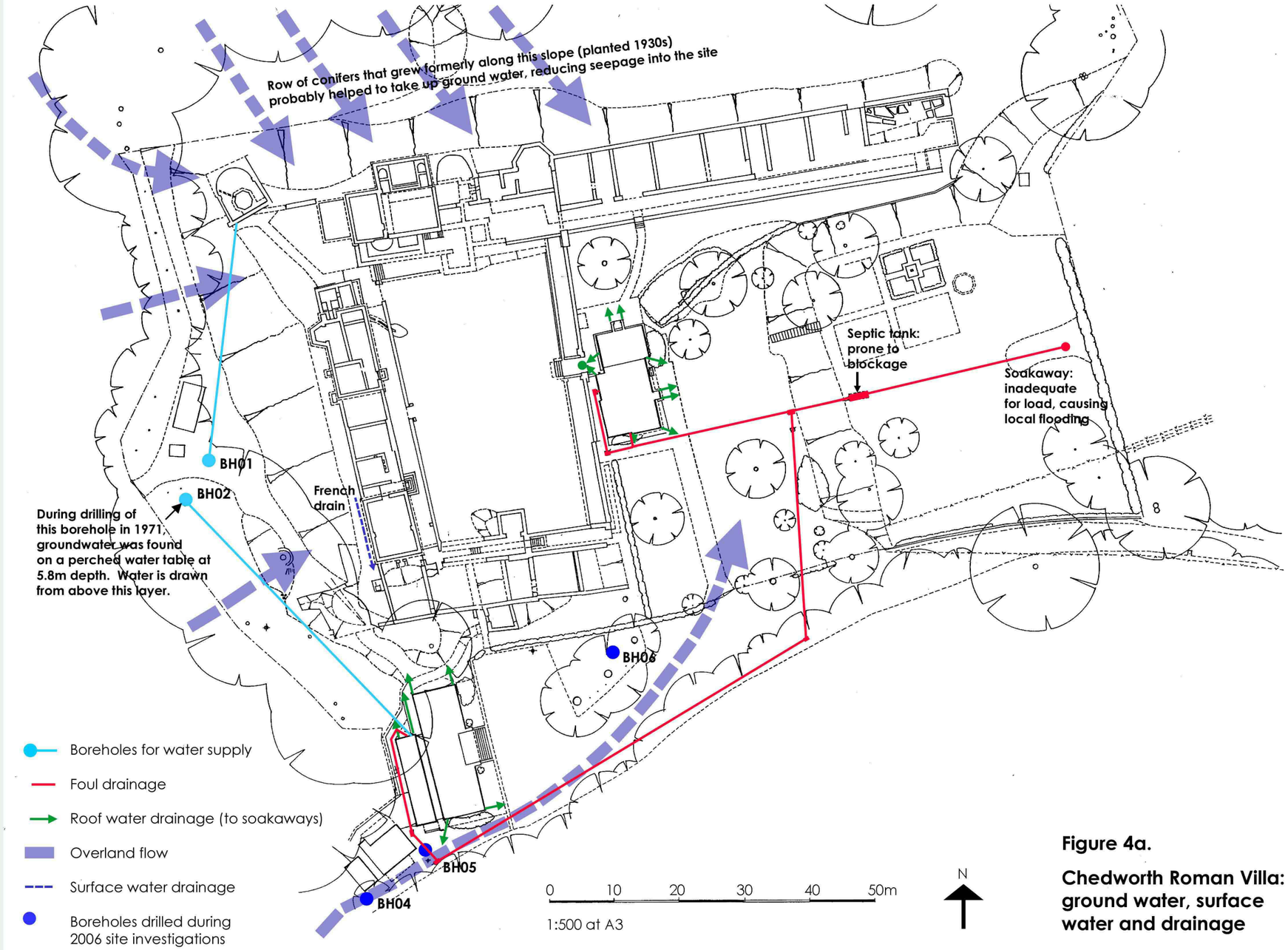

Figure 4a.

Chedworth Roman Villa: ground water, surface water and drainage

Groundwater

Information on the groundwater regime of the Chedworth Roman villa site is sketchy. The following presents a compilation of information drawn from a number of sources.

The Site Investigation Report by Mann Williams Consulting Engineers (March 2006) states that the underlying geology of the site comprises Greater Oolite Limestone above Inferior Oolite Limestone, with Lower Jurassic Whitby Mudstone Formation beneath. The latter is assumed to also underlie the drift deposits of the Coln valley. Within the valley of the Roman Villa, the limestone bedrock is overlain by drift deposits which are likely to be slightly gravely clays and dense clayey gravels with cobbles. The general dip of the strata is southward. Owing to this, the older Inferior Oolite is exposed locally to the site and to the north and west. The younger Greater Oolite is exposed at the surface to the south and east. [2]

The Hydrogeological Survey and Drainage Survey by Hunting Technical Services (Feb 1999) more specifically states that the geology of the area is Middle Jurassic Oolite limestone (which is within the upper strata of the Inferior Oolite), overlain by Fullers Earth blue clay (within the lower strata of the Greater Oolite). The Fullers Earth is impermeable and can cause perched water tables. Surface exposures are usually marked by a spring line, like the one that occurs at the villa site.

In 1971, a borehole was drilled on the bank to the immediate west of the Roman Villa to obtain a water supply for the new reception building. The information gathered from that drilling operation was considered by Hunting Technical Services, in their 1999 report. During drilling of the borehole a groundwater table was logged at 5.8m below the surface (that is, at approximately 154m AOD). On continuation of drilling, it became apparent that this was a perched water table as the water quickly drained away (presumably down the borehole) into the underlying limestone. Further occurrences of groundwater were not logged and at a depth of 30.5m a clay horizon was reported. To provide the property with an adequate water supply, the borehole was plugged at 5.5m so that the perched water table could re-fill and then be tapped. Hunting Technical Services concluded that the same perched water table had historically supplied the spring of the Nymphaeum. [3]

From the information available is not possible to be certain of how far this particular clay layer extends. The boreholes drilled during the 2006 geotechnical survey were all located in the track and car park area to the south of the site offices and villa ruins respectively. BH04 found clay and then clayey gravel to a depth of 1.85m; BH05 was very similar; BH06 encountered topsoil and then made ground (possible around the edges of the Victorian spoil deposit?) to a depth of about 1m and then clayey gravely limestone beneath. These clayey strata would appear to correspond to the clay layer encountered by the 1971 borehole at a level of approximately 154m AOD).

It is tempting to infer that the villa site in general may be located above an impervious clay layer. However, it is equally possible that the upper layers of the underlying strata, including any clay layer, could have been disturbed when the Romans created terraces for the villa.

In their 1999 report, Hunter Technical Services suggest that an existing French drain outside the south-west corner of the villa may have gone someway towards intercepting water held in the adjacent bank which would otherwise reach the villa ruins, but that its length is much too short to serve the overall need.

All these points may offer clues to the cause of the problems of capillarity and frost damage which is occurring in some parts of the ruins. Water appears to seep through the Oolitic limestone but becomes trapped above lenses or layers of impermeable clay. It then emerges as springs and/or rising damp through structures on the site.

Surface water run-off

Surface water run-off patterns during periods of heavy or prolonged rainfall reflect the topography. Water runs off the steeper slopes around the site, accumulating in and being channelled through the smaller natural valleys and gullies. In particular, surface water runs down the track past the portakabin site offices, across the car park area and into the garden area south-east of the custodian's house.

Roof drainage

Both the modern and Victorian roof water drainage systems rely on soakaways. At the reception building, the soakaways are at least three metres from the building. Very few of the soakaways for the Victorian rainwater downpipes could be traced by Hunter Technical Services in 1999. However, it is assumed that they are located directly at the bases of the downpipes. These may be contributing to damp problems in the cellars of the custodian's house. [4]

Foul drainage

In 1999, Hunting Technical Services reported that the foul drainage systems (that is, the pipework) appeared to be well-maintained and that all waste was being removed successfully to the septic tank and soakaway disposal system. However, the septic tank and soakaway are under-sized for the quantities of foul sewage that are reaching them. To address this problem, the septic tank is pumped out on a very regular basis but refills rapidly. The soakaway system is not extensive enough to disperse the grey water outfall and, as result, the immediately surrounding area tends to flood.

1 Mann Williams Consulting Engineers, March 2006. Chedworth Roman Villa Site Investigation Report, section 2.0
2 Hunting Technical Services, Feb 1999. Chedworth Roman Villa: Hydrogeological Survey and Drainage Survey, pp.4-7
3 *Ibid*, p17