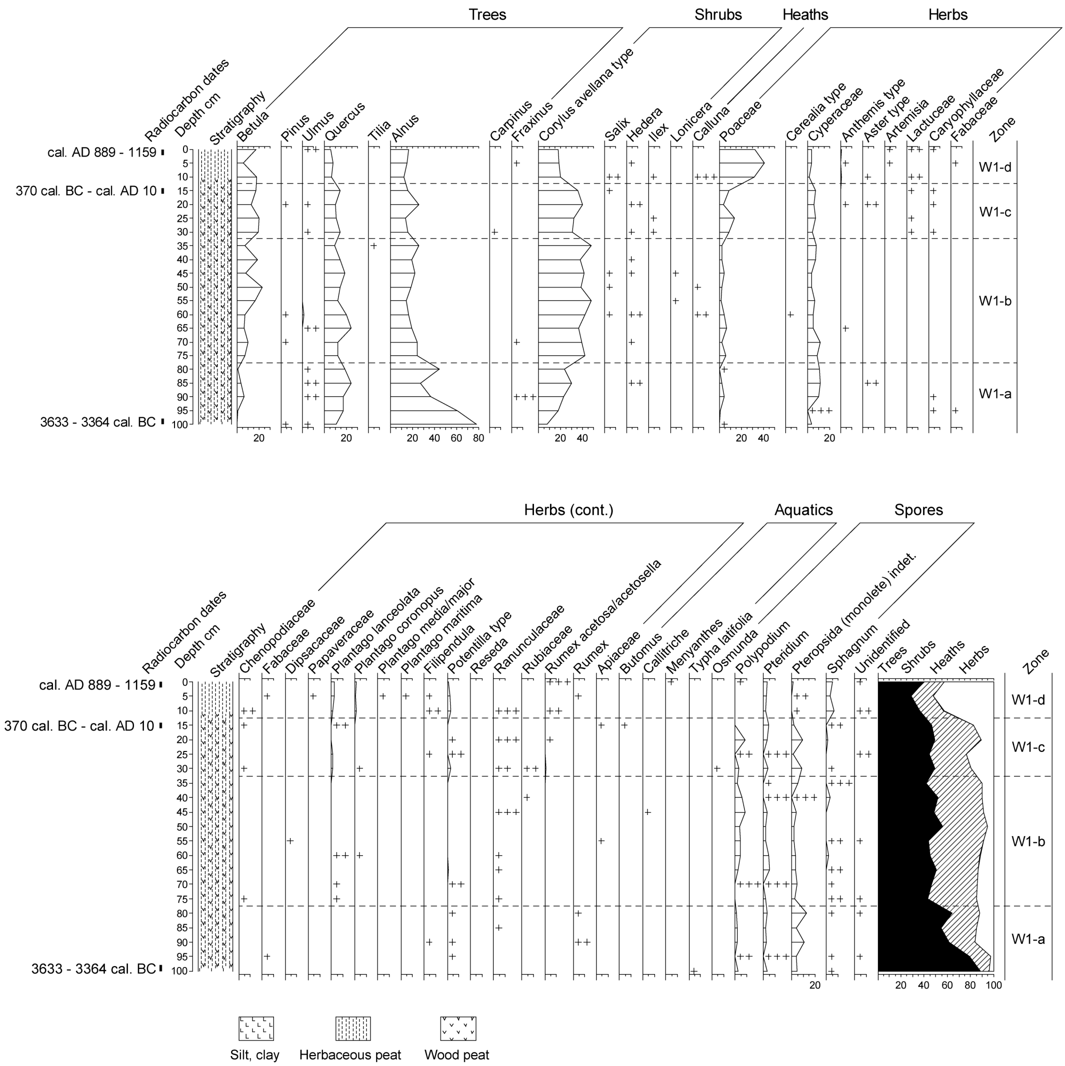


Fig. 19. Whitland 1 percentage pollen diagram.

LPAZ W1-b	*Corylus-Alnus-Quercus-Betula* (77.5–32.5cm).
Characteristics	A biozone dominated by *Corylus avellana* type with significant counts for *Quercus*, *Alnus* and *Betula*.
Vegetation	Expansion of hazel scrub, with stands of birch and oak. Alder was present but less abundant – perhaps reflecting drier conditions locally.
Chronology	Base of paz: *c*. 4065 BP (interpolated). Top of paz: *c*. 2670 BP (interpolated).
LPAZ W1-c	*Corylus-Alnus-Quercus-Betula*-Poaceae (32.5–12.5cm).
Characteristics	A biozone dominated by *Corylus avellana* type with significant counts for *Quercus*, *Alnus*, *Betula* and Poaceae.

Vegetation	This biozone reflects a phase of woodland clearance, and the expansion of grassland habitats. Characteristic open-ground herbs include *Plantago lanceolata* (evidence of human impact?), *Potentilla*, *Anthemis* type, *Aster* type, Lactuceae and *Rumex.*
Chronology	Base of paz: *c*. 2670 BP (interpolated). Top of paz: *c*. 1935 BP (interpolated). Radiocarbon date of 2130±70 BP (Beta-98683: median probability age: 161 cal. BC) at 15cm.
LPAZ W1-d	Poaceae (12.5–0cm).
Characteristics	A biozone dominated by Poaceae, with *Corylus avellana* type, *Betula*, *Quercus* and *Alnus.*
Vegetation	This biozone reflects an acceleration in the rate of woodland clearance, with further expansion of grassland habitats. Characteristic open-ground herbs include similar to those is W1-c.
Chronology	Base of paz: *c*. 1935 BP (interpolated). Top of paz: 1030±60 BP (Beta-98682: median probability age: cal. AD 1015).

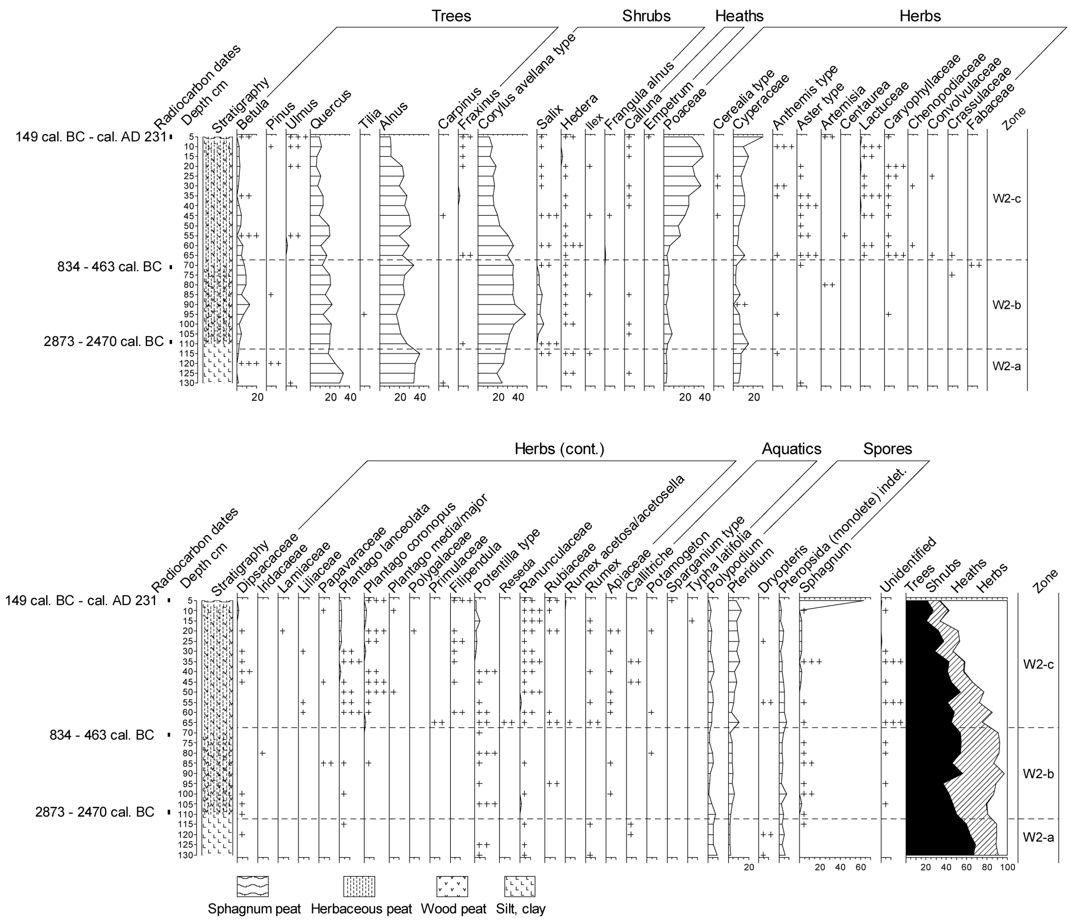


Fig. 20. Whitland 2 percentage pollen diagram.

Whitland 2 (Fig. 20)

LPAZ W2-a	*Alnus-Quercus-Corylus* (below 112.5 cm).
Characteristics	A biozone dominated by *Alnus*, with significant percentages of both *Quercus* and *Corylus avellana* type.
Vegetation	An alder scrub, probably on wetter substrates, with hazel and oak on drier areas nearby.
Chronology	Base of paz: *c*. 4500 BP (interpolated). Top of paz: *c*. 4150 BP (interpolated).
LPAZ W2-b	*Corylus-Alnus-Quercus* (112.5–67.5cm)
Characteristics	A biozone dominated by *Corylus avellana* type with *Quercus*, *Alnus* and *Betula*. *Salix* is also present.
Vegetation	Expansion of hazel scrub, with stands of birch, oak and willow. Alder was present but less abundant, again perhaps reflecting drier conditions locally.
Chronology	Base of paz: *c*. 4150 BP (interpolated). Top of paz: *c*. 2540 BP (interpolated). Radiocarbon dates of 4080±70 BP (Beta-98687: median probability age: 2650 cal. BC) at 109cm and 2570±70BP (Beta-98686: median probability age: 679 cal. BC) at 71cm.
LPAZ W2-c	Poaceae (67.5–5cm).
Characteristics	A biozone dominated by Poaceae, with *Alnus*, *Corylus avellana* type, *Quercus* and Cyperaceae. *Pteridium* is also present in consistent frequencies.
Vegetation	This biozone reflects a phase of woodland clearance, with the expansion of grassland habitats. Characteristic open-ground herbs include *Plantago lanceolata*, *Plantago coronopus*, *Potentilla*, Caryophyllaceae, *Aster* type, Lactuceae and *Ranunculus*. Bracken (*Pteridium*) was also present locally.
Chronology	Base of paz: *c*. 2540 BP (interpolated). Top of paz: 1970±70 BP (Beta-98685: median probability age: cal. AD 51).

Whitland 3 (Fig. 21)

LPAZ W3-a	*Quercus-Corylus-Alnus* (below 62.5cm).
Characteristics	A biozone dominated by *Quercus* and *Corylus avellana* type with significant counts for *Alnus*.
Vegetation	The pollen spectra reflect the presence of extensive stands of oak woodland, with hazel on more open sites and alder locally present on wetter substrates.
LPAZ W3-b	*Corylus-Quercus-Alnus* (62.5–22.5cm).
Characteristics	A biozone dominated by *Corylus avellana* type with significant counts for *Quercus*, *Alnus* and *Betula*. Poaceae is also present in the middle and upper levels of the zone.
Vegetation	An episode of hazel scrub, with stands of birch and oak. Alder was present locally and birch was also a component of the nearby wood and scrubland.
LPAZ W3-c	*Corylus*-Poaceae (with *Alnus* and *Quercus*) (22.5–0cm).
Characteristics	A biozone still dominated by *Corylus avellana* type, but Poaceae is also abundant along with *Quercus* and *Alnus*.
Vegetation	This biozone reflects the continued presence of hazel and oak wood and scrub, but with open areas of grassland within and around the woodland stands. Characteristic open-ground taxa include *Plantago lanceolata*, *Potentilla*, Lactuceae and *Pteridium*.

Whitland 4 (Fig. 22)

LPAZ W4-a	*Quercus-Corylus-Alnus* (below 22.5cm).

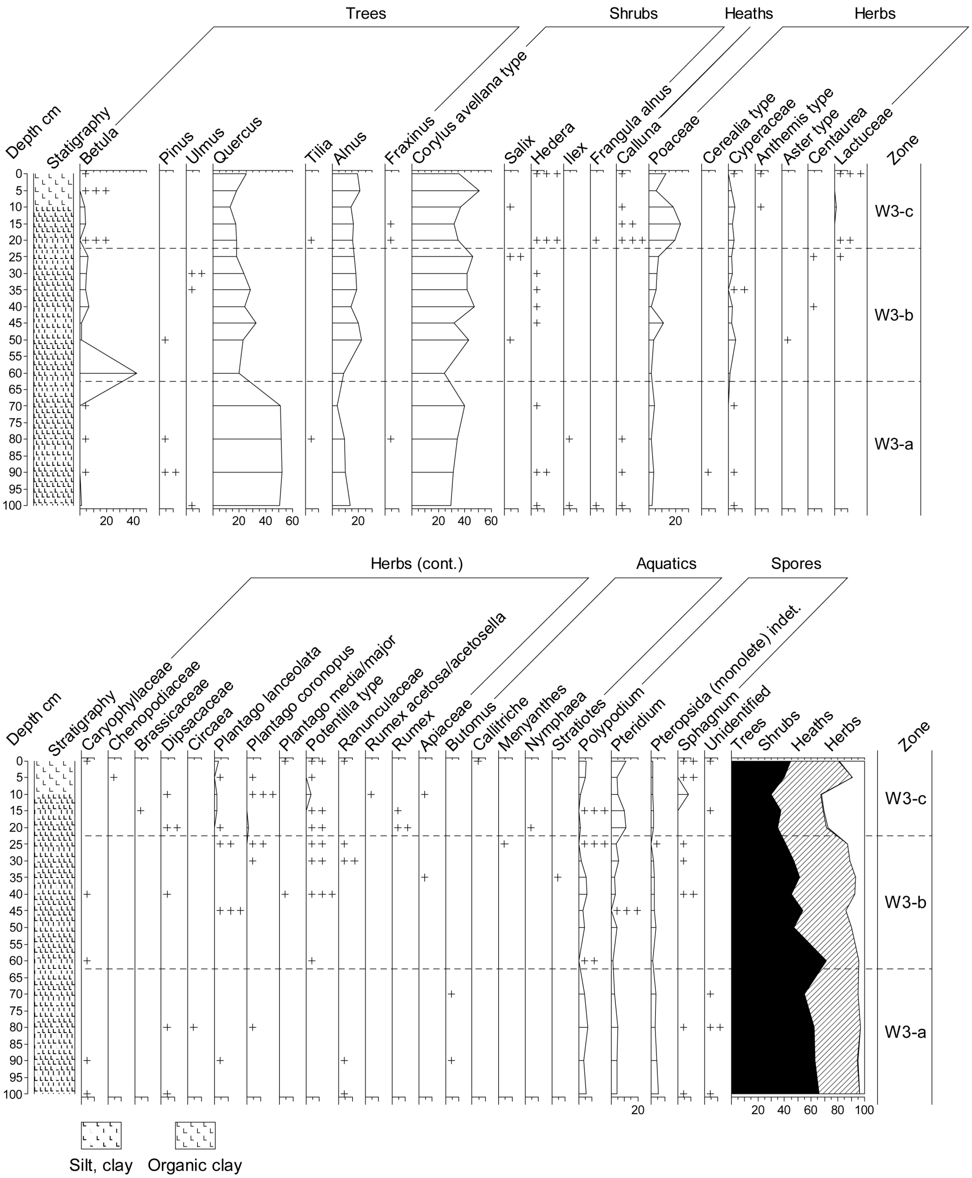


Fig. 21. Whitland 3 percentage pollen diagram.

Characteristics A biozone dominated by *Quercus* and *Corylus avellana* type, along with *Alnus*.
Vegetation Oak and alder woodland, with alder on wetter sites.
LPAZ W4-b Poaceae-*Corylus* (22.5–0cm).
Characteristics A biozone dominated by Poaceae, with *Corylus avellana* type, *Quercus* and *Alnus*.
Vegetation This biozone reflects a phase of woodland clearance, with the expansion of woodland habitats. Characteristic open-ground taxa include *Plantago lanceolata*, Lactuceae,

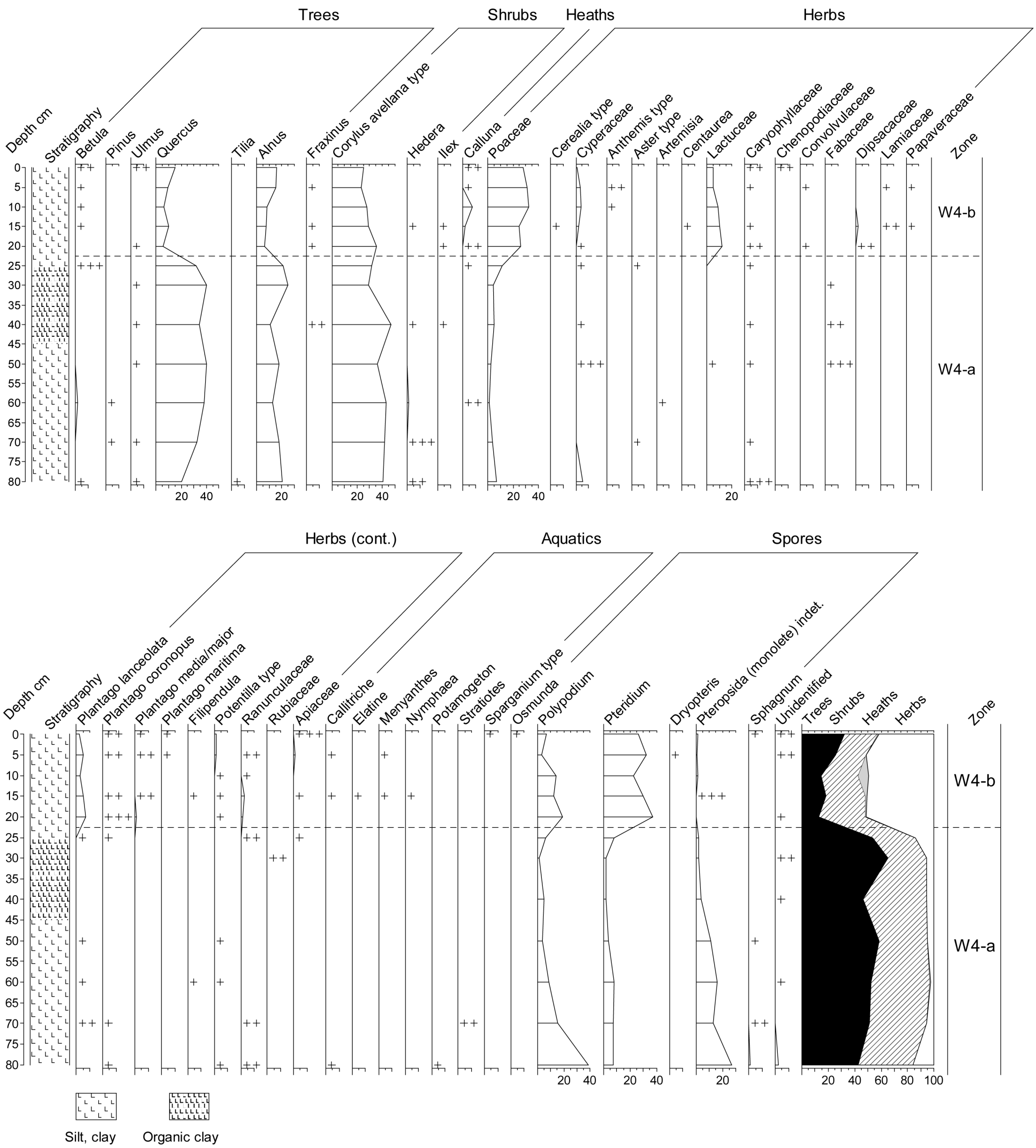


Fig. 22. Whitland 4 percentage pollen diagram.

Ranunculus and *Potentilla*. Bracken was also abundant locally and there is evidence of heathland nearby (*Calluna vulgaris*).

Whitland 5 (Fig. 23)

LPAZ W5-a *Alnus* (below 92.5cm).

Characteristics A biozone dominated by *Alnus*, with small numbers of *Quercus* and *Corylus avellana* type.

Vegetation An alder scrub, probably on wetter substrates, with hazel and oak on drier areas nearby.

LPAZ W5-b Poaceae-*Corylus*-*Alnus* (92.5–0cm).

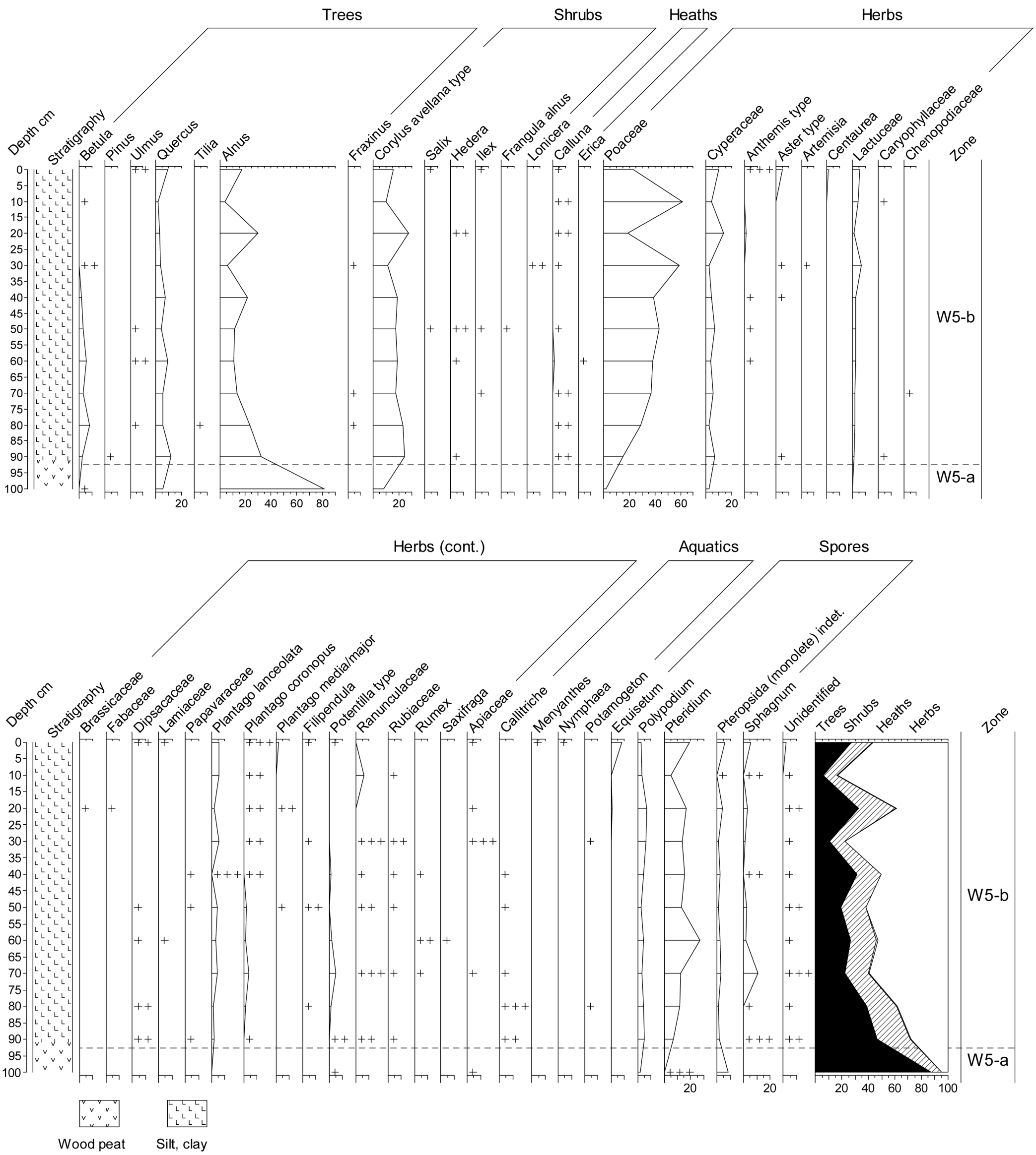


Fig. 23. Whitland 5 percentage pollen diagram.

Characteristics A biozone characterised by a rising curve for Poaceae, with *Corylus avellan* type, *Betula*, *Quercus* and *Alnus* also present.

Vegetation This biozone reflects a phase of woodland clearance, with the expansion of grassland habitats, but with stands of alder, hazel, oak and birch still present in the vicinity. Characteristic open-ground herbs include *Plantago lanceolata*, *Plantago coronopus*, *Potentilla*, Lactuceae and *Ranunculus*. *Pteridium* was also abundant locally.

Correlation between the LPAZs (Table 1) suggests that at Whitland 4 and 5 the equivalent biozones W1-b, W2-b and W3-b are missing. This accords with the lithostratigraphic evidence which points to an unconformity in the former two profiles. In Whitland 4 the fine clays with gritty horizons in the upper part of the profile above 25.5 cm are deposits associated with shallow ditch 197 at the edge of drain 198. In Whitland 5 there is a clear break at *c*. 91cm between the overlying grey clays and basal peats, which marks the interface between the natural peat and later ditch deposits. In terms of the vegetational sequence, therefore, these stratigraphic breaks mean that the episode of hazel wood and scrub recorded in W1-b, W2-b and W3-b is not preserved in the pollen diagrams from Whitland 4 and 5.

Plant macrofossil data (AEC and SJ)

The plant macrofossil results from the pollen monoliths will be considered first followed by the evidence from the spot samples.

The results from Whitland 1 reflect the nature of the local peat and hence the local plant community. The lowest deposits are minerogenic and contain few plant remains, only the occasional *Juncus* (rush) seed. The peat deposits above are woody with fragments of bark, wood, roots and leaf fragments as well as seeds of *Alnus* (alder) and *Betula* (birch). *Betula* cone-scales are also present. Herbaceous plants are represented by seeds of *Carex* (sedge) and *Juncus*. Higher in the stratigraphy *Juncus* dominates with the occasional *Carex* seed. The evidence suggests birch-alder carr woodland with an understorey of sedges and rushes which is later replaced by a more open environment dominated by rushes and sedges.

Although the stratigraphic sequence is slightly more complicated in Whitland 2, again the occurrence of woody remains and *Betula* and *Alnus* seeds and cone-scales throughout much of the profile indicate the existence of woodland locally. Further confirmation of this is the presence of seeds of *Oxalis acetosella* (wood sorrel), a species commonly found in woods and often on humus but tending to avoid particularly wet soils. Occasional charcoal indicates some burning of woodland either as a result of natural or human agencies. However, the generally wet nature of the immediate area is demonstrated by *Carex*, *Juncus* and *Bidens cernua* (nodding bur-marigold) seeds. The last species is generally found besides ponds and streams and in marshy areas. *Lychnis flos-cuculi* (ragged robin) is another plant of marshy ground and seeds of *Viola* (violet) may represent viola species found in such an environment.

In the upper part of the statigraphy there is evidence for wet conditions with the appearance of *Potamogeton* (pondweed) seeds, indicating the presence of pools of standing water. *Hydrocotyle vulgaris* (marsh pennywort) and *Lycopus europaeus* (gypsywort), which grow in fens, are also represented. Immediately below the road there is evidence for a thin layer of *Spahgnum* moss. The evidence intimates fairly open and very wet marshy ground.

The deposits from the remaining columns were essentially minerogenic in nature with a varying degree of organic material. *Juncus* seeds throughout the deposits in Whitland 3 suggest wet, rushy ground in the vicinity. In the upper deposits below the road, seeds of *Juncus*, *Carex*, *Ranunculus*, *Hypericum* (St John's wort), *Potentilla* (tormentil) and *Potamogeton* and the occasional *Sphagnum* leaf occur, an assemblage not dissimilar to the ground flora assemblage from the upper deposits of Whitland 2. The evidence suggests wet marshy ground, perhaps with a small stream or pools.

Plant remains were scarce from Whitland 4 and only seeds of *Juncus* were recorded, again reflecting wet or damp, rushy ground. In contrast there was a greater variety of seeds from Whitland 5 taken through ditch deposits in the north roadside ditch. The lowest deposits comprised a woody peat into which the ditch had been cut. Seeds present in the ditch deposits include aquatics such as *Potamogeton* and *Ranunculus* subgenus *Batachium* (crowfoots). *Stellaria uliginosa* (bog stitchwort) and Poaceae (grass) seeds and *Pteridium aquilinum* (bracken) leaf fragments probably reflect vegetation growing on the ditch sides or close to the ditch.

The plant macrofossil assemblages from the larger spot samples from the ditch deposits are similar to that from Whitland 5, although a greater range of species is present. Many of the taxa are indicative of the ditch environment itself. *Callitriche* (water-starwort), *Potamogeton*, *Ranunculus* subgenus *Batrachium* and *Ranunculus flamula* type (spearwort) reflect the presence of standing water. Other species such as *Juncus*, *Luzula* (wood-rush), Poaceae and the Carices may represent rushes, grasses and sedges either growing on the ditch sides or the environment close to the ditch. A number of other taxa are typical of grassland environments, including *Hypericum*, *Prunella vulgaris* (selfheal), *Hypochaeris radicata* (cat's ear), *Rumex acetosella* (sheep's sorrel) and *Potentilla erecta* (tormentil). A few species such as *Urtica dioica* (common nettle), *Chenopodium album* (fat-hen and *Aphanes arvensis* (parsley-piert) could indicate cultivation in the area but their presence may equally be due to the existence of bare ground and disturbed habitats. Seeds of *Betula* and *Alnus* suggest the continued occurrence of some birch and alder woodland locally.

The remaining two spot samples were from deposits associated with drain 125 and contained a similar range of plants to that from the ditches, but comparatively few. The only species recorded not found in the other samples was *Persicaria lapathifolia* (pale persicaria), a species sometimes indicative of cultivation but also found on waste ground and especially damp ground, often besides water.

Fossil insect data (MR)

The insects from the southern roadside ditch (sample 9) suggest that the ditch held stagnant water. The more numerous Coleoptera included *Helophorus* cf. *brevipalpis* and *Limnebius* cf. *papposus*, beetles which readily colonise stagnant water. Larval remains of Trichoptera (caddis flies) and Chironomidae (midges) were also present. Some indication of aquatic vegetation in the ditch was given by *Plateumaris discolor* or *sericea*, which feeds on Cyperaceae (sedges) and *Prasocuris phellandrii*, which feeds on aquatic Umbelliferae such as *Oenanthe* spp. (water dropwort).

The majority of the Coleoptera had been derived from the terrestrial environments alongside the ditch. They included Carabidae (ground beetles) such as *Trechus obtusus* or *quadristriatus* and *Calathus melanocephalus* which occur in a range of habitats whereas *Pterostichus diligens* and *P. nigrita* favour damp ground. One species, *Pterostichus niger*, is generally regarded as a woodland beetle, but under the more humid conditions of Wales and Northern England it also occurs in grassland and on arable land.

Some weedy ground was present in the vicinity of the ditch. The most numerous phytophagus beetle was *Brachypterus* sp., which feeds on *Urtica dioica* (stinging nettle). Other phytophagus beetles included *Gastrophysa viridula*, which feeds on *Rumex* spp. (dock) and the elaterids *Cidnopus aeruginosus* and *Agriotes* sp., whose larvae feed on the roots of grassland herbs. The grass-feeding bug *Aphrodes* sp. was also present. The only indication of trees or shrubs came from a single specimen of the bug *Aphrophora* sp., which feeds on a variety of such plants.

About 25% of the terrestrial Coleoptera were scarabaeoid dung beetles from the genera *Geotrupes*, *Aphodius* and *Onthophagus*, the most numerous being *A. contaminatus*. They feed on the droppings of larger herbivores, including domestic animals on pastureland. Such a high value would suggest that domestic arrivals were concentrated in the vicinity of the site (Robinson 1991, 278–80). One of those beetles, *Onthophagus nutans*, which was represented by a single elytral fragment, is now extinct in Britain. However, there are other archaeological records of it and it survived as a member of the British insect fauna well into the nineteenth century (Allen and Robinson 1993, 138).

The insects gave no evidence for the proximity of human settlement. Synanthropic species were entirely absent and the beetles of decaying organic material such as *Cercyon ustulatus* and *Megasternum obscurum* would have found suitable habitats in plant debris on the edge of the ditch or in the dung.

Discussion of the palaeoecological evidence (AEC and MJCW)

The three different types of palaeoecological evidence (pollen, plant macrofossils and fossil insect remains) from the various contexts associated with the Roman road combine to provide a remarkably coherent (and consistent) picture of vegetation and local environment in the period leading up to the construction of the road. Indeed, some of the pollen diagrams contain a record of vegetational history extending back into the Bronze Age and Neolithic periods, commencing shortly after the 'elm decline'. At that time, this part of South Wales was covered by a mixed oak woodland, with stands of birch and hazel on more open sites and extensive thickets of alder and willow in damper localities. Gradual clearance of the woodland resulted in the expansion first of hazel, a notable light-demanding species, presumably onto ground that had formerly been occupied by mixed woodland, and subsequently by grassland plants. The evidence suggests that this increase in areas of grassland began during the early Iron Age with a further marked expansion during the later Iron Age–Romano-British period so that by the time of road construction, extensive areas of open ground existed in the vicinity. However, the pollen record does indicate that some arboreal and scrub stands were still present in the area, and that these continued into the medieval period. There are strong suggestions that the clearance of the forest was an anthropogenic phenomenon, for the decline in woody plant pollen is accompanied by an increase in all of the pollen profiles by taxa associated with agricultural activity.

Herbaceous plants found today growing in short-turf communities, and hence typically correlated in prehistoric pollen records with pastoral activity, include, *inter alia, Plantago lanceolata, Plantago coronopus*, and species of *Ranunculus, Potentilla, Anthemis, Aster* and Lactuceae. Interestingly, there are only isolated grains of Cerealia-type pollen, which suggests that pastoral rather than arable was the dominant form of prehistoric farming practiced in the area and that this continued through into historical times.

This reconstruction based on the palynological evidence is strongly supported by both the plant macrofossil and fossil insect records. The plant macrofossils from the peats confirm the presence of carr woodland locally throughout most of the period, as indicated in pollen diagrams Whitland 1 and 2. The pollen and plant macrofossil evidence from the deposits below the road, represented in Whitland 2 and 3 pollen columns, demonstrate clearly the wet marshy conditions the builders of the road had to contend with. Plant remains from the ditches and drain 125 suggest a largely grassland environment was contemporary with construction and use of the road, which is also reflected in the pollen records from the ditch deposits in Whitland 4 and 5 as well as the other diagrams, particularly Whitland 1 which extends into the early medieval period. As was noted above, the Coleoptera recovered from the ditch deposit are also typically associated with grassland habitats, and only a very few are characteristic of woody environments. Moreover, around one quarter of the terrestrial Coleoptera are dung beetles, which corroborates the pollen evidence that suggests that a well-established pastoral economy was operating in the area in the period prior to, and contemporary with, the construction and use of the Roman road. The dates suggest that this type of farming was of some antiquity, the first indications in the pollen record dating to the Bronze Age.

Unfortunately, there are few other palynological records from lowland south-west Wales with which these sequences can be compared, for Donald's (1987) evidence focuses more on the early and middle Holocene, while Seymour's (1985) data are from sites on the Preseli uplands some distance to the north. The nearest published pollen diagram is from Llanllwch immediately to the west of Carmarthen (Thomas, 1965), and some 15km to the east of the Whitland sites. There, a raised bog contains a vegetational record that appears to extend up into the Norman period. The evidence from Llanllwch is in close agreement with the Whitland records in pointing to a relatively low level of agricultural activity during the Neolithic period but a marked intensification during the Iron Age and Roman-British periods. Interestingly, cereal pollen is relatively well-represented in that profile, by contrast with the records from the Whitland sites, suggesting significant variations in prehistoric land-use in this part of south-west Wales. There are, however, a number of similarities between the Whitland records and those obtained from the Bryn Farm profiles, some 2–3km to the west of Whitland, and which also underlie the Roman road (Caseldine 1997). The upper parts of the Bryn Farm sequence also show an alder phase succeeded by a wood and scrub episode (this time dominated by birch rather than hazel) followed, in turn, by the demise of woodland and an expansion of grassland but a Late Bronze Age date from peat immediately below the road suggests that the pre-Roman Iron Age record is missing either because peat growth ceased or because peat was removed during construction of the road. In contrast to Whitland the onset of this decline dates to the Late Neolithic (*c*. 4100 radiocarbon years BP). A further decline in woodland and rise in Poaceae pollen, accompanied by an increase in 'agricultural weeds', in the basal deposits of the road may indicate an expansion in grassland and pastoral farming during the Roman period.

More recently, pollen evidence has become available from the wider region and includes a diagram from a peat deposit at the gas storage installation at South Hook, Herbranston, near Milford Haven (Bates *et al.* 2007; Crane and Murphy 2010); pollen data from sites at Maes-y-llan (RDX05), north of Llanedi, near Ammanford and, to the south of Llanedi; and records from Tal-y-cynllwym (RLX01) in the Canffrwd valley, a tributary of the river Loughor, the last two both associated with the South Wales Gas Pipeline (Rackham 2020). At South Hook and Maes-y-llan (RDX05), as at Whitland, there is evidence for woodland clearance during the early Iron Age accompanied by pastoral and arable farming. At South Hook the record ends probably in the late Iron Age or Romano-British period, after which there is a depositional hiatus until the later medieval period, whilst at Maes-y-llan evidence for extensive pasture and a small amount of cereal cultivation at the top of the sequence may be late Iron Age or Roman in date. In contrast at Tal-y-cynllwyn (RLX01) woodland comprising birch and alder continues on the valley floor along with oak and hazel on the valley sides and there is only limited evidence for grassland and minimal evidence for arable activity during the first millennium BC, demonstrating local differences in the vegetation and landscape in the wider region. However, an expansion in grassland and some cereal cultivation is attributed to the Roman period.

DISCUSSION

Dating the road

It was disappointing but not surprising that there were no datable finds from the surfaces of the road, from the road make-up or from below the road. Dating therefore depends on radiocarbon determinations obtained from two samples from timbers from the drains beneath the road (median probability ages: 123 BC (Beta-84187) and 27 BC (Beta-84188), and also radiocarbon determinations from the pollen sample columns.

There can be no doubt that the road is Roman in date so the important question to be answered is how early is it. The identification of early Flavian forts at Carmarthen (James 2003, 29–46), Llandeilo (Hughes 2005) and Wiston (Meek 2017) undoubtedly date to the military campaigns of Frontinus (AD 73/4–77/8) and it is reasonable to conclude that the Roman road west of Carmarthen dates to this period. An excellent account of the chronology of the conquest of Wales and a gazetteer of roads can be found in Burnham and Davies (2010, 37–48, 315–32).

In west Wales, a general reduction and virtual withdrawal of many military garrisons had taken place by AD 120. However, even though forts and their attached *vici* — civilian settlements — may have been abandoned, roads between them seem to have continued in use. Therefore, we can conclude that there was likely to be continued maintenance of the road west of Carmarthen, following construction and use by the military, between the early second and the fourth centuries AD.

The road structure and resources

This picture of a rapidly constructed road by professional military engineers provides the framework for considering the similarities and differences between the two sections of the road so far investigated by excavation at Bryn Farm and Pwll-y-Hwyaid. Both were over wet ground entailing the construction of an agger or causeway. The dates from the pollen sample taken through the peat at Bryn Farm do not extend beyond the Bronze Age suggesting that the later surface of the peat over which the road had been constructed had been removed, perhaps to create a more compact and level surface. There was no suggestion that this kind of surface preparation had been carried out at Pwll-y-Hwyaid. Instead, a foundation corduroy of brushwood and branches was identified in all the excavated sections. The palaeoecological analyses demonstrate that stands of suitable woodland would have been available close by to supply this wood and timber.

It is estimated that the stone and clay foundation for the earlier road surface would have required approximately $4m^3$ of clay and $2m^3$ of stone cobbles and boulders for each 5m section of road. This foundation was overlain by further alternate layers of clay and shale requiring a further $4m^3$ of clay and $4m^3$ of shale per 5m section. Finally, the road surface itself would have required approximately $2.5m^3$ of cobbles per 5m section. The stone would have been readily and locally available as water-worn pebbles and boulders from streams and rivers. In addition, as the section describing the whole course of the road and the aerial photographic evidence makes clear, quarrying for clay, gravel, shale and stone took place close to the road along its whole length. Where it crossed wetter ground, the later road surface would also have required substantial quantities of stone and clay, probably in excess of $6m^3$ of clay and $4m^3$ of stone per 5m section. In addition, the sandstone slabs for the upper road surface must have been obtained from quarries further afield.

The two-phase construction of the Roman road at Pwll-y-Hwyaid is one of the most interesting results of the excavation. It is thought most likely that this rebuilding and heightening of the road was a localised response to a particular circumstance. This road heightening was most noticeable in the central section of the excavation where the ground was both lower and wetter. By contrast, there were no intervening layers of clay and shale in Section 3 at the western end of the excavation. The earliest road surface in the central area seemed to have been frequently patched and a number of longitudinal grooves also suggested considerable wear. However, there was no sign of any slumping or subsidence. It is possible that the decision to raise the road level and construct a new surface was prompted by a rise in water levels in the surrounding bog. It is not known how long an interval there was between the construction of the lower road surface and the upper road surface, although the replacement of the drain 142 by drain 125 and the reuse of timbers from 142 in 125 indicates a relatively short time period between the two.

The drains beneath the road conform to known Roman woodworking practice. Very similar stake and wattle-lined gulleys have been recorded at Annetwell Street, Carlisle, and Copthall Avenue, London (Nigel Nayling pers. comm.), where they have been identified as drains, with the wattle sides intended to stop erosion. A wattle structure was also recorded in association with a first- to early second-century road at South Ferriby in the Ancholme Valley, Lincolnshire. However, in this instance the structure was parallel to the road and may have been intended as a revetment for the edge of the causeway (Chapman *et al.* 1998, 242–4).

The destination of the road

As has been seen, the line of the road has now been traced as far as the fort at Wiston (SN 0256 1851), but from here its course, or courses, is unknown. There are several possible explanations for what happened at Wiston: the road may have terminated at the fort, with the implication that there were no Roman military installations to the west; the road may have headed for a single coastal destination; it could have split and extended to multiple coastal and/or inland destinations. However, it is assumed that the road headed for a location on the coast, and if that is the case there are several possibilities: it could have headed south-west to the north side of the Milford Haven waterway, north-west to Whitesands Bay near St David's; or north along the Western Cleddau gorge to Fishguard Bay. All, especially Whitesands, are known embarkation and arrival points to and from Ireland in the early medieval period (Hughes 1960). Alternatively, the road could have continued on its relentless course just south of due west to emerge on the coast at Druidston Haven/Nolton Haven on St Brides Bay.

The names of some headlands and rivers in Ptolemy's *Geography* (Rivet and Smith 1979, chapter III, 103–31) are evidence of knowledge of the coastal waters around west Wales, and a review has revealed sparse but nevertheless convincing archaeological evidence of Roman military shipping around the coast of Wales (Evans *et. al*. 2010). Confirmation of coastal trade between south-west and south-east Wales was found during an excavation at the legionary fortress of *Isca* (Caerleon) where phyllite roofing slate from the southern Preseli Mountains, Pembrokeshire, was used in the make-up of the second century quay (Boon, 1978). It is clear that coastal trading in the Romano-British period in west Wales must have depended on a network of minor roads and tracks linking the sources of goods to natural harbours and landing places. A single military road could have functioned as a major axial route serving these minor roads and tracks. Without suggesting a situation as developed as that of Roman Brittany, the physical similarities between west Wales and the Armorican peninsula make comparison with its Roman road system very instructive (Galliou 1983, chapter 4: Galliou and Jones 1991, 81–3).

If a landing place was established on the west Wales coast in the late first century, was it intended to serve as an embarkation point for Ireland? The only known Roman military intentions towards Ireland come from Tacitus's biography of his father-in-law, Agricola (Ogilvie and Richmond 1967, chapter XXIV). During his campaigns in southern Scotland and the fringes of the Highlands, in Galloway, in AD 82 he is reported to have received a refugee Irish prince whose information, together with that of merchants, regarding harbours and approaches, led him to conclude that the country could be conquered with one legion and some auxiliary forces. His fleet had certainly carried out coastal survey off the Scottish coast. This came to nought due to rapid changes in political circumstances and military objectives. But that combination of sufficient military forces at a period of campaigning when proximity to one of the 'jumping-off' points for sea-crossings to Ireland allowed the possibility to be entertained, could have also occurred in either north-west or south-west Wales in the late AD 70s.

Roman military sites in west Wales

Prior to the discovery of the fort at Wiston, the absence of recognised military sites west of Carmarthen has led past commentators to argue for a peaceful, or even an acquiescent, relationship between the Demetae and the Romans (cf. Wainwright 1967, 62). Many sites in both north and south Pembrokeshire have yielded finds of Roman date and these, along with an increasing number of reported stray finds, indicate widespread Roman influence and Romano-British settlement throughout the region. But, apart from Wiston, no military installations have been discovered. If they did exist, where are they likely to be located? Given a generally accepted average of 15 miles (24km) distance, a day's march for the Roman military, between Roman auxiliary forts, a fort could be expected in the Whitland area, 11 miles (18km) from the Wiston fort and 14 miles (22km) from the Carmarthen fort. The locations of forts or other military installations to the west of Wiston, if indeed there were any, would be determined by the course of the road.

It could be that the forts at Carmarthen and Wiston and the possible presence of the Roman fleet operating around the coast were enough to exercise control without the need for actual campaigning into the western Pembrokeshire peninsular. Viewed in this context, the road can be seen to have been a potent symbol of *imperium*. Not only would the road have had a physical impact on the landscape and on the social structure of the area by crossing existing landholdings and boundaries, in effect, slighting tribal lands and their associated heritage (Witcher 1997, 7), it would also have carried an implicit threat by being a constant reminder of the army stationed along the road at Wiston and Carmarthen. The fact that the road ran close to several late Iron Age sites, particularly the enclosed settlements at Llawhaden (Williams and Mytum 1998), may have been a deliberate decision on behalf of the road builders to make a political point. On the other hand, the road and the Llawhaden settlements being close to each other at this point may simply reflect the fact that this area was the best crossing place, or a convenient landing place, on the Eastern Cleddau river.

As well as providing military options, the road also had an important economic role to play in the region by opening up access to the fertile farmland of west Carmarthenshire and Pembrokeshire and by giving the local population access to imported goods and the markets at the Roman town at Carmarthen.

Post-Roman abandonment and the survival of the road in the landscape

This section aims to briefly outline some of the possible processes and landscape changes that have resulted in sections of the road becoming fossilized in the present network of roads, tracks and boundaries and to some sections being abandoned.

The withdrawal of the Roman army from Britain in the early fifth century and the resultant breakdown of centralised government created a vacuum that was filled throughout Britain by local affiliations, social, political and military, which redefined the way in which regions were governed. This change in government would have been accompanied by significant reorganisation of the social and physical landscape, possibly tied in with changes in landownership and agricultural practice (Fenton-Thomas and Drew 1997, 23). One of the major factors in the new style of government may have been the reduction in importance and use of long-distance communications routes, such as Roman roads. This would ultimately have led to some sections of roads becoming abandoned as the foci of power were shifting and regional relationships changing. These changes would probably have been felt first in the outlying regions like *Demetia* where reorganisation of the landscape could have started quite early on. This may have been a significant factor in the apparent disappearance of the road west of Wiston, if indeed the road continued to the west.

Between Carmarthen and Wiston the process of abandonment appears to have been a more piecemeal affair with some stretches continuing in use as roads or tracks, some lengths becoming fossilized in boundaries and some stretches being abandoned completely. A bilingual (Roman and Ogham scripts) memorial stone to Voteporigis (Voteporix),[8] a fifth-century king of Dyfed, was discovered in the last century built into the wall of a chapel at Castell Dwyran close to the line of the Roman road (SN 1442 1821). The Roman road at this point is now represented by a parchmark and a small unclassified road. The original location of the stone is unknown, but it has been considered that it came from the near vicinity, possibly alongside the road itself. If this is correct, it suggests that this section of the road maintained a significance beyond being just a local byway well into the fifth century (Fenton Thomas and Drew 1997, 22).

Other significant places developed along the road during the early medieval period. Carmarthen maintained its importance throughout the period and Whitland came to prominence in the early tenth century as the place that Hwyel Dda drew up the first Welsh laws. It seems reasonable to assume that the Roman road route was still viable between these two places at the time, although, that does not necessarily mean that the structure itself remained intact or in its original form for the whole route. There is evidence to suggest that the route, if not the road itself, was still in use in the twelfth century when Gerald of Wales made his journey through Wales (Colt Hoare 1806). The route he took, like the road, ran from Carmarthen to Llawhaden, via Whitland.

Today there is a short stretch of bridleway that links Whitland Abbey to North Road in modern Whitland town. This has always been known locally as the Roman Road and it does indeed run close to the line of the road and only 100m north of the excavation site at Pwll-y-Hwyaid. It meets the actual Roman road at the point where it crosses modern North Road. To the west of this point the line of the Roman road survives as a farm track, but to the east it survives only as the earthwork agger, partly investigated during the excavation. Here it seems likely that the foundation of the abbey in the twelfth century prompted the construction of an access road to link the abbey with the Roman road, some 1km to the south-west. In time this link road took over in importance and use from the original Roman road line, which passes to the south of the abbey, as traffic now tended to pass directly by the abbey (Fenton-Thomas and Drew 1997, 23).

The rate of landscape change accelerated during the post-medieval and modern periods as the amount of enclosed land increased and more intensive agricultural techniques were introduced. All these factors have played a part in the survival and present condition of the road and how it is visible today. The 1993–94 fieldwork showed that the areas where the road survived as an earthwork, agger, terrace or hollow, were generally low-grade agricultural land. Inevitably, ploughing has had a dramatic effect on the survival of the road structure. Over large stretches, where the upper levels of the agger have been levelled, the foundation stones have been exposed and are now frequently dislodged during ploughing. Large earthwork features are also being affected, such as the cutting at Zabulon Farm (SN 2369 1674) where it is being flattened by continued ploughing.

In other locations it is likely that the road has been covered by alluvium or colluvium and may survive beneath the present ground surface. This may be the situation where the road runs through water-meadows alongside the river Taf, which are prone to flooding. Very clear parch-marks are visible here on aerial photographs. Another threat to the road structure is erosion through river action. At Llwyn-Drissi Farm (SN 1838 1726) a section across the road is clearly visible in the bank of a stream, the Nant Cwmfelin-boeth. Here the road is made up of compacted layers of shale and cobbles and is about 15m wide. Other examples of this kind of damage must exist despite the lack of similarly clear evidence (Fenton-Thomas and Drew 1997, 12).

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NOTES

1. All of or formerly of the Dyfed Archaeological Trust, Corner House, 6 Carmarthen Street, Llandeilo, Carmarthenshire SA19 6AE.
2. Somerset Heritage Centre, Taunton, Somerset TA2 6SF.
3. All of or formerly of the School of Archaeology, History and Anthropology, University of Wales Trinity St David, Lampeter, Ceredigion SA48 7ED.
4. St Cross College, University of Oxford, Oxford OX1 3LZ.
5. Recorded as 3733 on the Dyfed Historic Environment Record.
6. E. Grimm, 1991–2015, *TILIA* 2.0 (computer software) (Springfield: Illinois State Museum).
7. Stuiver, M., Reimer, P. J. and Reimer, R.W., 2021. 'CALIB Radiocarbon Calibration Program', ver. 8.2html, available at <http://calib.org>.
8. Recorded as 3731 on the Dyfed Historic Environment Record. The stone in now in Carmarthen County Museum, Abergwili.

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Cover image: Llwyn Celyn, Cwmyoy, Monmouthshire: a hall-house of 1420, barely changed since the hall was floored over in *c*. 1690, and restored by the Landmark Trust. *Photograph: Dafydd Wiliam.*