Historic England

Mineral Extraction and Archaeology

Historic England Advice Note 13

Summary

This Historic England Advice Note is written for use by all those involved in mineral planning and it provides advice for making decisions about archaeology as part of mineral development within the English planning process.

Section 1 of the advice note introduces the advice note's aims, coverage and underlying principles and outlines issues in plan-making and the economics of minerals extraction. Section 2 explores archaeological significance within a mineral site. Sections 3 and 4 respectively offer advice on key considerations before and after a planning determination is made.

The advice note has been developed through discussions and consultation between all key stakeholders in the Minerals and Historic Environment Forum (MHEF), though the final version has been prepared by Historic England. MHEF produced a Practice Guide in 2008 and this document, published by Historic England, updates and replaces the previous version, Minerals Extraction and Archaeology: A Practice Guide. The document and its effectiveness will be subject to periodic review.

Front cover: A Saxon post-built structure under excavation. Horcott Quarry, Fairford, Gloucestershire.

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Contents

1 Introduction

1 This Historic England Advice Note has been prepared for use by all those involved in mineral planning. It provides advice for making decisions about archaeology as part of mineral development within the English planning process.

2 The last two decades have seen a huge increase and improvement in quality of archaeological knowledge on mineral sites, improved understanding of the types of sites that occur in certain landscapes, the judicious deployment of investigative techniques to maximise new information, together with a major overhaul of the English planning system.

3 There has therefore been considerable change since the 2008 version of this publication was written and the relationship between mineral development and archaeology merits renewed scrutiny to support the efficient use of resources and effective, consistent and informed decision-making in accordance with national policy.

4 Issues covered in the advice note merit focused consideration, acknowledging that quarries can be significantly more destructive to archaeological remains than other types of development-led projects, as they remove almost all the deposits of archaeological interest within their (often very large) footprint; and they can also impact on surrounding archaeology, beyond the site itself, through dewatering and changes in water flow patterns. That said, in the work to mitigate harm to heritage assets of archaeological interest, minerals extraction provides a range of opportunities to deliver new knowledge about our historic environment, in particular wide-scale information (landscape archaeology) and Palaeolithic evidence about the distant past. There is scope to deliver beneficial outcomes such as:

- In some circumstances archaeological remains within or on the fringes of a site might be excluded from extraction and the land in question set aside for the long term to protect the assets from further decay
- Mineral developments may afford opportunities to improve public access to heritage assets as well as provide up-to-date information and interpretation
- Archaeological fieldwork on quarry sites provides a huge opportunity for public engagement, education and involvement, as well as for site tours, open days and on-line content

The aims of the advice note

5 The aim of the advice note is to support practitioners in the delivery of consistent, proportionate and question-led archaeological evaluation, recording and dissemination on a range of different mineral sites throughout England.

6 The advice note seeks to ensure that:

- informed decisions are made regarding the level of archaeological assessment and understanding needed at each stage of the planning process
- mineral planning authorities have up-to-date evidence about the historic environment sufficient to inform plan-making
- mineral operators provide sufficient archaeological information to support a minerals planning application
- the full range of up-to-date and appropriate investigative techniques is considered, driven by a thorough desk-based assessment that takes account of geomorphology and Quaternary geology and its archaeological associations; the Quaternary covers the most recent period of geological time during which humans evolved, encompassing all archaeology from the Palaeolithic onwards
- there is a consistency of approach within and between mineral planning authorities, and that such approach is proportionate to the heritage significance of the site and the significance of affected heritage assets
- archaeological understanding is demonstrably advanced by archaeological works undertaken and opportunities are taken to share the findings with the public

What does it cover?

7 The advice note deals specifically with land-based mineral extraction in England. Mineral developments covered include those for aggregates, building stone, coal, industrial minerals (eg china clay and gypsum) and peat. It is confined to archaeological considerations and does not cover the conservation of other types of heritage asset, such as listed buildings, Conservation Areas or Historic Parks and Gardens, for which other sources of guidance and advice exist, such as the Planning Practice Guidance (PPG) and Historic England's advice notes and web pages.

8 Good practice for mineral extraction and archaeology in the marine environment is dealt with elsewhere (British Marine Aggregates Producers Association 2003).

9 Historic environment considerations in relation to on-shore unconventional hydrocarbons (eg shale gas) are not included in this document.

Underlying principles

10 The following five principles form the basis for this advice note:

1 A steady, adequate and sustainable supply of minerals is essential to the nation's prosperity, infrastructure and quality of life and great weight should be given to the benefits of the mineral extraction, including to the economy.

2 Minerals are finite and irreplaceable resources that can only be worked where they occur. Proposals for the extraction of those resources will only proceed if the commercial risk is considered acceptable.

3 Archaeological remains are a finite and irreplaceable resource. In many cases they are highly fragile and vulnerable to damage and destruction.

4 Archaeological remains are not all equal in significance. Staged investigation can help to understand their significance and determine that level of significance and appropriate mitigation of impacts, informed by reference to the NPPF, supporting guidance, research frameworks and other archaeological studies.

5 It is the role of the planning system to balance and reconcile the needs of the historic environment and minerals development, together with other competing material considerations in the context of sustainable development.

Archaeology may be found in different types of quarry

Mill House Farm, Chadwell St. Mary © Adam Stanford (Aerial-Cam) Archaeological Solutions Ltd. Picture supplied courtesy of Ingrebourne Valley Ltd.

a) A sand and gravel quarry

Mill House Farm, Chadwell St. Mary, Essex (close to the M25 and the River Thames) is an agricultural reservoir, from which the sand and gravel was extracted and sold as part of the construction process. Several phases of archaeological evaluation took place at the site, including aerial photographic assessment, trial trenching and palaeoenvironmental and geoarchaeological assessment. The excavation strategy was informed by the results of these surveys and allowed for the strategic investigation of a Late Bronze Age ringwork, associated settlement and later Saxon settlement with the recovery of an extensive artefact assemblage that will provide an important regional addition to the corpus of sites overlooking the Thames, alongside Mucking.

Top: Ham Hill 2011 season © Cambridge Archaeological Unit
Bottom left: Human remains in Iron Age enclosure ditch
Bottom right: Ham Hill excavations open day 2013 Both © M. Brittain, Cambridge Archaeological Unit

b) A building stone quarry

Ham Hill is protected as a Scheduled Monument (no.100). At over 88 hectares it is one of Britain's largest hillforts, with important prehistoric and Roman archaeology known from its interior. For centuries Ham Stone was quarried from the hill and used in the construction of many of the region's historic buildings; up to 40% of the hill has been entirely quarried. The ongoing need to conserve these buildings enabled further quarrying of Ham Stone from 1.28 hectares of the hill on condition of archaeological mitigation there. This was carried out over three summers (2011-2013) as a training excavation for 150 students from the

University of Cardiff, with 75 local volunteers, led by the University of Cambridge's Archaeological Unit (CAU). This was a rare opportunity to investigate a hillfort in detail, during which English Heritage (Historic England) also conducted a full coverage geophysical survey of the hillfort's interior. The project's extensive community programme saw over 4200 visitors to the excavations, from which an extensive monograph is in preparation. Prominent during the excavations was the varied and macabre treatment of human remains during the later Iron Age. Disarticulated human bones were found within layers of the hill's bordering ramparts, laced with fine cut marks indicative of dismemberment and also of defleshing. The hill's interior excavations focused upon a ditched enclosure wherein remains of at least 14 individuals were deposited in various states of articulation. Three of these displayed signs of blunt force and/or penetrative trauma to the skull. These examples highlight the connection between conflict and ritual behaviour within the region at this time.

Whitwell Quarry
© Trent & Peak Archaeology

c) A limestone quarry

Whitwell Quarry, Derbyshire: stripping of subsoil to reveal the top of the degraded Magnesian Limestone bedrock. An archaeological watching brief was maintained during the stripping of topsoil, subsoil and degraded bedrock overburden from the limestone escarpment adjacent to the Palaeolithic cave sites of Creswell Crags gorge.
The removal of topsoil and subsoil was monitored with the aim of identifying artefact scatters, structural remains, cut features and archaeological deposits. Attention focused during the stripping of bedrock overburden upon the identification of natural deposits that might yield archaeological or palaeoenvironmental remains (e.g. wind-blown loess in hollows; deposits in caves and fissures). Discoveries of prehistoric flintwork, particularly redeposited finds in deeper colluvial deposits, provided valuable evidence for activity from as early perhaps as the Mesolithic, but revealed no material that might derive from open-air Palaeolithic sites.

Minerals plan-making and mineral site allocations

11 The National Planning Policy Framework (NPPF) sets out national policy which must be taken into account in minerals plan-making. When dealing with mineral matters, attention should not be confined to the sections on the historic environment and minerals. Issues such as local circumstances, place-making, good design, landscape and ecology should also be taken into account as in many cases the issues are inter-related.

12 Whilst the NPPF sets out national policy, the primary document for the consideration of all mineral applications is the Local Plan (where up to date). Planning decisions are required to be made in accordance with the development plan unless material considerations indicate otherwise (see Section 38(6) of the 2004 Planning and Compulsory Purchase Act). This provides the basis of a plan-led system (see Box 1). Depending on the particular part of the country, the policy framework for future mineral development could be set out in a specific minerals plan, as part of a minerals and waste local plan, or as part of an authority's district-wide Local Plan.

13 The NPPF requires all plans to set out a 'positive strategy for the conservation and enjoyment of the historic environment' (Paragraph 185). It is essential therefore, as part of the preparation of a minerals plan, that there is a proper understanding of the historic environment of the area and how the demand for future minerals might impact upon it. Consequently, dialogue between the planning authority and its historic environment advisors is essential at **all** stages of the planning process and not simply when a planning application for mineral development is made, or is likely to be made. The nature of that dialogue and the level of information that must be considered will be different at each stage of the system. Early discussion between developers and mineral planning authorities regarding perceived risk of potential sites is beneficial.

14 Minerals can only be worked where they occur. Mineral planning authorities decide which locations are acceptable for mineral operations, taking into account all the interests that would be affected.

15 Mineral plans not only have to include an appropriate policy framework for the historic environment but also have to demonstrate that the sites that they are putting forward for future minerals development are likely to conserve the area's heritage assets in a manner appropriate to their significance. It is important, therefore, that the allocations which are being proposed have been informed by a suitable assessment sufficient to ascertain the likely impact which their development might have upon the historic environment.

16 A heritage assessment of the proposed allocation should take into account evidence on designated and non-designated heritage assets (which are explained further in the PPG). The location of these assets can be identified from sources such as the National Heritage List for England and the local Historic Environment Records. Archaeological assessment studies on aggregate producing areas are another useful source of data, published by the Archaeology Data Service (ADS). Where an assessment identifies archaeological potential, or that an allocation might cause harm to the significance of a heritage asset, it should identify the need for evaluation and the means by which the harm could be removed or reduced to an acceptable level. These measures should be incorporated into the Local Plan framework, where relevant.

17 When considering areas of search and/or preferred areas for mineral development, the underlying evidence base should identify potential historic environment constraints, using all appropriate evidence available at the time and take into account relevant historic environment advice. Identified constraints should inform the associated mapping exercise as far as practicable. Depending upon the extent of these areas, detailed assessment may not be necessary at this stage, but it should be possible to identify potential constraints that would inform more detailed site assessments in due course.

Box 1: Mineral Plan Preparation

The following bullets summarise key activities undertaken by the different roles in mineral plan preparation.

Mineral Planning Authority:

- Assess the need for minerals (Information sources include: Government forecasts, local assessments, Aggregates Working Parties)
- Identify possible locations as potential mineral site allocations / preferred areas / areas of search (Information sources: historical working, geological maps, local operators)
- Identify the historic environment of the Plan area and how the demand for minerals development might impact upon it (Information sources: National Heritage List for England, local historic environment records). Good Practice Advice in Planning 1: The Historic Environment in Local Plans provides advice on gathering evidence

- Where potential allocations are identified as being likely to impact on heritage assets, undertake an appropriate Heritage Impact Assessment to evaluate the extent to which the significance of any assets may be harmed and to identify measures to remove or reduce that harm. Historic England Advice Note 3: The Historic Environment and Site Allocations in Local Plans sets out advice on site allocations in Local Plans

- In discussion with site promoters regarding site suitability and viability for minerals extraction, agree which sites might host mineral extraction and constitute sustainable development

- Ensure that the Sustainability Appraisal (SA) and Strategic Environmental Assessment (SEA) is incorporated into the plan-making process

Local Authority Archaeological Advisers and Historic England:

- As consultees, identifying known heritage assets and their settings and advising on the potential for heritage assets (as yet unknown) to be present, which could be adversely affected by mineral working in any identified location, giving confidence that archaeological works carried out are proportionate, reasonable and justified in accordance with the NPPF

- Advising the planning authority on the historic environment issues in the SEA, and on the details of policies

Mineral operators:

- As consultees, providing geological data

- As consultees, proposing future extraction sites and where possible supplying information on the suitability and viability of those sites for minerals extraction. When promoting a site, evidence provided by the operator (in the form of assessments and/or evaluation results) can help to support the site allocation process

The economic viability of mineral extraction

18 As part of building a strong, competitive economy, the NPPF requires planning policies and decisions to help to create the conditions in which businesses can invest, expand and adapt (see paragraph 80). Most minerals extracted in England are a low-value, high bulk commodity. The income generated by a quarry is spread over its operating life. The upfront costs of submitting a mineral application can be high, and archaeological evaluation can be a significant part of this cost.

19 In advance of a planning application being made, an applicant will need to assess the proposal's likely impacts and the costs of their avoidance or mitigation. Work at this stage helps to ensure that an application is well-informed and appropriately designed and can reduce the risk of additional unexpected costs at a later stage. Section 3 of this advice note provides advice on assessing archaeology pre-determination.

20 Archaeological post-permission works are more easily dealt with from a cashflow perspective, because by this stage the commercial risk is significantly lower, as planning permission has been granted and the site is producing regular income which can fund the mitigation works. Section 4 provides advice on activities after the planning determination is made, acknowledging the importance of estimating in advance the order of costs of post-permission mitigation, including post-excavation analysis, publication and archiving. Any escalation of these costs can pose considerable financial risk, particularly if the mineral returns are marginal or if risks associated with geological evaluation of mineral quality and the recoverable quantity are high.

21 It can be helpful for all parties if the archaeological work post-determination is aligned with the phasing of extraction and annual budget-setting and planned to avoid piecemeal excavation of important archaeological structures/features. Provision by the minerals developer should be reviewed throughout the life of the development.

22 Archaeological responsibilities and costs do not end when the fieldwork is complete. Only following post-excavation analysis, dissemination and archiving can archaeological mitigation be considered to be complete. It is through this process that the greatest added-value and wider public benefits come to bear. Where work is carried out to deliver public benefits (eg direct outreach, public engagement and dissemination), the relatively small cost involved is usually far outweighed by the benefits accrued.

2 Mineral sites and archaeological significance

23 The NPPF defines 'significance (for heritage policy)' in its Glossary. The level of significance accorded to any heritage asset is arrived at through an 'assessment of significance', which informs the approach taken when considering potential impacts (in line with paragraphs 193-202 of the NPPF). Good Practice Advice in Planning 2: Managing Significance in Decision-Taking in the Historic Environment and the PPG provide relevant further advice on significance.

24 It may be that an assessment of the asset(s) has already been carried out resulting in an asset being 'scheduled'. A scheduled monument is an historic site that is included in the Schedule of Monuments kept by the Secretary of State for Digital, Culture, Media and Sport (DCMS) and the regime for its protection is set out in the Ancient Monuments and Archaeological Areas Act 1979. Scheduling criteria are explained in the document Principles of Selection (DCMS 2013). Scheduling Selection Guides explain what Historic England is looking for when assessing applications for inclusion on the NHLE and advising the Secretary of State on recommendations for scheduling.

25 Following the scheduling of a site, Scheduled Monument Consent from the Secretary of State will be required for any works undertaken on it. If works are proposed on or affect the setting of a Scheduled Monument early discussions with Historic England are recommended.

26 Many nationally important heritage assets of archaeological interest are known but not scheduled, exemplified by Sites of Early Human Activity, while on occasion non-designated heritage assets of archaeological interest which are demonstrably of equivalent significance to scheduled monuments are discovered through evaluation or mitigation works. In either case, in accordance with the NPPF, for planning purposes these should be treated by the mineral planning authority in the same way as a scheduled monument.

27 Before archaeological significance can be understood, the potential for archaeology needs to be assessed.

Top: The location of the site (the tent) within the quarry.
Bottom: The excavation underway within the tent.

Must Farm Quarry, Cambridgeshire

Archaeological evaluation prior to Oxford Clay extraction at the Must Farm Quarry, Cambridgeshire, revealed exceptional preservation (by waterlogging and charring) of a Late Bronze Age settlement of round stilted wooden structures built over a freshwater palaeochannel with associated artefacts. An astounding range of fabric, glass beads, metalwork and ceramic vessels complete with their contents was found, which made the site nationally significant. The position of the archaeology so close to the edge of the quarry presented a number of challenges that needed to be overcome when strategies to retain and manage the site within the scheme were discussed. As a result, excavation, to recover the remaining significance of the site before it was potentially lost was considered to be the most effective way of managing the long-term risks to the archaeology.

Identifying archaeological remains

28 The following archaeological remains may be encountered within the various strata of the minerals extraction site (also known as the stratigraphic sequence):

- Visible features – such as upstanding structures, earthworks, boundary features and routeways
- Topsoil – artefacts such as lithic scatters, ceramics and metalwork (which might be all that remains of former archaeological sites)
- Subsoil – cut features and ‘in situ’ later prehistoric and historic archaeological remains
- Deep ‘natural’ Holocene stratigraphy (e.g. alluvium and colluvium) – might both seal and contain archaeological remains
- The mineral body itself (for Pleistocene sand and gravel quarries) – evidence of early humans (Palaeolithic evidence)

29 Significance is influenced by the state of preservation of the archaeological remains. Where the burial environment is likely to be critical to the state of preservation, for example in the case of waterlogged remains, early consideration of likely impacts from quarrying is crucial if it is intended for those remains to be kept in-situ.

30 The combination of a detailed desk-based assessment (DBA) and use of appropriate techniques and well-thought out targeted evaluation should provide sufficient information to inform the planning decision (as outlined in section 3) and the approach to mitigation work (as outlined in section 4). However, the DBA and evaluation will rarely identify everything that is of archaeological significance on a site; it is only when quarrying begins can one know for certain what is there.

31 On rare occasions, despite suitable assessment and evaluation, unexpected remains, such as lithic scatters or waterlogged archaeology, may be encountered during quarrying, which could have implications for extraction timescales as well as costs. Delays can be avoided by ensuring archaeological monitoring and recording works take place as far in advance as practicable.

32 If remains are present that may warrant designation as a Scheduled Monument then discussions would be required between the developer, the planning authority, Historic England and other relevant stakeholders. Developers are advised to incorporate the potential for unexpected discoveries into their risk management strategies. In extremely rare cases where genuinely unexpected remains of national / international significance are discovered that could not reasonably have been predicted and dealt with through the planning system then Historic England may be able to offer limited financial support. This will only be considered if desk-based assessment and field evaluation were appropriate and sufficient. Support cannot be offered where the process set out in NPPF has not been followed, an inadequate brief set, in cases of poor practice or where a developer is not prepared to meet the full costs of the conditions placed upon them. If a genuine case can be made applications must come from the local government archaeological officer; retrospective applications will not be considered. It will be important too to learn lessons as to why their presence was not identified at the evaluation stage.

Taking a structured approach to setting

33 Significance may derive not only from a heritage asset's physical presence, but also from its setting. Setting is defined in the NPPF Glossary. It should be borne in mind that setting can contribute both to the significance of a heritage asset and it can allow that significance to be appreciated. Mineral development can affect the significance of heritage

assets through impacts on their setting as well as more direct physical impacts on the assets themselves. Potential setting impacts may include any combination of the following:

- Soil bunds (temporary)
- Soil heaps/mounds (permanent)
- Mineral stockpiles
- Working voids (surface coal)
- Winding gear or production facilities/crushers etc.
- Noise from operations
- Secondary uses if landfill forms part of the application – dust, smell
- Changes to landscape / topography / views
- Creation of new prominent working faces or scars (hard rock quarries)
- Changes to historic visual relationships between heritage assets and surroundings
- Traffic movements
- Changes to hydrology
- Associated (offsite) development eg the construction of a roundabout or access road to accommodate traffic movements

34 Heritage assets range in scale from the smallest structures to whole landscapes. Their interest may be specific to their context, so a structured approach to understanding setting is vital. Good Practice Advice in Planning 3: The Setting of Heritage Assets (Historic England 2017) outlines a structured approach on setting that takes into account all types of heritage asset and includes detailed, but non-exhaustive, checklists.

35 The loss of buried or earthwork remains may need to be considered both as direct impacts upon those archaeological features themselves and as setting impacts upon the significance of other assets located off-site. In a similar way hydrological and vibration effects may represent direct physical as well as setting impacts upon assets located outside the development boundary. The impacts of extraction, processing and haulage on how heritage assets are experienced is usually temporary, but will often require broader consideration than in visual terms alone, hence dust, noise etc are also considerations regarding the historic environment.

36 As noted in section 4, restoration of a site may include backfilling the void and returning the land to its former use or an acceptable alternative use, potentially meaning the visual impact on setting is temporary. A development might provide an opportunity to improve the setting of heritage assets in the long term by providing an opportunity to improve the setting of a heritage asset through sensitive and enhanced restoration. This could include removal or infilling of previous workings and the removal of unsightly redundant buildings without heritage significance.

Dealing with historic mines, caves and fissures

37 Mineral developments sometimes occur in areas where historic mine workings and spoil dumps may survive as above ground or underground features, or where archaeological remains survive in underground caves or fissures such as in limestone or some sandstone geologies. The presence of mine workings is often established during site investigation works to prove a reserve.

38 The evaluation and/or recording of underground remains is always subsidiary to health and safety considerations.

39 To inform the approach taken, maps and plans often exist for former below ground mine workings. For sites that have no records in standard planning-related archives, methods of pre-planning application and post-determination assessment of significance, and assessment of risks of encountering deep heritage assets, need to ensure that they include appropriate survey techniques in rock formations likely to contain either mine workings or caves.

Church Hole Cave, Nottinghamshire

Top: View towards Church Hole cave, Cresswell Crags. Caves and rock shelters preserving important evidence for Palaeolithic and later activity can be encountered in Limestone quarries. Photograph ©Trent & Peak Archaeology, December 2012

Bottom: Laser technology provides a highly accurate and cost-effective tool for the surveying of subterranean features, as demonstrated by this unprocessed point cloud image of the interior of Church Hole cave. Photograph © Trent & Peak Archaeology

40 Information may also be gained from local interest, exploration and speleological societies, especially for those workings still capable of being accessed. In some locations there are volunteer mine exploration groups and speleological societies who explore and record old workings who can be consulted. Upon request they may make information available, and even undertake bespoke mapping work as part of pre-application consultation and evaluation.

41 Old coal workings in seams exposed during surface mining developments are the most frequent instance of uncovering old mine workings. There is an established method of recording the workings, involving cleaning (exposing) them where practical and viable, and then recording through either photographs or surveys as part of the extraction process by the operator as part of the mining operations. Early coal workings (typically pre-nineteenth century) may require other approaches such as detailed recording of any surviving above-ground earthworks prior to extraction. Planning conditions normally set out the need for recording any significant finds.

42 Other forms of extraction – particularly of Carboniferous limestone, sandstone and industrial minerals (non-coal) – may interact with old workings or underground caverns. In most cases, as these mineral operations progress more slowly than surface coal extraction, below ground workings can be recorded during the extraction phase of a mineral operation by an intermittent watching brief condition with surveying of the quarry face as mine workings become visible. Laser scan surveys of quarry faces can supply rapid and accurate records of underground workings. Archaeological recording only takes place where highly significant, or designated, remains or fissures are present, subject to health and safety constraints. On rare occasions caves are unexpectedly encountered which may be of national significance and this may require temporary or permanent change in extraction activities, noting that the site may potentially be suitable for designation and will require detailed investigation or swift avoidance. Old mine records may record the location of workings.

Dealing with peatland

43 Peat is of special interest for archaeology because of the potential quality and quantity of survival of archaeological remains due to the saturation of the ground and the lack of oxygen. These conditions help to preserve organic material such as wood, skin, leather, hair, textiles and paleoenvironmental remains. Changes to hydrology therefore have the potential to be particularly damaging to any heritage assets that might be present.

44 Any requests for a variation to an existing peat application should be discussed in detail on a case by case basis with the local planning archaeologist and where necessary with the Historic England Regional Science Advisor.

Dealing with Palaeolithic archaeology

45 Quarries, especially those where Quaternary sands and gravels are extracted (which by their nature remove Pleistocene deposits of Palaeolithic interest), are an important source of evidence for better understanding early humans. As the evidence can be deeply buried within Pleistocene deposits, it often lies beyond the impact of many building schemes and beyond the accessibility of research projects. Therefore, where Pleistocene deposits are mapped or anticipated within a minerals extraction site, provision for a Palaeolithic specialist to contribute to DBA and evaluation project stages is essential.

46 The detail held by HERs about the Palaeolithic is not always as detailed as for later periods (though some enhancement work has recently taken place). At the DBA stage it is important that additional collection of baseline information is undertaken, for example from the English Rivers Palaeolithic Survey and the Southern Rivers Palaeolithic Project (Wessex Archaeology) and from Quaternary Research association Field Guides and Regional Research Framework resource assessments.

47 Unlike archaeology of later periods, deeply buried archaeology (such as Palaeolithic remains) will not be identified by evaluation through the overburden or strip, map and sample during soil stripping, as it will lie at depth within the Pleistocene deposit sequence. Therefore appropriate techniques for identifying the Palaeolithic / Pleistocene potential of the deposits include initial borehole surveys to construct or update deposit models, which will help target locations for test pits and deep trenching or sondages within shallower evaluation trenches.

48 A deposit-led approach to investigation is recommended for the Palaeolithic. This is explained in more detail in a separate (forthcoming) publication by Historic England, focusing on dealing with Palaeolithic archaeology in development-led projects. The focus of desk-based and fieldwork project stages is always the sediments themselves. Identifying Palaeolithic potential depends on understanding how the Pleistocene sediments formed, their date and any palaeoenvironmental evidence they contain. This will require assessment of biological remains and scientific dating techniques. Geological and archaeological interests in the mineral body can often most effectively be dealt with by a joint approach.

49 For sites where Palaeolithic material might be present within Pleistocene deposits or within the minerals body itself, then an intermittent watching brief and training session for quarry staff to recognise and inform on such remains might be appropriate, along with arrangements for specialists to record exposed section faces and deposits. Such intervention is likely to form part of a staged approach to mitigation, starting with boreholes, test-pitting and deep penetrating geophysics, to more closely define and target the area of potential, usually by means of deposit models. The design of such work must always be done in conjunction with a Palaeolithic specialist.

Chard Junction Quarry, Somerset

Recording of exposed section faces while aggregate extraction continues at Hodge Ditch, Chard Junction Quarry.

Top: Specialists in scientific dating and Pleistocene sediments are examining the deposits to select suitable locations for sampling

Middle: Laser scanning is being used to rapidly record the sections and enable them to be examined in 3D later on

Bottom: Taking samples for luminescence dating (OSL), which measures the time elapsed since sand grains were last exposed to daylight

Images © Laura Basell

Dealing with landscape archaeology

50 The nature of the extraction process, with a phased approach to operations over many years, often extending to dozens of hectares, can allow developers, their archaeological consultants and contractors to build long-term relationships that offer the potential for the mitigation strategy (see section 4) to take a true landscape approach, in which analysis takes place at a level above individual sites and research objectives and methods can evolve in the light of previous results. At the same time the long-term, large-scale nature of many extraction sites produces significant challenges in making sense of and providing access to substantial amounts of archaeological data, which need to be carefully considered in designing programmes of post-excavation analysis and reporting.

3 From pre-application to determination

Pre-application engagement

51 Developing good relationships with local communities is an important part of good practice, as well as fulfilling legal requirements.

52 Mineral operators commonly undertake public consultation during the pre-application stage. Including information or a presentation on the archaeological resource as part of that early engagement with the community and statutory and non-statutory consultees can be helpful, and would ideally include input from archaeologists on behalf of the mineral developer.

53 Archaeological remains are usually high profile and interest in them can provide an effective way of engaging with local communities. Mineral developers may consider establishing links with local schools and/or historical interest groups in relation to the archaeological remains on their site. Consulting local communities about archaeological remains produces an inclusive approach that helps provide them with information about the site and feel more engaged with their local area and the change it is undergoing.

54 Pre-application discussions between the applicant and the mineral planning authority is the most effective way to ensure pre-application investigations are fit for purpose and proportionate. Informed by local authority archaeological advisers and reference to the Historic Environment Record (HER), such discussions inform the choices made about what archaeological investigation techniques are necessary to inform any subsequent planning application.

55 If the information necessary to give informed pre-application advice is not available, it is reasonable to ask for such information to be provided by the prospective applicant, particularly in cases where the site in question has not already been allocated in an adopted Mineral Plan.

Box 2: Pre-application engagement and front loading

The following bullets summarise key activities undertaken by the different roles in early engagement regarding a minerals development proposals.

Mineral Planning Authority:

- Identifying if the proposed area has or has not been allocated in the mineral plan
- Indicating which policies of the development plan (including the mineral plan) and the NPPF are pertinent to the proposal
- If requested, providing a formal Screening Opinion on the need for Environmental Impact Assessment (EIA) of the proposal
- If EIA is required and if they are requested to do so, defining what that EIA must cover in the form of a formal Scoping Opinion
- Where EIA is not required, advising what particular issues are likely to be significant in dealing with the application and what information is needed to support the proposal
- Stating its validation requirements

Local Authority archaeological advisers and Historic England (if there is a requirement to consult):

- Advising the planning authority on historic environment issues in the drafting of a Screening Opinion
- Advising the planning authority on historic environment issues in the drafting of a Scoping Opinion
- Engaging in discussion with applicants or their agents and the planning authority about pre-application investigations, their scope and a phased approach
- In all other cases, advising the planning authority on archaeological issues associated with proposed sites and the information that they would advise to accompany a planning application

Mineral operators:

- Defining clearly the area over which the development is proposed and the precise form of development that it is intended should be carried out
- Providing sufficient information to inform screening / scoping for EIA
- Engaging in pre-application consultation and local public engagement as appropriate
- Providing sufficient archaeological information to support the planning application

Environmental Impact Assessment (EIA)

56 EIA is a process which must be undertaken for certain types of planning applications and it applies to most mineral applications. A formal view on the need for EIA can be obtained by seeking a Screening Opinion from the mineral planning authority. A formal view on the content of an EIA can be obtained by seeking a Scoping Opinion. A thorough and unambiguous Scoping request and response will help to define the level of information needed to inform the planning decision.

57 The Environmental Statement of the EIA submission should synthesise the results from the various archaeological pre-application investigations and set out the impacts on heritage assets according to a clearly outlined methodology in addition to any cumulative effects and mitigation measures.

58 Archaeological interest (or 'cultural heritage' as it is known in EIA regulations) should be taken into account by planning officers in each of those processes, informed by advice from local authority archaeological advisers.

59 Local authority archaeological advisers should therefore be consulted on the scoping opinion, as well as results of an EIA when it is submitted with a planning application in the form of an Environmental Statement chapter with supporting studies.

60 For mineral applications that are not required to be accompanied by an Environmental Statement, advice from local authority archaeological advisers should still be sought at key stages in the decision-making process. The PPG provides more detailed guidance on EIA.

Pre-determination evaluation

61 Mineral development occurs on a wide variety of geologies and landforms and within widely contrasting landscape settings. Types of archaeological remains also have regional variation. It follows that local conditions will affect the type and quantity of pre-determination evaluation (and post-permission recording work) that takes place. Therefore a flexible approach to selection of technique types, their combination, scale and positioning can be expected.

62 Consistency within and across mineral planning authorities is nonetheless important, informed by reference to the NPPF and relevant standards and guidance. Box 3 outlines key elements of a consistent approach which are explored further in the subsequent sections. Consistency in this context does not mean repeating the same steps for all applications, but using the same basic principles to address and implement the requirements of policy. It is particularly relevant in cases where mineral development straddles mineral planning authority boundaries, noting the context set by the legal 'Duty to Co-operate' on strategic cross-border issues.

Box 3: Key elements of a consistent approach

A. Undertake a high quality and detailed desk-based assessment, making the most of all available information and including an assessment of the level and quality of the information that is available

B. Consider the full suite of appropriate archaeological techniques, building on the results of previous work, with dialogue informing the selection of appropriate techniques, their combination and scale. Flexibility of approach is needed to take account of the different types of archaeological interest that might exist within the topsoil, subsoil or mineral body itself

C. Take a question-led approach to evaluation work, focused on the information needed to make a planning decision in accordance with the NPPF (in particular paragraph 189)

A. Undertaking a high quality and detailed desk-based assessment (DBA)

63 The desk-based assessment (DBA) is one of the most critical pieces of work undertaken. This is because all subsequent work flows from it. As a minimum, a desk-based assessment will need to comply with the relevant professional standards (CIfA 2017, section 3.5.3 outlines what should be included in the written report). Delivering a good DBA relies on making the most of all available information, including an assessment of the level and quality of that information, the reasons for that, and the reliability of any conclusions and assessment of heritage significance.

64 In areas of little prior development DBAs may be poor guides to the archaeological potential of the site, if there is little information available in the HER. However, in other areas a full and well-thought out DBA can help to reduce uncertainties and the risk of delays to the project, whilst ensuring that evaluation occurs in a more targeted and question-led way.

65 The DBA is developed in discussion between the applicant and the mineral planning authority to agree its scope and it will be informed by a search of all relevant available local and national records such as the National Heritage List for England (NHLE), Historic Environment Records and other relevant sources as agreed with the local authority's archaeological adviser (with reference also to CIfA's Standard and Guidance on DBAs).

66 Given the extensive scale and depth of archaeological interest (and almost complete deposit removal), a geoarchaeological assessment is an important component of a DBA on all mineral sites where the overburden (the material that covers the mineral body) is deep (eg where alluvial and colluvial sediments exist) or where there is the potential for archaeology to be in the mineral body itself. A typical geoarchaeological assessment would usually:

- be prepared by a geoarchaeologist;
- be based on existing geological, geotechnical (eg from the British Geological Survey and minerals operator), topographic (eg lidar) and archaeological information;
- include a deposit model, providing information about the sequence, distribution and character of buried Quaternary deposits across the site and suggesting their likely archaeological potential;
- divide the site into zones of different archaeological interest and potential;
- illustrate the likely depth of deposits of archaeological interest in maps and cross sections;
- be used to enable subsequent evaluation stages (eg geophysical survey, test pits and evaluation trenching) to be targeted on areas where they are best suited.

67 Consideration of the likely range and state of preservation of archaeological remains should be considered as a component of a DBA (see Preserving Archaeological Remains for additional information).

68 A setting study may be undertaken as part of the DBA but this could equally be undertaken as a standalone study or as part of the Environmental Statement chapter if the application requires EIA. For EIA applications the historic environment setting study is usefully undertaken alongside the landscape assessment as they can share information such as photographic studies. Consideration of historic land use should be included in a DBA, in particular the potential impacts of ploughing, forestry, orchards, previous mineral working and built development.

B. Considering the full suite of appropriate techniques

69 Underlying all archaeological works undertaken as part of the preapplication phase is the principle of a phased programme of works with one phase informing the next. By this method increasingly targeted and appropriate techniques can be deployed in a proportionate way. Relevant information and advice may be available from Historic England science advisors.

Box 4: A typical phased sequence of evaluation works where each piece of work informs the next (if all deemed appropriate and necessary)

Desk-Based Assessment
(incl. geoarchaeological and Palaeolithic assessment)

↓

Borehole survey
(purposive geoarchaeological
and/or use made of geotechnical investigation where possible)

↓

(updated) deposit model

↓

Geophysical Survey
(varied techniques relevant to likely depth or archaeology,
as identified in the deposit model)

↓

Fieldwalking (where possible) or ploughzone sampling (where the ground conditions do not support fieldwalking)

↓

Test-pitting and targeted gap-filling boreholes

↓

Evaluation Trenching
(with further cores and sondages as necessary)

70 Geoarchaeological boreholes (where possible making use of any done for geotechnical purposes) are usually undertaken as a preliminary stage of evaluation.

71 Borehole data can help to develop or fill in the gaps of a deposit model where such a model is appropriate and necessary. A deposit model can be used to target productive areas for non-invasive techniques such as geophysical survey which, together with fieldwalking and the updated deposit model, will inform any subsequent evaluation trenching or test-pitting.

72 Box 4 outlines a typical sequence of works. This phased approach to evaluation constitutes good practice for all quarries, but the scope for each stage will depend on whether there is the potential for archaeological remains within the mineral body itself (eg Pleistocene sand and gravel quarries) or whether archaeological interest is limited to the overlying deposit sequence.

73 Extensive minimally-invasive techniques (such as borehole survey, geophysical survey and fieldwalking) can be useful for initial assessment of large areas and help to focus invasive techniques such as evaluation trenching. This helps to reduce excessive evaluation of large areas and produces information directly relevant to informing a planning decision. All work should follow relevant professional standards (CIfA 2014c, 2014d).

74 Box 5 provides a tool to help to determine which techniques are most appropriate, informed by the results of the DBA.

Box 5: A basic tool to inform technique selection

See overleaf

Technique	Pre- or post planning permission?	Requires access to land?	Involves intrusion into the ground?	Seasonal?	Post-fieldwork processing required?	Reliability (in terms of locating previously unknown archaeological remains)
Geophysical survey *	Normally pre-	Yes	No, or negligible	Yes – needs to be done on bare ground or with crop cover knee height or lower, some results may be affected by soil moisture	Processing of data, interpretive plots and text description	Variable (from very good to poor). Results can be affected by geology and soil type, soil moisture, presence of metallic debris, presence of services etc. Specialist advice on the type of survey to use and on local conditions and questions to be answered is important. It is also better at detecting some kinds of features than others.
Fieldwalking . This could include gridded metal detector survey **	Normally pre-, but can be used post-	Yes	No, though it involves the collection of archaeological material from the ground surface	Yes - needs to be done after land has been ploughed, but before crops have grown an appreciable cover.	Artefacts found will need to be washed, identified, recorded, mapped and interpreted	Variable. It is good at locating some kinds of material (eg. Roman buildings, prehistoric activity), poor for other kinds (eg late pre-historic settlements).
Geoarchaeological survey: (sediment coring, feeding into a deposit model) and assessment ***	Pre- and possibly post-	Yes	Yes (minimal)	No	Deposit model construction and samples submitted for scientific dating and (where appropriate) palaeoenvironmental assessment	Reliability depends on spread of datapoints and type of exposure or record examined (geotechnical or geoarchaeological borehole log, sediment core, test pit section). Typically very useful in assessing depth and distribution of deposits of archaeological potential and cost-effectively targeting use of subsequent techniques (geophysics, fieldwalking, trenching).
Test pits (with sediment sieving)	Pre- and possibly post-	Yes	Yes	No	Yes	Topsoil test pits are useful when the ground conditions do not support field walking Deeper machine-dug test pits are more effective for Palaeolithic archaeology, used as part of the investigation under appropriate specialist supervision where remains might be buried within the mineral deposit itself.
Evaluation trenching	Pre- and possibly post-	Yes	Yes	No	Yes	Depending on the type of remains being assessed there may be merit in excavating evaluation trenches in alternative shapes to linear trenches; for example squares might be better suited over an area of a surface artefact scatter revealed by fieldwalking than a narrow linear trench. Also see Box 6

* Refer to EAC Guidelines for the Use of Geophysics in Archaeology for more information
**Refer to Managing Lithic Scatters (forthcoming) for more information
***Refer to Geoarchaeology: Using earth sciences to understand the archaeological record for more information. Note Historic England's Deposit Modelling Guidance is forthcoming

C. Taking a question-led approach to evaluation work, focused on the information needed to make a planning decision in accordance with the NPPF

75 Set in the context of paragraph 189 of the NPPF, selective use of a range of techniques in combination and in a targeted and iterative way can often produce a highly informative data set that effectively characterises the archaeological interest of a proposed development area. From this the significance of heritage assets can be assessed and an informed view developed of the impact of the proposed development on that significance, which is sufficient to make a planning determination in accordance with the NPPF.

76 Following early consultation, a thorough and well-thought out desk-based assessment (DBA) is essential to devise an informed question-oriented evaluation strategy which minimises the amount of prospection work required and helps to target investigations. The more reliable the DBA and preliminary stages of minimally-intrusive fieldwork, the more targeted evaluation trenching can be, leading to well-informed mitigation strategies that reduce the risk of unexpected surprises.

77 Evaluation strategies should be site specific, noting that the level and nature of evaluation will vary with geomorphology, topography and the character of archaeology interest.

78 Geoarchaeological boreholes and deposit modelling may be used to identify areas for geophysical survey and fieldwalking, potentially reducing the scale of trenching and test pitting required.

79 Rather than attempt to identify all features across a given site, the starting point is to consider what level of evaluation is needed to understand the type and significance of archaeology that is, or is considered likely to be, present to a level that will inform a planning determination.

80 Data gathered can also help to inform a costed mitigation strategy, the benefits of which include:

- a reduction in delays to the extraction programme (or and/or allowing delays to be programmed-in);
- a reduction in the chances of unexpected risks and associated costs; and
- scope to allocate the cost of archaeology appropriately into financial forecasts.

81 Discussions on trenching can be facilitated by the applicant proposing an approach to evaluation, supported by reasoned justification, for discussion with the mineral planning authority. The mineral planning authority will need to consider carefully the strategy being proposed as part of a comprehensive approach which is likely to require both non-invasive and invasive techniques. Informed by its discussions with the applicant, the mineral planning authority's archaeological advisor will need to be satisfied that the evaluation strategy is fit for purpose and justified in accordance with paragraph 189 of the NPPF. The setting of a common or baseline percentage of evaluation trenching might be appropriate in some circumstances. In less predictable scenarios experience shows that a flexible approach, using a range of techniques can give the best insights. Box 6 offers further advice on evaluation trenching.

82 Providing the scope for an iterative response during a pre-determination trenching programme can be useful, by including an agreed quantity of further evaluation trenching as a contingency (as mentioned in Box 6). This allows for any areas of interest identified to be explored further, or for the extension of some trenches to better examine and understand the significance and condition of remains that are encountered but which extend beyond the trench boundaries.

83 For types of heritage assets where evaluation trenching is less effective it may be more appropriate to define an encompassing and/or flexible scheme of archaeological mitigation to make sure any significant archaeological remains are adequately managed (in accordance with paragraphs 193-202).

Box 6: Evaluation trenching

Pre-determination evaluation helps to characterise the archaeological interest of a site and its significance and to review the impact of the proposed development on that significance.

Evaluation trenching rarely takes place in isolation. It is usually informed by prior knowledge from nearby or adjacent sites, desk-based work and field prospection, which in combination help to identify the need for trenching and target the trenching that is required. It frequently forms the final stage of the overall field evaluation process and differs from most other evaluation techniques as it provides the opportunity to directly access and assess buried remains.

What are the aims of evaluation trenching?

The principal aim of evaluation trenching, particularly on large greenfield prospective mineral sites, is to search a site to identify whether any important archaeological remains are present that could preclude or modify the proposed development, including by the imposition of appropriate conditions.

A subsidiary aim of evaluation trenching is to enable better estimates to be made of archaeological costs that can inform commercial decisions on the mitigation strategy after operations commence; for example, by identifying parts of a site with a large quantity of remains entailing such cost to investigate that it would be preferable to forgo or defer mineral extraction.

What are the uses and limitations of evaluation trenching?

Evaluation trenching can be effective:

- in finding large features, particularly linear and arcing remains such as the remains of field systems, enclosures, defended sites and those with extensive walls;
- in testing and examining features identified on aerial or satellite imagery, or from geophysical survey or historic maps; and
- in establishing the date and state of preservation of archaeological remains.

It is, though, a less reliable technique for identifying the presence of dispersed remains, irregularly laid-out sites, small and/or clustered features such as post-built buildings, pits, isolated burials and lithic scatters.

Where archaeological remains are likely to be deeply buried, test pits and boreholes are a more appropriate method of evaluation than shallow evaluation trenches for assessing archaeological potential.

When prior evidence suggests that significant archaeological remains are likely to be present in the topsoil, provision for recording this needs to be made in the form of fieldwalking, shovel or test-pitting, metal-detecting or other appropriate investigative techniques.

Riding Court Farm, Datchet, Berkshire

Top: Aerial view of the Early Neolithic causewayed enclosure and oval monument at Riding Court Farm, under excavation. The image shows how the archaeological programme works in advance of gravel extraction. The M4, Datchet and Windsor Castle are in the background

Middle: The Early Neolithic oval monument at Riding Court Farm, excavated in advance of gravel extraction

Left: Early Neolithic cultural material within an oval monument under excavation at Riding Court Farm

Making an informed decision

84 Archaeology is a highly specialised area of knowledge and this can make weighing up the professional judgement of different stakeholders challenging for mineral planners and the planning committee. It is important, therefore, that all documentation relating to archaeological works is written clearly, accurately and concisely with minimal jargon.

85 When employing external contractors, mineral developers are advised to be careful to ensure they enlist professionally accredited consultants and contractors who have the relevant ability, expertise and knowledge to deliver against the specific needs of successful mineral developments and follow relevant professional standards including those published by CIfA. Getting the best advice at an early stage can save significant costs further down the line (the following documents have been produced to assist developers in selecting the most appropriate archaeological consultants and contractors: 'Which Archaeologist? The Procurement of Archaeological Services' (FAME 2014) and 'Professional Archaeology: A Guide for Clients' (CIfA 2015)).

86 For expert archaeological advice and services CIfA maintains a register of accredited organisations and requires its members to meet defined levels of competence (www.archaeologists.net/ro). Consultants advising on procurement of archaeological services are referred to relevant standards (eg the CIfA Standard and Guidance (CIfA 2014b)).

87 Box 7 (overleaf) provides a set of precise questions to assist in establishing whether a mineral development application has met its requirements in relation to archaeology. An adequate application will be able to provide positive answers to each question. These questions can also be informative if a mineral planning application is turned down or appealed on archaeological grounds, providing a checklist against which archaeological work, advice and decisions can be measured.

Box 7: A checklist for archaeological works in support of a minerals application

- ☐ Was a sufficiently thorough and detailed DBA undertaken that took account of remote sensing data (aerial photographs, lidar and satellite imagery) and included a geoarchaeological study of the landforms and deposits within the proposed development area (PDA), and considered what types of archaeological remains have been found within the topsoil, subsoil and within the mineral body itself in the vicinity of the PDA?
- ☐ Has the potential for Palaeolithic and other deeply-buried archaeology been assessed?
- ☐ Was the evaluation work targeted and question led?
- ☐ Was the archaeological evaluation work phased so that one piece of work informed another?
- ☐ Did the evaluation works comprise a suite of methodologies appropriate to the likely depth of archaeological interest (topsoil, subsoil and mineral body) under study, the scale of the site, complementary to each other and with clear objectives?
- ☐ Was the quantity of pre-determination evaluation sufficient, and no more than necessary, to inform the planning decision, including a description and assessment of the significance of any heritage assets within the PDA (including their likely state of preservation) and an assessment of the proposal's impacts on their significance?
- ☐ Was a setting study undertaken to consider the impact on designated heritage assets within and around the PDA and did it follow an explicit and objective methodology, and does it refer to the restoration plan so that the long-term effects of setting can be established?
- ☐ Are the results of the pre-determination archaeological work accurately and correctly summarised in the planning application?
- ☐ Have effects on the significance of heritage assets and their settings been clearly and objectively described?
- ☐ Has an adequate scheme of archaeological post-determination measures been set out, and does it follow a question-led and targeted approach to recording and sampling? This could be set in a Written Scheme of Investigation (WSI).
- ☐ Is the quantity of proposed post-determination works proportionate to the assets' significance?
- ☐ Are the benefits of the development for archaeology clearly stated and are they achievable?
- ☐ Is the archaeological documentation clear and has it been carried out professionally?
- ☐ Has an active approach been taken to community engagement, including opportunities for public engagement, education and involvement as appropriate?
- ☐ Was the work undertaken in alignment with the requirements of the NPPF and did it take into account the PPG, relevant professional standards and this advice note?

88 Following one or more stages of pre-determination works, an informed decision is made by the planning authority to grant or refuse planning permission. If permission is granted, appropriate planning conditions or obligations, such as Section 106 Agreements, will be applied.

89 Permission may be granted subject to a range of conditions, such as archaeological recording or monitoring. On some occasions, a condition may require that archaeological remains identified during the pre-determination evaluation stage are retained and conserved within the scheme (preserved in situ). In addition to the long-term protection of the heritage asset/s this may be beneficial for the developer as this approach may have lower costs than full excavation. A longer-term management plan or agreement may be needed in some circumstances.

90 If archaeology is identified that might warrant being retained within the scheme then sufficient evidence should be collected as part of the decision-making process to determine whether it is likely to survive during and following mineral extraction. This evidence should consider the current state of preservation of the archaeological remains and their burial environment and the likely changes to these, brought about by mineral working or reinstatement. If quarrying is likely to lead to deterioration of the state of preservation, then the archaeological significance will be harmed and long-term preservation is unlikely to be a suitable mitigation method (and excavation or refusal might be more appropriate). Refer to Preserving Archaeological Remains for further advice.

Shardlow quarry, Derbyshire

During the excavation for a quarry haul road at Shardlow sand and gravel quarry in Derbyshire, a Bronze Age boat was discovered within a palaeochannel. As the quarry company already had experience of the excavation and conservation of one log boat elsewhere in the quarry, they were keen to re-route the haul road to avoid impacting the boat and the costs of excavation and conservation.
For more information on this case study, refer to Preserving Archaeological Remains

91 Obligations for operators to carry out comprehensive schemes of investigation before extraction commences, and during the extraction operations, can be applied through planning conditions imposed on the planning permission. Measures introduced through the Neighbourhood Planning Act 2017 mean that pre-commencement conditions must be agreed in writing by the applicant. Additional information is available in the PPG.

92 Including a full WSI for post-permission recording works within a planning application, informed by dialogue between the developer and the mineral planning authority, can be highly advantageous to all parties as it will mean the nature, scope and anticipated costs of the recording is established up front rather than it being left to negotiation post- determination. In some cases there may be merit in producing an overarching WSI that contains the full scope of works required and the general approach with subsequent, short, method statements produced as specific phases get underway. This allows for flexibility as the development progresses with the surety of a defined overall approach. It is to be expected that archaeological programmes will be integrated with the mineral operator's programmes, and that the WSI will reflect this.

93 Restoration is a key element of mineral extraction and one that has been carried out to good effect on many sites. Subject to agreed conditions, it is desirable that plans for quarry restoration are in keeping with the historic landscape character of the site's surroundings. In practice this has to be reconciled with a wider range of interests that may also include the wider historic environment, biodiversity, geodiversity and recreation. It might include the installation of paths, interpretation materials, tidying up and maintenance of a site, re-grading quarried land, targeted planting of trees or shrubs, establishing long term land use practices for areas of preserved remains, or even gifting land to a community, historical or charitable group to ensure the long term care of a site.

Review of Old Minerals Permissions (ROMPs)

94 Very long duration mineral consents (granted mainly by Ministers in the immediate post-war period) are known as Old Mineral Consents. Planning authorities are empowered to review planning permissions at intervals of not less than 15 years. This is initially known as the Review of Old Minerals Permissions (ROMP) process, after which all subsequent reviews are known as Periodic Reviews.

95 The ROMP process enables archaeological (or other heritage) measures to be agreed, which are needed to make the continued working of a mineral acceptable to modern environmental standards. Usually this entails an updated heritage assessment as a minimum, often followed by a scheme of archaeological mitigation and/or the exclusion of areas from the scheme of working. There are different arrangements for 'active' and 'dormant' consents.

96 To address setting issues in the ROMP process, restoration proposals, planting schemes or exclusions may focus on sustaining or better revealing the significance of heritage assets.

97 Local authority archaeologists are consulted on ROMPs, as are the appropriate Statutory Consultees, and they advise planning officers accordingly.

98 If any new conditions are applied through this process which fundamentally affect the economic viability of an operation then compensation will be due (subject to interpretation of the original consent), although such occasions are rare. Where a Scheduled Monument has been designated since the old mineral consent was granted, Scheduled Monument Consent would also be required; however, applicants generally negotiate an appropriate exclusion of land in relation to the monument as part of a holistic scheme of working and cases of compensation claims for refusal of Scheduled Monument Consent are thus very rare.

99 In any case affecting the significance of a Scheduled Monument, highly graded Listed Building, Registered Park and Garden, Registered Battlefield, Conservation Area or World Heritage Site early discussions with Historic England are recommended alongside the Mineral Planning Authority.

4 Post-determination and operational phases

100 A sound, question-led mitigation strategy agreed as part of the planning submission will ensure the resources spent on archaeological work are appropriate and proportionate, directed at maximising information gain, the dissemination of information and the delivery of public benefit.

101 As quarries often have very long operational lives in planning terms it is important that results of evaluation and recording works are published according to a suitable and realistic timeframe. This could be on a staggered basis every few years or on a phased basis once so many phases of the quarry have been completed.

102 It is also important that as each phase of recording/mitigation takes place the research questions and the methodology are reviewed so that the works can adapt or change focus depending on what archaeological material is actually present on site. The principle at work here is to ensure all work stays targeted and focuses only on the work necessary to address the key questions which may change as remains and finds assemblages are excavated. Agreeing defined phases of work also helps to address any issues that may arise from changes in key staff, which are inevitable throughout the life of many mineral operations.

103 Coal extraction is different from that of other minerals as some sites may be worked shortly after a planning consent is granted. Extraction works are typically much more rapid with large topsoil strips undertaken in one phase of work and often with quick lead-in times. Coal and hard rock sites are also usually much deeper which means there is less potential for leaving areas of land behind where preservation in situ could occur. Winning of other mineral types, such as gypsum or peat, may also have special needs.

Box 8: Post-determination activities

The following bullets summarise key activities undertaken by the different roles after a planning application for minerals development has been determined.

Mineral Planning Authority

- Finalising any legal agreements subject to which it was decided that planning permission could be granted
- Issuing the permission
- Monitoring for compliance with planning conditions and legal obligations
- Taking enforcement action where necessary
- Assessing the need for a ROMP review/periodic review (no more frequently than every 15 years)

Local Authority Archaeological Advisers and Historic England (if there is a requirement to consult):

- Advising the planning authority on the discharge of archaeological historic environment planning conditions and any relevant legal obligations and the provision of monitoring advice on the associated works
- Advising on the need for ROMPs and periodic reviews
- Discuss with mineral operator and/or agent post-permission mitigation works

Mineral operators

- Complying with all planning conditions
- Complying with all legal obligations
- Submitting proposals in response to calls for ROMPs and periodic reviews
- Discuss with local authority archaeologist post-permission mitigation works

Approaches to field recording and mitigation

104 It will be important that discussions take place with the local planning authority's archaeological adviser as to the programme of archaeological works that may be required and how this will be secured and the timing of these works (as outlined in Box 8). This would usually be stated as part of an archaeological condition and described in a 'Written Scheme of Investigation' (WSI).

105 The WSI for subsequent mitigation works is a key document equivalent to the 'Method Statement' or 'Project Design' used in other areas of the construction process. The WSI for post-permission mitigation is a critical document that sets out precisely what archaeological works are to be undertaken, their scope and methodology, as well as plans for public engagement and the post-excavation, reporting, archiving and dissemination requirements (see also the relevant Standards and Guidance published by the Chartered Institute for Archaeologists (CIfA) and Good Practice Advice Note 2: Managing Significance in Decision-Taking in the Historic Environment). The WSI is referred to regularly throughout the life of the development.

106 Typically post-permission measures include preservation in situ, excavation (ie recording) and perhaps long-term monitoring (see Box 9). Mitigation measures such as a monitoring and recording brief (commonly referred to as a watching brief), strip, map and sample or set-piece excavation follow relevant professional standards (CIfA 2014e; 2014f). For sites where variable quantities of remains are anticipated then the most reliable way to avoid the loss of potentially significant remains without record is to observe the exposed undisturbed archaeological layer during and after soil stripping. Such a flexible watching brief can be scaled-up to strip, map and sample or scaled down to an intermittent watching brief according to what is encountered. This 'fail-safe' ensures that where there are reasonable grounds for anticipating the presence of buried remains (within the topsoil or subsoil) that could be of some significance, regardless of whether archaeological trenches managed to locate any buried remains, they will be recorded.

107 As the choice of post-permission measures requires a long-term perspective, due consideration should be given to ensuring that solutions are sustainable over the long term. Where archaeological remains are to be retained within the scheme, any changes to the burial environment needs to be factored into the design. For example , if ground water levels will need to be altered, these works could be designed to ensure that archaeological remains do not dry out or suffer from destruction or desiccation as a result of such measures.

Box 9: Commonly used post-determination techniques for archaeological recording

- Fieldwalking
- Analytical earthwork survey
- Watching brief (this may be continuous, intermittent or scalable to strip, map and sample depending on what archaeological remains may be present)
- Recording of exposed sediment faces where Pleistocene deposits are present
- Strip, map and sample
- Area excavation
- Sediment coring and geoarchaeological section recording for palaeoenvironmental investigation
- Trenching, test-pitting, sampling and occasionally sample excavation of palaeoenvironmental features such as kettle holes, enclosed basins, palaeolakes and palaeochannels and Pleistocene deposits

108 Where it is proposed that remains are preserved by retention in the scheme, their state of preservation, significance and capacity to survive a further period of burial need to be assessed. If the remains are waterlogged, then consideration of the present and future water table levels should be carried out, to establish whether there is sufficient water available to sustain the archaeological material in the long term. In most cases long-term monitoring shouldn't be necessary if adequate information is collected prior to the decision-taking point about whether long-term preservation is achievable. Further advice is given in Preserving Archaeological Remains.

109 Given the large areas covered by most mineral developments, different parts of a given site might be subject to different recording techniques. Parts of a site might require no archaeological work, whilst other parts might require a continuous watching brief.

110 The presence of significant palaeoenvironmental features such as kettle holes, enclosed basins, palaeolakes or palaeochannels might require special approaches such as geoarchaeological recording of exposed section faces, sediment sampling, dating and environmental assessment, combined with sample excavation to assess and record any archaeological remains that might be present within them.

111 For sites that might contain buried metalwork (eg bronze hoards), as for example in the Lower Trent Valley, special measures, such as the attachment of a metal detector to a conveyor, might be appropriate as part of the wider scheme of works. In other areas where such remains are anticipated targeted metal detector survey following soil stripping may be appropriate.

112 For sites where Palaeolithic material is known or likely to be present within or on sediment units an intermittent watching brief and training session for quarry staff to recognise and inform on such remains might be appropriate. Arrangements for specialists to record and sample exposed section faces and deposits and recover artefacts and other remains may also be appropriate. Such intervention is likely to occur as part of an iterative approach to mitigation, starting with a stage of deep test-pitting/trenching and deep-penetrating geophysics to more closely define and target the area of potential. On rare occasions where concentrations of Palaeolithic archaeology may be encountered it may be appropriate to undertake excavation of these remains. Where such remains or the possibility for such remains is anticipated, provision can be made to undertake this at an appropriate stage in the extraction of the mineral deposit.

Post-excavation analysis and community engagement

113 A key part of post-permission measures is the assessment, analysis, archiving and dissemination of the remains that come out of the ground and the interpretation of what they mean and how they fit into our broader national history. This 'post-excavation stage' can cost as much as fieldwork, indeed in some cases more than excavation, and it is essential that such work is factored in to the cost of post-permission measures. The amount of analytical work should be proportionate to the significance of the archaeological remains. Proposals for assessment and analysis should be critically reviewed and the appropriate level of such work agreed with the local authority archaeologist shortly after the fieldwork is complete.

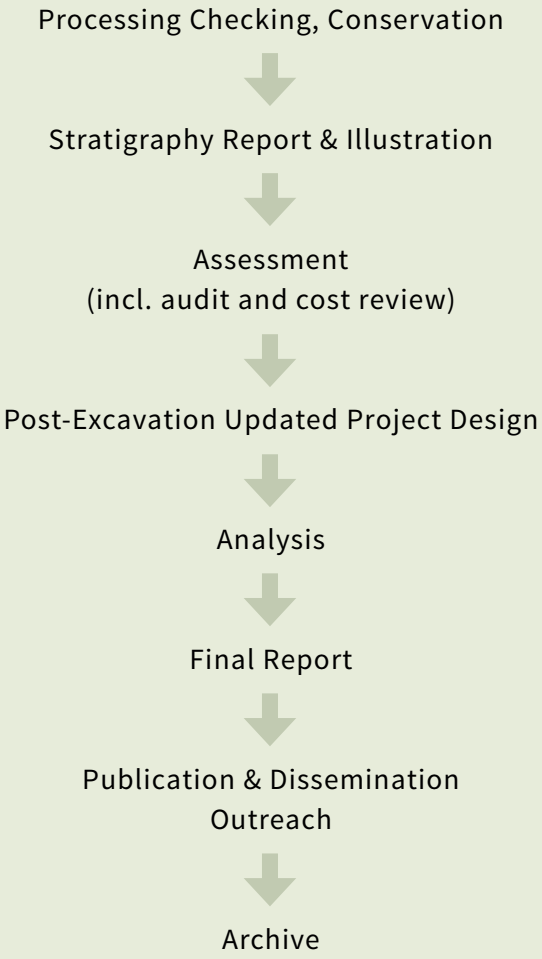
114 Following this, there may be significant opportunities for the developer to undertake interpretative, educational and outreach initiatives to achieve public benefit and gain recognition for their investment in the archaeological resource of an area.

115 Archaeological fieldwork on quarry sites provides a huge opportunity for public engagement, education and involvement, as well as for site tours, open days and on-line content (eg digital site tours, downloadable reports, site galleries, school resources, podcasts etc). When interesting discoveries are made mineral developers and their archaeological contractors might consider inviting local school/s, youth groups, special interest groups, local societies, university groups or other community groups. A local liaison group might be established and this provides an ideal opportunity for keeping the local community informed and up to date as well as aware of any opportunities to join in or visit the excavations. A local university might be interested in any student

training opportunities provided by the fieldwork. Communications can be established by collecting contact details at open days or by local advertisements and communication can be maintained via an email list. Engagement with these groups might also be of assistance in deterring trespass and also 'nighthawks' from damaging a site in search of treasure.

116 Post-excavation work follows an established routine (see Box 10), useful approaches being set out in MoRPHE (a project managers guide - Historic England 2015) and CIfA's various Standards and Guidance documents. It may be clear, based upon the results of the archaeological investigations, that only some of the stages mentioned in Box 10 are required to achieve a satisfactory outcome.

Box 10: The typical phases of post-excavation work that lead through to dissemination and archiving



117 During the post-excavation phase the remains recovered from excavation are assessed to identify what material is worth further analysis given the potential information it could yield. The amount of analytical work should be proportionate to the significance of the heritage asset and the recovered remains.

118 Up to date advice on appropriate techniques and specialists (eg for the conservation of fragile remains) can be sought from the Historic England Science Advisors.

119 Once the results of analysis are available a synthesis report is normally produced that draws together all the archaeological work and interprets it. If a mineral development is of a long duration, or is to be extended, then full reporting, analysis and publication of a site, together with archiving of finds and data, in separate manageable phases should be considered.

Publication and other forms of dissemination

120 Depending on the quantity and significance of the results an appropriate level of publication will be required. This could range from a note in a local archaeological journal through to an academically refereed paper or standalone monograph. One option is to put the relevant archive reports on-line and formally publish a summary of the archaeological investigations in a peer-reviewed journal that refers back to the detailed data in the on-line archive report.

121 For mineral sites that produce an interesting archaeological 'story' they may also lend themselves to the production of a popular book, booklet, ebook, website or phone app.

122 The Online Access to the Index of Archaeological Investigations (OASIS) system means that, ultimately, all formal excavation reports produced for mineral developments as part of the planning system will be stored free of charge by the Archaeology Data Service (ADS) and be made available on-line. This represents a significant value-added service that benefits developers at no expense. However, there is usually a time lag of sometimes a year or so before reports go on-line after initial submission. Therefore, it is worth considering putting reports on-line prior to them being submitted to the ADS to speed up public access. Some HERs make digital reports available either on-line or by request but this is not yet universal.

123 Publication in an accessible format provides only one form of dissemination, albeit perhaps the most highly regarded, for making archaeological evidence available to the public. Archaeological work provides a huge range of opportunities for mineral developers to engage with, and gain recognition from, the public in relation to caring for and championing archaeology. Other forms of dissemination could include open days, site tours, opportunities for volunteers, schools and universities to take part in archaeological fieldwork (see also above), public lectures, talks, walks, school activities, social media, information panels, leaflets, on-line materials, television and other media coverage, displays, reconstructions etc

124 Involvement of schools provides an opportunity for mineral operators to engage directly with their local community and bring the past to life for young people. It also provides an opportunity to show school children around a quarry and to explain how it works, what it produces and why we need them as a society. This can then lead on to some hands-on archaeological experience and learning built around what has actually been found in the ground.

125 The minerals industry measures sustainability indicators in terms of impacts on the natural but not historic environment. Important gains could be made by adopting ways of measuring archaeological outcomes so that they can be included as a sustainability indicator with associated annual metrics or qualitative information.

Archiving

126 An archaeological archive comprises all records and material objects recovered during an archaeological project and identified for long term preservation, including artefacts, ecofacts and other environmental remains, waste products, scientific samples and also written and visual documentation in paper, film and digital form (Perrin et al 2014). The documentary and material archive will be deposited with the appropriate museum, while the digital record will go to the Archaeology Data Service (ADS), the only Trusted Digital Repository that curates archaeological data (as required by footnote 64 of the NPPF:'Copies of evidence should be deposited with the relevant Historic Environment Record, and any archives with a local museum or other public depository').

127 A copy of the digital archive is expected to be deposited with the Archaeology Data Service (ADS) who will update the digital files in future years to ensure they remain compatible with upgrades in software technology. Most local authorities also require a copy of the final report to be uploaded on to the Online Access to the Index of Archaeological Investigations (OASIS) web site (maintained by the ADS).

128 Storage of archives is, however, increasingly challenging as some museums have either stopped accepting archives altogether or charge for deposition, usually on a 'box charge' basis. Normally arrangements for archive deposition are agreed and set out as part of the WSI and so early consultation with the relevant museum is advised. This will normally include obtaining an accession number from the regional museum in accordance with their procedures. In instances where there is no regional museum willing to take an archive then alternative arrangements need to be agreed.

129 The archaeological consultant or contractor should also have a clear selection strategy to determine which archive components, including documents, digital files and material objects, should be included in the archaeological archive. The aim of selection is to ensure that the archaeological archive contains everything required to establish the significance of the project and support future research, outreach, engagement, display and learning activities (CIfA Selection Toolkit). Archives guidance is available from the CIfA Special Interest Group for Archaeological Archives and the Society for Museum Archaeology. Also refer to ALGAO's publication on Planning for Archives. Contact with the local authority archaeological officer and the appropriate archaeological archive repositories (for both physical and digital materials) is essential.

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Relevant Organisations

Association of Local Government Archaeological Officers UK (ALGAO: UK)

British Aggregates Association

British Geological Survey: Centre for Sustainable Mineral Development

Chartered Institute for Archaeologists (CIfA)

Historic England

Mineral Products Association (MPA)

Sources of Information and Advice

Ancient Monuments and Archaeological Areas Act 1979

Association of Local Government Archaeological Officers UK (ALGAO: UK)

Heritage Gateway (A source of information on known archaeological sites and contact details for local HERs)

Historic England general planning advice

Historic England Regional Archaeological Science Advisors

MAGIC The web-based interactive map that brings together information on environmental schemes and land designations in England and is a partnership between six government departments

OASIS

Regional Research Frameworks for the Historic Environment. Each of the English government regions has devised its own regional research framework, some of which have been published as books and others are available on-line. The local authority archaeologist will have the reference for their given area.

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