Institution: University of Birmingham

Unit of Assessment: UoA29 - Classics

Title of case study: Stonehenge Landscapes Transformed

Period when the underpinning research was undertaken: 2000–2020

Details of staff conducting the underpinning research from the submitting unit:

Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
Paul Garwood	Senior Lecturer in Prehistory	1999–present
Henry Chapman	Professor of Archaeology	2005–present
Vince Gaffney	Professor of Landscape Archaeology & Geomatics	1992–2014

Period when the claimed impact occurred: 1st August 2013 to 31st July 2020

Is this case study continued from a case study submitted in 2014? No

1. Summary of the impact

Our research projects within the Stonehenge World Heritage Site (WHS) area have led to four significant and far-reaching impacts, transforming how the Stonehenge landscape is managed, understood and presented. Firstly, the new frameworks of knowledge and understanding of the WHS that we have established have impacted on **planning and policy**, particularly in the context of the A303 road tunnel scheme, by changing the knowledge base upon which decisions are made. Secondly, this transformed knowledge base has strongly impacted upon the **heritage management** of the WHS. Thirdly, there have been significant changes to the **heritage presentation** of the Stonehenge landscape, onsite, nationally and internationally. Fourthly, there has been global impact on **public understanding** of Stonehenge and the use of science in archaeology.

2. Underpinning research

The research underpinning this case study consists of two large-scale internationally significant collaborative fieldwork projects led by the University of Birmingham. These integrated long-standing research activities in the Stonehenge landscape (since the 1990s) with pioneering work in the development and application of novel digital and geophysical methods. The results of these projects have far surpassed the research objectives and priorities concerning geophysical survey identified in the *Stonehenge World Heritage Site Research Framework* (2005) and have established a new foundation for all future archaeological investigation within the WHS.

The *Stonehenge Hidden Landscapes Project* (SHLP), 2010–2020, is the largest archaeological geophysical survey ever undertaken (15km²), using multiple state-of-the-art prospection technologies (O1, O2, O3). The SHLP, led by the University of Birmingham as one of a series of investigations across Europe by the Ludwig Boltzmann Institute for Archaeological Prospection and Virtual Archaeology consortium, has resulted in major discoveries that change fundamentally our knowledge and understanding of the Stonehenge landscape (O1, O3, O4).

The *Stonehenge Landscape EMI Project* (SLEP), 2016–2020, is a University of Birmingham/ Ghent University collaboration, using boreholes and trench excavation (O5) to evaluate large-scale Electro-Magnetic Induction (EMI) prospection data covering 3km² of the WHS (O6).

Key findings from this research comprise:
RF1: New approaches to the analysis and categorisation of geophysical data in relation to archaeological and non-archaeological features in chalkland landscapes (O1, O2, O3) have

resulted from the innovative integration of very large-scale automated and motorised archaeological prospection techniques by the SHLP, subsequent innovation of multi-receiver EMI methods (O6), and ground-truthing in the course of the SLEP (O5).

RF2: The discovery of over 30 previously unknown prehistoric monuments, some in areas once thought to be empty spaces (O1, O3), including a vast Late Neolithic timber monument beneath Durrington Walls super-henge (O3) challenge current understandings of the Neolithic ceremonial landscape and establish new frameworks for its investigation. The Durrington Walls findings, for example, led to an award-winning excavation in collaboration with Stonehenge Riverside Project.

RF3: The discovery of an unparalleled array of massive Neolithic pits, each *c*.20 m across, encircling Durrington Walls super-henge in an arrangement 2.2 km in diameter (O4), has revealed an entirely new kind of spatial structuring of monuments and practices with profound implications for how the Stonehenge landscape was configured and changed over time.

RF4: Transformative understanding of the Stonehenge landscape through the documentation of thousands of previously unidentified anthropogenic and natural features. These include two massive pits within the Great Cursus that are aligned on the solstitial axis in relation to the Heel Stone (O1), with major implications for future interpretations of Stonehenge itself.

RF5: The first characterisation of Pleistocene and Early Holocene geomorphological processes in the formation of the pre-Stonehenge landscape, leading to a new understanding of the early environmental context before and during earliest human occupation (O6).

RF6: New evidence for the reoccupation of the post-glacial Stonehenge landscape, including the discovery of the largest Early Mesolithic dug feature in northwest Europe (O5).

3. References to the research (bold denotes University of Birmingham staff at time of publication)

O1: Gaffney, C., **V. Gaffney**, W. Neubauer, E. Baldwin, **H. Chapman**, **P. Garwood**, H. Moulden, T. Sparrow, R. Bates, K. Löcker, A. Hinterleitner, I. Trinks, E. Nau, T. Zitz, S. Floery, G. Verhoeven and M. Doneus. 2012. The Stonehenge Hidden Landscapes Project. *Archaeological Prospection*, 19(2): 147–55. DOI: 10.1002/arp.1422

O2: **Gaffney, V.**, C. Gaffney, **P. Garwood**, W. Neubauer, **H. Chapman**, K. Löcker and E. Baldwin. 2013. Stonehenge Hidden Landscapes Project: geophysical investigation and landscape mapping of the Stonehenge World Heritage Site, in W. Neubauer, I. Trinks, R.B. Salisbury and C. Einwögerer (eds), *Archaeological Prospection. Proceedings of the 10th International Conference on Archaeological Prospection*, 19–23 (Wien: Verl. der Österr. Akad.d.Wiss).

O3: Gaffney, V., W. Neubauer, **P. Garwood**, C. Gaffney, K. Löcker, R. Bates, P. De Smedt, E. Baldwin, **H. Chapman**, A. Hinterleitner, M. Wallner, R. Rilzweiser, E. Nau, J. Kainz, P. Schneidhofer, G. Zotti and A. Lugmayer. 2018. Durrington Walls and the Stonehenge Hidden Landscape Project 2010–2016, *Archaeological Prospection*, 25(3): 255–69. DOI: 10.1002/arp.1707

O4: Gaffney, V., E. Baldwin, M. Bates, C.R. Bates, C. Gaffney, D. Hamilton, T. Kinnaird, W. Neubauer, R. Yorston, R. Allaby, **H. Chapman, P. Garwood**, K. Löcker, T. Sparrow, I. Trinks and M. Wallner. 2020: A massive, Late Neolithic pit structure associated with Durrington Walls Henge, *Internet Archaeology*, 55.

O5: De Smedt, P., **P. Garwood** and **H. Chapman**. 2018: *Stonehenge EMI Landscape Project Geoarchaeological Investigations at Stonehenge, July 2017*. Interim report for The National Trust and Wiltshire County Archaeology Service (PDF available on request)

O6: De Smedt, P., M. Van Meirvenne, T. Saey, E. Baldwin, C. Gaffney and **V. Gaffney**. 2014. Unveiling the prehistoric landscape at Stonehenge through multi-receiver EMI. *Journal of Archaeological Science*, 50: 16–23. DOI: 10.1016/j.jas.2014.06.020

4. Details of the impact

4.1 Changes to policy and planning of heritage sites

Our work has established new baselines for making planning decisions within the World Heritage Site (WHS) at a time when the Stonehenge landscape is facing extensive policy and planning challenges relating to major infrastructure developments. The identification of over 30 previously unknown ceremonial and funerary monuments (RF2), the discovery of an array of massive pits encircling Durrington Walls super-henge (RF3), and discoveries of thousands of other archaeological features in the course of the SHL and SLE projects have **fundamentally altered the way that we understand the Stonehenge landscape**, including areas previously perceived to be 'empty spaces'. Together, these **define new frameworks of knowledge and understanding for making planning decisions within the WHS**. The joint World Heritage Committee/ICOMOS (International Council on Monuments and Sites) advisory mission report on the WHS explicitly recognises the significant contribution of the research findings (RF2, RF4) to its baseline understanding, in addition to technical and methodological approaches (RF1) now considered essential to future planning and development-related field investigation (E1).

This fundamental shift in understanding has **changed the knowledge base for decision-making relating to the current A303 tunnel scheme through its planning stages** (2017–present). Highways England purchased SHLP research data in advance of publication for intensive use in developing the archaeological evaluation and mitigation strategies for the scheme (referenced, for example, in their *Heritage Impact Assessment*; E2). A written submission from the Consortium of Archaeologists (including Garwood) contributing to the A303 road scheme public consultation was mentioned in parliamentary debate (E3), and the significance of the research findings has resulted in Garwood making expert contributions to the A303 Examination process that have informed and influenced a range of stakeholder bodies. These include the A303 Heritage Management Advisory Group, Highways England, Wiltshire County Archaeology Service, and the A303 Road Scheme Examination Authority (E4).

Our further intervention in the A303 road scheme decision process in June 2020 led directly to the Secretary of State for Transport granting a four-month postponement and additional consultation period for all Interested Parties (E5). This was in response to a written submission from the Consortium of Archaeologists, based on a statement by Garwood concerning the significance of the discovery of the massive pits encircling Durrington Walls super-henge (RF3). This has resulted in a multiplicity of responses from all parties connected with the A303 scheme and its examination, and **recognition that understanding of the Stonehenge landscape has changed as a consequence of the latest SHLP discoveries** (e.g., Historic England's submission to the Secretary of State, August 2020: E5).

4.2 Changes to heritage management

Significant changes in the heritage management of the WHS have resulted from the major advances in understanding that the SHLP and SLEP have produced, with respect both to the character and distribution of known and new monuments (RF2, RF3, RF4) and new information regarding the Pleistocene and early post-glacial landscape (RF5, RF6). SHLP results (RF2, RF4) have been used "to improve understanding and to inform management initiatives" within the WHS, as is highlighted in the current Site Management Plan (E6, p. 42). The importance of the research to this change was acknowledged in the current WHS Research Framework as "revealing a wealth of previously unknown sites via remote sensing and geophysical survey" (E7, p. 4). The **effectiveness of new methods** pioneered by the SHLP (motorised survey and multi-sensor investigation; RF1), demonstrated by project findings (RF2, RF4, RF6), resulted in **new methodological approaches to non-invasive survey and the establishment of a new Remote Sensing Group by the National Trust** (E8), Europe's largest heritage conservation charity and one of the largest landowners in the UK.

The significance of the findings for heritage management strategies within the WHS have also been recognised by the Avebury and Stonehenge Archaeological and Historical Research Group (ASAHRG), who support the **delivery of the Heritage Management Plan**. New monuments and additions to previously known monuments (RF2, RF4) have fed into heritage databases used to **inform the management of the landscape**, particularly in relation to planning. This has included a large number of new entries in the Historic Environment Record, maintained by the Wiltshire County Archaeology Service and the register of Scheduled Ancient Monuments, maintained by Historic England (E9).

4.3 Changes to heritage presentation

Representations of Stonehenge and the wider WHS have changed (E10), both in the UK and overseas, as a result of the research findings of the SHL and SLE projects (RF2, RF4, RF5, RF6). The most recent Stonehenge guidebook edition (2017; published in eight languages), for example, includes the Durrington Walls super-henge discoveries, and the large-screen landscape film in the Stonehenge Visitor Centre permanent exhibition shows results of SHLP surveys more widely (such as the new henge monument discovered under the Amesbury 50 round barrow). Partly on this basis, and also as a result of several talks at the Visitor Centre by Garwood, Chapman, and other members of the SHL and SLE project teams, staff from the National Trust and English Heritage, in addition to volunteer guides, **now present a revised and enriched interpretation of the landscape for visitors, reflecting the discoveries of new monuments and new knowledge regarding the Stonehenge prehistoric landscape** (E10).

Significant heritage presentation reach is also evident in exhibitions and displays both in the UK and Austria. A major SHLP-centred museum exhibition ran for 9 months in 2017 at the MAMUZ museum in Mistelbach, Austria, an institution hosting around 70,000 visitors annually. Reach was further extended through a SHLP stand at the Royal Society Summer Science Exhibition in 2015, where hundreds of attendees completed a simulation game relating to the cultural heritage of the Stonehenge landscape, focusing on prehistoric funerary practices and monuments.

4.4 Changes to public understanding of the Stonehenge landscape

Changed public understandings of how innovations in geophysical methods have led to new insights into the past (RF1) and dramatic new knowledge of the Stonehenge landscape (RF2–6) have taken place as a result of intense media interest in the SHLP and other kinds of public and institutional engagement through both the SHLP and SLEP. These impacts are evident both in terms of the **exceptional international reach of the SHLP results** and in the ways that **popular narratives of Stonehenge and its landscape setting have changed at Stonehenge itself** (E10) and through broadcast media. In particular, a two-part Emmy-nominated mini-series, *Operation Stonehenge*, focusing directly on the results of the SHLP (RF2, RF4), was first broadcast on BBC2 in 2014 (2.27m viewers for ep.1; 1.82m for ep.2) and simultaneously on ORF2 in Austria. The series has been re-broadcast three times in the UK and re-sold in at least 15 other countries, demonstrating economic impact in addition to reach. Other documentaries that have disseminated project results include National Geographic's *The Story of God, with Morgan Freeman* (season 1, ep.3), and Channel 5's *Beneath Britain* (ep.1: *Stonehenge*).

The significant international reach of our research is further evident in television, print and online news media (e.g., *BBC News*, *Sky News*, *The Times*, *Telegraph*, *Guardian, The Economist, USA Today, Washington Post, El Pais*, *Wiener Zeitung*, *Augsburger Allgemeine*, *NRC Handelsblad*). Just one press conference in London in September 2015, concerned with major discoveries at Durrington Walls super-henge, generated news coverage in at least 15 countries with audiences and readerships of over 30 million people. The SHLP has also featured in a range of special interest television programmes, magazines and blogs (e.g., *BBC Countryfile*, *British Archaeology*, *Current Archaeology*, *Scientific American*, *Bild der Wissenschaft*, *EOS Magazine*, *ZME Science*, *LiveScience.com*, *The Geological Society blog*). Notably, the collaborative work at Durrington Walls (RF2) was voted *Research Project of the Year 2017* by

readers of *Current Archaeology*, the UK's only independent archaeology magazine with a readership of over 45,000.

5. Sources to corroborate the impact

E1: World Heritage Centre/ICOMOS 2015: *Report On The Joint World Heritage Centre/ICOMOS Advisory Mission To Stonehenge, Avebury And Associated Sites* (downloadable from: under Mission Report 2015; specifically pages 14,18)
E2: Highways Agency 2018: *A303 Amesbury to Berwick Down TR010025. 6.3 Environmental Statement Appendices, Appendix 6.1 Heritage Impact Assessment*
E3: Hansard: Commons debate 5/6/2018; *Stonehenge: proposed road alterations*
E4: Impact on the A303 road scheme Examination process can be seen in the following sequence of linked/inter-referenced Examination documents:
(1) Garwood written and oral submissions to the Examination Authority (ExA), May/June 2019: accessible using the following filter – 'Paul Garwood'
(2) ExAs verbal questions relating to Garwood submissions during the Cultural Heritage (CH) Hearing on 5/06/2019 (pm)
(3) Highways England response
(4) ExA's Questions stemming from CH Hearings (CH2 & LV2), referencing Garwood and Consortium of Archaeologists
E5: Impact on the Department for Transport's National Infrastructure A303 road scheme decision process can be seen in the following sequence of linked documents (June–August 2020):
(1) Consortium of Archaeologists submission to the Secretary of State for Transport, June 2020:
(2) Written Ministerial Statement to Parliament, setting a new deadline for the A303 scheme planning application decision
(3) Secretary of State for Transport request for comments and further information (second A303 scheme consultation)
(4) Historic England 2020: Submission on Behalf of the Historic Buildings and Monuments Commission for England (Historic England):
E6: Simmonds, S. and B. Thomas. 2015: *Stonehenge and Avebury World Heritage Site Management Plan 2015*
E7: Leivers, M. and A. Powell. 2016: *A Research Framework for the Stonehenge, Avebury and Associated Sites World Heritage Site: research agenda and strategy*
E8: Testimonial from the Head of Archaeology for The National Trust
E9: Example Historic Environment Record
E10: Testimonial from English Heritage Senior Properties Historian, Stonehenge