



CENTRAL YARD, BAE SYSTEMS, BARROW-IN- FURNESS, CUMBRIA

Archaeological Watching Brief



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SUMMARY

An archaeological watching brief was carried out by Oxford Archaeology North (OA North), commissioned by Jacobs UK Ltd on behalf of BAE Systems, during preparatory ground investigations at Central Yard, Barrow-in-Furness, Cumbria (NGR SD1945 6860). The monitored groundwork involved the excavation of 6 trial pits and 12 foundation pits, mostly within the still-standing principal Central Yard structure. The watching brief was required to investigate the potential for preservation of pre-industrial archaeological features and deposits, and was carried out between 2nd October and 7th of November 2007.

No pre-industrial archaeological remains were found during the works and, whilst there was evidence for earlier industrial activity on site, the limited scope of the investigation meant that it was not possible to tie these remains to any specific phase of activity. The concentration of the geotechnical pitting around existing structures inevitably meant that considerable subsoil disturbance was observed, exceeding depths of 2m in some places. In a number of instances, demolition debris had been used as a backfill, and for levelling, whilst the origin of a number of thick clay deposits was harder to define; these too may be imported levelling material, but the absence of finds recovered from this material means that they may be natural in origin. No definite natural geological deposits were encountered within the scope of the monitored works, although such deposits were encountered during the archaeologically unmonitored programme of geotechnical boreholing.

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The watching brief was undertaken by Phillipa Haworth and Steve Clarke, who also compiled the report. The drawings were produced by Marie Rowland. The project was managed by Stephen Rowland, who also edited the report.

1 INTRODUCTION

1.1 CIRCUMSTANCES OF PROJECT

- 1.1.1 BAE Systems propose to redevelop the Central Yard, Barrow-in-Furness, Cumbria (NGR SD1945 6860; Fig 1). The scheme will involve the demolition of elements of the present building of the Central Yard, which represents an agglomeration of shipyard structures, elements of which may date to the later nineteenth century, and the construction of a new building on the site (Fig 2). A desk-based assessment undertaken by Jacobs UK Ltd (Jacobs 2007) indicated that the site lies within an area of archaeological potential and, accordingly, Cumbria County Council Historic Environment Service (CCCHES) requested that, in order to further inform the planning process, a programme of archaeological monitoring should be maintained during investigative groundworks on the site. A Written Scheme of Investigation for such works was compiled by Jacobs (*Appendix 1*) and, following its approval by CCCHES, OA North was commissioned by Jacobs, on behalf of the BAE Systems, to undertake the watching brief. The watching brief was required to investigate the potential for preservation of pre-industrial archaeological features and deposits, and was carried out between 2nd October and 7th November 2007.

1.2 SITE LOCATION, TOPOGRAPHY AND GEOLOGY

- 1.2.1 Barrow-in-Furness lies at the south-western tip of the Furness Peninsula in South Cumbria, although it is historically in that part of Lancashire known as ‘across the sands’, or North Lonsdale. It is bounded by Morecambe Bay to the south and Duddon Sands to the north, with the Furness Fells to the east and Irish Sea to the west (Fig 1). The site is located to the south of the centre of Barrow-in-Furness, on Barrow Island and north-west of the junction of Michaelson and Bridge Roads. The site is bound to the north by the Devonshire Dock, to the south by Bridge Road, to the east by the Grade II listed Heavy Engineering Shop and to the west by Edwardian terraces. The Central Yard comprises an ‘L’-shaped agglomeration of shipyard structures. Although the majority of the building remains standing, elements to the south have recently been demolished (Fig 2).
- 1.2.2 The topography is essentially artificial due to the massive extent of construction and development within the study area. It is typically low-lying, little more than 10m above sea level. The more general area is a mix of stretches of coastline and undulating fields rising up to fells to the north-east (Countryside Commission 1998, 25).
- 1.2.3 The solid geology is made up almost entirely of Triassic red sandstone, with areas of red, grey and green mudstones and siltstones to the south-west (British Geological Survey 1982). As the study area is entirely urban the nature of the overlying drift geology is not clear. It is likely to consist of glacially derived deposits, overlain by typical brown earths as in neighbouring areas (Ordnance Survey 1983).

1.3 HISTORICAL AND ARCHAEOLOGICAL BACKGROUND

- 1.3.1 **Prehistory:** evidence for post-glacial activity is not common in this part of North West England. Nevertheless, recent work has established that groups of hunter-gatherers were active in the region, some of the most compelling evidence having come from the Furness Peninsula itself (Young 2002). Cave sites excavated near Ulverston and Grange-over-Sands have revealed remains dating to around 10,000 years ago (*op cit*, 20), and it is possible that the remains of deer discovered during the construction of the Barrow Docks in layers of peat at great depth could also date to this period (Kendall 1900). There is considerably more evidence of sites in the vicinity of Barrow dating to the Mesolithic period, many artefacts having been discovered on Walney Island, just off the south-west coast. These consist almost entirely of surface finds (Cherry and Cherry 2002). Needless to say by the beginning of the Neolithic the area around Barrow was well visited, although recent excavations suggest a degree of continuity from the Mesolithic (Jones 2001; OA North 2002).
- 1.3.2 During the later Neolithic and Bronze Age more extensive settlements began to be established across the Furness Peninsula and numerous stray finds have been discovered, including stone and bronze axes, along with bronze swords, spearheads and other weapons (Barnes 1978, 9). Large enclosures such as those at Skelmore Heads and Stainton, may have their origins at this time (Powell *et al* 1963; Barnes 1978), although they appear to have remained in use until the coming of the Romans. Numerous burial mounds, many of which were explored during the eighteenth and nineteenth centuries (West 1774), also date to this period, as well as the stone circle at Birkkrigg (Gelderd and Dobson 1912). During the Iron Age further settlements were constructed, such as that at Stone Walls near Urswick, where there is evidence that open cast mining was carried out (Bowden 2000), and there may even have been some form of habitation at Back (or Black) Castle, now the site of Barrow public park (Barnes 1978, 9).
- 1.3.3 **Roman:** although there are no confirmed structural remains dating to the Roman period, it is not clear to what extent there was a Roman presence within the area. Shotter (1995) has argued that the relatively large number of Roman coins found in South Cumbria, particularly in the Furness Peninsula, suggests a large degree of interaction between the Romans and the local population and the possibility that a fort may yet be discovered.
- 1.3.4 **Early Medieval:** like many parts of North West England evidence for activity during the early medieval period is largely confined to two sources: place-names and the remains of a cross fragment. The name Barrow-in-Furness is a relatively modern one, the village originally being called Barrowhead. Barrow appears to have referred to Old Barrow Island and is thought to consist of an early Celtic word ‘barr’ meaning top or summit with the Norse ‘ai’ meaning island added to the end making ‘barrai’ (Ekwall 1922), and it is still pronounced ‘Barrah’ by locals to this day. Furness too is possibly named after Fouldney Island (sometimes mistakenly called Piel Island) ‘fu’ or ‘fud’ being Old Norse for small island, and ‘ness’ meaning headland or peninsula (*ibid*). Finds from the area include the pommel, grip, guard and 400mm of the blade

of a Viking sword which was recovered in 1909 while digging a grave in the churchyard at Rampside, near Roa Island (Parsons *pers comm* 2002).

- 1.3.5 At the time of the Norman Conquest Furness formed part of the Manor of Hougun, thought to be based at High Haume near Dalton, under the control of Earl Tostig (*op cit*, 19).
- 1.3.6 **Medieval:** the history of Furness soon became synonymous with that of its abbey, which was founded in 1127 after a gift of land by Stephen (later King Stephen) in 1124 (*op cit*, 24). The abbey came to dominate almost everything in the area and both Barrow and Salthouse were granges connected to it; however, Barrow was not mentioned by name until after the Dissolution (Leach 1981, 24). Salthouse, as the name might suggest, was established as a grange in 1247 with a saltworks, and was granted several indulgences, including exemption from tithes (Kendall 1948, 24). Both Barrow and Salthouse are likely to have changed little in the following centuries and, although the Great Raid by Robert the Bruce of 1322 entered Furness and caused much devastation, it is not clear how severe this was (Barnes 1978, 32). One of the obligations held by the villagers was to maintain the sea defences (Kendall 1948), which was observed until the Dissolution of the Monasteries. During the sixteenth and seventeenth century there were several inundations of the coastline, which destroyed property in the village of Salthouse among others (Phillips and Rollinson 1971, 3).
- 1.3.7 **Post-Medieval:** until the end of the eighteenth century Barrow consisted of only five farm houses with outbuildings, and originally consisted of eight homesteads founded by the abbey (Kendall 1909, 185). With the exception of a small farm, located close to the centre of the island, Barrow Island itself remained largely undeveloped pasture and arable fields well into the eighteenth century. In 1726, a large house was built close to the island's north coast, with a ford crossing the tidal Barrow Channel (Kendal 1948). The island, mansion and farm were bought by Robert Michaelson of Cartmel in 1746 (*ibid*). Salthouse too originally consisted of only four houses, the people living there were no doubt engaged at the salt works (Kendall 1948). Barrow was a farming village, not a fishing village, the latter would appear to be a Victorian myth (Trescatheric 2000, 2); its produce including oats, barley, wheat, beans and dairy cattle, (*op cit*, 1) which remained the same into the nineteenth century (Rollinson and Harrison 1986). The houses were probably similar to two pulled down in Salthouses in 1800 and 1802, which were recorded as being made of cobbles and clay, with cobbled floors and thatched roofs and included a buttery (Kendall 1948, 36-7).
- 1.3.8 At first the events of the industrial revolution had little effect on Barrow, but the huge iron ore reserves of the Furness peninsula were soon to become a dominating factor in the town's development. The ore had been exploited on a small scale since at least medieval times (Fell 1908), and was shipped from a number of places across Furness (Marshall 1958). Transport links by land across the Furness Peninsula were very bad, consisting of little more than cart tracks, and the way across the sands of Morecambe Bay southwards was extremely dangerous (Marshall 1958, 82-3).

- 1.3.9 The deep-water port at Barrow was controlled by a custom house built at Piel and connected with Furness Abbey. By the middle of the eighteenth century the Backbarrow Iron Company began transporting small quantities of ore from Barrow and as a result a small number of new houses were built (Kendall 1909, 185). As demand for iron increased the Newland Company bought land to found an ore-dumping ground in 1776, to allow the larger scale transport of material (Marshall 1958, 88). The Newland Company bought more land in 1780 and, in 1782 built a jetty, followed by a larger one in 1790 so that boats could be loaded at low tide (*ibid*). In response to this threat a canal was built in Ulverston to allow large loads to be transported directly into the town (*ibid*), but it was too late as Barrow's rise to dominance was underway.
- 1.3.10 Ore shipments increased steadily over the next few years; with a second jetty being built in 1833 by John Rawlinson, a third in 1839 by the Ulverston Mining Company, and a fourth in 1842 by Schneider and Partners (*op cit*, 91; Plates 1 and 2). Barrow increased little in size during this time and is described as a 'hamlet' in 1829 (Parson and White 1829, 710) and gets almost no mention in guides of the period (such as Evans 1842 and Jopling 1843). It was the coming of the railway in 1846 that transformed Barrow, allowing huge amounts of iron ore to be transported from the mine to the harbour (Banks 1984). Two principal figures stand out in the history of Barrow at this crucial point: HW Schneider and James Ramsden. It was Schneider who encouraged the exploitation of iron in the area, albeit after several abortive attempts (Banks 1984), which led to increased prosperity in the area and ultimately to the development of smelting furnaces in the town. Ramsden increased the ability to transport the iron ore by massively improving the rail network in the area (Kellett 1990), which in turn led to the enlargement of the docks. In 1867 the Devonshire dock was opened (Barnes 1978, 91) after an Act was passed in 1863 allowing this expansion. In 1867 Barrow had grown so large that it received its Charter of Incorporation as a Borough (Trescatheric 1987, 5). It continued to grow from this point on, the docks growing alongside the development of the town. Many new houses were built at this time (Trescatheric 1985), including large blocks of flats built in the Scottish style (*op cit*, 27), the grid-pattern layout of the town having been established by James Ramsden in 1856.
- 1.3.11 Barrow's prosperity continued to rest on its maritime links and ability to provide a safe harbour for ships. Shipbuilding itself did not begin in earnest in the town until the end of the 1840s (Latham 1991, 20), and it became a significant industry in the following decades. By 1872 the Graving Dock was opened, and in 1873 the Buccleuch Dock was complete (Barnes 1978, 91). Ramsden Dock was finished in 1879, and Cavendish Dock opened shortly afterwards (*ibid*). By this point, however, Barrow's iron industry was in serious decline; not only was the supply of ore at the mines running out, but there was also less demand for the materials and the hinterland could not support such a large harbour (Stark 1972, 2). As a result the Cavendish Dock was never properly used and is perhaps symbolic of the excessive aspirations for Barrow which in the event were not fulfilled (*ibid*). As a result of the collapse of the iron and steel industry Barrow reverted to an economy based entirely on shipbuilding and armaments (*ibid*).

1.3.12 As late as 1867, Barrow Island remained largely undeveloped (Kellet 1990), and the earliest documented industrial activity on the present development site was that of the Barrow Iron Shipbuilding Company, established in 1871. The 1873 1:10560 OS map would suggest that the three main shipyard structures and a reservoir to the north of Bridge Road (then Island Road) are likely to have stood partly within the footprint of the present Central Yard building. In 1887 the shipyard fell within the jurisdiction of the Naval Construction and Armaments Company, formed to centralise control of work being carried out for the Senior Service, and on the 1891 1:2500 OS map, the site is labelled as 'Naval Construction and Armaments Works'. The map would also indicate that the buildings had been extended. The company was bought by Vickers of Sheffield in 1897 after the death of James Ramsden in 1896 (Trescatheric and The Dock Museum 2000, 22). Vickers heavily redeveloped the works to form the present configuration, and the intensification of the early twentieth-century development of the site at that time is revealed by the 1913 1:2500 OS map, which labels the Central Yard building as an Engineering Works. Such development was no doubt fuelled by the Anglo-German arms race that preceded the First World War, and the yard continued to produce armaments during both World Wars. Although the following decades were far from economically stable (*op cit*, 42), shipbuilding has remained the dominant industry ever since.

2. METHODOLOGY

2.1 WRITTEN SCHEME OF INVESTIGATION

- 2.1.1 The CCCHEs-approved Jacobs WSI (*Appendix 1*) was adhered to in full, and all works were consistent with the standards of the IFA and generally accepted best practice.

2.2 WATCHING BRIEF

- 2.2.1 The programme of groundworks comprised the excavation of foundation pits (FP), largely located against the walls within the standing buildings of the northern part of the development area (Fig 2), and test pits (TP), mostly positioned in external areas and within the footprint of the demolished building to the south. The test pits and foundation pits were excavated using a 360° mechanical excavator fitted with a toothed 0.6m wide bucket and utilising a pecker where necessary. A programme of observation was undertaken to record the location, extent, and character of any surviving archaeological features, artefacts and/or deposits revealed within the excavations. Recording comprised a full description and preliminary classification of features or structures revealed, on OA North *pro-forma* sheets, and their accurate location in plan. An indexed photographic record in colour slide and monochrome formats was also compiled, with digital photographs taken for illustrative purposes.

2.3 ARCHIVE

- 2.3.1 A full archive of the watching brief has been produced in accordance with current English Heritage guidelines (English Heritage 1991). The archive will be deposited in the County Record Office, and a copy of this report submitted to the Cumbria Sites and Monuments Record as an appendix to the Desk-Based Assessment being prepared by Jacobs. An archaeological fieldwork record form will be forwarded for deposition to the National Monuments Record (NMR).

3. RESULTS

3.1 RESULTS OF WATCHING BRIEF

- 3.1.1 **Introduction:** the following section summarises the results of the watching brief; detailed context descriptions are provided in *Appendix 2* and the pit locations are shown on Figure 2. Each of the pits were recorded from the surface due to their high depth to width ration and the fact that in many cases the large component of demolition debris meant that the pit sides were frequently unstable. The locations and numbering of the pits was established prior to the works taking place but, in the event, not all of the pits were excavated, with the result that the pits below do not always run concurrently.
- 3.1.2 **Test Pits 1, 3, 5, 6 and 9:** these test pits, averaging 2.8m in length, were dug through external concrete surfaces to a depth of 0.3-0.65m below ground level, at which point another layer of concrete was revealed, and further works were abandoned. Excavation of TP9 was abandoned at a depth of 0.4m below ground level without ever breaking through the uppermost concrete layer.
- 3.1.3 **Test Pit 2:** this pit, situated on the west side of the site, measured 2.8m north/south by 1m, with a maximum depth of 0.8m. Beneath the concrete surface, **201**, made ground **202** was encountered, containing a high proportion of demolition debris. Within this demolition material, and preventing any further excavation beyond a depth of 0.8m below ground level, were two reinforced steel beams.
- 3.1.4 **Test Pit 4:** this pit was situated to the south of the site and measured 3.6m east/west by 1.2m, and was 1.6m deep. Removal of gravel carpark surface **400** and redeposited demolition debris **404** revealed structural remains, comprising three brick walls of machine-made frogged red brick in English garden wall bond (Plate 1). Walls **402** and **403** ran parallel to the axis of the trench, whilst wall **401** ran north/south at the east end of the trench (Plate 1). At the base of these walls was a concrete floor, **405**, which marked the limit of excavation at 1.6m below ground level.
- 3.1.5 **Test Pit 7:** TP7 measured 3.6m east/west by 0.6m and was situated close to the western edge of the recently demolished southern building. Removal of the gravel carpark surface, **700**, revealed a small red brick wall, **703**, running north/south across the east end of the trench. This wall consisted of frogged machine-made red brick and was 0.40m in width and had been built into a thick deposit of made ground, **702**, which contained a high concentration of demolition debris. Excavation indicated that deposit **702** continued below the water table, at 3.2m, to a depth of at least 3.6m.
- 3.1.6 **Test Pit 8:** TP8 measured 2.7m north-west/south-east by 2m and was situated at the south end of the site within the area of the recently demolished building. Removal of the 0.5m deep gravel car park surface, **801**, revealed two layers of made ground, **802** and **803**, containing a large amount of demolition rubble, consisting mainly of machine-made frogged red bricks stamped 'Furness Co LTD Barrow.' This loose

material, which made the pit sides very unstable, continued beyond the excavated depth of 2m.

- 3.1.7 **Foundation Pit 14:** FP14 measured 5.1m east/west by 1.4m by up to 1.9m deep and was situated towards the northern end of the site, where it was bound to the north by an east/west aligned wall, **1405**. Directly below the 0.1m thick concrete surface, **1400**, and sealed by sandy clay deposit **1408** at the east end of the trench was an arch-roofed flue, **1403**, built of machine-made red brick laid as double stretchers (Fig 3; Plate 2). This flue was approximately 0.8m wide, 0.9m high and was constructed on a 0.25m thick concrete base, **1404**, which extended 0.3m to the west and also supported a poorly-constructed brick wall, **1407**, which ran parallel with the flue and survived to a similar height. Two metal rods, 1m long and 0.03m in diameter, were set vertically into the wall, 0.9m apart. At a depth of 0.85m below ground level, the north wall footings, **1402**, were revealed along the northern edge of the pit. This concrete footing, which was at least 0.7m wide within the trench, abutted flue foundation **1404** to the east and supported the stepped red brick foundation of wall **1405**. Keyed into wall **1405** was the supporting brickwork for a service pipe exit, **1406**, measuring 0.36m by 0.28m. Between service pipe **1406** and flue **1403** and directly overlying footing **1402** and wall **1405** was concrete base **1401**, which measured 1m by 0.7m by 0.6m deep and supported a single girder steel column. Each of the concrete footings appear to have been inserted into a firm yellow sand, **1409**, which extended below the investigated depth of 1.9m; this deposit is likely to represent imported material, but could potentially be natural in origin.
- 3.1.8 **Foundation Pit 15:** FP15 lay due south of FP14. Removal of a 3m x 1.9m area of concrete surface **1500** revealed a 0.12m thick make-up layer of loosely laid bricks, **1501**, which in turn sealed concrete surface **1502**, 0.25m in depth. Adjacent to a steel column at the east end of the FP (Fig 3), an area 1.05m by 1m was cut through concrete surface **1502** to reveal firstly a 0.35m thick sandy clay **1505**, then the south-west corner of brick and concrete column base, **1503**, at a depth of 0.95m below the surface. This base was over 1m deep, extending below the limit of excavation, and appeared to have been set into a deposit of heavy clay revealed within the north- and east-facing sections of the FP.
- 3.1.9 **Foundation Pit 18:** located towards the centre of the site, FP18 measured 3m east/west by 1m and 2.2m deep. Removal of 0.15m thick concrete **1800** and underlying 0.2m thick ash and slag levelling layer **1801** revealed footing **1802**, consisting of a coarse concrete and hardcore mix with traces of a brick wall 0.23m wide running along the top (Fig 4; Plate 3). Footing **1802** appeared to run for 2.6m at right angles from a pier of the existing west wall before turning south. These footings had been set within firm reddish-brown clay made ground **1803**, and continued below the investigated depth of the trench.
- 3.1.10 **Foundation Pit 19:** FP19 measured 3.15m east/west by 1.6m and 2.8m deep and was situated towards the centre of the site. Lying flush with concrete surface **1900** at the eastern end of the FP was the top of a concrete block, **1903**, measuring 0.65m by 0.25m and 0.87m deep (Plate 4). Directly beneath, and continuing below the limit of excavation, was a substantial stepped footing, **1904**, constructed of large sandstone blocks measuring approximately 0.6m by 0.3m. The footing had been

backfilled with compacted reddish-brown clay, **1905**, the base of which again lay below the limit of investigation.

- 3.1.11 **Foundation Pit 20:** located at the north-eastern end of the site, FP20 measured 2.6m east/west by 1.5m and was excavated to a depth of 0.55m where a concrete surface, **2002**, was revealed. Above this surface was a (steam?) pipe running east/west and set in a fine light brown sand, **2001**.
- 3.1.12 **Foundation Pit 21:** FP21 was located towards the centre of the site and measured 4m east/west by 2.4m, with a maximum depth of 1.35m. Removal of 0.15m deep concrete surface **2100** and levelling layer **2101**, also approximately 0.15m in depth, revealed a number of features. At the eastern end of the trench these included westward running brick wall **2104** and, in the north-facing section, the remains of a concrete crucible, **2105**, with 0.2m thick walls (Plate 5). The crucible had been inserted within cut **2107**, which measured 1.4m in depth by 0.98m wide and, like that for wall **2104**, had been made through 0.55m deep rubble levelling layer **2106** and reddish-brown firm clay **2103**, which extended below the base of the trench at 1.35m. At the western end of the trench directly below levelling layer **2101** was the corner of a concrete surface, **2102**. This surface was 0.25m in depth and extended beyond the limit of excavation to the south and east. Directly below this surface, and projecting from its north side across an area 0.96m by 0.55m, was the corner of a concrete base, **2108** with two securing bolts 0.2m apart embedded within its north-east corner. Adjacent to the west side of concrete surface **2102** was a small brick and concrete base, **2109**, measuring 0.38m x 0.35m.
- 3.1.13 **Foundation Pit 22:** FP22 measured 4m east/west by 1.1m and 1.9m deep and was located just within the west wall of the proposed new building. Directly below the reinforced concrete floor, **2200**, was a substantial concrete footing, **2201**, extending in an 'L'-shape along the southern and eastern edges of the FP, its depth exceeding the depth of the trench at 1.9m (Plate 6). The deposit, **2202**, below the floor was very loose soil and rubble made ground, and again, exceeded the depth of investigation.
- 3.1.14 **Foundation Pit 23:** FP23 measured 1.7m east/west by 1.4m and was situated just to the south of FP22. The pit revealed a series of make-up layers, those at the top containing rubble, that at the base comprising reddish-brown clay, and a 0.4m ceramic service drain running east/west at the base of the FP at a depth of 0.6m.
- 3.1.15 **Foundation Pit 24:** FP24 comprised a 'V'-shaped pit dug to a depth of 1.2m at the northern end of the proposed new building. Removal of concrete surface **2400** revealed a ceramic service pipe at the base of the trench, overlain by light brown silty sand backfill **2401**.
- 3.1.16 **Foundation Pit 25:** FP25 was roughly 'L'-shaped and was situated in the north-east corner of the existing building, adjacent to the corner pier (Fig 5). It ran north/south for 2.5m by 2m, and east/west for 2.5m by 0.55m, and was excavated to a maximum depth of 1.6m. Removal of concrete surface **2500** and underlying make up **2501** revealed the footings of the north wall, comprising a sandstone foundation, **2502**, resting on a concrete footing, **2503**, the depth of which exceeded that of investigation. The footing had been inserted into dark brown compact clay,

2505, which again exceeded the limit of investigation, and had then been backfilled with orange/brown compact clay, **2504**, approximately 0.65m in depth. Along the south edge of the trench beneath the surface layers was a deposit of concrete, **2506**, approximately 0.45m in depth, sealing a service pipe running east/west.

3.1.17 **Foundation Pit 26:** FP26 was 1m square by 0.8m deep and was situated at the north-east end of the building (Fig 6). Directly below the 0.25m thick concrete floor, **2600**, was the concrete footing, **2603**, for the east wall, extending out by 0.3m. This was abutted by a levelling layer of limestone chippings, **2601**, which in turn sealed a firm reddish-brown clay, **2602**, the backfill for a 0.3m ceramic service drain running east/west at a depth of 0.66m.

3.1.18 **Foundation Pit 27:** FP27 measured 4m east/west by 0.7m and 1.7m deep at the south-east end of the building. Below the 0.1m thick concrete surface, **2700**, and levelling layer, **2701**, was a substantial brick foundation, **2704**, measuring 2.1m in length (Fig 6; Plate 7). Towards the centre of FP27 the coarsely-faced western edge of foundation **2704** dipped below the limit of excavation and had been backfilled first with firm brown clay, **2703**, and then with a thick deposit of ashy material, **2702**.

4. CONCLUSIONS

4.1 DISCUSSION

- 4.1.1 The results of the archaeological watching brief were essentially characterised by the objectives of the geotechnical investigation. As such, the foundation pits have confirmed the location and extent of footings for walls and bases for roof support columns within the main building, whilst the test pits to the south of the main building revealed walls and surfaces from the recently demolished buildings here. The concrete footings for the external walls of the main building were sunk at least 2m below the modern floor surface, and extended beyond the wall at varying distances from 0.3m to 0.7m. The bases supporting the steel columns were generally more shallow, and varied in size and depth according to the size and function of the columns; observed thicknesses varied from 0.6m to 1m. All the column bases inspected were of similar concrete construction except for that exposed in FP19, a large tiered base constructed of sandstone blocks, exceeding 2.8m in depth, and likely to run the entire length of the building.
- 4.1.2 There was occasional evidence for different periods of structural modification, and for varying phases of industrial activity on site, including the presence of concrete surfaces at different levels. Different periods of construction were also indicated by the varying use of brick and of sandstone, the latter of which, identified in FP19 and FP25, may relate to the early development of the core building constructed *c* 1873, developed *c* 1891 and then further expanded upon by Vickers. Contemporary with this early period was the pair of irregular reservoirs to the south of the late nineteenth-century building and latterly subsumed by buildings during the expansion under Vickers. No structural remains relating to these features were found during the watching brief, although it may not be co-incidental that TP8, the only pit located within the area, encountered deep deposits (2m+) of demolition debris made ground, likely to represent backfill of the decommissioned reservoir. Some of the surfaces could be seen to be earlier concrete floors, such as surface **1502** in FP15 onto which a layer of bricks had been laid and a new concrete surface laid on top; this surface was probably localised to the west side of the west wall. Other concrete features, like those in FP21, could not be ascribed a purely structural function, and were possibly machine beds. Evidence for industrial activity is provided by the possible crucible within FP21, although it is not certain to which phase of usage this feature relates. No pre-industrial archaeological remains were identified during the works, whilst there was also an absence of definite natural geological deposits within the areas investigated by the geotechnical pitting. Elsewhere, the archaeologically unmonitored borehole survey identified natural deposits, including orange-brown glacial till at 0.6m below ground level (BH3). It is possible that the thick reddish clay deposits identified within a number of the pits could be natural in origin, as they contained no finds.

4.2 IMPACT

- 4.2.1 On the basis of the results of the geotechnical investigations, it would appear that the erection of the structural elements of the existing buildings have inevitably had a significant impact upon any underlying deposits to depths of around 2m. Within the footprint of the building, away from the footings, the truncation would appear to be less significant, but still likely to have had a negative impact on underlying pre-industrial remains. Although the borehole survey identified natural deposits at shallow depths outside the footprint of the main building, the overall potential for pre-industrial remains, even within these isolated pockets, cannot be considered high. Conversely, there would appear to be better potential for the preservation of industrial remains relating to the different phases of usage and refurbishment of the buildings, and away from areas of maximum disturbance, there is a possibility that remains of earlier shipyard activity may be well-preserved. The impact of the new development upon these earlier industrial remains is thus likely to be more severe.

5. BIBLIOGRAPHY

5.1 PRIMARY SOURCES

British Geological Survey, 1982 *Lake District*, Sheet 54° N 04° W, 1 : 250000

Ordnance Survey, 1851 1st edn, 6" : 1 Mile, Lancashire

Ordnance Survey, 1873 1st edn, 25" : 1 Mile, Lancashire

Ordnance Survey, 1891 2nd edn, 25" : 1 Mile, Lancashire Sheet

Ordnance Survey, 1913, 3rd edn, 25" : 1 Mile, Lancashire Sheet

Ordnance Survey, 1983 *Soils of Northern England*, 1 : 250000

5.2 SECONDARY SOURCES

Banks, AG, 1984 *HW Schneider of Barrow and Bowness*, Kendal

Barnes, F, 1978 *Barrow and District*, 3rd edn, Barrow-in-Furness

Bowden, M ed, 2000 *Furness Iron*, Swindon

Cherry, PJ and Cherry, J, 2002 Coastline and Upland in Cumbrian Prehistory – A Retrospective, *Trans Cumberland Westmorland Antiq Arch Soc*, 3rd ser, **2**, 1-20

Countryside Commission, 1998 *Countryside Character Volume 2: North West*, Cheltenham

Ekwall, E, 1922 *The Place-Names of Lancashire*, Manchester

English Heritage, 1991 *Management of Archaeological Projects*, 2nd edn, London

Evans, F, 1842 *Furness and Furness Abbey*, Ulverston

Fell, A, 1908 *The Early Iron Industry of Furness and District*, London (1968 facsimile)

Gelder, C and Dobson, J, 1912 Report on the Excavations Carried out at the "Druid's Circle" on Birkrigg in the Parish of Urswick, September 1911, *Trans Cumberland Westmorland Antiq Arch Soc*, n ser, **12**, 262-276

Jacobs UK Ltd, 2007 *Central Yard Development*, Barrow unpubl rep

Jones, E, 2001 *Results of an Archaeological Evaluation at Roose Quarry, Barrow-in-Furness, Cumbria*, Headland Archaeology **RQB01**, unpubl rep

Jopling, CM, 1843 *Sketch of Furness and Cartmel*, Ulverston

Kellett, J, 1990 *James Ramsden, Barrow's Man of Vision*, Ulverston

Kendall, WB, 1900 Submerged Peat Mosses, Forest Remains, and Post-Glacial Deposits in Barrow Harbour, *Furness Lore: Trans Barrow Nat Field Club* **3**, 54-62

Kendall, WB, 1909 The Village of Barrow in the Parish of Dalton-in-Furness, *Barrow Nat Field Club, Annual Rep Proc 1903-4* **17**, 181-91

Kendall, WB, 1948 The History of the Hamlet of Salthouse, *Proc Barrow Nat Field Club*, n ser, **6**, 21-43

- Latham, T, 1991 *The Ashburner Schooners*, Manchester
- Marshall, JD, 1958 *Furness and the Industrial Revolution*, Barrow-in-Furness
- Mills, D, 1976 *The Place-Names of Lancashire*, London
- OA North, 2002 *Holbeck Park Avenue, Barrow-in-Furness, Cumbria: Archaeological Evaluation*, unpubl rep
- Parson, W and White, W, 1829 *History, Directory and Gazetteer of Cumberland and Westmorland With Furness and Cartmel*, Beckermest (1976 facsimile)
- Phillips, AW and Rollinson, W, 1971 *Coastal Change on Walney Island*, Ellesmere Port
- Powell, TGE, Fell, CI, Corcoran, XWP and Barnes, F, 1963 Excavations at Skelmore Heads Near Ulverston, 1957 and 1959, *Trans Cumberland Westmorland Antiq Arch Soc*, n ser, **63**, 1-30
- Rollinson, W and Harrison, B, 1986 *The Diary of William Fisher of Barrow, 1811 to 1849*, Centre North-West Regional Studies, occ pap **15**, Lancaster
- Shotter, DCA, 1995 Romans in South Cumbria, *Trans Cumberland Westmorland Antiq Arch Soc*, n ser, **95**, 73-8
- Stark, D, 1972 *The Origins of a Single Industry Town – Barrow-in-Furness 1890-1910*, unpubl dissertation
- Trescatheric, B, 1985 *How Barrow was Built*, Barrow-in-Furness
- Trescatheric, B, 1987 *Barrow Town Hall 1887-1987*, Kendal
- Trescatheric, B, 1992 *Building Barrow, From Fisher's Farm to Maggie's Farm*, Kendal
- Trescatheric, B and The Dock Museum 2000 *The Barrow Story*, Barrow-in-Furness
- Young, R, 2002 *The Palaeolithic and Mesolithic Periods in Northern England: An Overview*, in Brooks, C, Daniels, R and Harding, A eds, *Past Present and Future, The Archaeology of Northern England*, Architect Arch Soc Durham Northumberland, res rep **5**, Durham
- West, T, 1774 *The Antiquities of Furness*, Beckermest (1977 facsimile)
- West, T, 1813 *The Antiquities of Furness*, 3rd edn with additional notes by W Close, Ulverston

6. ILLUSTRATIONS

6.1 FIGURES

Figure 1: Site Location Map

Figure 2: Site Investigation Location Plan

Figure 3: Plans of Foundation Pits 14 and 15

Figure 4: Plans of Foundation Pits 18 and 21 (with section)

Figure 5: Plan and Sections of Foundation Pits 22 and 25

Figure 6: Plans and Sections of Foundation Pits 26 and 27

6.2 PLATES

Plate 1: Walls **401** and **402**, west end of TP4

Plate 2: Brick flue, **1402**, at east end of FP14

Plate 3: Footings, **1802**, jutting from west wall, FP18

Plate 4: Sandstone footings, **1905**, east end of FP19

Plate 5: Concrete receptacle, **2105**, in north facing section of FP21

Plate 6: Concrete footings, **2201**, in south and east sections of FP22

Plate 7: Brick foundation, **2704**, at east end of FP27

APPENDIX 1: WRITTEN SCHEME OF INVESTIGATION

1.1 Introduction

- 1.1.1 A watching brief is required on geotechnical trial pits shown on plan B0389300/SI/003. Recording of previously excavated inspection pits should also be undertaken.
- 1.1.2 The work shall be undertaken in accordance with the requirements of the Institute of Field Archaeologists' Standard and Guidance for an Archaeological Watching Brief (1994). This Specification is supplementary to the Standard and Guidance and all requirements of the Standard and Guidance shall apply.

1.2 Methodology for Watching Brief

- 1.2.1 Stripping overburden and any associated excavations shall be carried out by the Geotechnical Contractor either by hand or using mechanical excavators and shall be continuously monitored by a suitably qualified archaeologist. Sufficient archaeologists shall be provided to ensure that all relevant works can be properly monitored. It is unlikely that full time attendance will be required on site and the Sub-consultants archaeologist should liaise with the Geotechnical Contractor as to their proposed programme.
- 1.2.2 Where any remains are identified in the course of monitoring work the archaeologist shall notify the Geotechnical Contractor, the Engineer's Representative in charge of the geotechnical investigations and the Consultant and shall investigate and record the remains by the methodology set out below:
- Archaeological investigation and recording shall be undertaken in such a manner as to minimise the delay and disruption to the GI investigation; however, if necessary the archaeologist may instruct short suspensions of mechanical excavation, and may ask for backfilling to be delayed, to allow recording work to be undertaken;
 - Where archaeological deposits of minor or unclear significance are identified, the GI investigation may continue to the full intended depth;
 - Where the archaeological deposits are of greater significance, and in the judgement of the archaeologist in attendance, the completion of the investigation would cause an unacceptable impact, the archaeologist may instruct the abandonment of the trial pit, which may if necessary be re-sited and re-excavated subject to the approval of the Engineer's Representative and the Consultant and
 - Where there is any doubt or dispute about the need for this, the archaeologist shall seek advice from the Consultant.
- 1.2.3 A written and photographic record of each trial pit, and where possible each foundation inspection pit shall be made. In addition, a written, drawn and photographic record shall be made of all foundations prior to their removal. Where sample excavation takes place, all excavated contexts shall be fully recorded by a descriptive written context record for each stratigraphic unit, giving details of location, composition, dimensions,

relationships, textual description and interpretation, sketch (if appropriate) and cross-referencing to other parts of the site records such as drawings, photographs, artefactual and other finds, and soil or other samples.

- 1.2.4 Plans and sections of excavated features shall be produced at appropriate scales.
- 1.2.5 All finds shall be retained and removed from the site and cleaned, catalogued and appropriately packaged.
- 1.2.6 Soil samples shall not be collected except as part of any more detailed investigations instructed by the client.
- 1.2.7 If any human remains are encountered, the appropriate procedures shall be adhered to, including notification to the Coroner and obtaining an appropriate license for their removal.

1.3 Site Archive

- 1.3.1 Prior to the start of fieldwork, the Contractor shall determine and liaise with the appropriate museum, in order to:
 - inform them of the intended work, including its nature, location, start date and intended duration;
 - obtain the agreement in principle of the relevant museum to accept the archive for long-term storage and curation;
 - identify any policies of the museum in respect of selection /retention of archive materials;
 - identify any requirements of the museum in respect of the format, presentation and packaging of the archive records and materials; and
 - determine a policy for the selection, retention and disposal of excavated material by consultation with the museum prior to excavation.
- 1.3.2 Adequate resources shall be provided during fieldwork to ensure that all records are checked and internally consistent. Archive consolidation shall be completed immediately after the conclusion of fieldwork, to ensure that the site record has been checked, cross-referenced and indexed as necessary and that all retained finds have been cleaned, conserved, marked and packaged as appropriate. The Contractor shall include the cost of deposition and long-term storage of the archive in their tender price.
- 1.3.3 Immediately after completion of fieldwork, all retained soil samples shall be appropriately processed in accordance with the sampling strategy agreed prior to the start of fieldwork or otherwise agreed during fieldwork, and appropriate records shall be kept.
- 1.3.4 The Site Archive shall be prepared in accordance with the standards set out in Appendix 3 of MAP2.

- 1.3.5 The Site Archive shall contain all the data collected during the investigation, including records and excavated materials. It shall be quantified, ordered, indexed and internally consistent.
- 1.3.6 Archive consolidation shall be undertaken immediately following the conclusion of fieldwork.
- 1.3.7 The site record shall be checked, cross-referenced and indexed as necessary.
- 1.3.8 All retained finds shall be cleaned, conserved, marked and packaged in accordance with the requirements of the recipient museum.
- 1.3.9 All retained finds shall be assessed and recorded using pro-forma recording sheets, by suitably qualified and experienced staff. Initial artefact dating shall be integrated with the site matrix.
- 1.3.10 The archive shall be assembled in accordance with the guidelines set out in English Heritage's Management of Archaeological Projects 2 (MAP2; paragraphs 4.9, 6.8 and 6.10 and Appendix 3). In addition to the site records, artefacts, ecofacts and other sample residues, the archive shall contain:
- site matrices where appropriate;
 - a summary report synthesising the context records;
 - a summary of the artefact record; and
 - a summary of any other records or materials recovered.
- 1.3.11 The integrity of the primary field records shall be preserved and the Contractor shall create security copies in digital, fiche or microfilm format of all primary field records.

1.4 Reporting

- 1.4.1 The Sub-Consultant shall provide verbal or written progress reports and interim plans or other data at any point during the contract, on request from the Consultant.
- 1.4.2 The report shall clearly acknowledge the role of the Employer, and shall show the logo of Jacobs. All reports shall be prepared in line with the principles set out in Appendix 4 of MAP2, and shall include as a minimum:
- a description of the background to and circumstances of the work;
 - a brief description of the previously known archaeology of each site;
 - a description of the methodology used;
 - an objective description of the results of the evaluation ("factual data" in MAP2);
 - an assessment of each category of data ("statement of potential" in MAP2);
 - a brief interpretation of the results of the fieldwork;
 - a statement of the storage and curation requirements for each category of data;

- general and detailed plans at appropriate scales, showing the location of each trial pit accurately positioned on an up-to-date Ordnance Survey base;
- detailed plans and sections of individual features where necessary;
- complete matrix for each trial pit;
- all scales used on any drawings should be standard scales such as would appear on a normal scale ruler;

- 1.4.3 A draft report shall be completed within four weeks of the completion of fieldwork.
- 1.4.4 One copy of a complete draft report, or additional appendix, shall be submitted in the first instance for review/checking by the Consultant who may also consult the Curator during the review period. In finalising the report, the Contractor shall take into account any comments and remedy any faults identified by the Consultant. The Contractor should note that six bound copies, one unbound copy and a digital copy (including drawings) of the final report will be required. The finalised report shall be submitted to the Consultant within five working days of receipt of the Consultant's comments on the draft report.
- 1.4.5 Immediately upon completion of the revised report, the report and any data or other documentation produced during the post-excavation assessment process shall be integrated into the site archive. The Contractor shall store the archive in suitable conditions in a secure location until instructions are received from the Consultant for its deposition in the museum or other transfer.
- 1.4.6 The results of the watching brief may be such as to warrant publication of a summary note in a regional journal.
- 1.4.7 Copies of the final report shall be deposited with Cumbria Historic Environment Record (HER).
- 1.4.8 Cumbria Historic Environment Record (HER) supports the Online Access to Index of Archaeological Investigations (OASIS) Project. The overall aim of the OASIS project is to provide an online index to the mass of archaeological grey literature that has been produced as a result of the advent of large scale developer funded fieldwork.
- 1.4.9 The archaeological contractor will complete the online OASIS form at <http://ads.ahds.ac.uk/project/oasis/>. If the contractors are unfamiliar with OASIS, they are advised to contact Cumbria HER prior to completing the form. Once a report has become a public document by submission to or incorporation into the SMR, Cumbria HER will validate the OASIS form thus placing the information into the public domain on the OASIS website. This shall be undertaken as part of the post-excavation works.

1.5 Additional Requirements

- 1.5.1 The Sub-consultant shall supply should also include the following information:

- Confirmation, with copies of certificates, of the amount of Professional Indemnity Insurance, Contract All Risks Insurance, Public Liability

Insurance, Employers Liability Insurance and Motor Insurance carried;

- Details and an organogram of the staffing and management structure that would be applied to the project, including the number and types of staff to be employed in the field;
- Detailed curricula vitae for the proposed Project Manager, and for the Project Officer(s) or equivalent who would be in charge full-time on site;
- Details of the facilities, policies and arrangements which are in place to ensure storage and curation of the project archive in accordance with published IFA standards;
- An outline risk assessment and Health and Safety plan. This should take into account the "Risk Assessment for German Air Dropped UXO" (BAR Environmental 2007).

1.5.2 The Sub-consultant shall supply brief weekly reports summarizing progress and results to the Consultant. As a minimum, the weekly reports shall include the following:

- a table setting out all staff and other resources used on the project during the relevant period;
- staff time shall be broken down by staff grade/role and task on project;
- a short free text summary of archaeological tasks undertaken and archaeological results.

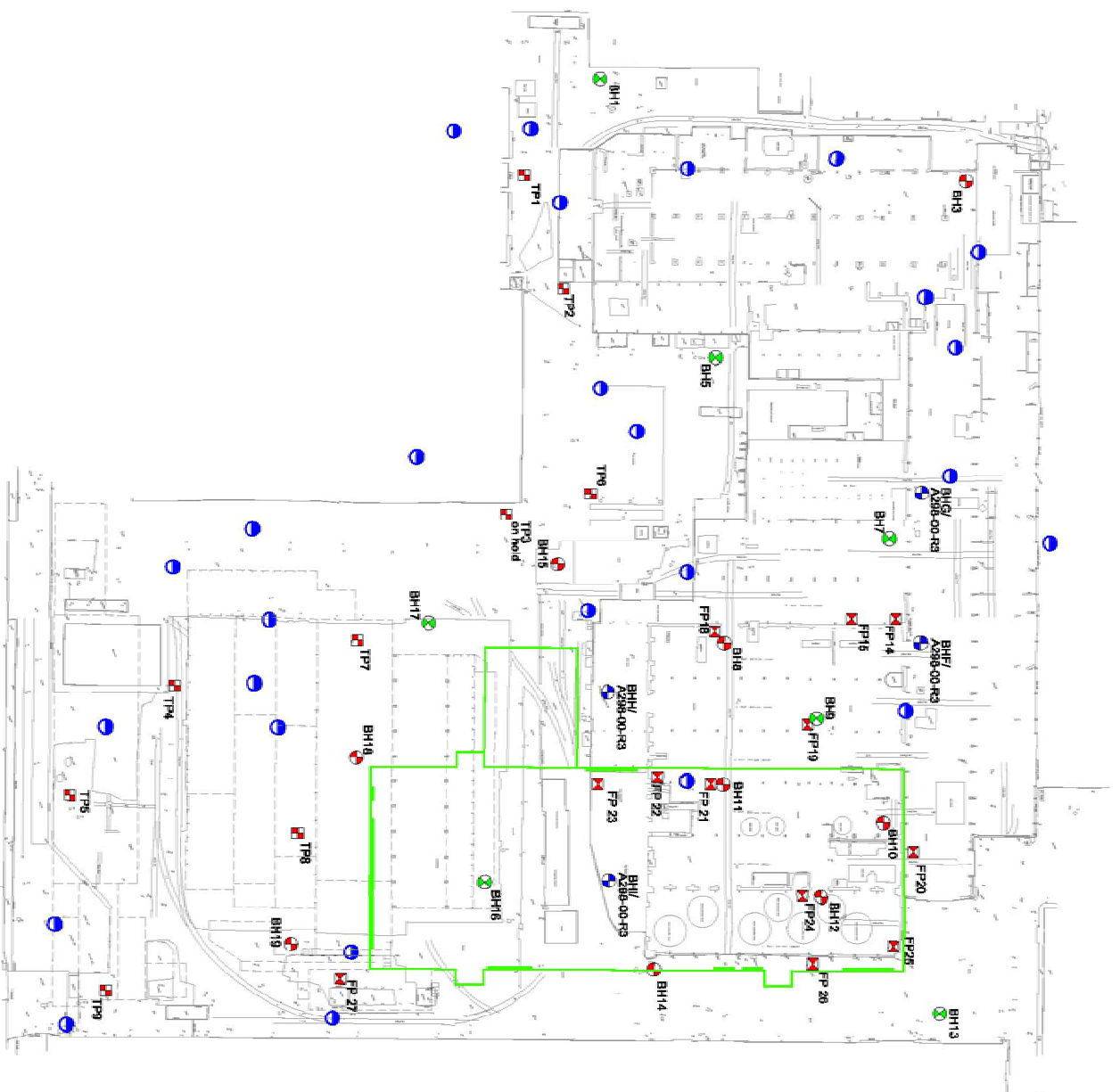
APPENDIX 2: CONTEXT INDEX

Context	Pit No	Depth (m)	Category	Description
101	TP1	0-0.3m	Surface	Concrete
102	TP1	0.3m+	Surface	Concrete
201	TP2	0-0.3m	Surface	Concrete
202	TP2	0.3-0.8m+	Made ground	Demolition debris
301	TP3	0-0.2m	Surface	Concrete
302	TP3	0.2-0.65m	Made ground	Mid-brown gritty clay and mudstone (40%)
303	TP3	0.65m+	Surface	Concrete
400	TP4	0-0.1m	Surface	Gravel
401	TP4	0.1-1.6m	Wall	33m thick. Red brick, frogged
402	TP4	0.1-1.6m	Wall	Red brick, frogged
403	TP4	0.1-1.6m	Wall	Red brick, frogged
404	TP4	0.1-1.6	Made Ground	Demolition debris with high brick content
405	TP4	1.6m+	Surface	Concrete
501	TP5	0.1m	Surface	Gravel
502	TP5	0.1m	Levelling layer	Light grey sandy gravel
503	TP5	0.22m	Made ground	Dark greyish brown sandy clay, 30% inclusions of red brick
504	TP5	0.1m	Levelling layer	Light grey sandy gravel
505	TP5	-	Layer	Concrete
600	TP6	0.1	Layer	Surface
601	TP6	-	Layer	Concrete
700	TP7	0-0.1m	Surface	Gravel
701	TP7	0-0.1m	Surface	Concrete
702	TP7	0.1-0.3.6m+	Made ground	Dark brownish black gritty sand, 80% brick / limestone rubble
703	TP7	0.1-0.5m	Wall	Red brick, very degraded
801	TP8	0.5	Surface	Blackish brown gravel and gritty sand, 20% small sub-rounded stones
802	TP8	0.5-0.8m	Made ground	Very loose mid-reddish-brown sandy clay soil and brick rubble
803	TP8	0.8-2m+	Made ground	Very loose mid-greyish-brown sandy clay soil and brick rubble (80%)
900	TP9	0.4m+	Concrete	Surface
1400	FP14	0-0.1m	Concrete	Floor
1401	FP14	0.1-0.7m	Concrete base	Concrete block 1mx0.7mx0.6m deep supporting cast iron pillar
1402	FP14	0.85m+	Concrete base	Footing for North wall
1403	FP14	1.28m	Flue	Red brick, doubled lined, arched with flat base
1404	FP14	0.25m	Concrete base	Concrete base of flue, 1403
1405	FP14	0.65m	Wall footings	Red brick
1406	FP14		Pipe	Ceramic service pipe and supporting brick work
1407	FP14		Wall	Red brick Wall
1408	FP14	0.1-1.1m	Made ground	Blackish-brown friable soil and ash mixed with deposits of clay and chipping
1409	FP14	1.1-1.9m+	Made ground?	Firm Yellow sand
1500	FP15	0-0.2m	Concrete	Surface
1501	FP15	0.2-0.35m	Brick	Loosely laid brick surface
1502	FP15	0.35-0.6m	Concrete	Surface
1503	FP15	0.95m-1.95m+	Brick and concrete	Footing for steel column
1504	FP15	0.6m+	Made ground?	Compact orange-brown clay

Context	Pit No	Depth (m)	Category	Description
1505	FP15	0.6m-0.95m	Made ground	Blackish-brown firm sandy clay
1800	FP18	0-0.15m	Surface	Concrete
1801	FP18	0.15-0.35m	Levelling layer	Greyish-black friable ash and slag
1802	FP18	0.35-2.2m+	Footing	Concrete with hardcore inclusions
1803	FP18	0.35-2.2m+	Made ground	Reddish-brown firm clay
1900	FP19	0-0.15m	Surface	Concrete
1901	FP19	0.15-0.27m	Backfill	Concrete
1902	FP19	0.15-0.27m	Levelling layer	Compacted crushed red brick
1903	FP19	0.27-1.14m	Footings	Concrete
1904	FP19	1.14-2.8m+	Footings	Large sandstone blocks, approx. 0.6m x 0.4m x 0.3m
1905	FP19	0.27-2.4m+	Made ground	Reddish-brown firm clay
2000	FP20	0-0.15m	Surface	Concrete
2001	FP20	0.15-0.55m	Backfill	Light brown fine sand
2002	FP20	0.55m+	Surface	Concrete
2100	FP21	0-0.17m	Surface	Concrete
2101	FP21	0.17-0.32m	Levelling layer	Compact small limestone chippings
2102	FP21	0.32m+	Surface	Concrete
2103	FP21	0.32-0.65m+	Made ground	Reddish-brown firm clay
2104	FP21	0.17-0.47m	Wall	Red brick, 0.23m wide, truncated
2105	FP21	0.32-1.42m	Cylinder	Concrete crucible
2106	FP21	0.55m	Made Ground	Blackish-brown friable sandy clay mixed with building rubble
2107	FP21	0.32-1.72m	Cut	Cut for 2105
2108	FP21	0.32m+	Base	Concrete
2109	FP21	0.32m+	Base	Red brick, double stretchered
2200	FP22	0-0.1m	Surface	Reinforced concrete
2201	FP22	0.1-1.9m+	Footings	Concrete
2202	FP22	0.1-1.9m+	Made ground	Very loose soil and brick rubble (80%)
2300	FP23	0-0.1m	Surface	Concrete
2301	FP23	0.1-0.52m	Make up layer	Concrete with hardcore inclusions
2302	FP23	0.52-0.92m	Levelling layer	Compacted crushed red brick
2303	FP23	0.92-1.57m	Backfill	Friable mix of soil and ash
2304	FP23	1.57m+	Made ground	Reddish-brown firm clay
2400	FP24	0-0.17m	Surface	Concrete
2401	FP24	0.17-1.2m	Backfill	Light brown fine silty sand
2500	FP25	0-0.2m	Surface	Concrete
2501	FP25	0.2-0.4m	Levelling layer	Greyish-black firm sandy clay
2502	FP25	0.4-0.8m	Wall foundation	Sandstone blocks
2503	FP25	0.8-1.6m	Footing	Concrete
2504	FP25	0.8-1.45m	Backfill	Light orange/brown compact clay
2505	FP25	1.45m+	Made ground?	Dark brown compact clay
2506	FP25	0.4-0.8m	Backfill	Concrete backfilling service trench
2600	FP26	0-0.25m	Surface	Concrete
2601	FP26	0.25-0.45m	Levelling layer	Compact limestone chippings
2602	FP26	0.45m+	Made ground	Compact reddish-brown clay
2603	FP26	0.25m+	Footing	Concrete
2700	FP27	0-0.1m	Surface	Compact gravel
2701	FP27	0.1-0.25m	Levelling layer	compact mix of gravel and hardcore
2702	FP27	0.25-1.65m	Made ground	Friable ash
2703	FP27	1.65m+	Made ground	Brown firm clay
2704	FP27	0.25m+	Foundation	Red brick



Figure 1: Site Location



Key

Test pit

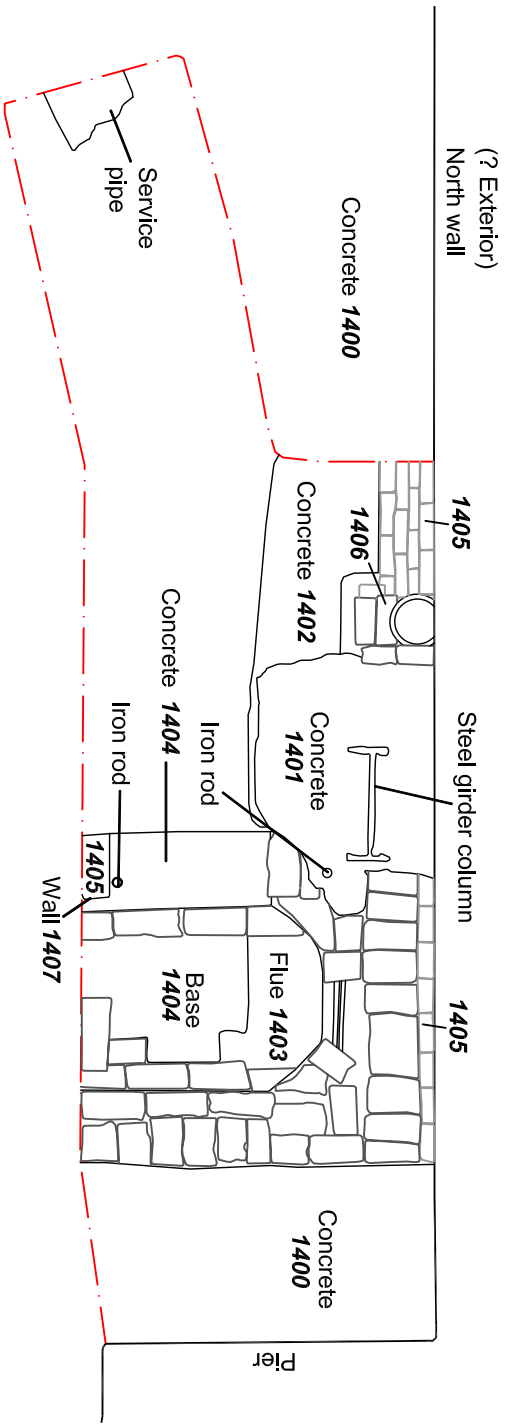
Foundation pit

New building

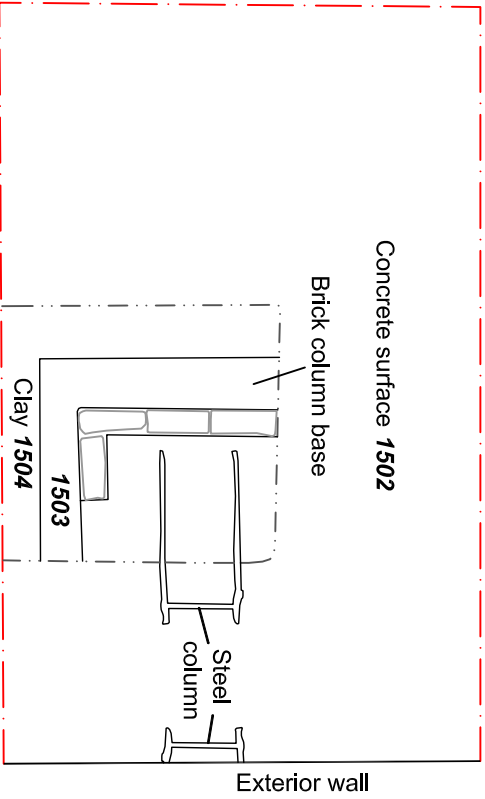
0 50 m

Scale 1:2000 @ A4

Figure 2: Location map, showing test and foundation pits



Plan of Foundation Pit 14



Plan of Foundation Pit 15

Key

Line of excavation	— · — · —
Feature	—
Sondage	- - -
Stone	—

0 0.5 m
Scale 1:30 @ A4

Figure 3: Plans of Foundation Pits 14 and 15

0 0.5 m
Scale 1:30 @ A4

Technical drawing showing a cross-section of a wall construction. The drawing is divided into two main parts by a vertical dashed line labeled "Section".

Left side (Existing concrete surface 2100):

- 2103**: Concrete base, shown as a rectangular block.
- Securing bolts**: Two bolts are shown passing through the concrete base (2103) and the existing concrete surface (2100) into the new concrete base (2108).
- 2102**: Concrete surface, shown as a rectangular block.
- Render**: A layer of render is shown between the concrete surface (2102) and the existing concrete surface (2100).
- 2101**: Existing concrete surface, shown as a rectangular block.
- 2104**: Bride wall, shown as a small rectangular block at the bottom left.

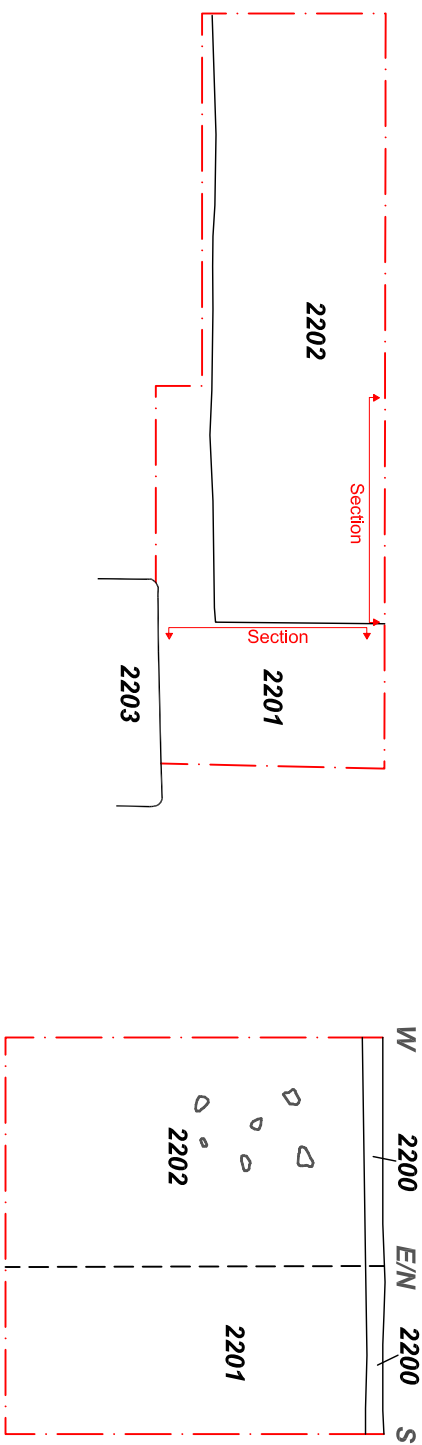
Right side (New concrete base 2108):

- 2108**: New concrete base, shown as a rectangular block.

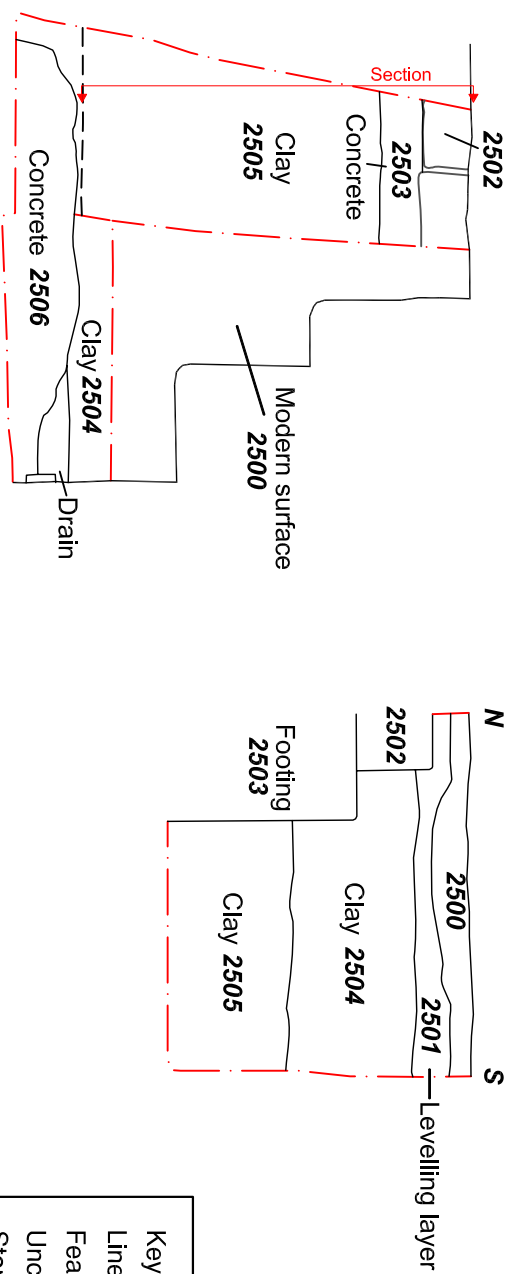
The diagram shows a cross-section of a road or embankment. At the top, there are two horizontal sections labeled 'N' and 'S/E'. Below these, a vertical section is labeled 'W'. The main body of the diagram consists of several layers and structures:

- A top layer labeled 'Service pipes' at both ends.
- A central rectangular structure labeled '2105'.
- To the left of '2105' is a smaller rectangular area labeled '2103'.
- To the right of '2105' is another rectangular area labeled '2103'.
- Below '2105' is a layer labeled '2106'.
- At the bottom, there is a wavy line representing the ground surface, labeled '2101'.
- Various other labels include '2100', '2104', '2107', and '2108'.

0 1 m
Scale 1:40 @ A4



Plan of Foundation Pit 22, with south and west-facing section



Plan of Foundation Pit 25, with west-facing section

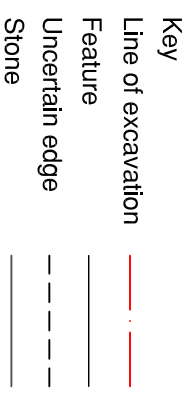
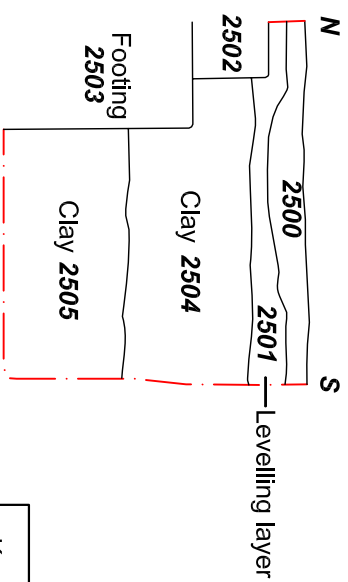


Figure 5: Plans and sections of Foundation Pits 22 and 25

Section

Brown clay 2703

Brick base 2704

Air-raid shelter

Modern surface

Levelling layer 2701

Backfill 2702

2700

2704

W E

W 2700 E

Modern surface

Levelling layer 2701

Backfill 2702

Clay 2703

2704 Brick foundation

Figure 6: Plans and sections of Foundation Pits **26** and **27**



Plate 1: Walls **401** and **402**, west end of TP4



Plate 2: Brick flue, **1402**, at east end of FP14



Plate 3: Footings, *1802*, jutting from west wall, FP18



Plate 4: Sandstone footings, *1905*, east end of FP19



Plate 5: Concrete receptacle, **2105**, in north facing section of FP21



Plate 6: Concrete footings, **2201**, in south and east sections of FP22



Plate 7: Brick foundation, **2704**, at east end of FP27