

High on London: aerial archaeology and the ‘Lost Gardens’ of Seething Wells

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The aim of this paper is to highlight the potential of a well-established archaeological method – aerial survey – for the exploration of towns and cities. Aerial archaeology is relatively under-used in the archaeological exploration of cities, or even considered unsuited to urban areas. We suggest this may arise from a lack of awareness of the resources available, combined with a lack of appreciation of just what aerial survey has to offer to the investigation of urban landscapes.

We begin with a brief introduction to aerial archaeology. We then review the resources available for aerial archaeology in London, before summarising the potential these resources have to offer for the investigation of London’s buildings and open spaces, especially in public spaces suitable for community projects. By way of illustration, we report on the initial stages of a small ongoing community and research excavation which is examining parchmarks on lawns associated with a mid-19th century industrial site – the Lambeth and Chelsea Water Works at Seething Wells. In conclusion, we suggest misconceptions about how aerial archaeology is applied may mean that a potentially significant source of information risks neglect.

Aerial archaeology

Aerial archaeology is a specialised form of aerial survey mainly concerned with analysis of archaeological remains through airborne reconnaissance. Although increasingly exploiting non-photographic technologies such as LiDAR,¹ aerial archaeology remains most commonly associated with systematic procedures for the interpretation and transcription of archaeological detail from aerial photographs.

Aerial archaeology is primarily a desk-based activity focused on the detailed study of existing archived materials. Although targeted and

speculative reconnaissance flights continue to make new discoveries, survey projects do not depend upon access to aircraft, but upon access to aerial photographs. Discoveries can be made on photographs that are years or even decades old. Most of these photographs were not taken with archaeology in mind, but nonetheless they captured much that may now be of archaeological, architectural or historic interest. The earliest extant aerial views of London, for example, date from the 1880s.² Even for late Victorian and Edwardian times London is remarkably well-served by airborne images.

For many, aerial archaeology has become closely associated with prospection for sites in open, rural

landscapes, and particularly for prehistoric, Roman and medieval sites identified as cropmarks or earthworks.³ However, aerial archaeology is not limited to this kind of survey – it is increasingly being applied in other ways, including tracing the transformations in 19th- and 20th-century built environments. A considerable range of features is now sought and mapped in aerial survey projects, with great effort put into identifying and mapping sites and structures of 19th- and 20th-century date.⁴ For example, features dating from the Second World War are often mapped from photographs taken while they were in use. Prior knowledge of the former existence of wartime

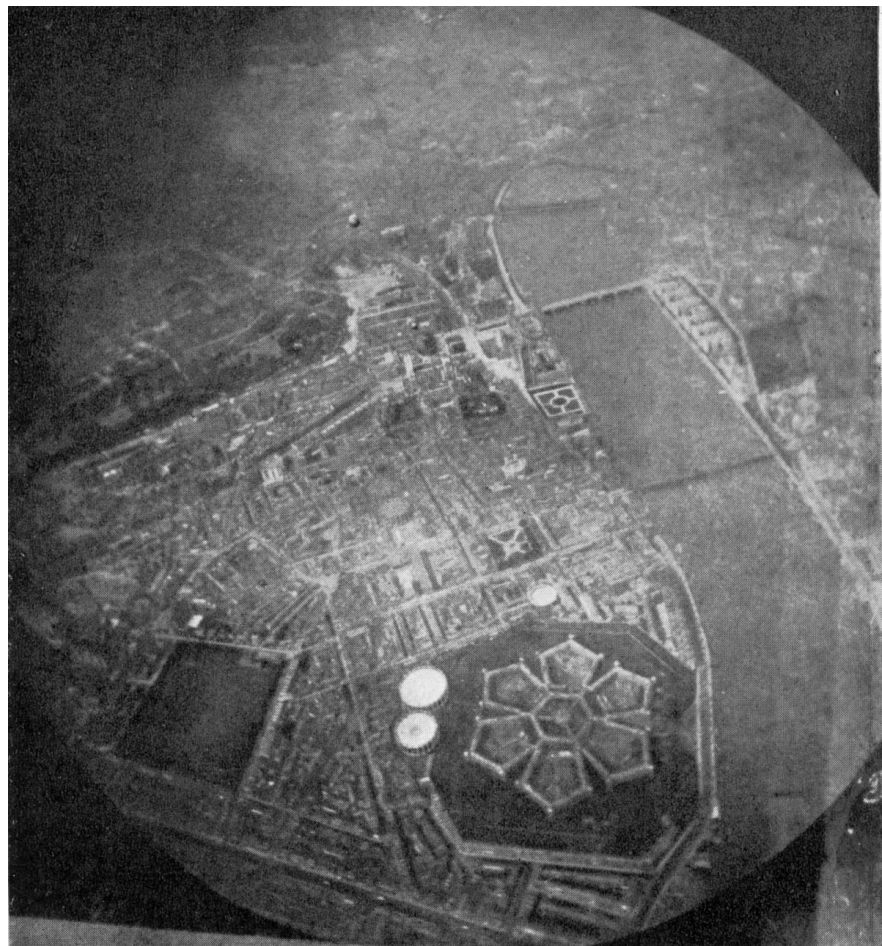


Fig. 1: Millbank Prison, photographed from a balloon by Griffith Brewer in 1891, shortly before its demolition. See *London Archaeol* 11 no. 7 (2006) 177–83.



Fig. 2: 1955 vertical RAF view of Seething and environs. The water treatment works can be seen just left of and below centre. North of the river are the grounds of Hampton Court. 82/RAF/1190/0395 | 1 May 1955 English Heritage RAF Photography.

structures is of increasing importance to developer-funded investigations, and the careful examination of historic aerial photographs allows archaeologists to assess the potential of such remains, which frequently lack any other form of documentation, in advance of development.

Even the more traditional application of aerial archaeology – as prospection over open ground – has been under-used within urban areas,⁵ perhaps because many popular and introductory texts on the subject place a great emphasis on the search for ‘cropmarks’.⁶ Cropmarks are the result of buried archaeological features affecting the growth of crops above them, given the appropriate conditions. A key factor, but by no means the only one, is the moisture content of the soil. Cropmarks are more likely to occur where the soil is markedly drier than normal. While London lacks expanses of waving corn, the phenomenon can

also occur on grass – ‘parchmarks’ – and London is not short of grass-covered open spaces. There are several reasons why the study of parchmarks may be particularly fruitful in cities such as London. Firstly, the intensity of land use in urban areas means that many currently open spaces will contain traces of past human activity with the potential to produce parchmarks. Secondly, cities like London have a greater resource of historical documentation and mapping, as well as other investigations (including archaeological exploration) which can provide rich contextual insight into the surroundings of even the smallest spreads of parchmarks, offering tremendous assistance in interpreting them.

Aerial photography over London: a history

The long history of aerial photography over London has left a resource whose

wealth and historical depth is rivalled only by those of Paris and Rome.⁷ Aerial photography’s history began half a century before powered flight. The first successful aerial photograph was taken over Paris by the French photographer ‘Nadar’ in December 1858, while the first over England was taken somewhere above the Medway five years later by Henry Negretti. By the 1880s, developments in cameras, plates and processing meant successful aerial photography was more regularly achievable. During the following decade, the appearance of the first Kodak camera further simplified the process of actually taking aerial photographs, while the development of the half-tone process exposed aerial photographs to a far wider audience than had previously been possible through the pages of books and, especially, the numerous and popular illustrated magazines of the time. These magazines themselves constitute an invaluable resource, along with the surviving prints and negatives of the period.

London was the subject of so much early aerial photography because much ballooning during the 19th and early 20th centuries was based in and around the capital.⁸ Furthermore, the need for many balloonists to begin their journey at a gasworks, and their inability to control the direction of flight, means that Victorian and Edwardian views do not consist solely of the obvious landmarks. Early aerial views captured a wide range of architectural and historical detail that may be difficult, if not impossible, to obtain from maps, documents, or ground-based photography.

Aeroplanes replaced balloons as the principal platform for the aerial photographer during the second decade of the 20th century. Occasional photographs taken from privately-owned aircraft exist, but far more abundant are verticals and obliques taken from military flights during the First World War. After the war, coverage of London was mainly undertaken by commercial firms established from 1919 onwards, many of whom were based in and around the capital, Aerofilms perhaps being the best-known today.⁹ Reasons for commissioning aerial photographic

surveys over London were many and varied, but included town planning, road and rail schemes, boundary changes, mapping, traffic management, engineering schemes and, of course, images for use as illustrations for books, magazines, advertising and postcards.

Military photography before, during and after the Second World War was taken by the RAF and the USAAF as well as the Luftwaffe. At the end of the war, the RAF took on the role of principal supplier of survey photography to the Ordnance Survey, an arrangement that continued into the early 1950s and resulted in a sizeable archive of repeat vertical stereo cover of the British Isles.¹⁰ Subsequently the Ordnance Survey undertook its own photography in support of its map revision programme, while commercial firms often undertook surveys for local authorities, many timed to coincide with census years. Commercial aerial photography continues today, of course, with online imagery such as that provided by Google and its competitors being the best known and most accessible.

As far as archaeological aerial photography is concerned, the small number of individuals active between the wars (for example, Major George Allen, who was mainly active in the Thames Valley) was replaced by greater and increasing numbers from the 1950s. Cambridge University began a flying programme soon after the war ended,¹¹ while the Royal Commission on the Historic Monuments of England (RCHME) added aerial reconnaissance to its ground-based survey programme in the late 1960s. After the RCHME merged into English Heritage in 1999, the flying programme – which had already been venturing more frequently into urban areas – continued.

A considerable quantity of the aerial photographs taken over London since the 1880s – numbering in the hundreds of thousands – are accessible for research. The last edition of the NAPLIB *Directory of Aerial Photographic Collections in the United Kingdom*, published in 1999,¹² listed 120 archives and other repositories within the London area alone, and this total excluded the largest collections, which lie outside the capital, notably the holdings of the English Heritage Archive

(formerly the National Monuments Record) in Swindon.¹³ Most Historic Environment Records (HERs) generally hold, or have access to, collections of aerial photographs covering their area. In addition, the presence of the British Library makes many of the earliest images, which survive only in published form in books and magazines, easily accessible.

The potential of aerial archaeology for London

The Greater London area has yet to see the kind of large-scale systematic aerial survey that has occurred elsewhere in England.¹⁴ The same is true of other large urban areas. Extensive and intensively urban landscapes do not naturally lend themselves to the kinds of archaeological survey undertaken in rural landscapes. Nonetheless, the use of historical photographs in regions including the South Downs and Essex has demonstrated their potential for identifying cropmarks or earthworks in areas that have subsequently seen urban or suburban development.¹⁵ Aerial archaeology is also increasingly used to identify features contemporary with the photographs but which are no longer extant, such as structures associated with wartime activity (see below). The time depth of aerial coverage for London, as well as the availability of regular and comprehensive survey coverage from the mid-20th century onwards, make this an essential resource for exploring particular aspects of the capital's history. The following – far from exhaustive – list notes just some of the applications that we consider have special potential for London.

Open spaces

London contains innumerable open spaces, varying considerably in shape, size and purpose, each with its own history. Aspects of these histories can be gleaned from documentary sources, including historic maps. However, not every episode of activity within these spaces will have left a documentary trace – not every parchmark or earthwork can be explained by recourse to the archives, especially those that represent traces of short-term or ephemeral events, such as those that occurred in wartime (see below).

Features of any period can produce parchmarks, and there is no lower limit to the size of open spaces in which parchmarks can develop. Not consulting aerial photographs will always increase the risk of missing something.

Buildings

Aerial photographs offer the opportunity to analyse buildings and other structures over time. Documentation of changes to particular buildings, their immediate environs and their wider setting can span the period from prior to a building's construction up to the present, as well as providing a glimpse of some buildings that have long since disappeared, a case in point being Millbank Prison (Fig. 1), photographed from above in 1891 by Griffith Brewer shortly before its demolition.¹⁶ The time depth of London's aerial photography and the extensive repeat coverage means that the capital is especially suited to this particular application of aerial archaeology.

The archaeology of the two World Wars

Extensive and repeat coverage, especially during and immediately after the Second World War, means that even short-lived structures such as road-blocks, barbed wire fences, shelters, emergency water supply containers, and so on can be identified. These are all features for which other forms of evidence may be scarce or non-existent. For open spaces of any size, conversion to allotments is a marked feature of Second World War aerial views of London. Repeated cover over time allows the possibility of mapping and assessing change over time, particularly changes in the nature and purpose of defensive schemes which, as work elsewhere has shown, can be tied to changing perceptions of the nature of the wartime threat.¹⁷

Community Archaeology Projects

Urban parks and public gardens offer potentially suitable locations for community projects. There is often a shortage of information about archaeological potential in such places.¹⁸ The creation of a database of urban open spaces containing features of archaeological interest would be a

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key benefit of any programme of aerial prospection targeted on London's open spaces. Such community projects might combine, and therefore provide training in, air photo interpretation, documentary research, map regression and geophysical survey as well, perhaps, as excavation. It was a demand for training in urban remote sensing that led the authors of this paper to initiate the small-scale excavation project which here serves to illustrate this point.

The lost gardens of Seething Wells

Aerial survey skills are useful to practitioners and students across a range of disciplines and university departments, including Earth Sciences, Forensics, and Historic Buildings Conservation, as well as Archaeology. To meet this cross-disciplinary demand, the authors of this paper created an aerial survey-based training programme

focused on a small part of the Kingston University campus. This programme culminated in a small training excavation which took place over three days in January 2013.

The site of Kingston University's Seething Wells Hall of Residence is the former location of the 1852 Lambeth and Chelsea Water Treatment Works (Fig. 2). This industrial site remains home to Grade II listed buildings belonging to the former Works as well as a related complex of subterranean tunnels. Water from Seething Wells played a role in the eradication of cholera and establishment of the germ theory of disease. Treated water from Seething, compared with untreated water, helped make the case that cholera was water-borne rather than spread through 'miasma'.¹⁹ A Heritage Lottery Funded project, 'Seething and the Defeat of King Cholera', stimulated interest in the history of the Works,

allowing members of nearby communities to participate in university-led activities alongside students, using techniques including air photo interpretation, geophysical survey, and excavation to uncover aspects of the spaces around the surviving buildings.²⁰ Using historic aerial photographs, which record the works still in use from the early 1940s onwards, participants were able to reconstruct aspects of the history of this complicated and extensive industrial site that would not have been easily recoverable through other sources.

The 19th-century buildings of the Water Treatment Works are surrounded by areas under grass (see Fig. 3). Maps from the mid-19th century show a network of paths crossing several of these lawns, and RAF verticals from the 1940s showed areas between the paths in use as wartime allotments. The most recent accessible aerial coverage of the area is provided by online sources, including Google Earth. One Google Earth image dated to 2003 shows parchmarks whose locations matched those of the 19th-century paths. These parchmarks suggested solid remains below the turf were affecting grass growth. Auguring and electrical resistivity profiles demonstrated the presence of resistant features below the surface at the approximate locations of the paths, as measured from historic aerial photographs. Consequently it was decided to open a small trench to investigate the cause of the parchmarks.

A small (2m x 4.5m) trench was excavated by students from Kingston University's Historic Buildings Conservation MSc, in partnership with local volunteers. The purpose of this first excavation was simply to investigate the causes of the parchmarks, so features were exposed and recorded in plan rather than fully excavated (see Figs 4, 5). A topsoil layer (101) associated with contemporary student occupation (bottle tops, canteen cutlery, shavings from electrical cabling), overlay a subsoil layer (102) containing finds including 19th-century transfer-printed pottery and clay pipe fragments. Among the most intriguing items were aluminium plant tags with people's names written on them in pencil. It is presumed that these relate to the wartime allotments.



Fig. 3: Seething Wells: top – extract from a 1945 RAF vertical showing the wartime allotments at Seething: RAF 106G/UK/872/6164 30 September 1945; bottom – 2003 view of the same area from Google Earth showing parchmarks corresponding to the paths visible in 1945, plus 2013 trench location. Google Earth image © The Geoinformation Group, 2014. Northwest to top. The Trench measures 4.5m x 2m.

Beneath these layers, excavation uncovered a path made up of patches of cinder (Fig 5: (107)) and gravel with shell inclusion (Fig 5: (106)) – (103) is a utilities trench. These materials would have been to hand during the life of the water treatment works: the cinder comprised waste from the furnaces of the steam engines driving the pumps, while gravel and shell were used in the nearby filter beds to purify the water. The earliest find came from gravel used to construct the path – a single water-worn prehistoric struck chert flake.

Small and brief as this excavation was, it can be used to draw out wider points concerning the potential benefits of aerial archaeology to urban archaeology. Aerial photographs can yield potentially important information even in small areas of urban grassland. They are particularly useful for the identification and analysis of changes associated with wartime, and can equally be used to investigate the history of standing buildings and their immediate surroundings. For example, we can see that the allotments were already present on the earliest wartime photography, taken on 29th June 1941, were still active immediately post-war, but after 1947 the photographs show a change from allotments to a more open area, with the paths disappearing from view and trees allowed to grow across the site, until at some point between August 1966 and June 1971 most of those post-war trees disappear and the area becomes a single unbroken lawn. Again, from the end of the war the



Fig. 4: our 2013 trench in the process of excavation by Kingston University students.

photographs document the different uses of the water treatment works site, with the gradual disappearance of buildings and associated structures. Finally, aerial photographs can be used to identify archaeological features in areas of public open space that can offer opportunities for people living in cities to discover and learn more about archaeology and local history.

Conclusion: on the uses of aerial photography in London

Misconceptions about the nature and purpose of aerial archaeology risk blinding researchers to the considerable potential it offers to London's archaeologists. Far from being an area that lacks objects of interest for the

aerial camera, the exceptional variety and time depth of the resource available for London makes it an extremely rich field for the aerial archaeologist. Despite this wealth of resources, aerial archaeology appears under-used in London. Assessing the extent to which aerial photographs are consulted on a site-by-site or project-by-project basis is difficult, but aside from a few large-scale landscape-based projects (for example by RCHME in Kensington Gardens and Hyde Park),²¹ the use of aerial photographs seems to be the exception rather than the rule. Searching through back issues of *The London Archaeologist* and the contents of the LAARC online database²² reveals very few references to aerial survey.

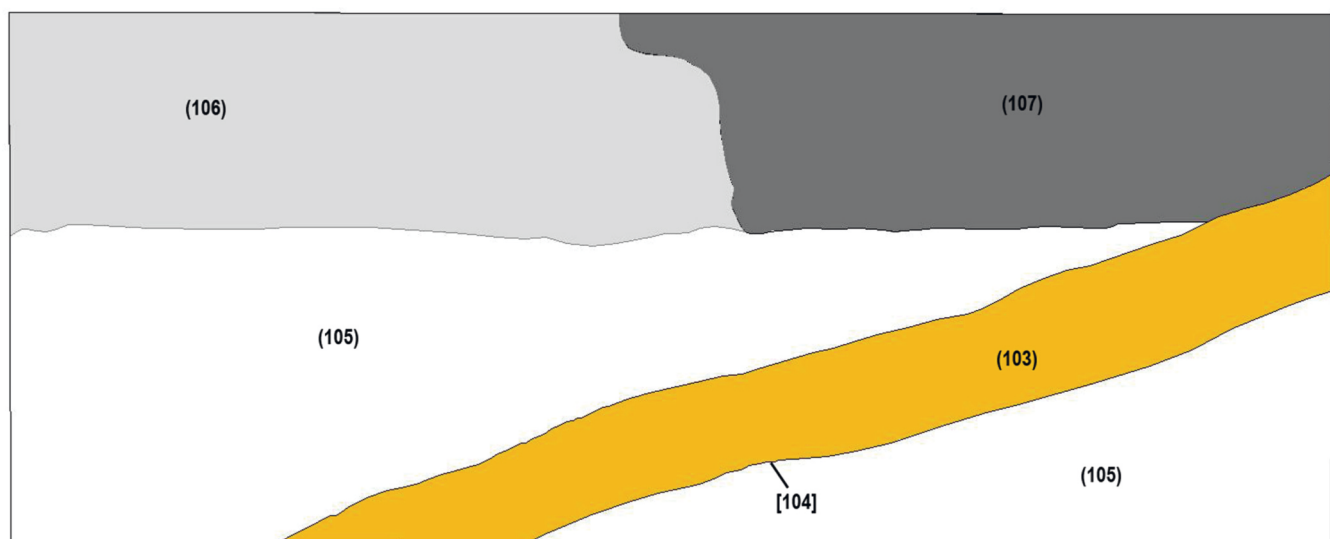


Fig. 5: plan of exposed features: (105) – garden soil; (106) – gravel and soil plus shell; (107) – cinder path. [103] and [104] – respectively cut and fill of a utilities trench. Trench measures 4.5m x 2m, northwest to top.

Strategic documents and guidelines for archaeology in Greater London view aerial archaeology as primarily a method for detecting ancient sites as cropmarks or earthworks in open environments, rather than recognising the wider range of potential applications described here. For example, the guidance on standards for archaeological work in Greater London prepared by the Greater London Archaeology Advisory Service (GLAAS) notes that “there are still considerable areas of outer London that are green, and some actively farmed”, suggesting that “Any study of an area that has not been built over, or only developed since 1945, would merit study of aerial photographs”.²³

The Research Agenda for London observed that “a detailed review of aerial photography evidence is...long overdue”.²⁴ However, this statement occurs in the section dealing with the Neolithic, Bronze and Iron Ages only, and is concerned primarily with prospection for cropmarks on the outer limits of the urban area, an application

which, we have argued, is only one among many in aerial archaeology today. The Resource Assessment for Greater London²⁵ suggested that the lack of use of aerial photographs in the capital could be explained by the extent of urban development, unsuitable geology, and flying restrictions caused by the presence of Heathrow Airport. The extent of urban development, as we have argued here, is only a problem if the built environment and the spaces within it are assumed to be of no interest to the aerial archaeologist. Similarly, unsuitable geology is a limitation mainly in terms of potential for cropmark development, not to aerial archaeology in general. Finally, the reference to flight restrictions overlooks the considerable potential of the hundreds of thousands of photographs that already exist. In any analytical mapping project, it is generally the historic collections that comprise the bulk of the photographs studied. Aerial archaeology is not a matter of access to airspace, but of access to aerial photographs, which London has in

abundance. This resource represents a largely unexplored terrain for the city’s archaeologists.

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1. LiDAR – Light detection and ranging, or airborne laser scanning. See S. Crutchley and P. Crow *The Light Fantastic: Using airborne lidar in archaeological survey* English Heritage (2000). Download from www.english-heritage.org.uk/publications/light-fantastic/.

2. The earliest extant is probably the vertical view taken from a balloon over the Stamford Hill area by Cecil Shadbolt in 1882. It is reproduced in B. Newhall *The Airborne Camera: The world from the air and outer space* (1969) 37.

3. See for example O.G.S. Crawford and A. Keiller *Wessex from the Air* (1928); D. Wilson (ed.) *Aerial Reconnaissance for Archaeology* CBA Res Rep 12 (1975); G. Maxwell (ed.) *The Impact of Aerial Reconnaissance on Archaeology* CBA Res Rep 49 (1983); G. Allen *Discovery from the Air* *Aerial Archaeology* 10 (1984). Both CBA Research Reports can be downloaded from archaeologydataservice.ac.uk/archives/view/cba_rr/

4. For example, see E. Carpenter *Worthing to the Weald: The South Downs NMP Pilot Area I*; Research Dept Report Series 11 (2008) English Heritage; and E. Carpenter, M. Barber and F. Small *South Downs: Beachy Head to the River Ouse*, Research Report Series 22 (2013) English Heritage. Both can be downloaded from www.english-heritage.org.uk/aerialsurvey/

5. Museum of London *The Archaeology of Greater London. An assessment of archaeological evidence for human presence in the area now covered by Greater London*. MoLAS (2000). See especially p. 66.

6. For example, D. Wilson *Air Photo Interpretation for Archaeologists* (2000); K. Brophy and D. Cowley (eds) *From The Air: Understanding Aerial Archaeology* Tempus (xxxx).

7. For more on the historical detail contained in this paper, see M. Barber *A History of Aerial Photography and Archaeology: Mata Hari’s Glass Eye and Other Stories* English Heritage (2011). See also K. Hauser *Shadow Sites: Photography, Archaeology and the British Landscape*

1927-1955 (2007); D. Cosgrove and W. Fox *Photography and Flight* (2010); H. Wickstead and M. Barber ‘A Spectacular History of Survey by Flying Machine’ *Cambridge Archaeol J* 22 no. 1 (2012) 71–88.

8. For more on early aerial views of London, both before and after the advent of photography, see M. Barber and H. Wickstead ‘“One immense black spot”: Aerial views of London 1784-1918’ *London J* 35 no. 3 (2010) 236–54.

9. For Aerofilms see www.britainfromabove.org.uk/
10. The advantage of stereo cover is that images can be viewed in 3D through a stereoscope.

11. For the Cambridge University Collection of Aerial Photography (CUCAP) see www.geog.cam.ac.uk/cucap/

12. NAPLIB, the National Association of Aerial Photographic Libraries, was dissolved in 2009. The second and last edition of its *Directory of Aerial Photographic Collections in the United Kingdom* was published in 1999. Clearly it would be advisable to check the current details of any collection listed prior to visiting.

13. The English Heritage Archives (formerly the National Monuments Record), based in Swindon, contains the largest collection of aerial photographs in the country. Along with the CUCAP and the local HER, it is essential that it should be consulted for any aerial survey project. For further details see www.english-heritage.org.uk/professional/archives-and-collections/nmr/

14. For England, around half the country has been mapped as part of the National Mapping Programme, begun by the RCHME and continued by English Heritage. For details of past and present survey projects and reports see www.english-heritage.org.uk/professional/research/landscapes-and-areas/national-mapping-programme/

15. For Essex, see C. Ingle and H. Saunders *Aerial Archaeology in Essex: The role of the National Mapping*

Programme in interpreting the landscape East Anglian Archaeology Monograph 136 (2011). For reports on the South Downs see fn 4.

16. The Millbank photograph is discussed in Barber and Wickstead *op. cit.* fn 8. It was originally published in an anonymously authored article ‘London from Aloft’ in *The Strand Magazine* vol 2 (July-December 1891) 492–8.

17. See for example C. Hegarty and S. Newsome *Suffolk’s Defended Shore: Coastal Fortifications from the Air*, English Heritage (2007); various papers in D. Cowley, R.A. Standing and M.J. Abicht (eds) *Landscapes through the Lens: Aerial Photographs and Historic Environment*. Occasional Publication of the Aerial Archaeology Research Group No. 2. (2010).

18. Kath Creed, *pers comm.*

19. For cholera and miasma, see www.wellcomecollection.org/explore/sickness--health/topics/epidemics/articles/hidden-extras-cholera.aspx

20. For Seething Wells and the HLF-funded project see <http://seethingwellswater.org/>

21. RCHME *Hyde Park and Kensington Gardens Air Photographic Survey*. RCHME (1994) (access via English Heritage Archives, *op. cit.* fn 13).

22. LAARC – the London Archaeological Archive and Research Centre. The archive can be searched here: www.museumoflondon.org.uk/collections-research/laarc/

23. *Greater London Archaeology Advisory Service: Standards for Archaeological Work*, consultation draft dated July 2009. Available from www.english-heritage.org.uk/publication/glaas-standards-for-archaeological-work.

24. Museum of London *A Research Framework for London Archaeology 2002* MoLAS (2003) 18.

25. Museum of London *op. cit.* fn 5.