Chapter 1

Archaeology and Engineering: High Speed 1

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Introduction

High Speed 1 (HS1) is the first new railway to be built in Britain for over a century and is the UK's first high speed railway. The construction of the railway became an opportunity to investigate the rich heritage of a long-inhabited corridor through Kent from London to the channel coast, and the engineering feats required to construct the rail link are rightly celebrated (Fig. 1.1). We hope, through the publication of this volume, that the scale and importance of the associated archaeological and historic building investigations will be become evident to those with an interest in the heritage of the region.

Readers should realise from the outset that High Speed 1 was built in two sections, and that this volume is concerned only with Section 1, which runs from the Channel Tunnel Portal at Folkestone to Fawkham Junction near Southfleet. This section of the rail link lies entirely within the County of Kent and was known before 2007 as the Channel Tunnel Rail Link (CTRL) Section 1. It excludes the very rich archaeological landscape of the Ebbsfleet Valley in North Kent, which falls within HS1 Section 2 (formerly CTRL Section 2) and is the subject of a separate series of publications (see below). While it would have been desirable to consider the Ebbsfleet Valley within this volume, this was not possible as archaeological fieldwork on the two route sections was completed three years apart. Most of the chapters in this volume were drafted while analysis of the HS1 Section 2 results was still in progress.

The extent of archaeological investigation along the route of High Speed 1 Section 1 defies simple summary. The results of a tremendous effort by hundreds of archaeologists and other heritage and construction professionals over a twenty year period cannot readily be compressed into a single volume. The purpose of this book is to present a synthetic overview and critical analysis of the HS1 Section 1 archaeological results by a group of leading regional and period experts, placing the investigations within the context of current frameworks of archaeological understanding at a regional, national and international scale. This book is the tip of an information iceberg, the bulk of which is presented in digital form as a series of technical reports and supplementary data on the Archaeology Data Service website (ADS 2006, last updated 2009; see below for further details). This volume is in part intended to provide an introduction to the HS1 archive on ADS. A Gazetteer of individual sites along the route, illustrated with route maps, is provided in Appendix 1, and a list of the detailed digital site and specialist reports that are available to download from the ADS website is provided in Appendix 2.

The route

The high-speed line runs for 109km (68 miles) in total, between St Pancras International in London and the Channel Tunnel on the Kent coast near Folkestone, and connects with the international high speed routes between London and Paris, and London and Brussels. HS1 Section 1—the subject of this book—was the first 74km section to be built and lies entirely within Kent, much of it lies alongside the route of the M2 and M20 motorways.

Between the opening of Section 1 in 2003 and the opening of Section 2 in 2006 the railway was temporarily linked into the national rail network at Fawkham Junction near Southfleet, via existing track to the south of Gravesend, the Eurostar trains terminating at London's Waterloo International station during that period. Following the opening of Section 2, the terminal moved to its permanent home at the rejuvenated St Pancras International in London. Intermediate international stations were built at Ashford on Section 1, and Ebbsfleet and Stratford on Section 2.

Ebbsfleet International lies close to the Thames crossing on the Kent side of the river, at the junction between the two route sections. From there Section 1 runs south and east to the A2/M2, running parallel to, and to the south of, Watling Street and the M2 Motorway as far as Nashenden Valley in the North Downs, crossing the River Medway on a spectacular 1.2km viaduct to the south-west of Rochester and Chatham. From Nashenden Valley to Bluebell Hill the railway passes underneath the North Downs Area of Outstanding Natural Beauty via a 3.2km long, 12m diameter, bored tunnel.

Emerging from the escarpment of the North Downs below Bluebell Hill, the rail link runs south and east, broadly parallel with the A229, and merges with the route of the M20 near Boxley. The railway then runs alongside the M20 motorway, parallel and to the south of the North Downs escarpment, reaching the Channel Tunnel portal at Dollands Moor near Folkestone.

Two substantial portions of the Section 1 route were largely excluded from archaeological investigation—The North Downs Tunnel, as there was no possibility of useful archaeological observation during the tunneling, and the Ashford urban area where the route was built along existing lines. Apart from the railway itself, some of the most substantial excavations arose from temporary construction work sites, which were necessarily much wider than the railway itself. For example, the important archaeological sites at White Horse Stone coincided with the North Downs Tunnel Country Portal site, and the 37ha Beechbook Wood site was excavated in connection with a temporary railhead construction site.

Project background

Preliminary assessment and selection of the route

The choice of route was perhaps the biggest environmental challenge for the proposed railway. Preliminary scoping began in 1989 at an outline level, considering six alternative route options. The formal route selection process began in 1991 and it took two years of rigorous planning, government and local consultation and community relations work to present and explain the scheme. The selected route passed through Kent, the Garden of England, and through many environmentally sensitive areas. Added to this was the scale and complexity of the

Figure 1.1 High Speed 1 construction in progress at White Horse Stone. View NW along the Pilgrim's Way towards the River Medway (top of shot)

scheme, which meant that there were many unique challenges from the outset. Work to identify the location and nature of known archaeological and heritage features started in tandem with the route selection process and was one of the many environmental and engineering matters that influenced the eventually selected alignment.

The assessment process

Once the preferred route was announced it was subject to a more detailed process of assessment. The Assessment of Historic and Cultural Effects (1994) undertaken by Oxford Archaeology (OA), ran to four volumes and remains a benchmark for Cultural Heritage assessments to the present. A copy of the assessment report is included in the ADS digital archive (URL 1994).

Non-intrusive site survey work was subsequently carried out to augment the baseline database, resulting in a further three volumes of supplementary assessment data. Surface artefact collection surveys and geophysical surveys were conducted where access was granted by landowners, verifying information from aerial photographs, or revealing new areas of archaeological potential. Site visits were made to build on this information, to comprehensively understand the setting of key sites and structures. In addition, archaeologists monitored the geotechnical investigations and reviewed the borehole logs gathered by the engineers to provide an early insight into the sediment sequences along the route.

The archaeologists and heritage professionals at Oxford Archaeology were very much part of the project's planning and design team in these early stages. In a high-pressure planning environment, in which a wide range of engineering, environmental and economic issues competed with heritage conservation issues for the designers attention, conflicts and compromises were inevitable. Nevertheless the assessment was highly successful in identifying major constraints on the railway design and establishing a reliable baseline dataset of known and suspected heritage features. It is worth noting that of the significant buried archaeological sites eventually discovered and investigated along the Section 1 route, approximately half were first identified or predicted on the basis of the desk-based assessment. The process was arguably 100% successful in identifying historic standing buildings and extant historic landscapes at risk from the railway construction.

Where potential adverse archaeological impacts were identified, discussions with the engineering designers and other specialists, such as landscape architects and noise engineers, considered how these could be avoided or reduced. This process is familiar today, especially for large scale construction schemes, but in the early 1990s, the methods we now take for granted were just emerging. While many potential impacts were avoided through sensitive design, the imperatives of railway engineering—such as the obvious need for an alignment without sharp bends—severely constrained the ability of the design team to avoid direct or indirect impacts to some designated archaeological sites and historic buildings of known importance. For example the scheduled ancient monuments at Thurnham Roman Villa/Corbier Hall, as well as the various listed historic buildings described and discussed in Chapter 7. Other known sites were preserved *in situ*, through minor re-alignments of the route, such as the Tollgate Cropmark Enclosure, the site of a possible Neolithic mortuary enclosure, which is now preserved beneath landscaped earthworks in a narrow strip of ground between the A2 road and HS1 track.

Given the competing design constraints, at any point in the planning process heritage conservation issues were at risk of being side-lined, were it not for the constant pressure applied by the Kent County Council and English Heritage archaeologists, and others representing the local planning authorities on heritage conservation matters. Their essential role as 'curators' and later 'statutory consultees' under the terms of the CTRL Act, was to insist that heritage conservation was given due weight in the route selection and design process, and that the inevitable programme of archaeological mitigation would result in a lasting legacy of valuable research data. Their diligent scrutiny was clearly far-sighted and instrumental in shaping the project towards that outcome.

The Parliamentary process

In 1994 the completed environmental impact assessment culminated in the UK's largest environmental statement, which was submitted to Parliament in support of the hybrid Channel Tunnel Rail Link Bill. Important changes were made to the route as a result of the Parliamentary process, which lasted for two years and included consideration by Select Committees in both Houses of Parliament. Royal Assent through the Channel Tunnel Rail Link Act was granted in 1996. The concession to develop and build the CTRL was subsequently awarded to London and Continental Railways. Enshrined in an Undertaking to Parliament were the Project's environmental responsibilities. The CTRL Environmental Minimum Requirements (EMRs), set out the commitments of the CTRL project, which were detailed in technical standards and processes for managing impacts to ecology, air quality and cultural heritage (the latter a generic term incorporating archaeology, historic buildings and historic landscapes). A crucial concept was that the subsequent design development should have no greater impact on the environment than the baseline design assessed by the Environmental Statement. In terms of the archaeological and heritage work, this meant that the Assessment of Historic and Cultural Effects was the point of reference for all subsequent design work.

The EMRs included the following key documents:

The Code of Construction Practice was a series of objectives and measures to be applied throughout the construction period to maintain satisfactory levels of environmental protection and limit disturbance from construction activities.

The Environmental Management System was a project management process developed to ensure that the environmental risks identified were managed throughout the design and construction processes.

The Planning Memorandum set out the undertakings given by the local authorities with respect to the handling of planning matters.

The Environmental Memorandum set out undertakings in relation to environmental aspects of the design, construction and operation of High Speed 1.

The Heritage Deed was a system designed to manage impacts to 'Listed Buildings & Buildings in Conservation Areas' and 'Ancient Monuments' that would be affected by the construction of the railway. These included procedures very similar to those for obtaining Scheduled Monument and Listed Building consent, but with the key difference that from the outset it was presumed that the development would go ahead. The Heritage Deeds provided strict parameters for responses by statutory authorities, including time limits; if no response was received to a Heritage Deed submission within a twenty day period it was deemed that consent was granted. A special planning regime was created and developed by the railway promoters, providing the basis for the delivery of high environmental standards in compliance with the EMRs. In developing the detailed design and construction of the railway, the project was required to have due regard to the guidance set out in Planning Policy Guidance Notes 15 and 16, which at the time governed planning policy in relation to non-designated archaeological sites and monuments and historic buildings.

Archaeological investigations along the High Speed 1 route

Putting the CTRL Act into practice

The new railway was built under a Public-Private Partnership contract between the Government and London and Continental Railways (LCR). LCR's shareholders are Bechtel, SBG Warburg, National Express, French Railways, London Electricity, Halcrow, Arup and Systra. The Project was funded through a combination of Government-guaranteed bonds, Government grant and commercial project finance and bank finance, with assistance from the European Union.

As Client, Union Railways (South) (URS) oversaw delivery of the Section 1 railway on behalf of LCR, while Union Railways (North) (URN) oversaw construction of Section 2. The design and project management of the new line was the responsibility of Rail Link Engineering (RLE), a consortium of the construction and engineering consultancy firms Bechtel, Arup, Halcrow and Systra. RLE was responsible not only for designing the bridges, tunnels and tracks, but also for managing the procurement of all contracts and then overseeing the construction contractors who built the railway. This unified approach to the design and management ensured that all of the engineering, planning, community and environmental requirements of the project were met.

The depth and scale of HS1's commitment to the environment set new standards for the United Kingdom. A team of specialists was established to manage the environmental challenges, with a wide and varied brief which included archaeology and listed structures, ecology, environmental management systems, landscape design, soils and agriculture, air and water quality, noise and vibration and waste management.

The research strategy

To place the evaluation and mitigation designs within a coherent framework of understanding, and establish priorities and directions for the investigations, Peter Drewett (then Institute of Archaeology, UCL), in association with the RLE team, developed an Archaeological Research Strategy, which was completed in November 1997. While at that time no formal regional research framework existed for south-east England, the HS1 strategy was informed by the previous work of various academics and curators who have attempted to synthesize the archaeology of individual counties crossed by the rail link, and south-east England more broadly (Drewett 1997, in ADS Collection 335). The extent to which the original aims and objectives set out in the research strategy have been addressed is discussed in Chapter 2 of this volume.

The research objectives sought to investigate shifts in landscape organisation through time, by providing a framework of enquiry based on 'landscape zones'. Although not specifically designed as a 'research' sample, High Speed 1 has created a wide transect through the geological landscape zones of Kent, providing an extraordinarily rich insight into the distribution of settlements, tracks and field systems, burial grounds, and all of the other hidden components of an ancient and constantly evolving man-made landscape. The landscape zones used for the project were those defined in the Character Map of England (Countryside Commission and English Nature), and the following are relevant to Section 1:

North Kent Plain

North Downs

Wealden Greensand (with some Low Weald)

For some comparative purposes, where appropriate and useful, these have been sub-divided in post-excavation analysis into a series of more narrowly defined zones, although in all cases these are derived from the research strategy landscape zones.

Each Written Scheme of Investigation was developed against the backdrop of the research strategy; site specific aims and objectives flowed from the high level questions, enabling clear research priorities to be addressed. Copies of the WSIs can be downloaded from the ADS website (ADS Collection 335).

Project management

Formal Project Management has become commonplace in archaeological practice in the UK, particularly on large construction projects. However HS1 was among the first major projects to impose formal project management mechanisms on archaeological contractors. For many archaeologists involved in the project this was their first exposure to Gantt Charts, spreadsheets, health and safety plans and all of the other requirements of construction project management. Careful planning, intensive management and rigorous quality control were required to ensure that the archaeological contracting organisations involved in the Section 1 excavations adhered to the strategy, and that the objectives were followed through consistently during the intensive fieldwork and lengthy post-excavation programmes. The general themes of the research strategy were developed by the RLE team into more detailed project designs for each project area, and for individual sites or groups of sites. Copies of the Research Strategy were incorporated into each of the 'WSIs' and formed part of the contract agreements and specifications that the archaeological contractors signed before starting work on site. The WSIs formed the basis against which each contractors work was assessed by the RLE archaeological team and the statutory consultees. By such mechanisms were the general objectives of the project transmitted to the teams on the ground and enforced through the lifetime of the project.

The need for this unprecedented level of management arose because of the degree to which the archaeological work was integrated into the construction earthworks programme, which in turn was driven by the large scale of controlled soil stripping demanded by the research strategy. Much more was at stake than the archaeological results—a complex unexpected discovery at a critical point could have had a catastrophic effect on the rail link construction programme. Intensive management ensured that adequate resources and flexibility were available to deal with any eventuality. In the event, the systems were sufficiently robust that the project weathered several unexpectedly complex discoveries without causing significant delays.

Evaluation trenching

Although the 1994 assessment work had identified a series of archaeological 'hotspots', only a few sites had been subject to intrusive site investigation at that stage. The Assessment of Historic and Cultural Effects (1994), included a series of preliminary evaluation and mitigation strategies which, following the granting of Royal Assent in 1996, were re-shaped as necessary to take account of design changes and the Environmental Minimum Requirements and were then implemented under the direction of the RLE archaeological team (URL 1994, in ADS Collection 335). Four archaeological contractors were employed to undertake the field investigations due to the short time available for the work—Oxford Archaeology (OA), Museum of London Archaeological Services (MoLAS), the Canterbury Archaeological Trust (CAT) and Wessex Archaeology (WA).

Trial trenching was the main method of evaluation employed in this stage of the project. A total of 122 evaluations were undertaken in total, comprising more than a thousand individual evaluation trenches, distributed relatively evenly along the route corridor, but with some gaps in coverage in areas of no identified archaeological potential, or in which impacts from the railway construction were expected to be very limited (most significantly the tunnel through the North Downs and Ashford urban area). The earliest evaluations on Section 1 were carried out in 1995–6 and were targeted predominantly on the scheduled monuments directly affected by the proposed route, including Thurnham Roman Villa/Corbier Hall, although unscheduled land to the south of Snarkhurst Wood (Hollingbourne) and Tollgate Cropmark Enclosure, were also investigated in this early series, due to the known high archaeological potential of the area.

The vast majority of the trial trenches in HS1 Section 1 were undertaken in 1997–8, although a small number of evaluations took place as late as Spring 1999. Unlike the non-intrusive survey methods, trial trenching could be relied upon to produce hard data on which to base detailed plans for mitigation, under most geological and ground conditions. The trenches provided further information on the date, character and preservation of sites identified through earlier studies and also greatly reduced the risk of unexpected discoveries during construction. This meant that trial trenching was targeted not only at areas of archaeological potential but also at locations where there was to be early construction activity, such as the establishment of work sites.

The methods used on the rail link built on the experience of the Kent County Council archaeological team in managing county road schemes. The stripping of large open areas provided an ideal opportunity to test the validity of standard investigation methods of the late 1980s and 1990s. The higher percentage trenching samples now routinely requested by curators in SE England, and the increasing preference for large scale strip, map and sample excavations in place of extensive trial trenching, directly reflects the experience gleaned from HS1 and other contemporary major developments in SE England. Four HS1 Section 1 sites (Northumberland Bottom, Thurnham Villa, Tutt Hill and White Horse Stone) were among 12 sites used as the basis for an influential study undertaken for the 'Planarch' project (part of the European Union funded Interreg programme) which modelled the effectiveness of different archaeological evaluation techniques (Hey and Lacey 2000)

Methods of investigation

The overarching research strategy was necessarily framed in very broad terms, but nevertheless established some important principles. One critical outcome of this approach was an emphasis on stripping and recording

the largest possible continuous areas under archaeological supervision, not just to examine obvious individually defined archaeological sites, but also to examine the spaces and links in between them.

The intensive planning for the archaeological work was of great value in ensuring that adequate resources were available to deal with any eventuality, but in the end it was rarely possible to accurately predict the extent and significance of archaeology in a given area until the topsoil had been extensively stripped. However, the planning and methods were sufficiently flexible and robust to deal with the unexpected.

Apart from the evaluation trenching, described above, four defined levels of intrusive field investigation were adopted (detailed excavation; strip, map and sample; targeted watching brief; general watching brief). In practice the dividing lines between these methods became blurred because all of them allowed for a flexible response in the event that the archaeology discovered was more extensive or significant than expected. However, the levels of investigation and recording were generally at their highest in areas of 'detailed excavation' and at their lowest under 'general watching brief' (see Gazetteer mapping, Appendix 1).

Detailed excavation was reserved for sites identified by the 1994 assessment and subsequent evaluations as having very high archaeological potential. The soil stripping was carried out by the appointed archaeological contractors, well ahead of the main construction earthworks, and generous allocations of time and resources were allowed for the investigations. All of the detailed excavations were completed in the period 1998–9. One example is the scheduled area of Thurnham Roman Villa. The non-scheduled parts of the villa site were subject to 'strip, map and sample' (see below), but the boundary of the detailed excavation area was modified during the investigation to include an aisled building discovered unexpectedly outside the scheduled area.

Strip, map and sample (SMS) was the most common type of formal archaeological excavation, and was generally applied to areas considered to have limited or uncertain archaeological potential. As with the detailed excavation areas, the soil stripping was carried out by the archaeological contractor, ahead of the main construction earthworks. However the initial scope of investigation was limited to mapping the archaeological features and carrying out just sufficient sample hand excavation to establish the date and significance of the archaeology. If the archaeology was more extensive or more significant than expected, further work could be agreed to expand the stripped area, or undertake more detailed investigation within the existing area.

Targeted watching brief was intended to allow formal archaeological investigation to take place alongside the construction works, with the earthmoving machinery and other support being provided by the construction contractor. In the planning stages of the project there was considerable concern to complete formal archaeological investigations as far as possible before the construction contractors started work. However, in some areas access was not possible until the contractor had completed their preliminary work. Crucially, under this method the mechanical excavators were fitted with a toothless ditching bucket in compliance with archaeological methods, ensuring a high level of feature visibility. This method was consequently generally comparable with SMS in terms of method and results. Some specific targeted watching briefs, such as a large section cut through the Pilgrim's Way trackway at White Horse Stone, was an extension of the detailed excavation previously carried out at that site, which had to wait until electrical cable and footpath diversions had been completed. In the case of Northumberland Bottom, Beechbrook Wood and North of Westenhanger Castle, initially quite small SMS areas were greatly expanded by means of targeted watching briefs on the construction earthworks, which allowed the mapping and investigation of extensive but sparsely distributed archaeological features over a much wider area (in the most extreme case, the excavated area at Beechbrook Wood amounted to 37ha).

General watching brief was the most extensive form of investigation, and the most difficult to assess in terms of its value and reliability. The very intensive nature of the watching brief, in which almost every machine working on deposits with archaeological potential was monitored by an archaeologist, means that an unusual level of confidence can be placed on the negative evidence from HS1. However, under the 'general watching brief' specification the archaeologists had no remit to modify the soil stripping method adopted by the earthmoving contractor unless significant archaeology was encountered, so the level of archaeological visibility was highly variable. It was rarely possible to obtain a coherent site plan under these circumstances. Methods varied between the main project areas (330, 410, 420, 430, 440), each of which was under control of a different contractor with different working methods. There was also a great deal of variation at a detailed level depending on the type of earthworks being undertaken. The watching brief archive includes annotated route maps showing a complex patchwork of different earthmoving methods and levels of visibility.

Preservation *in situ*

In considering design and methodological options, the first option considered in any given sitiuation was 'preservation *in situ*'. Preservation in some cases involved active intervention by the RLE archaeological team to obtain design changes and modifications to avoid construction impacts to known or suspected archaeological sites. Preservation *in situ* was the default mitigation measure for certain types of earthworks, such as temporary spoil storage areas, some landscaping earthworks and temporary works compounds. In these cases topsoil stripping was usually not carried out to a

sufficient depth to expose archaeological features, and any archaeological deposits present were effectively preserved *in situ* beneath the earthworks, without record.

Case studies

It is not possible in this volume to describe the entire evolution of the project from the drawing board to the ground. The complex discussions between engineers, planners, curators, statutory bodies and construction and heritage specialists which shaped the archaeological results at each of the sites could fill at least another volume. That information is contained in the archaeological and RLE project archives. Relevant information on individual sites is most readily available in digital form in the ADS archive, which contains the 1994 assessment report, written schemes of investigation and fieldwork and post-excavation reports (ADS Collection 335). The following selected 'case studies' serve to illustrate the different circumstances under which excavations took place and the constraints and decisions that shaped some of the most important investigations.

Case study 1: Pepper Hill Roman cemetery

Excavation of the Roman cemetery at Pepper Hill was undertaken following the unexpected discovery of Roman burials during a watching brief on cable diversion works for SEEBoard, enabling works for the construction of HS1. The 1994 Assessment Report and the WSI for Project Area 330 had both included a general prediction that Roman cemeteries were likely to be found in the vicinity of Springhead, particularly at roadside locations. However, the course of the Roman trackway on which the cemetery was discovered was previously unknown, so in effect there was no specific indication that the site was present before the cable diversions took place. The cemetery was discovered at an early stage of the construction programme, in an area that had not yet been yet been subject to evaluation trenching. The watching brief on the cable diversion trench effectively served the purpose of a giant evaluation trench in this case. The 10m cable easement lay immediately alongside the rail link route and was excavated under close archaeological supervision using a toothless ditching bucket. Once the significance of the site was realised, a WSI was prepared by Rail Link Engineering (RLE), and agreed in consultation with English Heritage and Kent County Council (KCC) on behalf of the Local Planning Authorities (URL 1998, in ADS Collection 335), which designated the site as a 'detailed excavation'.

The first stage of work began in November 1997 (ARC PHL97). After several weeks, it became apparent that it would be impossible to complete the excavation of the, by now obvious, cemetery within the easement width before the cable trench was due to be excavated. Following meetings with SEEBoard, KCC and RLE it was agreed that work would concentrate on clearing a 9m wide strip across the cemetery, and that work should continue in a less critical adjacent area. SEEBoard conceded that the area to the north of the cable trench was no longer required as part of the cable diversion work. However, it became clear that the area would be affected in due course by construction work for the HS1 and that complete excavation of the remainder of the cemetery would be necessary. Oxford Archaeology carried out this second stage of work between August 1998 and January 1999 (ARC NBR98). The total excavated area was *c* 0.99ha in extent although the cemetery and associated features fell within an area of only *c* 0.2ha. The cemetery was designated a 'detailed excavation', while the remaining areas of the HS1 route on either side were subject to 'strip, map and sample'. After several months of painstaking intensive work by a team of up to 30 excavators, almost the entire plan of the cemetery was revealed—a total of 558 graves and other funerary-related features. The excavation was undertaken in a period of prolonged wet weather, which required the use of 'polytunnels' to shelter the site and excavators. Other logistical issues included raids by illegal metal-detectorists, which caused significant damage to the site, requiring the employment of 24 hour security guards (Biddulph 2006, in ADS Collection 335).

Case study 2: White Horse Stone

The rail link route as planned emerged from a tunnel under the North Downs at Bluebell Hill, unfortunately coinciding with the eastern group of the Medway Megaliths, close to the Upper White Horse Stone, and cutting through the Pilgrim's Way trackway. The significance of the location was clearly identified and stated in the 1994 assessment. There was sufficient flexibility in the railway design to avoid directly affecting the known and suspected prehistoric funerary monuments, including Kit's Coty House and Little Kit's Coty, but it was clear from the outset that the railway would to some extent affect the setting of the monuments and any associated buried archaeology within the railway route. The reported location of the possible chambered tomb known as Smythe's Megalith, also lay immediately adjacent to the route, in the dry valley bottom.

The site comprised a dry valley at the foot of the North Downs Escarpment, including a chalk ridge area with very shallow soil cover, and the valley bottom, which was known from geotechnical investigations to be in-filled with colluvial deposits. Fieldwalking was employed, but it was realised that the sparse scatter of prehistoric artefacts found in topsoil was unlikely to be a true reflection of buried archaeological features because of the extent of the colluvium. Geophysical survey was not used in this case as it was considered unsuitable given the thick collluvial sequence in the dry valley and the difficulty in detecting potentially very ephemeral archaeological remains. A series of trial trenches was excavated in 1997 throughout the tunnel portal footprint, initially extending from the chalk escarpment as far south as the Pilgrim's Way trackway (a second phase of trenching was later carried out to the south of the Pilgrim's Way).

The trenching identified evidence for Early Iron Age activity on the chalk ridge, including a burial, pits,

postholes and ditches, although from the trenching they appeared sparsely distributed. It also allowed the depth and extent of the colluvial sequence in the dry valley to be modeled, and identified an extensive series of 'buried soils' and a natural sarsen field extending along the bottom of dry valley. However, it failed to identify any conclusive evidence for significant Neolithic activity—probably because very few trenches were excavated to the Neolithic horizon. A single possible Neolithic potsherd was found during the evaluation.

It was nevertheless clear that the site had both archaeological and palaeoenvironmental potential. A WSI was prepared by RLE for a 'detailed excavation' (URS 1998, in ADS Collection 135), which was initially restricted to the width of the railway itself, but once extensive archaeological features began to emerge was quickly expanded to include the full extent of the proposed railway cutting (see Fig. 1.1). Any archaeology in areas of construction fill, which was mainly to the north-east of the railway, were to be preserved *in situ*.

The mechanical excavation in the dry valley bottom was a substantial undertaking due to the thick colluvial deposits, and the fact that archaeological features were known from the evaluation to be cut from different levels within the colluvium. In the end the soil stripping took place in three main stages to allow features to be mapped and investigated at each level. The lowest level encountered the Neolithic longhouse, which was found beneath an extensive later prehistoric 'buried soil'. Although the significance of the structure was clear at this stage, it was not until a small number of pottery sherds recovered from one of the postholes were examined by a specialist that the full significance of the find became apparent. The investigation methodology was altered to include full excavation and sieving of all of the feature fills associated with this structure.

Figure 1.2 Thurnham Villa aerial view of excavations in progress. Roman buildings covered with marquees and polytunnels

An extensive geoarchaeological investigation was undertaken, mainly focused on evidence from molluscs and soil micromorphology.

Case study 3: Thurnham Roman villa

The site of Thurnham Roman villa was well known, and clearly identified as a major design constraint in the 1994 assessment, mainly as a result of previous investigations in 1933 and during construction of the M20 in 1958 (URS 1994, in ADS Collection 335) (Fig. 1.2). However, as the selected rail link route was constrained to a narrow corridor alongside the M20 in this section, there was no possibility of avoiding direct impact to the scheduled monument. The plan of some of the main masonry buildings was clearly visible as a cropmark on aerial photographs. A full range of evaluation techniques (fieldwalking, geophysical survey and evaluation trenching) was carried out to assess the preservation of the known archaeology and the extent of unknown features within the scheduled area and along the route on either side.

The CTRL Act 1996 negated the requirement to obtain Scheduled Monument Consent in order to carry out excavation of the villa; however, the nominated undertaker (URS) was required to obtain agreement under the Heritage Deed from the Secretary of State, as advised by English Heritage, for mitigation works in relation to the monument. The agreement set out the detailed mitigation required (replacing the WSI). The Thurnham Roman villa excavation investigated an area of land 470m long and 35–80m wide adjacent to the eastbound carriage of the M20 between Thurnham Lane and Honeyhills Wood. This 3.2ha area was excavated between November 1998 and June 1999.

During this time targeted excavations were carried out to investigate extant earthworks within the adjacent portion of Honeyhills Wood, and identify any remains that might have been associated with the villa. No conclusive dating evidence was forthcoming, but one of the earthworks coincided with the parish boundary between Thurnham and Detling.

The watching brief area was completed between June and December 1999 and during this period a sequence of small settlement enclosures of Late Iron Age–Early Roman date was encountered and excavated at Hockers Lane, immediately south of Detling village. The northern part of the site was preserved *in situ* under landscaping earthworks (Lawrence 2006, in ADS Collection 335). A decision was made to incorporate the Hockers Lane site into the Thurnham Villa 'principal site' in post-excavation, in order to facilitate direct comparison of the villa with this adjacent minor rural settlement of similar date.

Case study 4: Beechbrook Wood

The development of the Railhead site at Beechbrook Wood illustrates the flexible approach to design development very well. The total land-take for the Railhead was 37ha. The site had been subject to evaluation trenching in 1999, but the dispersed character of the archaeology and limited scope of the trenching meant that the extent and significance of the remains was initially not realised. Trial areas of gradiometer survey were undertaken, but as expected the soil conditions were not sufficiently responsive to give reliable results. The original 'strip, map and sample' excavation area, completed in 2000, proved far too small a window to interpret the archaeology found within it. It was clear that significant archaeology extended beyond the excavated area in all directions. A much larger 'targeted watching brief' area was therefore proposed by the RLE archaeological team, in which soil stripping would be carried out by the construction contractor, as part of the main earthworks, but under archaeological control. Excavations work at Beechbrook Wood eventually took nine months, spread over a three year period, in the later stages closely integrated with the construction of the railhead. The original targeted watching brief area served as a guide for planning purposes, but was modified as needed to include areas of significant archaeology as they emerged. Once the edge of significant archaeological features was encountered in a given area, the method reverted to a general watching brief (ie under archaeological observation but with no control over the excavation method or level unless significant archaeology was found). It proved possible to investigate one area at a time and release areas in stages to the contractor. Carried out under strictly controlled conditions this approach eventually resulted in the successful investigation of one of the largest continuous stripped area along the rail link route.

Case study 5: Saltwood Tunnel funerary landscape

The environmental assessment noted that in 1979, salvage recording during construction of the M20 motorway indicated that archaeological remains survived near the Saltwood Tunnel (URL 1994, in ADS Collection 335). Oxford Archaeology undertook fieldwalking and evaluation trenching immediately south of these remains (URS 1997, in ADS Collection 335), which revealed significant archaeological remains, although the full extent and significance did not become clear until the main excavations got under way.

Construction of the rail link in this section required excavation of two deep, approximately parallel railway cuttings north of Saltwood village, immediately south of the M20 motorway, and directly above the London to Folkestone railway as it passes through the Saltwood Tunnel between Sandling and Dolland's Moor (Appendix 1, Gazetteer Mapping).

Detailed excavation was initially carried out by the Canterbury Archaeological Trust (CAT) under the RLE site code ARC SLT98. A second phase of evaluation trenching revealed early Anglo-Saxon inhumation burials immediately west of the Stone Farm bridleway, and an area around these was also fully excavated (ARC SLT98C). In 1999 Wessex Archaeology (WA) was commissioned to commence a rolling 'strip-map-sample' excavation programme on land east of the bridleway (ARC SFB99), whilst CAT concurrently excavated the remaining ground between their previous sites, and beneath the western portion of the 19th century earth

Figure 1.3 Saltwood tunnel: archaeology and construction work progressing in parallel

bund overlying the Saltwood Tunnel (ARC SLT99). In the final phase of fieldwork WA recorded remains preserved in three separate areas: under the eastern tunnel-bund, within the footprint of a temporary soil storage area, and beneath the former Stone Farm bridleway (ARC SFB01). Overall the work took place between 1997 and 2001 (Riddler and Trevarthen 2006, in ADS Collection 335).

The site was excavated over an extended timescale, in variable conditions, and within the context of a complex civil engineering project to remove the 19th century spoil heaps from above the Saltwood Tunnel and build HS1 (Fig. 1.3). Difficulties inherent in identifying and interpreting archaeological remains on the loose natural sandy substrate of the Saltwood plateau were compounded by the piecemeal manner in which the site was acquired for excavation. Other challenges included the poor preservation conditions—formerly acidic soil conditions had stripped the site of most human and animal bone, removing much of the critical evidence from which its changing economic basis might be reconstructed, and denying the opportunity to carry out detailed osteoarchaeological analysis. Nevertheless the large scale of the excavations allowed the archaeological development of the Saltwood plateau to be charted in considerable detail, revealing a complex multi-period landscape, predominantly funerary in character, including extensive prehistoric, Roman and especially Anglo-Saxon cemeteries. As a result of the large areas stripped we have the most compelling example from the HS1 route for continuity in the basic framework of the man-made landscape, especially trackways, from the Bronze Age to the present (Riddler and Trevarthen 2006, in ADS Collection 335).

Post-excavation and publication

Post-excavation work for Section 1 fell into three main phases. A preliminary phase of data processing and reporting resulted in the completion of a series of summary interim reports for each of the excavated sites, and the publication of an overarching report in *Archaeologia Cantiana* (Glass 1999) summarising the results from the originally planned excavations. The report did not describe the results from the watching brief, which was still in progress at the time. The Phase 1 digital archive, including the evaluation reports and interim excavation reports, was uploaded to the ADS website in 2004.

The second phase was the MAP2 assessment reports, which were completed between 2000 and 2003 by the four archaeological contractors in accordance with a specification prepared by RLE (URS 2000, in ADS Collection 335). The assessments comprised specialist reports on the stratigraphic data, finds and environmental assemblages, and recommendations for further analytical work. The production of a post-excavation project design was delayed until all of the fieldwork and specialist assessment relating to HS1 Section 1 was

complete, and was jointly produced by RLE, in association with Peter Drewett and Sue Hamilton of UCL, and the Oxford Wessex Archaeology Joint Venture (OWAJV) in 2003 (URS 2003, in ADS Collection 335).

The third main phase of post-excavation was the final analysis and reporting of the 29 Principal Sites (see below), which were to be disseminated digitally on the ADS website. In addition, the present volume was envisaged in the project design as the only printed output within the dissemination scheme (see below). However, it was managed somewhat separately from the digital report series. Initially it was hoped that the monograph production would to some extent run in parallel with the analysis and digital reporting, but that proved impractical. Only when all of the technical reports were assembled and finalised was it possible for the chapter authors to begin their work of synthesis.

The historic buildings fell outside the post-excavation analysis framework, and in their case there was no requirement for further specialist analysis. Detailed archive reports were produced for each building investigation, which directly formed the basis for Chapter 7 of this volume. The archive reports are available on the ADS website (Historic building investigations; ADS Collection 335).

In addition to the reports and publications outlined above, an illustrated popular booklet and DVD, *Tracks and Traces: The Archaeology of High Speed 1*, was also produced in 2011, summarising the results of the excavations and building investigations in both route sections (HS1 2011). This volume superseded an earlier booklet which was published for distribution at the launch of Section 1 (*Tracks and Traces: The Archaeology of the Channel Tunnel Rail Link*).

Structure of post-excavation analysis and reporting

Principal Sites reports

The HS1 Section 1 route was divided, for post-excavation analysis and reporting purposes, into 29 Principal Sites (excluding the standing building investigations; see above). The Principal Sites are route sections, named after the most significant individual site contained within them (Fig. 1.4 and Appendix 2). These were defined in the post-excavation project design to reflect the realities of the archaeology as discovered, although due regard to the geological landscape zones defined in the original research strategy has been retained throughout the project (see Chapter 2). The purpose of this approach was to encourage team members to adopt a broad landscape view, taking into consideration the results from all fieldwork events within the defined geographical section, rather than focusing exclusively on the most significant individual sites.

The most significant fieldwork evidence and results of analysis are presented in the form of integrated, illustrated site narratives—'integrated site reports' (ISR). Of the 29 Principal Sites, only 20 are the subject of integrated site reports (see Table 1.1).

These reports are interpretative summaries of the site sequence, incorporating key supporting evidence and the summary results and interpretation of specialist analyses. The reports were for the most part produced by the organisations responsible for their excavation (OA, WA, MoLA and CAT), working to a single post-excavation project design overseen by the archaeological team at RLE and managed by the OWAJV. Five experienced specialists from within the OWAJV were appointed as period team leaders to provide guidance to the report authors and act as editors for the 'integrated site reports'. The period team divisions mirrored the intended structure of the main monograph chapters: Early prehistory, Later prehistory, Late Iron Age/Roman, Anglo-Saxon/Early medieval, Later medieval and Post-medieval (the latter including historic buildings). This arrangement was intended to achieve a balanced input from fieldwork directors most familiar with the sites, and period experts most familiar with the artefactual material and regional

Table 1.1 Principal Sites which were subject to post-excavation analysis, and for which 'integrated site reports' were completed

Principal Site name	*Post-excavation code*	*Main excavating organisation*
Pepper Hill Roman Cemetery	PHL	OA
Whitehill Road Barrow	WHR	MoLAS
Northumberland Bottom	WNB	MoLAS
Tollgate	TLG	MoLAS
Cobham Golf Course	CGC	MoLAS
Cuxton	CXT	MoLAS
White Horse Stone	WHS	OA
Thurnham Roman Villa	THM	OA
South of Snarkhurst Wood	SNK	OA
South-east of Eyhorne Street	EYH	OA
Sandway Road	SWR	WA
Leda Cottages	LED	OA
Tutt Hill	TUT	OA
Parsonage Farm	PFM	MoLAS
Beechbrook Wood	BWD	OA
Mersham	MSH	CAT
Bower Road	BOW	OA
Little Stock Farm	LSF	WA
North of Westenhanger Castle	WGR	CAT
Saltwood Tunnel	SLT	CAT/ WA

Table 1.2 Principal Sites of limited significance for which the post-excavation assessment is the final report

Principal Site name	*Post-excavation code*	*Main excavating organisation*
Nashenden Valley	NSH	OA
West of Sittingbourne Road	WEA	OA
Chapel Mill	CML	OA
A20 Diversion Holm Hill	HOL	WA
Hurst Wood	HWD	OA
Lodge Wood	LWD	OA
Boys Hall Balancing Pond	BHB	OA
West of Blind Lane	BLN	OA
East of Station Road / Church Lane	STR / CHL	OA

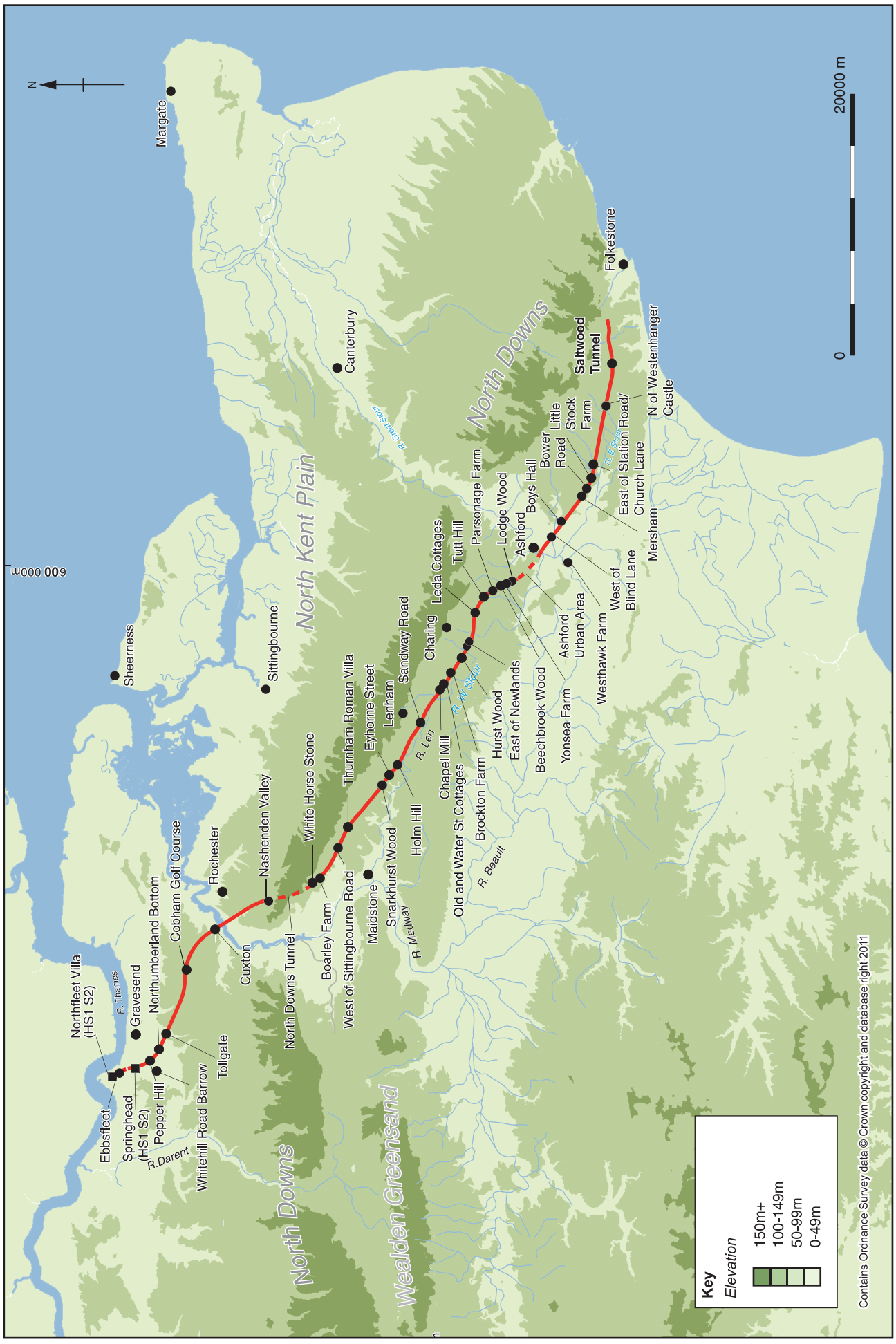

Figure 1.4 The route of High Speed 1 showing principal sites and historic buildings (of all periods) investigated along the route, in relation to elevation and drainage

research context. The level of descriptive detail provided is commensurate with the significance of the evidence and its ability to address the questions posed in the CTRL Research Strategy. The reports are cross-referenced to 'scheme-wide specialist reports' (which report in detail on the results of specialist studies) and the site databases (which contain feature descriptions and document phasing decisions).

MAP2 assessment reports were produced for all of the significant archaeological sites (ADS Collection 335; see above). In the case of the 20 sites selected for further analysis these have been superceded by 'integrated site reports'. The remaining eight principal sites lacked a major archaeological focus and therefore produced insufficient evidence to justify detailed analysis and reporting (Table 1.2).

Specialist analysis and reports

Specialist analyses were commissioned centrally by the OWAJV and a common approach to reporting was achieved through detailed specifications and task lists, and a period- and specialism-based team structure. Artefact and environmental specialists were grouped into teams with responsibility for the following main categories:

Ceramics (pottery and ceramic building material),
Small finds (including metallurgy and metal-working residues),
Worked flint,
Dating (mainly C14 with a small number of OSL dates),
Human remains,
Palaeoenvironmental studies (including animal bone).

For the larger assemblages, in particular the pottery, it was necessary to employ teams of specialists to meet the project deadlines, in which case team leaders were appointed to co-ordinate each element of the study, including writing the specification, editing the individual assemblage reports and writing a schemewide overview report. A series of five 'schemewide specialist reports' summarise and analyse the results from more than 200 site-specific 'specialist research reports'. A schemewide overview was not produced for the small finds category as the diverse nature of the assemblages and the concentration of most of the finds on a small number of major cemetery sites, made any overview of doubtful value. In this case the comprehensive site-specific specialist reports are left to speak for themselves.

HS1 Section 1 monograph

The purpose of this present volume is to introduce the project, to provide detailed expert reviews of the evidence and to outline the contribution of the project to the archaeology of south-east England, in particular Kent. The volume also serves as a guide and introduction to the digital archive (see Appendix 2), and contains a comprehensive gazetteer and mapping of archaeological investigations along the route (Section 1 only; see Appendix 1).

With the exception of Paul Booth and Julian Munby the main chapter authors were not personally involved in the field investigations, apart from site visits, but have been asked to contribute chapters because of their very extensive period-specific knowledge and expertise on the archaeology of South-East England. This approach represents a departure from normal practice and a model for future collaboration between commercial archaeological companies working on developer-funded projects, and university-based specialists.

No attempt has been made to reach a consensus between the opinions and interpretations of the authors of this volume and the underlying body of digital reports. The latter reflect, in the vast majority of cases, the interpretations of the organisations which excavated the sites, modified by detailed editorial input from period and specialist team leaders of the OWAJV. The points of difference with the authors of the present volume, where they occur, help to illustrate the range of different interpretations that are possible from the same dataset, and serve to highlight the different approaches, perspectives and interests of academic researchers as opposed to field archaeologists from a developer-funded background. Joint ventures between university-based and development-based archaeologists are still comparatively rare—the HS1 project has provided the opportunity for a most valuable and enlightening collaboration, the results of which speak for themselves in the following chapters. It is to be hoped that the project will contribute to a new age of close engagement between these currently quite distinct sectors of the archaeological profession.

Archives

The line between 'publication' and 'archive' for HS1 Section 1 is necessarily blurred. This volume lies at the top of the report hierarchy. At the next level down are the digital 'integrated site reports' and 'scheme wide specialist reports', which have been subject to a high level of specialist editorial scrutiny and peer review comparable with academic publication. The individual specialist reports and datasets have been reviewed and edited by relevant specialist team leaders, and most have also been reviewed by the period team leaders.

Other reports within the digital archive, such as project designs, evaluation reports, interim reports and post-excavation assessments, have been subject to the 'Quality Assurance' procedures of the archaeological companies involved, and the commissioning archaeologists at RLE, but have not been subject to the same level of specialist scrutiny as the reports above, so may be considered 'grey literature'. None of the digital reports have ISBN numbers, but they can be referred to in publications using the 'Digital Object Identifier' for the CTRL collection on the ADS website (ADS Collection 335; doi:10.5284/1000230).

Paper, photographic and finds archive

The HS1 Section 1 archive on ADS does not attempt to present the entire record in digital form—the primary record for this project remains the hard copy archive. Consequently researchers may find that some archive elements that would now be expected in digital form are only available in the hard copy archive. In particular, fieldwork specifications in the late 1990s did not require or encourage the use of digital photography. The hard copy archive includes extensive photographic records as 35mm colour slides and black and white film.