APPENDIX 1:
NATIONAL MAPPING PROGRAMME

A1.1 INTRODUCTION

A1.1.1 The NMP is generating a comprehensive record of the archaeology that is visible on air photographs for the whole of England. It is an ongoing programme and had covered over 46% of the country as of September 2013.

A1.2 BACKGROUND TO THE SURVEY AREAS

A1.2.1 Stage 1 of the Terrestrial Mineral Resource, Cumbria, project had defined 11 study areas where ‘the potential for the destruction of the archaeological resource was deemed to be greatest as a result of future aggregate extraction’ (OA North 2013, 7). The methodology and rationale for the selection of these 11 study areas was laid out in the project design (op cit, 17-18).

A1.2.2 To meet the requirements of the NMP, the study areas had to be extended to cover full kilometre squares (Fig 4). Parts of some of the extended areas had been dealt with by two earlier NMP-standard projects, namely the Hadrian’s Wall Project (NRHE Event UID 1360986) and the North-West RCZA (NRHE Event UID 1461811) (Small 2008; Bacilieri et al 2009), and so these parts were excluded from this new work. As a consequence, the areas covered by the air photographic and Lidar mapping interpretation element are slightly different from those defined for the present project.

A1.2.3 The NMP survey areas studied covered a total of 102km². The aggregate potential provided the focus for the definition for each of the 11 NMP study areas, all of which lay outside the Lake District National Park, although some of the NMP survey areas did clip the Park boundary.

A1.3 ARCHAEOLOGICAL SCOPE

A1.3.1 Sphere of Interest: the scope of this project broadly mirrors the NMP Sphere of Interest (Winton 2012, section 5). The main aspects that are pertinent to this particular project and any divergence from it are summarised below:

- **Cropmarks, Parchmarks, Soilmarks:** all sub-surface archaeological remains are recorded when visible as cropmarks, parchmarks or soilmarks;

- **Earthworks:** all archaeological earthworks that are visible on aerial photographs or Lidar imagery are recorded. This includes features visible as earthworks on early photographs, but which have subsequently been levelled;

- **Buildings and Structures:** all foundations of buildings visible as cropmarks, soilmarks, parchmarks, earthworks or ruined stonework are recorded. Standing roofed or unroofed buildings are usually more appropriately recorded by other methods, so will not normally be mapped. The exceptions are in specific archaeological contexts (eg industrial and military complexes and country houses), or when associated with other
cropmark and earthwork features. Other unroofed structures, particularly twentieth-century military structures, sheepfolds and shooting butts, can be mapped if considered to be of archaeological significance to the project;

- **Ridge and Furrow**: all medieval and post-medieval ridge and furrow and prehistoric cord rig are recorded, regardless of preservation, according to NMP conventions;

- **Post-medieval Field Boundaries**: exclude post-medieval field boundaries, whether seen as cropmarks, earthworks, or still extant, with the exception of circumstances when they may be of particular archaeological significance (eg when field systems are not mapped by the OS);

- **Parkland, Landscape Parks, Gardens and Country Houses**: this was not particularly relevant to this project, but refer to Winton 2012;

- **Industrial Features and Extraction**: due to this project’s focus on past and future aggregates and minerals, a more inclusive approach was taken to the recording of extraction sites in particular. Small local-use quarries were recorded and all quarries of all dates up to the most recent air photographs were depicted;

- **Transport**: the Sphere of Interest suggests that transport features, such as canals and railways, should not be recorded by the NMP if they are depicted on historical OS maps. The approach of this project was more inclusive, and disused mineral railways in particular were depicted where they were integral to the industrial landscape;

- **Urban areas**: this was not particularly relevant to this project, but refer to Winton 2012;

- **Twentieth-Century Military Features**: all First and Second World War, as well as Cold War features, were recorded;

- **Natural Features**: all natural features which are geological or geomorphological in origin are excluded. If there is risk of confusion in contexts with other archaeological features, then the natural features should be mentioned in the text record but they should not be mapped.

### A1.4 Sources Consulted

A1.4.1 **Air Photographs**: three collections of air photographs were consulted for this project (Table 5). Contact details for these collections are provided in Appendix 2.
<table>
<thead>
<tr>
<th>Collection Name</th>
<th>Quantity consulted</th>
<th>vertical air photographs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>oblique air photographs</td>
<td></td>
</tr>
<tr>
<td>EHA</td>
<td>363 specialist + 5 military obliques</td>
<td>2482</td>
</tr>
<tr>
<td>CUCAP</td>
<td>35</td>
<td>21</td>
</tr>
<tr>
<td>Cumbria County Council</td>
<td>127</td>
<td>21</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>803</strong></td>
<td><strong>2524</strong></td>
</tr>
</tbody>
</table>

Table 5: Air photograph collections and summary of material consulted (includes duplicates between collections)

A1.4.2 *English Heritage Archive (EHA) (formerly NMR):* the vertical, specialist oblique and military oblique air photographs held by the EHA were made available to this project in a series of loans. The prompt and efficient servicing of photographic loans by the Archives team, and in particular Luke Griffin, ensured that this project was able to progress smoothly. A small proportion of photographs could not be loaned and laser copies were supplied *in lieu.* Some recent digital photography was supplied as electronic files because no physical prints have been produced. Unfortunately, there is, as yet, no mechanism for the stereoscopic examination of digital photographs for the NMP, which may have been useful in some cases. The EHA loan reference numbers are given in Appendix 2. These refer to the lists of the loaned photographs and as such are a record of the EHA images consulted for this project.

A1.4.3 *Cambridge University Committee for Aerial Photography (CUCAP) collection:* this project was carried out in collaboration with CUCAP (briefly known as Cambridge University’s Unit for Landscape Modelling), its contribution being the loan of air photographs to English Heritage’s Aerial Survey and Investigation Team (York). Loans were limited to 100 photographs at a time.

A1.4.4 *Cumbria County Council:* the county holds a collection of oblique and vertical air photographs at its offices in Kendal. The vertical air photographs were flown by the RAF, the OS, Fairey Surveys Ltd and Hunting Surveys Ltd. The vertical coverage is inconsistent and not complete, and many of the vertical photographs are duplicates of those held in the EHA. The oblique air photographs are attributed to a variety of organisations and individuals, including CUCAP, Manchester University, T Gates and RH Bewley.

A1.4.5 To facilitate completion of each survey area in turn, the available air photographs in this collection were scanned in advance and the scanned copies were used for interpretation and mapping during the course of the project. Permission to scan the photographs of Tim Gates, solely for the purposes of mapping and interpretation, was sought and granted. Small-scale vertical photographs and those duplicated in the EHA were not scanned. Duplicates of CUCAP photographs were not scanned because these would become available via that collection (Section A1.4.3).

A1.4.6 Digital air photographs supplied through the pan-Governmental Agreement: geo-referenced 0.25m-resolution colour digital air photographs produced by GeoPerspectives were made available to this project through the pan-
Governmental Agreement (PGA). These were supplied as 1km² tiles and were taken on various dates between May 2008 and September 2010. This imagery is a digital-only product (no prints), so it was viewed on screen during the course of mapping from the other photographs and again towards the end of the mapping process for each quarter sheet, to inform the assessment of monument condition.

A1.4.7 **Online digital air photographs:** digital air photographs delivered online by Google Earth were examined and were captured and rectified where necessary. The imagery delivered by Bing was consulted on an *ad hoc* basis as and when information from all other sources was ambiguous.

A1.4.8 **Light Detection and Ranging (Lidar):** Environment Agency Lidar data were available for approximately 55% of the overall project areas. At the outset of this project, this was limited to low-resolution, georeferenced, colour raster images (jpegs) with fixed parameters (eg lighting, azimuth and vertical exaggeration). However, during the course of the project, 1m- and 2m-resolution ASCII data became available and were used in preference to the raster images for the remaining NMP survey areas. The ASCII data were processed either as 16-direction hill-shade models or as a series of single-lit views, depending on the resources available. Digital surface models were examined in preference to digital terrain models, except in areas of extensive tree cover. Figure 5 shows the relative coverage of raster and ASCII Lidar data as used by this project.

A1.4.9 **Existing Site Records:** the textual and spatial monument and event records in the National Record of the Historic Environment (NRHE) were routinely consulted during the course of this project. Existing NRHE monument records were updated with new information from the air photographs and mapping. Where there was no existing monument record pertaining to the archaeological features mapped from the air photographs and/or Lidar imagery, then a new record was created.

A1.4.10 The Cumbria HER supplied monument and events data for the NMP survey areas. This informed the mapping and recording, and the NRHE records that were created or enhanced by this project were concorded with the HER records.

A1.4.11 **Historical Maps:** the historical OS maps delivered through English Heritage’s WEBSiS were consulted in tandem with the air photographs and Lidar imagery. These informed interpretations and where appropriate were identified as a source in the NRHE monument record.

**A1.5 METHODOLOGY AND RECORDING**

A1.5.1 **Mapping Methods:** all of the available air photographs from the specified sources were examined under magnification and stereoscopically where possible. Photographs selected for transcription (rectification and mapping) were then scanned at a suitable resolution; this was usually 300 dpi, and output as uncompressed TIFF format images (.TIFF).

A1.5.2 Scanned images were rectified using the specialist software AERIAL5.33. Control information was mostly derived from the OS Land-Line™ 1:2500-
scale vector maps, which were also used as a base for mapping. Accuracy for
the OS raster 1:2500 maps is in the range of ±2m and acceptable tolerance for
rectification of photographs is generally ±2.5m.

A1.5.3 Rectified images were output from AERIAL in uncompressed TIFF format at a
minimum resolution of 300 dpi and a scale of 1:2500.

A1.5.4 Individual digital maps for each survey area were created in MAPINFO
Professional 11.5. The rectified images (air photographs and Lidar) were
placed into the relevant map drawing and the archaeological features were then
digitised from the images, observing the NMP standards (Winton 2012).

A1.5.5 **Recording Strategy:** there are two strands to the NMP recording strategy and
these were both employed for this project. The main strand is the creation of
new, or the enhancement of existing, monument records in the NRHE. The
NMP-generated entries or enhancements for each monument or monument
group in this database record the location, the monument types present and
their dating, the latest condition, a free-text description of the monument or
monument group, the source of record information (i.e. photograph and any
bibliographic or cartographic references) and administrative details such as
concordance with SMR/HER records, record authorship, and links to NRHE
event records and archives.

A1.5.6 To assist in the management and querying of the map data in a GIS or in
Autodesk Map® environment, selected monument data are attached to each
individual mapped feature (Table 5). The content of this data table is listed
Appendix 2.

A1.5.7 **Quality Assurance:** during the lifetime of the project, the air photographs,
mapping and recording for sample areas were examined and checked by
English Heritage’s own Aerial Investigators to ensure the product met the
required standard for the NMP.

A1.6 **BRAMPTON KAME BELT**

A1.6.1 The Brampton Kame Belt area is split into two by the Hadrian’s Wall NMP
Project (Small 2008; Fig 4). The two parts are quite distinct, with the northern
being dominated by the moorland fringe, small pasture fields and wooded
valleys, and the southern part being characterised by hummocky moraines and
larger fields.

A1.6.2 Considerable numbers of new monuments were recorded in this survey area
(Table 6). No monuments of Neolithic or Bronze-Age date were identified,
however. This agrees with the general paucity in the NRHE of finds or
monuments from these periods in this area.

<table>
<thead>
<tr>
<th>Survey Area</th>
<th>Brampton Kame Belt</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area covered (km²)</td>
<td>13</td>
</tr>
<tr>
<td>No new NRHE monument records</td>
<td>75</td>
</tr>
<tr>
<td>No enhanced NRHE monument records</td>
<td>5</td>
</tr>
<tr>
<td>No records concorded with HER monuments</td>
<td>15</td>
</tr>
</tbody>
</table>

*Table 6: Brampton Kame Belt: new and enhanced sites*
A1.6.3 Although most of the features recorded are earthworks of medieval or later date, the hummocky moraine to the south and east of Tarn Lodge Farm, Castle Carrock, has produced cropmarks that may be of earlier origin (UID 1029653, PN 553, Fig 20). Long ditches, 600m and more in length, cross east to west between the B6413 and the farm, with one long and several short sections extending north to south across these. An earlier assessment of recent aerial reconnaissance indicated that these linear features extended beyond the survey area and formed a fairly cohesive field system (Small 2008). A fragment of a possible contemporary enclosure is recorded a little to the north (UID 1573368, PN 8830), and another more substantial rectilinear enclosure lies to the west (UID 1573369; NGR 352860 554430). These features have been identified in the HER as being of possible Iron Age or Roman date, although the dating of the latter enclosure is more equivocal.

A1.6.4 In the northern area, cropmarks near Williamgill Wood suggest the presence of two Iron Age or Roman rectilinear enclosures (UID 928546, PN 884, Fig 17). Cropmarks in this part of the Brampton Kame Belt survey area are otherwise very rare.

A1.6.5 Cultivation ridges are fairly extensive in the northern area but appear to be absent in the southern strip, although this is likely to reflect differential preservation rather than the real extent of historical cultivation. Most of these features are in the form of narrow ridge and furrow and date to the post-medieval period. Some of the ridges are broader, but only those on the north bank of Coal Fell Beck have been identified as being of medieval origin; most are attributed to the medieval and/or post-medieval periods because specific dating information is lacking.

A1.6.6 The remains of several different post-medieval extractive industries are to be found in the northern part of this survey area. In the east, the landscape is dominated by Clowsgill Limeworks and its associated infrastructure (UID 12504, PN 885, Fig 17). The large quarry and internal features, including limekilns, an incline plane, the bed of a conveyor, and several structures, appear to be well preserved. The limeworks were served by the Tindale Fell Waggonway and the Blackside Railway (shown as dismantled railway on Figure 17), and parts of these survive as earthworks (UID 1573284, UID 1573219 and UID 1573229, PN 886, PN 414 and PN 887).

A1.6.7 To the east of Clowsgill Limeworks, on the slopes of Coal Fell Beck, the earthworks remains of a complex history of coal extraction are present. These include clusters of small extraction pits (eg UID 1573193, PN 888), larger single shafts with substantial rings of spoil (eg UID 1573166, PN 889), adits (eg UID 1573180, PN 900), and the Howard Pit drift mine (UID 963436, PN 901). Intriguingly, amongst these, on the north side of the beck, there is a series of tofts and building platforms, and fields arranged around several well-defined hollow-ways (UID 1573191, PN 902). These may have been a post-medieval settlement and/or processing area associated with the coal extraction, but an earlier origin for these earthworks cannot be discounted on the present evidence. These remains were not previously recorded in the NRHE.

A1.6.8 To the west of Clowsgill Limeworks, the features that were mapped comprise mainly the medieval and/or post-medieval cultivation ridges (PNs 937-47), small discrete quarries (eg UID 963430, NGR 356960 558397), some with
limekilns (eg UID 958433, NGR 356370 557986), and some incised trackways (eg UID 1573306, NGR 355697 558077) of likely post-medieval origin.

A1.6.9 Of particular note is a small group of earthworks at Moss Pladdow. These comprise walled and ruined walled boundaries of likely post-medieval date (UID 1573309, NGR 355949 557822) but within them, a small group of mutilated earthworks was noted that appear to represent small embanked or walled enclosures (UID 1573311, NGR 355930 557765 and NGR 355943 557849). Whether these are the remains of stock enclosures or roundhouses, and their date, are not known.

A1.7 LOW PLAINS

A1.7.1 Again, a relatively large number of sites was recorded in the Low Plains survey area (Table 7), and it is rich in prehistoric and Roman-period earthworks and cropmarks. Just below the ridge near Castlerigg Castle, there is a cropmark of a ring ditch that may indicate the remains of a Neolithic or Bronze-Age burial mound (UID 1573713, PN 903, Fig 27). The ring ditch is slightly oval in plan, which may suggest that this monument was more complex than a single-phase round barrow. On the opposite side of the valley, in the field to the north-east of Low Plains Farm, is a possible Iron Age palisaded enclosure (UID 1573681, PN 14). It is visible as a very narrow cropmark ditch or gully outlining a rectilinear enclosure with bowed sides. The enclosure appears to be cut by a field boundary of possible later Iron Age or Roman date (Section 19.4.5).

<table>
<thead>
<tr>
<th>Survey Area</th>
<th>Low Plains</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area covered (km²)</td>
<td>11</td>
</tr>
<tr>
<td>No new NRHE monument records</td>
<td>43</td>
</tr>
<tr>
<td>No enhanced NRHE monument records</td>
<td>16</td>
</tr>
<tr>
<td>No records concorded with HER</td>
<td>25</td>
</tr>
</tbody>
</table>

*Table 7: Low Plains: new and enhanced sites*

A1.7.2 Three hill-top enclosures of possible Iron Age or Roman date were recorded in this area. Two lie on local promontories and opposite one another on either side of a small valley (UID 1454250 and UID 1573704, PN 263 and PN 904) The third sits higher up, on the edge of Blaze Fell (UID 11356, PN 905). The two lower examples appear to be fairly simple ditch-defined enclosures, with only slight hints of internal or external features. The third example is defined by a more substantial ditch, with hints of an internal counterscarp and internal divisions. However, these differences may simply be the result of differential survival, since the latter is a substantial earthwork, whilst the two lower-lying enclosures have been truncated by modern ploughing.

A1.7.3 In the low-lying fields between the A6 and Blackrack Beck, there are traces of three rectilinear enclosures which may also date to these periods (UID 1573644, UID 1573647 and UID 1573648, PN 906, PN 63 and PN 264).
Unfortunately, the cropmark evidence there is rather ambiguous and they thus warrant further specialist reconnaissance.

A1.7.4 A significant feature in this survey area is the presence of numerous long linear boundaries. These have been recorded on Thiefsid Hill and the lower southern slopes of Blaze Fell (eg UID 1573628 and UID 1473670, PN 907 and PN 259). Most of these features are single-ditched, but there is a group of them that converge towards the A6 on the south-east side of Thiefsid Hill and which are double-ditched and may have been trackways (ie UID 1573629, UID 11364 and UID 1573638, PNs 908-10). Together, the boundaries and trackways appear to comprise a large and slightly irregular system of land division. This may have been associated with the Roman farmstead at Petterigreen (UID 11351, PN 911) on the north-west side of Thiefsid Hill, but may have had its origins in the Iron Age.

A1.7.5 The Petterigreen Roman farmstead is a substantial rectilinear enclosure defined by a broad rampart with inner and outer ditches (UID 11351, PN 911), surrounded by fields defined by ditches and trackways (UID 927416, PN 912 and PN 371). This farmstead was 700m to the west of the Roman road between Brougham and Carlisle (UID 1031541; PN 61). In this area, the A6 follows the course of this Roman road, except at Thiefsid Hill, where the modern route briefly diverts to the east around the hillside, and the remains of the Roman road are visible as distinct parchmarks on the air photographs (UID 1573635, PN 270 and PN 913).

A1.7.6 Three of the earthwork enclosures recorded on Lazonby Fell, near the southern edge of this study area, had been identified as being of medieval date within the NRHE record descriptions (UID 12466 and UID 12463). No new evidence arose from this work to contradict this. Two of the enclosures comprise low and indistinct earthworks (UID 12466, NGR 350137 540329), the larger being irregular in plan, and it apparently encircles a small knoll; the second appears to be cut by the north-eastern circuit of the larger, although a subsequent field inspection had concluded that these earthworks were indecipherable (UID 12466). The third enclosure sits slightly upslope and 540m to the east (UID 12463, NGR 350676 450419). In recent decades, it has been under woodland plantation and so has been obscured on most recent air photographs and but a site inspection concluded that a medieval origin was plausible (UID 12463).

A1.7.7 There is very little earthwork or cropmark evidence of other post-medieval activity in this survey area. Ridge and furrow of any date is relatively sparse and the large-scale extractions at Low Plains (UID 1573671, PN 257) and near Abbots Moss Farm (UID 1573696, PN 374) did not start until the twentieth century.

A1.8 CARDEW MIRES

A1.8.1 A relatively large number of new sites was recorded in the Cardew Mires survey area (Table 8). No monuments of Neolithic or Bronze Age date were identified, and this agrees with a general paucity in NRHE records of finds or monuments of these periods in this area.
<table>
<thead>
<tr>
<th>Survey Area</th>
<th>Cardew Mires</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area covered (km²)</td>
<td>10</td>
</tr>
<tr>
<td>No of new NRHE monument records</td>
<td>35</td>
</tr>
<tr>
<td>No of enhanced NRHE monument records</td>
<td>3</td>
</tr>
<tr>
<td>No of records concorded with HER monuments</td>
<td>6</td>
</tr>
</tbody>
</table>

Table 8: Cardew Mires: new and enhanced sites

A1.8.2 Three areas of possible Iron Age or Roman-period remains are in evidence on the air photographs. Near Cardew Hall, the cropmarked enclosures, trackways and fields that lie on the eastern side of Gill Beck have been scheduled as an undated settlement (UID 10507, SM1007206, PN 914, Fig 32). The visible remains are contained within a single modern field unit but are likely to extend further unseen. The scheduled area only encompasses the two enclosures and not the associated trackway or fields.

A1.8.3 In the Cardewleeas area, there is an extensive network of long single- and double-ditched linear features which appear to be the remains of a system of land division of possible Iron Age or Roman date (UID 10802 and UID 1574064, PNs 915-16). The evidence for settlement amongst these boundaries is equivocal. Two circular features north of Barras Brow that are defined by vigorous nettle growth have been interpreted as roundhouses (UID 10802, PN 915); a more circumspect interpretation of these features as pits has been made by this project, however. A small circular enclosure identified on the north side of Dalston has, though, been posited as a possible roundhouse (UID 1574064, PN 916). The latter feature was recorded from the PGA digital air photographs and it is clear that this area would benefit from further specialist reconnaissance.

A1.8.4 Further west, on the banks of Nealhouse Beck near Wood Farm, there are cropmarks indicating a curvilinear enclosure, a trackway and fragments of field boundaries (UID 1574035, NGR 333411 550143 and UID 1574033, NGR 333113 550760). Again, these are likely to be of Iron Age and/or Roman date. These three groups of cropmarks are all on slowly permeable soils, which indicates that there is potential even where the conditions for cropmark formation appear unpromising.

A1.8.5 Ridge and furrow is fairly widespread across this area but it is arranged in relatively small clusters of strip fields, some with broad ridges but others with later narrow ridge and furrow. Other post-medieval remains in this area are two possible construction camps sited alongside the Maryport and Carlisle railway (Fig 32; Section 10.5.5). They are of similar plan and comprised a large elongated rectilinear terrace or enclosure, and several building platforms or footings (UID 1574048, PNs 295-9, and UID 927357, PN 917).

A1.8.6 The late post-medieval small-scale extractions that are common in many of the NMP survey areas are seemingly absent in this area. The large-scale
extractions at Cardew Mires are of twentieth-century origin (UID 1574036, PN 291).

A1.9 ABBEYTOWN RIDGE

A1.9.1 The small Abbeytown Ridge NMP survey area lies to the east of, and is contiguous with, parts of the Hadrian’s Wall NMP Project (Small 2008). This is a small area which yielded relatively few sites (Table 9), no earthworks, only a small number of cropmarked ditches and a twentieth-century structure.

<table>
<thead>
<tr>
<th>Survey Area</th>
<th>Abbeytown Ridge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area covered (km²)</td>
<td>3</td>
</tr>
<tr>
<td>No of new NRHE monument records</td>
<td>7</td>
</tr>
<tr>
<td>No of enhanced NRHE monument records</td>
<td>1</td>
</tr>
<tr>
<td>No of records concorded with HER monuments</td>
<td>0</td>
</tr>
</tbody>
</table>

*Table 9: Abbeytown Ridge: new and enhanced sites*

A1.9.2 No monuments of Neolithic or Bronze Age date were identified by this project in this study area. This agrees with a general paucity in the NRHE records of finds or monuments of these periods in this area.

A1.9.3 This NMP survey area covers the eastern extents of the extensive Holme Abbey Ridge cropmark complex (Higham and Jones 1975, fig 4). This complex comprises a landscape of Iron Age and/or Roman settlements, field boundaries and dyke systems. Within the NMP survey area, only a few possible field boundaries are visible (eg UID 1574197, PN 918, Fig 38). Most of the Holme Abbey Ridge cropmarks are located on freely draining sandy soils but they peter out in the NMP survey area, where the cropmarks are formed on slower permeable soils. Again, this indicates the potential for unpromising areas to produce evidence, and further reconnaissance may be warranted. One of a pair of twentieth-century direction finders is visible as a structure on Common Moss (UID 1473538 PN 919). The other (UID 1469228, PN 470) was recorded by the Hadrian’s Wall NMP Project (Small 2008).

A1.10 MOOTA

A1.10.1 The Moota NMP survey area is contiguous with the Hadrian’s Wall NMP Project (Small 2008) to the west. As perhaps might be expected, a relatively large number of sites was recorded (Table 10). No monuments of Neolithic or Bronze-Age date were identified by the project, however, and this in part reflects a general paucity of NRHE records of finds or monuments of these periods in this area.
<table>
<thead>
<tr>
<th>Survey Area</th>
<th>Moota</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area covered (km²)</td>
<td>7</td>
</tr>
<tr>
<td>No new NRHE monument records</td>
<td>49</td>
</tr>
<tr>
<td>No enhanced NRHE monument records</td>
<td>1</td>
</tr>
<tr>
<td>No records concorded with HER monuments</td>
<td>3</td>
</tr>
</tbody>
</table>

**Table 10: Moota: new and enhanced sites**

A1.10.2 The Egremont to Carlisle Roman road (*Section 12.5.4*) is one of only two monuments previously recorded in this area in the NRHE. Although in the NMP survey area, this route is largely followed by the A595, but up to three possible sections of the Roman road are visible on the air photographs. In the fields south-west of Williamgate, cropmarks and low earthworks reveal a section of road and possible roadside ditches along the projection of the Roman road, where the A595 takes a slightly more southerly route (UID 1325580, PN 51, Fig 46). North-east of Threaplands Gill, the A595 again takes a more southerly path and its Roman precursor can be seen as cropmarks running in a more northerly orientation in a neighbouring field (UID 1574426, NGR 316715 537991).

A1.10.3 At Threaplands Gill itself, a hollowed way descends and ascends the banks of the gill on the alignment of the Roman road (UID 1574415, NGR 316263 537313). On the post-War air photographs, the modern road crossed the gill a little farther south, but this diversion was straightened out in the late twentieth century. Part of the hollow-way is depicted on the OS map of 1867 (OS 1867e), where it ran through Threapland Wood (now removed). This was probably in use in the post-medieval period, but it may have been part of the original Roman route.

A1.10.4 A significant element of this landscape is the pattern of long narrow fields that flank either side of the Roman road near Blinderake (*Section 12.5.6*). Now fossilised by hedges and walls, these fields are relics of a medieval strip-farming system that relates to the adjacent village of Blinderake. This project has identified the presence of medieval ridge and furrow within many of the strip fields and suggests that some ridges may still survive as earthworks. The village of Blinderake and the fields south of the road are a Conservation Area (LDNPA 2011) and the character of the fields is cited as one of the points of special interest that justifies its status (LDNPA 2011; UID 1574382, NGR 314588 535027).

A1.10.5 The second pre-existing monument record in this area was for a Prisoner of War (PoW) camp at Moota Hill (UID 1474045, PN 920). Camp 103 served as a PoW camp during the war and then as a Displaced Persons Camp in the immediate post-War period (Thomas 2003). The early vertical photographs show the layout of the camp, and more recent photography indicates that some of the buildings are still in situ.
A1.11 TENDLEY

A1.11.1 A relatively large number of sites was recorded in the Tendley survey area (Table 11). No monuments of prehistoric or Roman date were identified by this project, however, although a few Neolithic and Bronze Age finds have been recorded there (eg UID 8851, UID 8871 and UID 9032, PN 149, PN 151 and PN 571; Fig 51). The remains of ridge and furrow are present in many of the fields within this area, particularly around the two villages of Brigham and Eaglesfield. Some strips of possible medieval ridge and furrow have been recorded (eg UID 1574731, PNs 582-4, and UID 1574824, PN 602, PNs 627-9 and PNs 654-6), although these are far more fragmentary and dispersed than in the landscape around Blindcrake, which lies a short distance to the north-east (see Section A1.10). In common with the other areas, dating for most of the ridge and furrow is ambiguous, it having neither the broad, S-bend character of medieval plough ridges nor the very straight and narrow form of post-medieval ploughing (Eyre 1955).

<table>
<thead>
<tr>
<th>Survey Area</th>
<th>Tendley</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area covered (km²)</td>
<td>10</td>
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<tr>
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</tr>
<tr>
<td>No records concorded with HER monuments</td>
<td>8</td>
</tr>
</tbody>
</table>

Table 11: Tendley: new and enhanced sites

A1.11.2 The air photographs did yield some evidence of possible abandoned settlement remains around Eaglesfield (UID 1574725, UID 1574721 and UID 1574718, PNs 921-3). These include parchmarks that appear to relate to a group of structures that are depicted on the OS map of 1881 (OS 1881), but the other features may be older.

A1.11.3 This NMP survey area is dominated by two main industrial complexes: the limeworks at Brigham; and the Tendley Hill Quarry. Nineteenth-century OS mapping (OS 1881) indicates that the complex at Brigham was large and included limekilns, trackways, tramways and a coal depot, as well as deep excavations. It is not clear whether the complex was still in use on the earliest air photographs (1946), but certainly the quarry floors had been colonised by shrubs and trees at that time. This complex is now largely obscured by vegetation and some parts have been landscaped, so it not clear which historical elements still survive.

A1.11.4 By contrast, the Tendley Hill Quarry has expanded in recent decades (UID 1574742, PN 328). In doing so, it has subsumed a number of quite small individual pits and limekilns that were depicted on the OS map of 1864 (OS 1864a; 1864b; 1864c; 1864d) and were still extant on the earliest air photographs.
A1.12 Eskett and Rowrah

A1.12.1 The Eskett and Rowrah area contains a large number of monuments (Table 12), and is one of the more industrialised landscapes covered by this project. Aside from the trace of a possible Roman road at Frizington Parks (UID 1576115, PN 924, Fig 58) and a fragment of possible medieval ridge and furrow near Rowrah Hall Farm (UID 1576443, PN 701), most of the features recorded in this area pertain to the post-medieval period or later.

<table>
<thead>
<tr>
<th>Survey Area</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Area covered (km²)</td>
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</tr>
<tr>
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<td>0</td>
</tr>
<tr>
<td>No records concorded with HER monuments</td>
<td>25</td>
</tr>
</tbody>
</table>

Table 12: Eskett and Rowrah: new and enhanced sites

A1.12.2 Two main industries were active in this NMP survey area: ironstone mining and limestone quarrying. Most of the ironstone mines were active in the nineteenth century and are depicted in some detail on the OS maps of that time. In many cases it has been possible to reconcile earthwork shafts, spoil heaps and some structures with individual mines that are named on the historical maps (e.g. UID 1576146, Eskett and Eskett Park Iron Ore Mines PN 212, PN 215, PN 217, PNs 355-6, and PNs 223-8). This project has also recorded some of the infrastructure that was associated with the mines, namely the tramways and mineral railways (e.g. UID 1576127, PN 354). Most of the ironstone workings appear to have been abandoned by the date of the earliest air photographs (1946).

A1.12.3 Limestone extraction is concentrated at five main locations: Yeathouse Quarry (UID 1576156, PN 925); Eskett Quarry (UID 1576183, PN 360); at Rowrah (UID 1576183, PN 360); Stockhow Hall Quarry (UID 1576234, PN 926); and Kelton (UID 1576251, PN 927). All of these quarries originate from small nineteenth-century workings. The Yeathouse and Stockhow Hall works had been abandoned by the 1940s but the others have expanded in recent decades. In between the modern workings and landscaping, some historical remnants of these industries do survive, particularly at Yeathouse and Stockhow Hall quarries, and at the north ends of the Rowrah and Kelton complexes.

A1.12.4 Regarding the air photograph coverage, unusually, there is a slight gap between early vertical sorties in the vicinity of kilometre square 305 516. Historical maps (OS 1867c) show that there were ironstone workings in this area. The problem is compounded because, by the 1960s, the date of the next available photographs, Eskett Quarry had already expanded and subsumed many of those workings. Fortunately, the OS historical maps (e.g. OS 1867c; 1900e) serve as a record of what has been lost.
A1.13 PEEL PLACE

A1.13.1 The Peel Place study area is contiguous with the NW RCZA project (Bacilieri et al 2009) to the west. The NMP study area produced a relatively large number of sites (Table 13), but, although the surrounding area is relatively rich in Neolithic and Bronze-Age finds, notably lithics, no monuments of Neolithic or Bronze-Age date were identified by this project.

<table>
<thead>
<tr>
<th>Survey Area</th>
<th>Peel Place</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area covered (km²)</td>
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<td>1</td>
</tr>
<tr>
<td>No records concorded with HER monuments</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 13: Peel Place: new and enhanced sites

A1.13.2 There is, however, a pair of enclosures of speculative later prehistoric origin on the north side of Drigg (UID 1579049, NGR 366701 499423). These are in the form of two hedged fields, one oval in plan with an out-turned entrance, and the other of rather irregular shape. A small part of the hedging has been removed and has exposed a broad but seemingly shallow ditch. If not prehistoric, these features may have their origins in the medieval period.

A1.13.3 Most of the other monuments in this area are either ridge and furrow or quarries. A considerable proportion of the ridge and furrow is of the narrow form and of likely post-medieval date; the remainder may be of medieval and/or post-medieval origin.

A1.13.4 There are a few historical quarries in this area, including the excavations at Drigg Cross (UID 1579029, PN 928, Fig 64) and near Seascale Hall (UID 1579067, NGR 304222 502806). The larger workings, comprising the sand pit between Newton Wood and Fleming Hall (UID 1579003, NGR 305361 502772), and the quarries at Seven Acres (UID 1579013, PN 929) and near Peel Place (UID 1579019, PN 279), appear to have started in the mid-twentieth century or later.

A1.14 GHYLL SCAUR

A1.14.1 The Ghyll Scaur NMP survey area is contiguous with the NW RCZA project (Bacilieri et al 2009) to the east. Whilst identifying a relatively large number of sites (Table 14), this project did not identify any monuments of Neolithic or Bronze-Age date in this area, which agrees with a general paucity in the NRHE of any finds or monuments of any periods for this area.
Table 14: Ghyll Scaur: new and enhanced sites

<table>
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<th>Ghyll Scaur</th>
</tr>
</thead>
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<td>9</td>
</tr>
<tr>
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<td>47</td>
</tr>
<tr>
<td>No enhanced NRHE monument records</td>
<td>1</td>
</tr>
<tr>
<td>No records concorded with HER monuments</td>
<td>6</td>
</tr>
</tbody>
</table>

A1.14.2 This area is generally devoid of any cropmarks, so the two locations at which cropmarks were observed have significance for their rarity. Both were located in the north-west, by the side of Whicham Beck. Near Topping Moss Plantation, a sub-circular embanked feature is visible as a slight earthwork on earlier air photographs and as a cropmark on later (UID 1577369, PN 930, Fig 70). Approximately 1km upstream, a group of linear cropmarks and soilmarks appears to suggest enclosures and boundaries (UID 1577372, NGR 315837 483980). However, it is far from certain that any of these features are of archaeological origin.

A1.14.3 Cultivation ridges are fairly widespread in this area, except within the bounds of Millom Park. Although today the park is largely under plantation or has been taken by the Ghyll Scaur Quarry, most of the land surface was visible on air photographs up until at least 1972, and the absence of evidence for ridge and furrow appears to be an accurate reflection of its distribution. Beyond the park, very little of the ridge and furrow could be confidently identified as being medieval in origin. Of potential interest, though, are two low, broad banks (UID 1577435, NGR 318422 484964) near Arnaby that appear to be cut by medieval or post-medieval plough furrows (UID 1577433, NGR 318405 484880). These resemble plough headlands and may indicate an earlier phase of cultivation.

A1.14.4 Interestingly, around Greenhills (UID 1577487, PNs 829-37) and Crosshouse Hill (UID 1577457, NGR 317759 484248), evidence for the medieval and/or post-medieval ploughing continues up to and between the rocky outcrops that characterise this landscape. This might indicate that there were considerable pressures to bring such difficult terrains into cultivation.

A1.14.5 Some of the ridge and furrow is divided into fields by low, narrow banks or exposed walling. Many of these are depicted on historical OS mapping (OS 1867d) and so in general have not been duplicated for this survey, but where they have not they are recorded (eg UID 1577487, PNs 829-37). Of potential significance are the boundary remains found within the otherwise unenclosed north part of Millom Park (UID 1577405, PN 221).

A1.14.6 Quarrying activity in this area is characterised by small post-medieval quarries (eg UID 1577402, PN 43, UID 1577422, NGR 317211 484884, and UID 1577411, NGR 316264 481245). Only one such quarry developed into a larger
operation and this was the Ghyll Scaur granite quarry in Millom Park, which covered an area of approximately 21ha in 2010.

### A1.15 ROOSECOTE

A1.15.1 The Roosecote NMP survey area is contiguous to the south with the NW RCZA Project (Bacilieri et al 2009). The NMP survey revealed relatively few monuments (Table 15), although it contains several intriguing features of possible to likely later prehistoric or Roman date. Perhaps the most significant of these is the spread of cropmarked features recorded in the Catty Crook Lane area (UID 1572108, PN 881, Fig 75). The dominant features are a large rectilinear enclosure, which appears to contain an avenue defined by large pits, and at least two circular enclosures, though this relationship may be coincidental. Beyond the enclosure, there is a third circular enclosure and a large rectilinear pit, which appears to be aligned with the pit avenue. The pit arrangement might suggest a monument of Neolithic of Bronze-Age ritual purpose and so the circular enclosure might be the remains of round barrows or related monuments. However, the enclosure itself may as readily be of Iron Age or Roman date as of earlier origin and, in this context, the circular enclosure could be the remains of roundhouses.

<table>
<thead>
<tr>
<th>Survey Area</th>
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<tbody>
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<td>Area covered (km²)</td>
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<td>No enhanced NRHE monument records</td>
<td>1</td>
</tr>
<tr>
<td>No records concorded with HER</td>
<td>5</td>
</tr>
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</table>

*Table 15: Roosecote: new and enhanced sites*

A1.15.2 There are many ditches around the enclosure which appear to be from a system of land division, albeit rather fragmentary (UID 1579334 and UID 1579335, PNs 931-2, and UID 1579340, NGR 325338 468830). These features were identified by recent archaeological reconnaissance and were initially recorded by the English Heritage Aerial Reconnaissance (North): 2010-11 Programme (UID 1570057; English Heritage 2011b).

A1.15.3 By contrast, the two possible Neolithic or Bronze-Age round barrows identified just to the north of Moor Head Cottage are only recorded on vertical photographs (UID 1579508, PN 318, and UID 1579512, PN 316). Similarly, the faint cropmarks indicating a small Iron Age or Roman rectilinear enclosure with internal roundhouses, near Dungeon Lane (UID 1579320, PN 875), are only visible on recent imagery published on Google Earth. From a monument protection viewpoint, both sets of features would in the first instance benefit from specialist reconnaissance to establish their validity, or otherwise. Ridge
and furrow is sparsely distributed in this area, and is of medieval and/or post-medieval origin.

A1.15.4 This area also contains two Second World War features associated with the protection of the strategically important ports and industrial complexes at Barrow-in-Furness. They are a pillbox near the A5087 near Roose (UID 1429744, PN 933) and, on the opposite side of the road, the remains of a barrage balloon site (UID 1579305, PN 934).

A1.16 ROAN EDGE

A1.16.1 Prior to this mapping exercise, there were no monuments in this NMP survey area in the NRHE (Table 16). This work has revealed several possible sites of potential later prehistoric date, although, these are very cautious interpretations because of the nature of the remains and the available evidence.

<table>
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<tr>
<th>Survey Area</th>
<th>Roan Edge</th>
</tr>
</thead>
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<td>Area covered (km2)</td>
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<td>3</td>
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</tbody>
</table>

Table 16: Roan Edge: new and enhanced sites

A1.16.2 ASCII Lidar data for the Roan Edge area were available for manipulation and interrogation. These data appear to show the low earthworks of an embanked oval enclosure (UID 1576797, PN 312, Fig 81), a little to the west of the Roan Edge Quarry (UID 1576752, PN 309). It lies on high ground but in an inferior position, close to an area of issues and collects, and measures approximately 45 x 34m. It is not obviously visible on any of the vertical air photographs that cover this area and there is no specialist coverage. This feature is morphologically similar to others in the wider area that are thought to be of later prehistoric date (eg UID 1574607, NGR 364907 476350) but a medieval origin cannot be discounted, if the feature is indeed of archaeological origin.

A1.16.3 This area has produced the only identified examples of later prehistoric cord rig in the whole project. These characteristically narrow and uneven cultivation ridges are visible on the east side of the M6 on the western slopes of Drybeck Hill (UID 1576927, PN 882, and UID 1576929, PN 878). If they can be confirmed as cord rig, they might indicate that there was contemporary settlement in the area.

A1.16.4 There is a small earth disturbance by the side of the more northerly patch of cord rig, which resembles the remains of a scooped hut platform (UID 1576801, PN 877). However, the OS map of 1860 (OS 1860) also marks a triangulation station in the same area, which may explain the disturbance. A
second possible roundhouse is visible further north, between Spanisshaw Beck and the M6 (UID 1576800, PN 879). The oval enclosure, cord rig and two roundhouses all require ground-based investigation to validate their presence and these interpretations. Evidence of medieval or post-medieval ploughing is relatively sparse in this study area.

A1.16.5 One significant feature that was probably in use in the post-medieval period, but may have had earlier origins, is the long trackway across New Hutton Common, from Latterhowe Bridge towards Drybeck Hill (UID 1576749, PN 308, and UID 1576741, PN 935). Some sections have been destroyed by the Roan Edge Quarry (UID 1576752, PN 309) but, beyond this, it is defined by some deeply-incised hollow-ways.

A1.16.6 Until the 1980s, quarrying activity in this area was represented by a sparse distribution of small and abandoned post-medieval pits (eg UID 1576792, PN 310, and UID 1576934, PN 936). However, at the end of the decade, one of these pits, the Roan Edge Quarry (UID 1576752, PN 309), was reopened and extended, and now covers over 30ha.

A1.17 PROJECT REVIEW

A1.17.1 A review was undertaken of the aims defined in the project design (OA North 2013, 9-10):

- **Aim 1**: to contribute to English Heritage SHAPE sub-programme 32111.110 National Mapping Programme: recording and mapping archaeological landscapes using aerial photographs (English Heritage 2008). This project has contributed 102km² of mapping to the programme.

- **Aim 2**: to identify, characterise, and map, using a GIS, Cumbria’s historic environment resource in relation to areas of past and potential future extraction of sand and gravel.

A1.17.2 Prior to this project, the NRHE recorded a total of 158 monuments within the 11 NMP survey areas. A substantial percentage of these were standing buildings or structures, and a smaller proportion were small finds; earthworks or cropmarked archaeological monuments were in the minority. This project has enhanced 29 of those existing monument record entries and generated records for 500 new monuments or monument groups.

A1.17.3 The HER had previously recorded 312 monuments within the NMP survey areas, with a higher representation of archaeological monuments than had been recorded in the NRHE. Ninety-nine of the new or enhanced NRHE records were concorded with existing HER records, suggesting that the mapping and textual information for a further 430 monuments will be new to the HER (see Appendix 2 for a list of all the period terms and monument types identified by the project).
A1.18 **DATA ARCHIVING AND DISSEMINATION**

A1.18.1 *Copyright:* the copyright of the air photograph mapping and associated records produced by this project lies with English Heritage.

A1.18.2 *Project Archive:* the results of this project's mapping and interpretation are contained within 11 ESRI shape files. These will be deposited with the English Heritage Archive. English Heritage's Aerial Survey and Investigation team shall also retain digital copies.

A1.18.3 The records resulting from this project are contained within and are integral to the NRHE. They may also be accessed online via Pastscape ([www.pastscape.org.uk](http://www.pastscape.org.uk)).

A1.18.4 There are no formal arrangements for the archiving of other digital files created during the course of this project: scanned image files (.TIF); rectified image files (.TIF); World files (.TFW); AERIAL rectification files (.RDA); and lists of material consulted (.XLS). Copies of these will be deposited on the English Heritage file server under Aerial Survey. For this project, decisions regarding the preservation of these files will be the responsibility of English Heritage, but this is an area that needs consideration for future projects.

A1.19 **SUMMARY OF SUGGESTED ACTIONS**

A1.19.1 A series of actions has arisen from the project. These are:

- Consolidate the results of this survey with the earlier NMP projects for each Study Area;
- Target specialist aerial reconnaissance on cropmarked landscapes and features between the A6 and Blackrack Beck (Low Plains); near Dungeon Lane and Moor Head Cottage (Roosucote); the north side of Dalston (Cardew Mires); Whicham Beck (Ghyll Scaur); and the eastern end of the Holme Abbey Ridge complex (Abbeytown Ridge);
- Undertake ground-truthing of several previously unidentified earthworks in the Roan Edge NMP survey area, around Eaglesfield (Tendley), and the Drigg hedged enclosures (Peel Place);
- Undertake detailed field survey of the Coalfell Beck landscapes (Brampton Kame Belt);
- Re-evaluate Schedule Monument status and descriptions of the cropmarked settlement on Cardew Hill (UID 10507/SM10077206, PN 914, Fig 32) (Cardew Mires), and enclosures on Lazonby Fell (UID 12466, NGR 350137 540329 and UID 12463, NGR 350676 540419, both SM1007195) (Low Plains);
- Devise protection strategies for the potentially regionally important Catty Crook Lane cropmarked complex (Roosucote; PN 881);
- Formalise archiving procedures for non-core data, eg photograph lists;
- Provision should be made for the archiving and dissemination of a version of the project mapping that contains all the original object data (Appendix 2).
APPENDIX 2:
AIR PHOTOGRAPH DETAILS

A2.1 COLLECTION DETAILS

A2.1.1 English Heritage Archive (formally the National Monuments Record): English Heritage, National Monuments Record Centre, Great Western Village, Kemble Drive, Swindon SN2 2GZ.

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A2.1.2 Cumbria County Council: Historic Environment Team, County Offices, Kendal, Cumbria, LA9 4RQ.

A2.1.3 CUCAP: University of Cambridge, Air Photograph Library, Sir William Hardy Building, Tennis Court Road, Cambridge CB2 1QB.

A2.2 MONUMENT DATA TABLE

A2.2.1 The Monument Data table consists of ten data fields. These are associated with, and specific to, each graphical element in a monument depiction.
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<th>Field content</th>
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<td>Name of NMP layer to which the object belongs</td>
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<td>Form of remains, as recorded on the source photograph (EH Thesaurus)</td>
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* these are not core NMP-standard data fields and they may not be retained in the files that are formally archived by the English Heritage Archive and/or uploaded to the English Heritage GIS. However, it is highly desirable that arrangements are made for the archive and dissemination of the full data versions, as this information cannot easily be recovered from the NRHE records alone.
### A2.3 English Heritage Period Terms Indexed by the Project

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### A2.4 English Heritage Thesaurus Terms Indexed by the Project

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APPENDIX 3:
BELOW-GROUND INTERVENTIONS IN THE REFINED AREAS

A3.1 Brampton Kame Belt

A3.1.1 A watching brief and archaeological evaluation were conducted at Stone House in the village of Hayton (CFA 2003a; 2003b). Features associated with the garden were observed and included a cobbled path, flower beds, well, culvert, revetment wall and a set of steps. There were no features pre-dating the garden.

A3.1.2 Four linear trenches were excavated at Low Gelt Quarry, but there were no archaeological features and the only finds were modern (NPA 2009b).

A3.2 Low Plains

A3.2.1 An archaeological assessment, comprising a watching brief and walkover survey, was undertaken in 2000 (OA North 2000a). It highlighted, as the only site of archaeological significance, a small sub-circular cropmark that was associated with ditches or divisions within a large circular area that was c. 10-12m in diameter, perhaps of Iron Age or Roman date (HER 19239).

A3.2.2 This, alongside three other sites (HER 19240, HER 5989) and a sand hill (to the south of HER 19239), were further investigated during archaeologically supervised soil-stripping and excavations centred on NGR 349971 541661 in 2003 (OA North 2003b). During these investigations, c. 5000 square metres of topsoil was stripped to a depth of 0.30-0.60m to reveal the underlying natural glacial till, but no features were located of any significance, although the positions of the sites were particularly targeted. There was one find of a retouched flint flake, possibly of Neolithic date, that was recovered from the topsoil.

A3.2.3 In 2004, there was a further evaluation centred on NGR 350000 541700, which examined an area of around 4000 square metres in the wake of the observation of three small burnt areas and pottery during sand and gravel extraction (OA North 2005a). These were found to be cremation burials, with a fourth cremation burial found in the course of archaeological cleaning as the trench was extended. The archaeological remains occupied an area of c. 40 square metres. Two cremations contained Bronze-Age pottery and cremated remains, but two were associated only with bone. Topsoil, to a depth of c. 0.50m, was removed to the surface of the underlying sand and gravels. The base of the cuts of these features was 0.15-0.25m below the surface of the machined subsoil and they had clearly been truncated. Cropmarks indicate that the area had been ploughed prior to modern quarrying, and, indeed, abrasions on the upper body sherds of the cremation urn attest to in-situ damage.

A3.2.4 A further watching brief took place in 2005 during the removal of an approximate area of 10,500 square metres of topsoil centred on NGR 349970 541660 in the area to the west of the cremations found in 2004 (OA North 2005c). A depth of 0.50m of topsoil was removed to the surface of the natural subsoil. No features of any archaeological significance were located, although one retouched flint,
perhaps of Neolithic date, was recovered from the surface of the natural subsoil. Linear cuts in the natural subsoil may represent ploughing of relatively recent date.

A3.2.5 A watching brief in 2009 (NPA 2009a) found the remains of a post-medieval ditch. A possible Roman ditch, c 27m in length and 0.24-0.70m in depth, was also found, containing fragments of metal slag and possible kiln material. Five potentially prehistoric pits, each 0.15m in depth, had scorched stones inclusions.

A3.3 CARDREW MIRE

A3.3.1 There have been no below-ground archaeological interventions in this area.

A3.4 ABBEYTOWN RIDGE

A3.4.1 In 1992, Professor GDB Jones excavated the signal station at Raise Howe (NGR 313600 548500) and found that it was associated with a linear or circular ditch (Burnham et al 1993). Some 42 square metres were excavated and all the trenches contained significant archaeological remains. The maximum depth of archaeological stratigraphy was in a ditch, which was c 1m deep.

A3.4.2 At NGR 309700 646350, a cropmark site known as Old Mawbray Enclosure (HER 607; which totalled 4400 square metres), was investigated (Bewley 1993). A sample of 33 square metres was excavated, all containing archaeological remains to a depth of c 0.80m below the ploughsoil. A probable defensive ditch (maximum depth 1.0m) of Neolithic date and a series of post-pits were identified.

A3.4.3 Edderside settlement was the focus of archaeological investigation in 1988 (HER 605; Bewley 1998). The remains of a ditch, an enclosure, a possible pond and five large post-pits (with a central posthole of c 0.50-0.60m) were uncovered. Some 101 sherds of second- to fourth-century pottery indicate Romano-British occupation, but it is entirely possible that the site was reused and that its origins were in the prehistoric period.

A3.4.4 In 2006, a watching brief was undertaken at the Waste Water Treatment Works at Edderside (NGR 309900 545500), observing the removal of 3.5 square metres of topsoil to a depth of 2m through the sub-stratum (OA North 2006b). No archaeological horizons or features were observed, with just two small sherds of post-medieval pottery being encountered.

A3.4.5 To the south of the Newton outfield settlement, land at New Cowper Farm, centred on NGR 311600 545780, underwent a desk-based assessment and rapid field inspection to collate a gazetteer of sites (LUAU 1999).

A3.4.6 A total length of 374m of trenches was excavated at New Cowper Farm at NGR 311600 545780 (Headland Archaeology 2000). Three cultivation furrows were found across an area c 70 x 50m, ie 33% of the site. There were no finds.

A3.4.7 An evaluation, comprising an area of topsoil stripping and 14 trial trenches (a total of 8720 square metres), was undertaken at New Cowper Farm (3115 5460), which found truncated features (cut to a depth of c 0.13-0.45m). These comprised a possible trackway, with two phases of ditches, an enclosure, and linear sequences of postholes and post-pits. Also found were two small and very abraded pieces of
possible late prehistoric pottery, one burnt flint and three fragments of rubbing stone. The archaeological remains were seen across c. 50% of the area of topsoil stripping (HER 40814; Headland Archaeology 2003b). Thirty-one linear trial trenches were excavated at NGR 311584 545989, revealing possible archaeological features in c. 33% of the excavations (Headland Archaeology 2004). The features were c. 0.10-0.64m in depth. One pit had large quantities of charcoal and fragments of Iron-Age pottery. Cereal grains were recovered from palaeoenvironmental samples, primarily barley, with some oats.

A3.4.8 As a result of this work, in 2003 an evaluation and excavation was undertaken (by Headland Archaeology) prior to works at New Cowper Quarry. The assessment of this was written up in 2006, together with two further excavation reports of large areas directly north of this field (NPA 2006a). The excavations of 2003 were centred on NGR 311500 546000 and excavated an area of 9500 square metres of topsoils that are 0.40-0.50m deep, where large numbers of significant archaeological features were discovered in association with 165 sherds of Bronze-Age pottery and 26 pieces of worked lithics and debitage. The features, all truncated, varied in depth from 0.20m to 0.36m, with one ditch having a fill that was 0.70m deep.

A3.4.9 The two sites to the north of this field, centred on NGR 311500 545900, were excavated in 2005. The western excavation extended over 10,000 square metres, stripping off topsoils 0.40m in depth to find Neolithic pottery, a flint blade and a polished stone axe, and six spatially grouped pits and postholes, including perhaps the remains of a Bronze-Age palisaded structure, and of another possible Iron Age / Romano-British feature, comprising a linear ditch, pits and postholes (NPA 2006b). These prehistoric remains were truncated by post-mediterranean ridge and furrow.

A3.4.10 The excavation to the east occupied an area of 0.8ha, centred on NGR 311854 545989, and revealed significant remains of Early Neolithic pits, an Early Bronze-Age funerary cairn, linear features and a boundary ditch, perhaps of Iron Age / Roman date, and a number of isolated pits and postholes. The natural subsoil was revealed at a depth of 0.50m and the depth of archaeological features ranged from 0.08m to 0.70m (NPA 2007).

A3.4.11 At Overby Quarry, at NGR 312300 546700 and NGR 312700 547300, in 2006, four linear trial trenches successfully located four definite and two possible archaeological features, although these remain undated. The cuts of the features were 0.20-0.60m in depth. One pit (in Trench 3) contained charred grain, and produced a radiocarbon date of the Early to Middle Bronze Age (NPA 2006c).

A3.4.12 At Overby Quarry 48 trial trenches were excavated at NGR 312350 546750 (NPA 2008b). Area A yielded no archaeological features, but in Area B, there were five well-preserved in-situ cremations, four in pits and one in a Bronze-Age collared urn. Area C contained small linear gullies and pits. Areas D, E and F revealed no archaeology, excepting for linear boundary features, which related to those seen on nineteenth-century mapping (ibid).

A3.4.13 Given the identification of the five well-preserved in-situ cremations in 2008 (Section A3.4.12), Area B was enlarged to excavate an area of 120 x 40m. Some 36 prehistoric features were concentrated in an area of c. 110 square metres of the
A site, including 30 cremations, of which eight were vessels. The vessels were collared urns, except for one Bronze-Age food vessel (NPA 2010).

A3.4.14 An evaluation was undertaken at Dixon Hill, High House Quarry, in 2002 (CFA 2002), and subsequently, a targeted evaluation at High House Quarry, West Newton (NPA 2006d), excavated a single linear trench. This uncovered three, perhaps modern, features and one undated pit. The depth of the features was c 0.15-0.30m.

A3.4.18 Eighteen trial trenches were excavated at High House Quarry, and archaeological deposits were found in ten of the trenches (NPA 2008a). Possible prehistoric features comprised a continuous linear feature across five of the trenches, with a second linear feature at right-angles to this. These correlated with cropmark evidence and geophysical anomalies, and may represent a Bronze-Age field system. There were no finds. The depth of the features was c 0.20-0.80m.

A3.5  MOOTA

A3.5.1 On the west-facing slopes of Moota Hill, at NGR 314500 536500, close to the site of a medieval beacon (Section 12.4.3), a quarry extension necessitated an archaeological evaluation in 1999 (Headland Archaeology 1999). Six trenches were excavated, totalling 578m in length, all of which were 2m wide and 0.30m in depth. There were no archaeological features or finds, except for narrow ridge and furrow, encompassing c 20 square metres of archaeological remains.

A3.5.2 In the same area, at NGR 314500 536500, in 2006, there was a further evaluation in advance of the extension of the quarry (Headland Archaeology 2006). Twelve trenches, with a combined length of 850m, were excavated, each being 2m wide and 0.25-0.65m in depth. No archaeological features or finds were encountered in any of the trenches.

A3.5.3 A small overlapping part of the watching brief area for Tallentine Wind Farm lay on the western edge of the Moota study area (Wardell Armstrong 2013). There, topsoils were stripped to the depth of between 0.10m and 1.00m, including the 23 x 25m area of the substation, which just clipped the study area. No archaeological features or finds were recorded.

A3.5.4 On the eastern edge of the Moota study area, on the site of the Roman road at Wharrocks Hill, roadworks necessitated a watching brief at NGR 314900 535700 (NPA 2006e). The trenches were dug to a depth of 1m but no features of archaeological interest were noted.

A3.6  TENDLEY

A3.6.1 The early medieval inhumations recorded in the HER prompted a series of archaeological investigations centred on NGR 308900 528500. During 2003, an archaeological evaluation, using the results of an earlier walkover survey and geophysical survey to position a series of seven trial trenches, totalled an area of 560 square metres at NGR 308900 528550 (Headland Archaeology 2003a). Truncated features of a regular medieval or post-medieval ridge and furrow were found sealed by topsoils, and these were seen to a depth of 0.10m below the
topsoil. Some 248 artefacts were found, mainly ferrous (a metal detector was used) and those finds that could be dated were post-medieval. This assemblage was likely to have represented manuring practices in the post-medieval period. In addition, three other areas of archaeological remains were in an area of c 3 square metres.

A3.6.2 In 2008, a geophysical survey and archaeological evaluation were undertaken at NGR 308400 528850 (OA North 2008a). Four evaluation trenches were positioned to target geophysical anomalies thought to indicate ridge and furrow and quarrying/infilling activities. The trenches totalled 80m in length, each with a 2m width, and were excavated to a depth of c 0.50m. A possible posthole and a lens of burnt or decomposed dark material were the only identified features.

A3.6.3 In 2009, a further programme of trial trenching was undertaken in advance of extraction (NPA 2009c). Seventeen trial trenches, all 2m wide and excavated to a depth of between 0.60m and 1.4m, covered 965 square metres of the proposed area, centred on NGR 308900 528400. A linear deposit of river-worn cobbles was sealed by a deposit of brick and mortar; this was thought to be a possible field boundary. There was a finds assemblage of 80 modern items, but otherwise, there were no archaeological remains.

A3.6.4 In 2011, a further 18 evaluation trenches were excavated at NGR 308900 528400, totalling 1050 square metres, and these were excavated to a depth of between 0.4m and 1.20m. There were no archaeological features or finds (NPA 2011).

A3.7 ESKETT AND ROWRAH

A3.7.1 There have been no below-ground archaeological interventions in this area.

A3.8 PEEL PLACE

A3.8.1 There has been a series of archaeological projects at the Peel Place quarries, prompted by a large number of prehistoric find-spots in the area. In 1997-9, three phases of investigation took place, and in total 24 trenches were excavated; these were found to contain no significant archaeological deposits (LUAU 1997; 1998). Sieving for finds retrieved one iron nail and some post-medieval and modern ceramic artefacts.

A3.8.2 In 2003, a desk-based assessment and evaluation were undertaken (OA North 2003a). The evaluation comprised the excavation of 13 trenches, centred on NGR 306700 501200; they were all 20m in length and each had a width of 1.7m (thus the area excavated totalled 260 x 1.7m), and each was dug to a depth of 0.3-0.65m. Within these trenches, only post-medieval farming activity was identified, represented by three modern gullies and two tree throws. The finds, all within topsoil, comprised modern pottery and one clay pipe fragment.

A3.8.3 Expansion of the quarry in 2004 resulted in a desk-based assessment, a geophysical survey and walkover survey, and four evaluation trenches were excavated in areas where geophysical anomalies had been identified and where a hollow-way was located by the walkover survey (OA North 2004a). The four trenches were centred on NGR 306500 501100; they varied from 15m to 30m in
length, and totalled 85m of trenching; all had a width of 1.8m. They were dug to a depth of 0.40-0.90m. A single archaeological feature was observed, comprising a ditch or relict field boundary, containing seventeenth- to early twentieth-century pottery (totalling 2 x 1.8m of archaeology).

A3.8.4 During 2005, another archaeological evaluation was undertaken at NGR 306700 501100, in advance of a further area of extraction (OA North 2005b). Ten evaluation trenches were excavated, each 25-30m in length and varying in width from 1.75m to 3.3m wide (thus, a total of 795 square metres was excavated). They were excavated to a maximum depth of 0.70m. The only feature found was an iron pipe in the southernmost trench, and 27 post-medieval finds were retrieved from the topsoil. All were fragmentary and likely to be a result of spreading manure and midden across the fields. A further two finds of potential waste flint chunks could not be dated closely.

A3.8.5 In 2008, a further programme of evaluation trenching was undertaken, centred on NGR 306650 501228, when 17 trenches were excavated (OA North 2008b). These totalled a length of 414m. All the trenches were 2.3m in width and the maximum excavated depth was 1.17m. Most were randomly placed, except for five of the trenches, which were positioned to target a possible medieval field system and hollow-way. No archaeological evidence was identified within these trenches, but some linear features were seen in five other trenches, in an area of approximately 60 x 2.3m.

A3.8.6 In 2010, the second part of a quarry expansion occurred immediately to the northwest of the site evaluated in 2008, and a programme of 20 archaeological evaluation trenches was undertaken at NGR 306640 501234 (OA North 2010b). The total length of trenching was 4075m; all the trenches were 1.8m wide and were excavated to a maximum depth of 0.26-0.42m. Most trenches were randomly positioned, but five were placed in an area marked on the first edition OS map of 1867 (OS 1867f), which suggested that medieval strip fields may once have existed, and also in response to the point at which the physical landscape rose to a peak in the centre of the field. Archaeological remains of ridge and furrow were observed in ten of the trenches on the west of the site. Further trenches showed evidence of a ditch, field boundaries, and a rutted trackway. Archaeological remains, including the ridge and furrow, were seen in c 50% of the site area. The evidence suggested that the site had been used for agricultural activity dating back to the medieval period, with relatively little change during the post-medieval period.

A3.9 GHYLL SCAUR

A3.9.1 Within the Ghyll Scaur study area, an archaeological assessment and evaluation took place in the south of Millom Park. This comprised two watching briefs, one during the demolition of Park House (HER 16784) at NGR 316501 482000, which found an earlier farmhouse in the form of a two-celled structure, and the second during tree-felling (LUAU 1995). The area of tree-felling was to the northwest and north of the, then, quarry site, at approximately NGR 316800 482800, but no upstanding archaeological features were located. The evaluation centred on NGR 416800 582700, and comprised ten trial trenches, totalling 118m in length; each trench was 2m wide. Natural bedrock was found at depths of 0.10-0.95m
below the ground surface. Only a single archaeological feature of significance was found, comprising a thin band of coarse gravel directly above the silt subsoil, c 0.65m wide and 0.05m in depth. It was interpreted as a path and thus was taken to be a modern feature.

A3.9.2 The felling of 130 trees at NGR 316700 482400 and the removal of their tree stumps was undertaken under archaeological supervision. No archaeological features or finds were observed within the topsoils, which lay directly over natural subsoils (Headland Archaeology 2005).

A3.9.3 A watching brief at Bank House Pumping Station, to the east of Millom Park at NGR 317000 482200, was undertaken in 2005, to monitor the stripping of topsoils (to a depth of 0.30m) and the construction groundworks (OA North 2006c). Some 240 square metres of topsoils were stripped, but no significant archaeology was found there, although some sherds of post-medieval pottery and one flint/struck lithic were recovered.

A3.10 ROOE COTE

A3.10.1 An archaeological evaluation was undertaken in 2000 at the extreme eastern corner (NGR 422100 568900) of the western edge of the Rooscote area (OA North 2000b). At the south-eastern end of one trench, which was dug to a depth of 1.15m, was a small sub-circular pit. A sherd of modern pottery was in the fill.

A3.10.2 An archaeological evaluation in 2001 opened 12 trenches (HER 40768) within the area of the current Rooscote study area, at NGR 423130 468030 (Headland Archaeology 2001b). These trenches varied in length from 50m to 125m, but each was 2m wide, making a total area excavated of 1950 square metres. The trenches were dug to depths of between 0.30m and 0.90m, where the topsoils lay directly on subsoils. In three trenches, the topsoils sealed truncated cuts into the subsoils to a maximum depth 0.10-0.40m, but no finds were recovered. However, in one trench (NGR 32300 46800), a large circular pit and its fills were excavated, which produced sherds of Neolithic pottery, two small arrowheads, a retouched curved flint-flake, fire-cracked quartz stones and a fragment of a probable polished stone axehead. The pit was cut into the subsoil to a depth of 0.40m; this, and its size, suggest that it was used as a hearth. Another truncated pit was identified, with a depth of only 0.12m. This was oval and clay-lined, and perhaps used for storage. Archaeological remains were present in an area totalling c 90 square metres within the evaluation. The hearths, pits and pottery suggest occupation of a site centred on a raised area during the fourth millennium BC.

A3.10.3 In 2014, an evaluation, totalling 1456 square metres, at NGR 423100 568370, uncovered a small number of features which were mostly of modern date and of little archaeological significance. Three possible prehistoric pits were identified, however, containing several large unworked pebbles, perhaps pot boilers (OA North 2014a).

A3.11 ROAN EDGE

A3.11.1 In 2004, a desk-based assessment and walkover survey, centred on New Hutton Common, was undertaken. The work highlighted an area of poorly drained moss
(at present being used for rough grazing) at NGR 358400 492300, that had been enclosed in the nineteenth century, but remained unimproved and uncultivated (OA North 2004b).

A3.11.2 A programme of palaeoenvironmental sampling was undertaken in 2006 to assess the survival and extent of the peat deposits. This found only two small pockets of peat, one of which, at NGR 358400 492500, was 1.54m in depth, and had a well-preserved environmental record of mid- to late Holocene vegetation (OA North 2006a).

A3.11.3 In 2010, on the same site, two boreholes were drilled to a depth of 1.30m and subsamples were taken at NGR 358200 492600. These were used for palynological and plant macrofossil analysis (Cotswold Archaeology 2010).
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Figure 66: Areas of working and potential resource, together with the original and refined study areas at Ghyll Scaur

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Figure 68: Archaeological significance and previously identified sites, together with the extent of twenty-first-century and historical quarrying at Ghyll Scaur

Figure 69: The Ghyll Scaur refined study area, superimposed on the OS first edition mapping at 1:10,560 scale (6" to 1 mile) published in 1867

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Figure 72: Data before refinement at Roosencote

Figure 73: Archaeological significance and previously identified sites, together with the extent of twenty-first-century and historical quarrying at Roosencote

Figure 74: The Roosencote refined study area, superimposed on the OS first edition mapping at 1:10,560 scale (6" to 1 mile) published in 1851

Figure 75: Archaeological significance and previously identified sites, alongside the current planning permission extent at Roosencote

Figure 76: Underlying geology at Roan Edge

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EXPLANATION

Glacio-fluvial sand and gravel, shown in pink shading, forms the mineral in this area. It generally lies at the surface but in some places is concealed beneath post-glacial till (yellow) or peat (pale brown). In the area upstream of Low Gelt Bridge, the streams have cut through the glacio-fluvial sediments and glacial till (pale blue) to expose the underlying Silurian sandstones in places along the valley sides, and to lay down narrow fans of river terrace deposits.

To the east and west of the main area of glacio-fluvial deposits, the ground surface is largely mantled by glacial till (pale blue). Further east, on the rising ground of the Parham, bedrock is frequently exposed. This comprises successive beds of Carboniferous limestones, sandstones and shales. Major faults and some key marker horizons within the bedrock are projected as dashed lines in areas where the rocks are concealed beneath superficial deposits.

Figure 11: Underlying geology at Fawgb No 1, Low Gelt and Kirkhouse, in the Brampton Kyme Belt.
Figure 12: Areas of working and potential resources, together with the original and refined study areas at Silvertop (Brantpooe Quarry Bell)
EXPLANATION

The mineral extraction is a Carboniferous Limestone, which occurs as a series of inter-bedded beds, isolated by the clastic and dolomitic flint. The most important of these beds are shown in the clastic blue shading. They include the 4 Fathom Limestone (4FL), one of the thickest bed, which is currently being worked at Silverteg Quarry together with the 3 Yard Limestone (3Y) and the 2 Yard Limestone (2Y), which occur at successively lower levels within the sequences and crop out at the north of the quarry. Of these only the 4FL, and 3Y levels are recognised as worthwhile resources on the geology map and only the 4FL is currently worked. To the south of the quarry, the bed continues beneath an outcrop of other shales, slates, and sandstones (coloured shown by pale blue shading). The outcrop is the site of an abandoned mine shaft. None of these has been identified as a mineral resource by the RBR, although the Great Limestone was formerly quarried for lime at the Glevum quarries and limeburns, to the southeast of Holmwood.

The Carboniferous rocks are, in turn, largely overlain by superficial drift deposits comprising glacial till (shown by the brownish-blue shading), glacio-fluvial sand, and gravel (shaded pink), with some areas of more recent (post-glacial) alluvium (blue shading). The drift deposits are separated from the Carboniferous by the late-glacial Essex lignite (shown in brown). Within the former area, the geological map identifies a number of abandoned mine shafts (circles with crosses).
Figure 14: Data before refinement at Kithhouse and Silverthope, in the Romsey Kraig R&D.

Key
- Archaeological interventions
- Sites from first edition OS mapping
- HER site point
- NVR site point
- NVR site line
- HER site line
- NAIP site line
- NAIP site polygon
- HER site polygon
- NAIP site polygon
- Refined Study Area
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Figure 22: Areas of working and potential resource, together with the original and refined study areas at Low Planta.
EXPLANATION

The morainal comprises glacio-fluvial sand and gravel, deposited in the form of eskers (originally waterfilled channels contained within or beneath the former ice sheet). These eskers are shown by pink-hatched shading on the geological map.

The sand and gravel is generally fluvially sorted and partially overdrained, forming relatively thin deposits of glacial till (reddish clay, shown in pale blue) locally. It is overlain by narrow strips of palaeo-glacial alluvium (depicted in pale yellow).

Outcrops of the underlying bedsrock (Peneth Sandstone), shown in orange, occur on Blake Fell and other areas of higher ground, and along much of the eastern edge of the study area. Faults within the sandstone are shown as thick black dashed lines, though these have no influence at all on the underlying superficial deposits.

Figure 23. Underlying geology at Low Plains.
Figure 25: Archaeological significance and previously identified sites, together with the extent of twenty-first-century and historical quarrying at Low Flatts
Figure 26: The Low Plains referred study area, superimposed on the OS first edition mapping at 1:10,560 scale (1" = 1 mile) published in 1869.
Figure 27: Archaeological significance and previously identified sites, alongside the current planning permission extent at Low Plants.
Figure 28: Comparison between known archaeological sites and the location of archaeological sites contours at Low Places
Figure 29: Areas of working and potential resource together with the original and refined study areas at Gannel Mines.
Figure 30: Data before refinement at Carlew Mires
Figure 31: Archaeological significance and previously identified sites, together with the extent of twenty-first-century and historical quarrying at Cardew Mills.
Figure 32: Archaeological significance and previously identified sites, alongside the current planning permission extent at Cardew Mires
Figure 33: The Cardew kilns refined study area, superimposed on the OS First edition mapping at 1:10,560 scale (6" to 1 mile) published in 1808.
Figure 34: Areas of working and potential resources, together with the original and refined study areas at Abbeytown Ridge.
EXPLANATION

Glacio-fluvial sand and gravel, shown in pink shading, forms the material in this area. It generally lies at the surface but in some places is concealed beneath post-glacial alluvium (yellow) or peat (blue brown). Areas where the sand and gravel have been completely worked out (at the base of the SBS road near Melville) are shown in dark red to denote the underlying basaltic type (red) and red sandstones of the Ossian Shales Formation (SSH) in the north and west, and red sandstones of the Elgin Shales Formation (ESS) in the south.

On lower ground to the north-east and south-west in the main area of glacio-fluvial sand and gravel, these deposits give way to extensive areas of glacial till (shown in pale blue), whilst to the north-west and south-east, the till is overlain by accumulations of post-glacial peat.

Figure 35. Underlying geology at Abbeytown Ridge
Figure 37: Archaeological significance and previously identified sites, together with the extent of twentieth-century and historical quarrying at Abneydown Ridge.
Figure 39: Archaeological significance and previously identified sites, alongside the current planning permission extent at Abbeystown Ridge.
Figure 39: The Abbeytown Ridge refined study area, superimposed on the OS First Edition mapping at 1:10,560 scale (1” to 1 mile) published in 1888.
Figure 49: Comparison between known archaeological sites and the location of archaeological interventions at Abbeystrow Ridge.
Figure 41: Areas of working and potential resource, together with the original and refined study areas at Mesto.
EXPLANATION

The mineral resource explorable at Maita Quarry primarily comprises the A. Limestone (LM1) of the Cenomanian Chief Limestone Group (CLG). This rock type is characterised by lenses of interbedded sandstone (LM6) and limestone (LM1), occurring throughout the mapped study area and shown in dark blue shading on the geological map. Within the quarry and elsewhere within the study area, there are also beds of sandstone (LM6), shown in orange. These are primarily in between LM2 and LM1, though it is not known whether they are utilised as aggregates. Just outside the study area, to the west and further in the sequence of Cretaceous strata, is the Hemingford Gap Fm, coloured pale orange on the geological map.

Within the study area, and more widely, the bedrock resources are partly concealed beneath superficial alluvial deposits (shown in the green blue) that depict alluvium (superficial silts) and also occur in the far south of the study area. Throughout the area, the star-shaped symbols denote swallow holes, and the pointy symbols represent the underlying limestone. In practice, there are likely to be greater numbers of these, of varying sizes.

Figure 42: Underlying geology at Maita
Figure 44. Archaeological significance and previously identified sites, together with the extent of twenty-first-century and historic quarrying at Manta.
Figure 41: The Marnia refined study area, superimposed on the OS First Edition mapping at 1:10,560 scale (1" to 1 mile) published in 1847.
Figure 46: Archaeological significance and previously identified sites, alongside the current planning permission extent at Muxta
Figure 47: Areas of working and potential resource, together with the original and refined study area at Tendley
EXPLANATION

The mineral resources exploited at Tindal Dunny are Carboniferous Limestones of the Great Scar Limestone Group (GSLG). This comprises a cyclical succession of thinly bedded limestones with interbedded sandstones and mudstones. Together, they are shown in dark blue shading on the geological map. Within and beyond the western edge of the study area, the limestones are overton by the mudstones, sandstones, sandstones and supere limestones of the Herningham Formation (HGF), shown in pale yellowish green on the geological map. Within the study area, and elsewhere, the bearal rock types are partly concealed beneath superficial glacial till deposits (shown in the palest blue). More recent deposits (pale brown) overlie the glacial till in some areas.

Figure 48: Underlying geology at Tindal
Figure 49: Data before remaster at Tredley.
Figure 50: Archaeological significance and previously identified sites, together with the extent of twenty-first-century and historical quarrying at Tredley.
Figure S2. The Teakley relict study area, superimposed on the 158 first edition mapping at 1:10,560 scale (6" to 1 mile) published in 1807.
Figure 35: Underlying geology at Laskett and Rowrah

Key
- Colored Study Area

EXPLANATION

The mineral resources exploited at Laskett and Rowrah Quarries are Carboniferous Limestone of the Great Scar Limestone Group (GSL). The quarry comprises a cycling succession of thick-beded limestone with interbedded sandstone and siltstone. Together, they are shown in light blue on the geological map. In places, the limestone is overlain by the mudstones, dolomites, sandstones, and tuffaceous limestones of the Nelson's Limestone Formation (NLF) shown in dark yellow on the geological map. These, in turn, are overlain by the succeeding Upper Mereside Sandstone (UMS), and the Lower Mereside Sandstone (LMS) and the Overlying Coal Measures (OCM) which are not shown on the map. None of these extends into the study area itself.

The study area lies on the Carboniferous Limestone, which comprises a variety of limestones and dolomites. The Upper Mereside Sandstone underlies the Carboniferous Limestone in places, and the Lower Mereside Sandstone is present in some areas. The study area itself has been heavily worked for coal.

Areas of prevalence working and site (blowholes) are recorded at the times of the BGS surveys. Between the periods of surveys, the coalfields have been backfilled and cross-drilled, respectively.

Within the study area, the Carboniferous Limestone is partly covered by superficial glacial deposits as shown in the yellowish-brown sand and gravel (shown in part). More recent alluvium (grey yellow) at peak (grey brown) on the gravel till in some areas.
Figure 54: Areas of working and potential resource, together with the original and refined study areas at Esker and Rowerk
Key
- Slates from first iteration OS mapping
- HER site point
- NWR site line
- HER site line
- NWP site line
- HER site polygon
- NWP site polygon
- NWR site polygon
- Refined Study Area

Figure 39: Sites before refinement at Flettt and Rowrah
Figure 5. Archaeological significance and previously identified sites, together with the extent of twenty-first-century and historical quarrying at Lakenhath and Rowde.
Figure 15 The Lisken and Rowatt study area, superimposed on the OS 1:25,000 mapping at 1:40,500 scale (10" to 1 mile) published in 1907.
Figure 58: Archaeological significance and previously identified sites alongside the current planning permission extent at Elkins and Rowath
Figure 59: Areas of working and potential resource, together with the original and refined study areas at Peel Place.
EXPLANATION

Usually all of the remnant study area has glacio-fluvial sand and gravel (shown in pink shading) at the surface. Locally, the material is composed beneath post-glacial alluvium (yellow) or peat (blue shown), at grades the sands and gravel are absent, inter-glacial till being exposed at the surface.

Areas where the sand and gravel have been partially worked out and subsequently eroded (at the time of the Soil survey) are shown with cross-hatching. Bankside evidence reveals that layers of further glacio-fluvial sand and gravel are present at greater depth within the site, though these are most unlikely to be economically viable.

Overall, the thickness of superficial drift deposits ranges from about 30m to 65m and no exposures of the underlying bedrock occur anywhere within the area.

Figure 60: Underlying geology at Pearl Place
Figure 62. Archaeological significance and previously identified sites, together with the extent of twenty-first-century and historical quarrying at Port Place.
Figure 6.3: The Peel Place study area superimposed on the OS 1st edition mapping at 1:10,560 scale (1” to 1 mile) published in 1867.
Figure 64: Archaeological significance and previously identified sites, alongside the current planning permission extent at Peel Place.
Drift Stair Quarry exhibits a complex sequence of tuffaceous rocks known as the Millen Park Formation (MPF), shown in pale orange shading on the geological map. These are mainly volcanics rocks, massive tuff and tuff breccia, and agglomerate type tuffs, but they include tuffs and irregular intrusions of basalt (B), shown in green, andesite (A), shown in dark orange, and basaltic andesite (AD), shown in dark magenta. The far western wing of the study area includes part of the slightly older Ho House Tuff Formation (brown shading), comprising mainly planar-bedded andesitic lapilli-tuffs with similar intrusions.

One of these rocks is suitable for use as roadstone, although the basalt is likely to have a lower FSV (tensile strength) and has not yet been worked to any significant extent.

Faulted contacts between the different rock types are evidenced by the thick black dashed line (solid line within the study area and more occasionally within the surrounding area); these rocks are mantled by generally thin superficial deposits of glacial till (pale blue).

Figure 6. Underlying geology at Stair Stair
Figure 66: Areas of working and potential resource, together with the original and refined study areas at Gilby Hill Quarry.
Figure 4.7: Data before refinement at 1:5000 Scale
Figure 08: Archaeological significance and previously identified sites, together with the extent of twenty-first-century and historical quarrying at Ghyll Scar.
Figure 9: The Ghyll Scour refined study area, superimposed on the OS first edition mapping at 1:6,560 scale (6" in 1 mile) published in 1867.
Figure 10: Archaeological significance and previously identified sites, alongside the recent planning permission extent at Ghyll Scar
Figure 71: Areas of working and potential resources, together with the original and refined study areas at Rowscarre
Figure 73: Archaeological significance and previously identified sites together with the extent of twenty-first-century and historical quarrying at Moseley.
Figure 7d: The Rowncote outlined study area, superimposed on the OS first edition mapping at 1:10,560 scale (6" to 1 mile) published in 1851.
Figure 75: Archaeological significance and previously identified sites alongside the current planning permission extent at Horncribe.
EXPLANATION

The mineral comprises a sequence of hard, Silurian sandstones and siltstones, formerly known as the 'White Moor Flags', and now classified as part of the 'Kendal Group' (Kend) on the latest geological map. They are shown by the pale purple shading.

The rocks have been quarried at Ruan Edge since the early 1900s to provide a very important source of High-Specification (salt-resistant) Aggregate for use in road-surfacing materials. Areas which have been partially quarried at the time of the BGS mapping (between 1985 and 2002) are shown by diagonal black hachuring. (U:U: the same symbol is used for the newly quarried road and motorway cuttings as well as the quarry).

Within most of the study area, the Silurian rocks are exposed at the surface. Around the edges of the quarry, they are concealed beneath superficial glacial till deposits (shown in pale blue).

Key
- Defined Study Area
Figure 7: Areas of working and potential resource, together with the original and refined study areas at Rose Edge.
Figure 79: Archaeological significance and previously identified sites, together with the extent of twenty-first-century and historical quarrying at Rian Edge.
Figure 10: The Ruan Edge refit study area superimposed on the OS first edition mapping at 1:10,560 scale (6" to 1 mile) published in 1862.
Figure 31: Archaeological significance and previously identified sites, alongside the current planning permission extent at Howz Edge.