EARTHWORK SURVEY AT TEARSALL QUARRY, WINSTER, DERBYSHIRE (TELM 07)

Work Undertaken For
Wardell Armstrong

Report Compiled by
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1. SUMMARY

An earthwork survey was undertaken at Tearsall Quarry, Winster, Derbyshire. The work represents the first detailed examination of features within the application site.

The site lies within an area of extensive lead mining activities comprising both above and below ground features. Most of the above ground features are believed to be 18th and 19th century in date, although reworking occurred during the 20th century. The site has previously been subjected to walk-over surveys as part of an application to resume quarrying at the site.

The earthwork survey established the location and form of features previously identified. Further features, generally mounds, were also identified and recorded.

2. INTRODUCTION

2.1 Background

Archaeological Project Services was commissioned by Wardell Armstrong to undertake an earthwork survey of land at Tearsall Quarry, Winster, Derbyshire. The work was undertaken to support an Environmental Impact Assessment prepared by Wardell Armstrong to assist in an application for quarrying at the site. The work was undertaken on the 5th and 6th December 2007 in accordance with a written scheme of investigation prepared by Archaeological Project Services (Appendix 1) and approved by the Senior Conservation Archaeologist, Peak District National Park Authority.

2.2 Topography and Geology

Winster is located 6km west of Matlock and 9km south of Bakewell, within the Peak District National Park, Derbyshire (Fig. 1).

Tearsall Quarry is situated 2.2km southwest of Winster and north of the hamlet of Brightgate at National Grid Reference SK 263 601 (Fig. 2). The site lies on a north facing slope overlooking Wensley Dale and encompasses some 10 hectares.

Local soils are of the Maltham 2 Association, typically stoneless silty Aeolian drift (Hodge *et al*. 1984). These soils are developed upon a solid geology of Monsal Dale and Bee Low limestone.

2.3 Archaeological and Historical background

The archaeological and historical background has been fully rehearsed before by ARCUS (1998) and in the Environmental Impact Assessment. In summary, the site lies in an area recognised as being of high landscape importance for lead mining remains. This is exemplified by the adjacent Northern Dales Mine which has been afforded Scheduled Ancient Monument status.

Documentary evidence indicates lead mining occurring in the vicinity from at least the mid 16th century (Jim Rieuwerts *pers. comm.*). However, the surface remains at the site are believed to be largely of 18th or 19th century origin and survive well across the southern part of the site. Field 1 to the north displays evidence of secondary working which includes the remnants of a possible buddle dam, where early waste material was washed so that the heavier ore would sink and become concentrated. This area also appears to have been further reworked in the 20th century.

Prior to lead mining, the area was under an agricultural regime from which remnants of ridge and furrow as well as lynchets, the latter possibly of Romano-British origin,

survive in particularly good condition immediately north, but outside, of the site.

3. AIMS

The requirements of the survey, as detailed in the specification (Appendix 1), were to accurately record the location and form of earthwork remains across the proposed application area

4. METHODOLOGY

The earthworks were surveyed using a combination of instrumental (Thales Global Positioning System (GPS)) and graphical methods. A base receiver was established over a temporary survey station which logged satellite data while a roving receiver was used to record points of detail. This was processed using N4ce (version 1.11) software to produce CAD drawings. Archaeological detail was also added.

Data were also inputted into a contour generating programme to provide a contour survey of the site for reference. A full photographic record was also compiled.

5. RESULTS AND DISCUSSION

5.1 Earthwork survey

The results of the earthwork survey are depicted on Figure 3 and have been related to observations recorded as part of the Environmental Impact Assessment produced by Wardell Armstrong with additional features not previously recognised. These are summarised in Table 1 (Page 6).

Field 1

A total of twenty-five features were recorded for this field. The features are separated and show no clear stratigraphic link to each other.

A possible lynchet (No. 149, Fig. 3) may represent the earliest feature in this field. It is aligned northwest-southeast, thus paralleling better preserved lynchets located to the north of the site. No. 149 had a perpendicular lower lying linear mound at the northwest end. There is no continuation to the west and the eastern extent is obscured by hawthorn trees and a low mound (No. 150), which is itself disturbed by wall tumble and cattle trample.

Mining activities are represented by eight shafts, either without mounds (Nos. 112, 121, 123 and 138) or with extant spoil heaps (Nos. 113, 114, 115 and 117). Limited below-ground investigations undertaken by TL Excavations Limited in 2007 suggested that three were exploratory shafts and only two (Nos. 115 and 117) were perhaps sunk to reach mineral levels (TLEL 2007, 26).

The shafts were probably excavated during the 18th and 19th centuries and one (No. 112) has graffiti with the date 1863 (*ibid.* 12). No evidence for firesetting was identified in the underground survey which was the favoured means of fracturing the bedrock prior to the introduction of gunpowder in the latter part of the 17th century (Barnatt and Penny 2004, 105).

Additional shafts may be represented by a number of hillocks in the field. A number of mounds (116, 119, 120, 122, 146 and 148) share characteristics with known mounds and shafts. However, these and the remaining mounds (Nos. 111, 147 and 126) may also result from reworking at the site.

Extensive reworking at the site is more apparent in Field 1 than the adjacent fields. Obvious examples are where mounds have

been fully (*eg*. 112, 121, 123 and 138) or partially (No. 113) removed from the adjacent shafts.

Located at the northwest corner is a possible buddle dam (No. 118) which also provides evidence of reworking. This feature is defined by large banks to the west and north (Fig. 4). There are two breaks of slope on the south side, the more northerly defining the southern limit of boggy ground and to the east is a lower, though not continuous bank, with a shallow channel downslope to the northwest. There are stones within the banks, though it is uncertain if a wall is indicated. An enclosure is depicted in this location on the 1849 Tithe Award plan which accords well and suggests reworking is occurring from at least this date.

Slightly later than the buddle dam, is the track that runs across the field which appears to define the southern limit of this feature, though respects existing mounds elsewhere in the field. A track in this position is recorded on the Ordnance Survey plan of 1899.

Located 77m southeast of the possible buddle dam is another depression with low-banks defining a triangular area (No. 145). This appears to be associated with mounds 119 and 120 immediately to the west and may represent a small pond or perhaps a working floor.

The most recent features in this field are the circular low-lying earthworks of cattle trample associated with feeding stations (Nos. 127, 139 and 140). These certainly obscure mine workings as shafts are depicted on Ordnance Survey maps as being in this vicinity.

Field 2

Eleven features were identified in Field 2. Again, there is no stratigraphic relationship between them, although a mound associated with No. 106 and a hollow area (No. 144) both lie beneath the wall between Fields 2 and 3.

Of the eight hillocks recorded in the field, three have capped shafts (101, 106 and 108) while a circular depression in 107 almost certainly marks the position of another. Two mounds were investigated below ground (101 and 108) and were thought to be exploratory shafts (TLEL 2007, 26).

Mounds 102 and 103, downslope from 101, are probable further exploratory shafts, though no associated shaft was identified during the survey. Two smaller mounds (Nos. 109 and 110) are unlike the mounds associated with mining and may either be heavily eroded or discrete areas of dumping.

Towards the centre of Field 2 is an area of small depressions between 1m and 2.5m in extent (Nos. 104 and 105). These may indicate exploratory workings though they are heavily disturbed by burrowing.

At the southeast corner of the field is a low mound (No. 151). Its extent is similar to other hillocks, though rarely exceeds 0.2m in height and may be nothing more than soil slippage.

Field 3

Pre-mining activities are perhaps indicated by possible ridge and furrow or lynchet remnants (No. 143) located upslope towards the southern part of the field. These were clearly visible on aerial photographs, though not so well defined in the field, and could be interpreted as soil slippage.

Two shafts (Nos 124 and 141) are located within the field. No. 141 has an associated hillock downslope to the south, while feature 124 has no accompanying mound indicating later reworking. Access was

gained to 124 during the underground survey and was thought to be an exploratory shaft (TLEL 2007, 26), though working levels were not reached. A third hillock (142) and a mound (152) may also mask the position of shafts.

Upslope is a large hollow (144) which lies beneath the wall between fields 2 and 3. It would appear to be too large for a shaft but may represent a quarry pit.

Field 4

No clear evidence for pre-mining activities was identified within this field, principally due to deliberate levelling of most features. Immediately north of the field are well preserved lynchets and it is probable that they continued upslope.

There is only one visible shaft (No. 130) within the field, located towards the northwest corner. This has accompanying slight mounds but all form has been destroyed. Other shafts are indicated by a hollow (No. 136) and a parchmark (No. 132).

A mound (No. 133) alongside the southern wall is not too distant from a shaft recorded by the Ordnance Survey and perhaps indicates upcast from mining. However, slight boundary changes on the Tithe Award map and 1899 Ordnance Survey map may imply collapsed rubble walling.

Along the north edge of the field is a salient which on the Tithe Award plan once was part of the field to the northeast. A break of slope indicates the position of the former wall which had been removed by 1899. Within this area are small depressions (No. 131) that may indicate mining (an old shaft is depicted in this vicinity on the 1:2,500 Ordnance Survey map of 1880) and a larger waterlogged depression, perhaps indicating a pond (No. 154).

5.2 Complicating factors

A number of factors must be considered when dealing with the interpretation of the earthwork evidence. These are;

- Livestock erosion – this was noted on some of the larger features including 106, 108, 113, 118 and 150. Furthermore, cattle feeding stations had created a number of circular features with a slight rise in the centre along the eastern edge of Field 1, forming features 127 and 139.

- A series of depressions, features 104 and 105, may be attributed to animal burrows.

- Collapse and colluvial build up against the field walls has created adjacent banks. This is particularly apparent on the north, south and west sides of Field 1, particularly in the southeast corner. The earthworks associated with these have not been depicted on Figure 3.

- Soil slippage is marked in Field 3 and a discrete area of earthworks recorded as 143 maybe reinterpreted as earth movement.

- Field 1 has been extensively reworked and Field 4 is largely levelled.

- Hawthorn trees located along the southern edge of Field 1 and the northern part of Field 3 hampered reception for the roving receiver.

6. CONCLUSIONS

Earthwork survey carried out at Tearsall Quarry has recorded earthwork remains of

lead mining activities within the application site. This largely concurs with previous examination of the area, although additional features were identified during the survey.

The earthwork survey identified no pre-mining activities with certainty, though linear features following the contours of the slope may be vestigial lynchet or ridge and furrow remains.

All fields contain traces of 18th and 19th century lead mining activities, most notably the hillocks and shafts, though these are more numerous towards the north of the site. Previous work has suggested that many were exploratory shafts, though two were probably successful in obtaining mineral.

Secondary working is also apparent at the site and is best demonstrated by the absence of hillocks around some shafts and a possible buddle dam located in the northwest corner of the site. An enclosure marked on a plan of 1849 may be the buddle dam, thus indicating reworking was occurring at this time. This secondary working may have continued into the 20th century.

7. ACKNOWLEDGEMENTS

Archaeological Project Services wishes to acknowledge the assistance of Mr D Hodgkinson of Wardell Armstrong for commissioning the fieldwork survey and subsequent analysis, for providing background information and commenting on initial drafts of the report. Gratitude must be extended to Jim Rieuwerts for sharing his knowledge on lead mining features and their history on a visit to the site. The work was coordinated by Dale Trimble who edited this report along with Tom Lane. Access to the library maintained by Heritage Lincolnshire was kindly granted by Dave Start.

8. PERSONNEL

Project Coordinator: Dale Trimble
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Report Compilation: Paul Cope-Faulkner, Rachael Hall

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10. ABBREVIATIONS

ARCUS Archaeological Research and Consultancy at the University of Sheffield

GSGB Geological Survey of Great Britain

TLEL TL Excavations Limited

Table 1: Features recorded at Tearsall Quarry

Ref No	Field No.	TL Excavations Ltd Shaft Number	Grid Ref (SK)	Description
101	2	1	425947 360158	Large mound, located in the south of the application area. Mound approx 10m in diameter and downslope (northwards) stands to a height of 1.8m. Back of mound level with field. A capped shaft (sleepers) located on crown of mound (1.2m across). Signs of ginging.
102	2		425946 360156	A mound downslope from 101. The mound is characterised by a prominent bank which is formed on the downslope side (north). The rear of the mound is level with the surrounding ground. The mound measures 10m across and contains two small depressions each c1m across which may be infilled shafts.
103	2		425947 360195	A linear bank which is in contrast to the circular mounds uphill. The bank approximately 12m long x 4m wide, with a height of c 1.80m. A depression to the rear of the bank (south) may be an infilled shaft.
104	2		425974 360205	An area of small depressions each approximately 1m in diameter and c 0.30m in depth. The area covers c20m in diameter. The area does not appear to have been subject to extraction but maybe the remains of exploratory pits.
105	2		426000 360210	A second area of depressions of approximately the same extent.
106	2	2	426052 360220	A large mound, which has a steep bank to the north. The mound is approximately 9m across east-west and c 5m north-south. The bank in the north stands to a height of c1m. In the centre of the mound is a shaft, capped by corrugated iron.
107	2		426060 360262	A large horseshoe shaped mound, measuring approximately 10m across (east-west). The mound stands to a height of 1m on its northern side. A small depression on the south-western side of the mound may indicate the site of a former shaft.
108	2	3	426005 360265	A large mound, with banked material on its northern side. The mound measures 8m in diameter and is approximately 1.5m on its banked northern side. The mound contains a capped shaft, which was inspected by TL Mining Ltd
109	2		425980 360269	A small circular grass covered mound. The mound was approximately 4m in diameter and did not display any sign of having a shaft. Stood to a height of c0.8m
110	2		425970 360317	Small, low mound located immediately to the south of the field wall. No sign of surface shaft. c3m in diameter
111	1		425990 360322	A Bracken covered possible mound located on the northern side of the field wall, which runs centrally through the site. Bracken obscured much of the detail of this feature.
112	1	5	425961 360348	A shaft capped with concrete. There were no surface features associated with this shaft.
113	1	4	425984 360350	A low mound, which contains a capped shaft. The side of the shaft has been exposed showing clay deposits. The mound is approximately 6m in diameter and stands to a height of 1m. The presence of a mound in this area is attributed by TL Mining as being the result of hillocking.

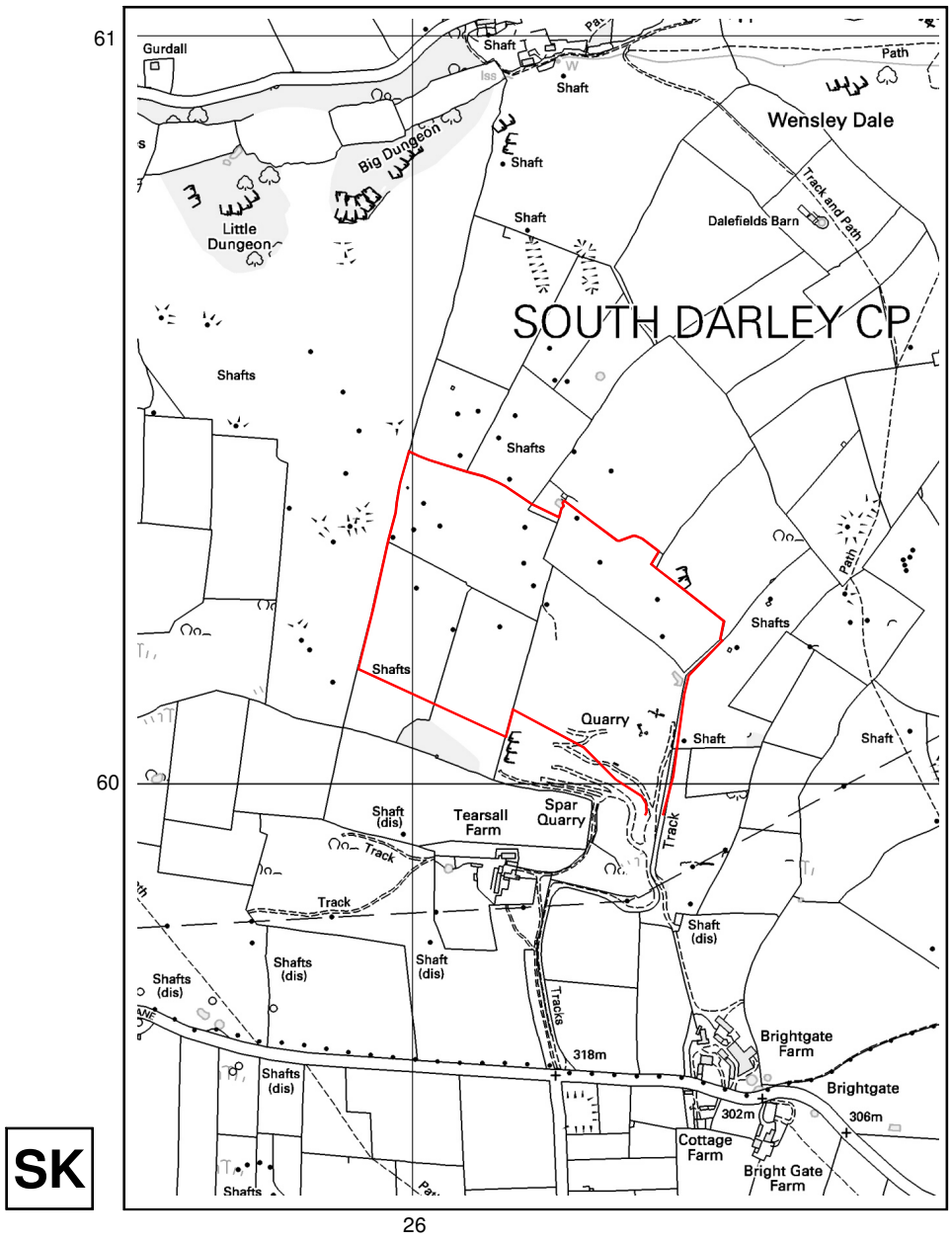
Ref No	Field No.	TL Excavations Ltd Shaft Number	Grid Ref (SK)	Description
114	1	8	426033 360360	A small bank defining a capped shaft. The bank is located to the south and is c3m in length and 0.8m in height
115	1	7	426012 360383	A capped shaft with a small bank on its western side. The bank has steep sides and may be modern.
116	1		426012 360396	An irregular shaped curvilinear mound, approximating a L shape. The mound was c 5m in length and stood to a height of 1m. It was grass covered with no visible sign of a shaft.
117	1	6	426000 360403	A small mound containing a capped shaft. Some surface stone is present. Mound measures approximately 7m in diameter
118	1		425998 360430	An area of low lying boggy ground located in the far north-western corner of the application area. The area is defined by large banks of material on the northern and western sides. There are the slight remains of a smaller bank in the east although this is discontinuous. The area is defined on its southern side by the 'causewayed' track which is higher. It is not certain whether this feature denotes a head pond on small reservoir or has been the result of hillocking. Discussion with Jim Rieuwerts indicated the possibility of this being a badly damaged buddle dam.
119	1		426070 360383	Small irregular mound located to the north of the banked path. Approximately 1m in height. C 3m across.
120	1		426058 360373	A horse shoe shaped mound, with the 'entrance' located in the east. Approximately 4m in diameter and reaching a maximum height of 1m.
121	1	9	426067 360305	A capped shaft with no visible surface features. Inspected by TL Excavations Ltd.
122	1		426072 360290	A large mound located to the immediate east of 121. This mound was approximately 15m in diameter, although irregular in shape, and was approximately 2m in height. There was no sign of any associated shafts.
123	1	10	426095 360278	A capped shaft investigated as part of the TL Excavations inspection. There were no associated surface remains.
124	3	11	426089 360255	A capped shaft located to the immediate south of the field boundary. The shaft is covered by sleepers which have been laid flush with the ground surface. There are no associated surface features. Inspected by TL Excavations.
125	1		426125 360263	A depression within a stand of hawthorn trees. The depression is approximately 10m in diameter and at a depth of c0.8m maximum. The area has been subject to cattle trampling which may have accounted for some of the depression however stone is evident at the surface and it is thought that this represents an infilled shaft.
126	1		426114 360330	Possible feature disturbed by cattle. Stone evident

Ref No	Field No.	TL Excavations Ltd Shaft Number	Grid Ref (SK)	Description
127	1		426154 360314	Possible feature: Area of disturbed ground
128	1		426202 360385	Stone structure located on the boundary of Field 3. Gabled and constructed from limestone. Pair of windows at 1st floor level in each gable. A wide main entrance in its southern wall, a small doorway in the north. Roofless and very overgrown. Unsafe to enter. Likely to be a coe rather than a field barn.
129	3		426195 360376	A stone revetted water feature located to the immediate south of the stone building 128. Rectangular in plan and approximately 10m in length, 5m in width. Filled with bullrushes but well constructed drystone walling still visible on the eastern and western pond edges. Potentially associated with mineral processing.
130	4		426221 360357	An area of small depressions and humps, characterised by nettle cover. Possibly an area of discrete working.
131	3		426284 360329	An area of disturbance, including a small depression containing the remains of a tractor. The area coincides with the salient to Field 3. A bank/contour mirrors the line of the existing field wall in the north. The area defined by the salient appears to have been subject to discrete disturbance characterised by very small hummocks. Maybe the remains of hillocking.
132	4		426342 360247	A potential infilled shaft, filled with soil and rubble. Forms a discrete patch at the surface c4m in diameter. Coincides with a shaft located on the Ordnance Survey.
133	4		426338 360189	A mound located on the southern edge of Field 3. Approximately 6m in diameter and 1.5m in height.
134	4		426281 360240	A very slight mound, with evidence of rubble within the soil matrix. Potentially an infilled shaft.
135	4		426237 360273	A depression located near the southern boundary of Field 4. The depression is relatively shallow at c0.30m and extends to a length of 8m being 3m in width. An infilled shaft.
136	4		426251 360296	A small mound, very discrete c0.20m in height and c 4m in diameter.
137	4		426224 360300	A small depression within Field 3, c5m in diameter. Very discrete.
138	1		426184 360342	An uncapped shaft to the south of the coe and water feature (128; 129). The shaft is open to a depth of approximately 2.5m but is partially filled with iron debris. The surface is partially overgrown obscuring the surface dimensions, however at a depth of c1m the shaft is approximately 1.5m square. It displays signs of ginging in its upper reaches. No surface remains were associated with this feature.

Ref No	Field No.	TL Excavations Ltd Shaft Number	Grid Ref (SK)	Description
139	1		426167 360263	An area of disturbed ground, which appears to have been worked to some extent. The area has been heavily trampled by cattle with a feeding station situated within the centre of the are, however there are areas of small discrete hillocks within bracken which may have a mining origin.
140	1		426166 360251	An area to the immediate south of 139 which displays similar attributes. Heavy cattle trampling has obscured much, however there are areas where there appears to have been some form of surface modification, either as levelling/hillocking or through mining activity.
141	3	12	426070 360240	A capped shaft inspected by TL Mining, very obscured by bracken cover. No surface features were associated with this feature.
142	3		426114 360175	A mound located on the slope of Field 3. The mound resembles those to the west identified in Field 2. The feature is c7m in diameter, with a northern bank/slope of approximately 1m in height. There is a depression visible within the centre of the mound which contains evidence of infilling.
143	3		426085 360122	An area identified on recent aerial photographic survey which indicates a series of linear features running parallel to the slope of Field 3. The site inspection identified very faint linear features however it was particularly difficult to trace these features with certainty largely due to their ephemeral nature and to the fact that they were heavily obscured by bracken. Confident dimensions could not be determined, however heights of c0.05m were noted in localised areas. It is possible that these represent the remains of ridge and furrow earthworks, however diagnostic dimensions for dating purposes could not be ascertained.
144	3		426047 360174	A large bracken filled depression which straddles the field wall which separates Field 2 and 3. The depressions is large, approximately 20m in diameter and c1m deep at its maximum. It is possible that the depression lies below the field boundary which would effectively date the depression as pre-dating 1849.
145	1		426077 360366	Triangular depression with slight bank on northern and southern sides measuring 14m long by 8m wide.
146	1		426063 360355	L-shaped mound with steep banks. The mound is 7m long and 2.5m wide. No associated features
147	1		426085 360334	Slight L-shaped mound with southern side level with natural topography. 6.5m long
148	1		426113 360308	Horseshoe shaped mound measuring 1.66m high and 6.9m long. No associated features
149	1		426131 360264	Low mound with scarp along the south identified in survey undertaken by ARCUS. Possible lynchet, though not extensive

Ref No	Field No.	TL Excavations Ltd Shaft Number	Grid Ref (SK)	Description
150	1		426147 360240	Irregular mound incorporating collapse from field wall with additional livestock erosion
151	2		426004 360108	Low mound at the southern (upslope) part of the field. 13m by 12m in extent. May possibly be soil slippage. No associated features
152	3		426120 360198	Low mound between features 141 and 142. Measures 8.5m by 7m with a small 1.1m depression on the southern side. Possible damaged hillock
153	4		426267 360325	Low irregular mound. Perhaps natural
154	4		426308 360320	A slight depression measuring 11m by 8m and waterlogged. Possible pond
155	1		426109 360388	Low irregular mounds which have been trampled by cattle. 15m by 15m in extent.

Figure 1 - General location plan



Application Area edged in red

Archaeological Project Services		
Project Name: Tearsall Quarry, Winster TEML07		
Scale 1:10000	Drawn by: PCF	Report No: 156/07

Figure 2 - Site location plan

Figure 3 - Results of the earthwork survey

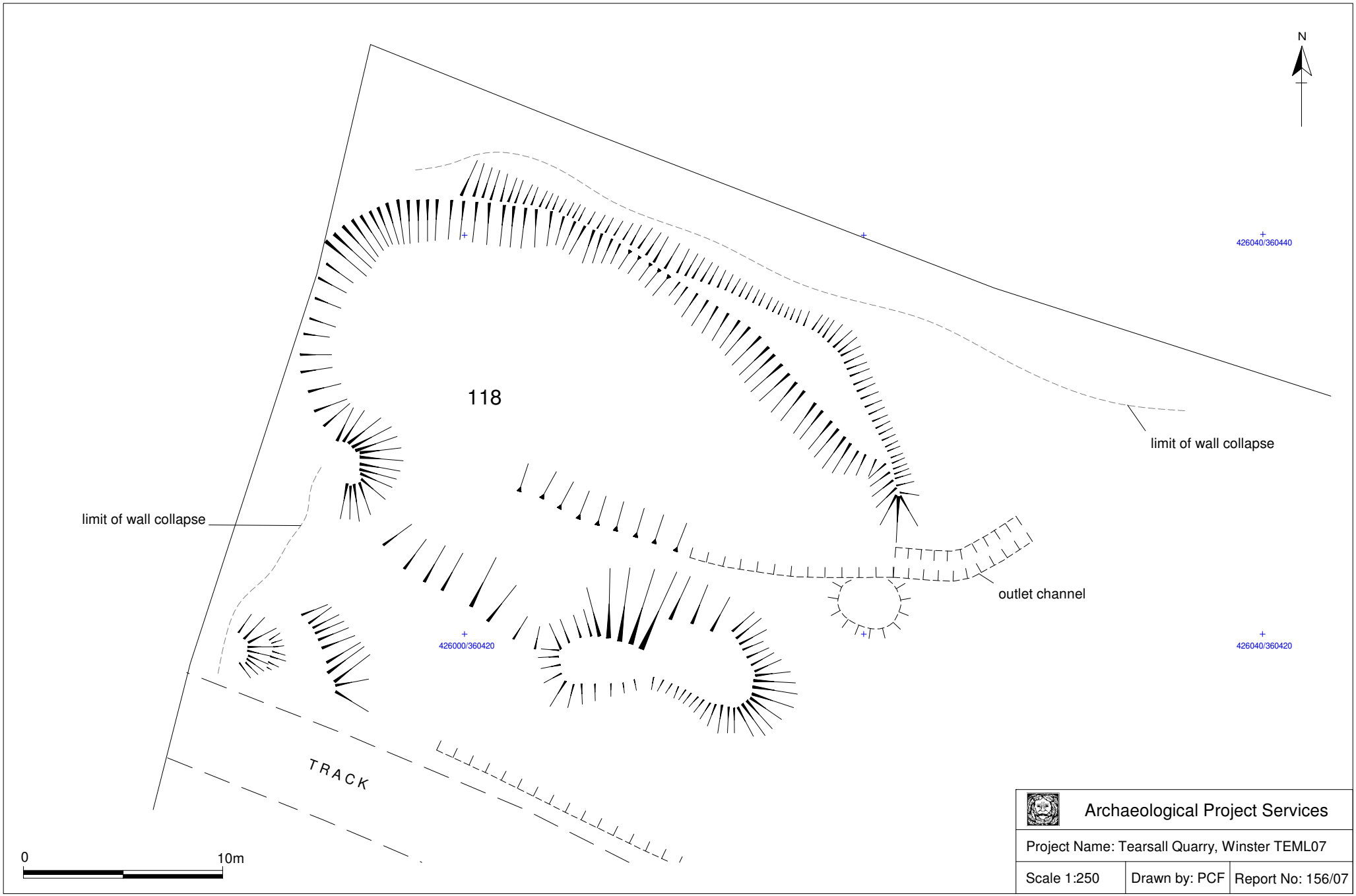


Figure 4 - Feature 118

Plate 1 – View across the site from Field 2, looking north

Plate 2 – Field 1, Feature 149, looking east

Plate 3 – Field 1, Feature 112, looking northwest

Plate 4 – Field 1, Feature 136, looking south

Plate 5 – Field 1, Feature 113, looking west

Plate 6 – Field 1, Feature 115, looking northwest

Plate 7 – Field 1, Feature 118, looking west

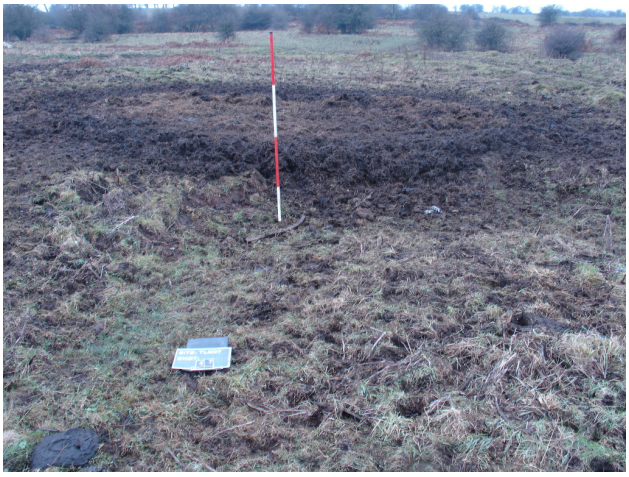


Plate 8 – Field 1, Feature 127, looking southwest

Plate 9 – Field 2, Feature 101, looking northwest

Plate 10 – Field 2, Feature 108, looking northeast

Plate 11 – Field 2, Feature 105, looking northeast

Plate 12 – Field 3, Feature 143, looking southeast

Plate 13 – Field 3, Feature 141, looking northwest

Plate 16 – Field 3, Feature 131, looking south

Plate 14 – Field 3, Feature 124, looking north

Plate 17 – Field 3, Feature 154, looking east

Plate 15 – Field 4, Feature 130, looking south

Plate 18 – Surveying under progress, Feature 118, looking north

Appendix 1

WRITTEN SCHEME OF INVESTIGATION FOR EARTHWORK SURVEY, TEARSALL LEAD MINE, WINSTER, DERBYSHIRE

1 SUMMARY

1.1 This document comprises a specification for an earthwork survey of earthworks at Tearsall leadmine, Winster, Derbyshire.

1.2 The site lies within an area recognised as being of high landscape importance for lead mining remains and is located adjacent to the Scheduled lead mining site known as Northern Dale Mines (SM 30945) .

1.3 The site is the subject of a proposal to extract vein mineral as an extension to the existing Tearsall Quarry. The Peak District National Park Authority has recommended archaeological evaluation of above and below ground remains.

1.4 On completion of the fieldwork a report will be prepared detailing the results of the investigation. The report will consist of a text describing and interpreting the earthworks supported by a hachured plans of these remains.

2 INTRODUCTION

2.1 This document comprises a specification for an earthwork survey on land adjacent to Tearsall Quarry, Winster, Derbyshire.

2.2 The document contains the following parts:

2.2.1 Overview

2.2.2 The archaeological and natural setting

2.2.3 Stages of work and methodologies to be used

2.2.4 List of specialists

2.2.5 Programme of works and staffing structure of the project

3 SITE LOCATION

3.1 The village of Winster, Derbyshire is located approximately 6km west of Chesterfield and 9km south of Bakewell within the Peak District National Park. Tearsall quarry lies approximately 3km to the east of Winster and around a kilometre to the south of Wensley village, immediately north of Tearsall Farm.

4 PLANNING BACKGROUND

4.1 The earthwork survey is to be undertaken as a part of an Environmental Impact Assessment of the proposed extension of Tearsall Quarry, at the request of the Peak District National Park Authority.

5 SOILS AND TOPOGRAPHY

5.1 Local soils are of the Maltham 2 series comprising stoneless silty Aeolian drift over Carboniferous limestone and Triassic limestone breccia (Hodge et al 1984).

6 ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

6.1 The brief issued by the Peak District National Park Senior Archaeologist sets out the archaeological background as follows:

6.2 The proposed extraction area was the subject of a desk-based assessment and walk-over survey, which was conducted in September 1998. This was undertaken by Archaeological Research Consultancy, University of Sheffield in relation to a previous application. No more detailed investigative works were undertaken at this time.

6.3 Subsequently further desk-based research and reconnaissance survey work has been undertaken by Wardell Armstrong as part of the preparation of the EIA for the current application. Underground investigation was also conducted to assess the nature, extent and archaeological importance of the evidence of early mining which might be affected should the development proceed. This inspection was by Terry Worthington, a local mining engineer and historian.

6.4 A rapid inspection of the application was also undertaken by Dr John Barnatt, Senior Survey Archaeologist, Peak District National Park Authority, in January 2007.

6.5 The application area is immediately south-east of the Northern Dale Mines (Schedueld Monumnet 30945) which has important surface and sub-surface features. Below ground surveys have recorded extensive evidence of 16th and 17th century lead extraction, particularly through the method of fire setting. Evidence for this includes heat-altered surfaces, distinctive passage shapes and shafts, ventilation control measures and detritus from the burning of fuels. (For more details see: 'Using coal to mine lead: firesetting at Peak District Mines', Mining History:The bulletin of the Peak District Mines historical Society, vol.16,no.3, Summer 2006)

6.6 Above ground within the Northern Dale Mine SM is Dale Field Engine shaft, which had a Newcomen engine in 1744, and a buddling complex using water from Tearsall pipe caverns. The southernmost area (SK2671001) retains very well preserved remains of mining and ore processing. The economical use of water is a major feature. From a shaft to the south, associated with a gin, a narrow water channel (partly stone lined) runs south and downhill. Heaps of dressing spoil are visible on each side and, to the east, earthworks by a small shaft indicate overgrown dressing areas. The channel runs between further shafts one with a collapsed coe at its head to two rectangular, stone-line buddles. These tilted troughs were used with water to separate lead and other minerals and they are well preserved. In one the tip of the incoming water channel survives in situ. To the north is a ruined building. Further north is a large heap of dressing spoil beyond which is a conical heap 2.5m high. The flat surface of this conical heap is though to be the infilled surface of a 'tailings dam' where fine waste was deposited to minimise pollution to other water sources.

6.7 To the north of Ash Plantation is the second area of protection (SM 30943 at SK26746051) which includes very intensive lead workings of varied form. Most apparent are well preserved shafts, rakes and opencuts of various size. Earlier features are often cut by later ones; opencuts cut by shaft mounds, clustered small scale workings are cut by larger shafts - all showing the progression of mining techniques. The southern part of this area is characterised by deep shafts. Some enter the Tearsall pipe caverns and evidence of dressing areas, spoilheaps and building are thought to be buried in this area. Dale Field Engine Shaft is within the protected area. This contained a Newcomen engine (1744). A large shaft mound at SK26608635 in the south western part overlies ridge and furrow, and is close to a series of shallow rakes which represent earlier mining. In the eastern corner of the site Northern Dale contains a series of early mine entrances. Old ash mine entrance opens into workings dating to at least 1635, and roman or Medieval origins have been suggested.

6.8 The various walkover surveys have identified a number of features within the application area. The bulk of these relate to lead mining activity of probable 19th century origin. Some 30 mine shafts and spoil heaps occur across the site. A degraded buddle dam has been recorded in the north-western corner of the application area. Other earthwork features (lynchets), representing early agricultural activity, have also been recorded.

6.9 Twelve shafts were investigated during the underground assessment. It is thought that these were all driven for exploratory purposes. Evidence of ropewear and pickwork was found in some of the shafts but none of firesetting. It is thought that the shafts were extensive infilled during re-working of the mine hillocks during the 20th century. The report on this work concluded that it was highly likely that deeper, currently inaccessible workings would be encountered should the site be worked.

7 AIMS AND OBJECTIVES

7.1 The aim of the work will be to accurately record earthworks remains within the application area.

7.2 The objectives of the work will be to:

7.2.1 Accurately record the location and form of all earthworks within the application area.

8 EARTHWORK SURVEY

8.1 Reasoning for this technique

8.1.1 An earthwork survey records the extent and form of upstanding remains such that they provide a means of interpreting the character of lead mining undertaken at the site.

8.2 Methodology

8.2.1 The survey will be undertaken using a survey grade differential GPS system. In relation to the system base station recording is accurate to within 1cm both in the horizontal and vertical planes.

8.2.2 The GPS base station will be linked to the closest OS trig point to accurately place the survey onto the Ordnance Survey National Grid.

8.2.3 A Thales ZMAX GPS connected to a hand held datalogger will be used to collect survey points. The instrument has a display screen on which the survey can be viewed and edited.

8.2.4 All breaks of slopes will be recorded with elevations. At the end of each day logged data will be downloaded to a PC and the survey processed using N4CE software.

8.2.5 A sketch plan of all recorded earthworks will also be compiled depicting relationships between features, hachures showing steepness and direction of slope and annotations describing features which can be used to interpret the earthworks.

8.2.6 Digital photographs of all recorded earthworks will be taken.

9 POST-EXCAVATION AND REPORT

9.1 Following completion of fieldwork the survey will be exported as a DXF file to a PC where CAD software will be used to produce a hachured survey drawing.

9.2 The report will contain appropriately scaled illustrations of the survey results, reproduced at 1:200 or 1:500 depending on the scale and complexity of the results.

9.3 The report will contain a descriptive text of the earthwork features recorded at the site, supported by selected photographs and relevant details from the survey if necessary.

9.4 Interpretation of the recorded earthworks will be contained within a separate section of the report.

10 ARCHIVE

10.1 The documentation, finds, photographs and other records and materials generated during the evaluation will be sorted and ordered in accordance with the procedures in the Society of Museum Archaeologists' document *Transfer of Archaeological Archives to Museums* (1994), and any additional local requirements, for long-term storage and curation. This work will be undertaken by the Finds Supervisor, an Archaeological Assistant and the Conservator (if relevant). The archive will be deposited with the receiving museum as soon as possible after completion of the project, and within 12 months of that completion date.

11 REPORT DEPOSITION

11.1 Copies of the evaluation report will be sent to: the client and the Peak District National Park Senior Conservation Archaeologist.

12 PUBLICATION

12.1 Details of the investigation will also be input to the Online Access to the Index of Archaeological Investigations (OASIS).

13 CURATORIAL MONITORING

13.1 Curatorial responsibility for the project lies with Peak District National Park Senior Conservation Archaeologist.

14 VARIATIONS TO THE PROPOSED SCHEME OF WORKS

14.1 Variations to the scheme of works will only be made following written confirmation of acceptability from the archaeological curator.

14.2 Should the archaeological curator require any additional investigation beyond the scope of the brief for works, or this specification, then the cost and duration of those supplementary examinations will be negotiated between the client and the contractor.

15 STAFF TO BE USED DURING THE PROJECT

15.1 The work will be directed by Tom Lane MIFA, Senior Archaeologist, Archaeological Project Services. The on-site works will be supervised by an Archaeological Project Officer with knowledge of archaeological surveys of this type.

15.2 Staff within Archaeological Project Services have undertaken a wide range of earthwork surveys of various sites including: lead mining sites along the Bamford to Buxton water pipeline (Steve Malone, APS Project Manager), lime kilns and coal mining sites in Shropshire and salt working sites in the Weaver valley Cheshire (Denise Drury, Project Manager). Recently APS have undertaken of a glass working site at Eastside, Birmingham. Tom Lane has extensive and detailed knowledge of salt working sites in the Lincolnshire Fenland. A recent pilot study funded by English Heritage and undertaken by APS involved data collated and survey of the built heritage of selected Lincolnshire waterways.

16 PROGRAMME OF WORKS

16.1 The site works are timetabled to take 4 days depending on the quantity and complexity of archaeological remains encountered. Post-excavation work is timetabled to take about 5 days, depending on the quantity and complexity of archaeological remains encountered.

17 INSURANCES

17.1 Archaeological Project Services, as part of the Heritage Trust of Lincolnshire, maintains Employers Liability insurance to £10,000,000. Additionally, the company maintains Public and Products Liability insurances, each with indemnity of £5,000,000. Copies of insurance documentation can be supplied on request.

18 COPYRIGHT

18.1 Archaeological Project Services shall retain full copyright of any commissioned reports under the *Copyright, Designs and Patents Act* 1988 with all rights reserved; excepting that it hereby provides an exclusive licence to the client for the use of such documents by the client in all matters directly relating to the project as described in the Project Specification.

18.2 Licence will also be given to the archaeological curators to use the documentary archive for educational, public and research purposes.

18.3 In the case of non-satisfactory settlement of account then copyright will remain fully and exclusively with Archaeological Project Services. In these circumstances it will be an infringement under the *Copyright, Designs and Patents Act* 1988 for the client to pass any report, partial report, or copy of same, to any third party. Reports submitted in good faith by Archaeological Project Services to any Planning Authority or archaeological curator will be removed from said Planning Authority and/or archaeological curator. The Planning Authority and/or archaeological curator will be notified by Archaeological Project Services that the use of any such information previously supplied constitutes an infringement under the *Copyright, Designs and Patents Act* 1988 and may result in legal action.

18.4 The author of any report or specialist contribution to a report shall retain intellectual copyright of their work and may make use of their work for educational or research purposes or for further publication.

19 BIBLIOGRAPHY

Hodge, CAH, Burton, RGO, Corbett, WM, Evans, R, and Seale, RS, 1984 *Soils and their use in Eastern England*, Soil Survey of England and Wales **13**

Appendix 2

THE ARCHIVE

The archive consists of:

2	Daily record sheet
5	Sketch plans
1	Photographic record

Various digital data

All primary records are currently kept at:

Archaeological Project Services
The Old School
Cameron Street
Heckington
Sleaford
Lincolnshire
NG34 9RW

The ultimate destination of the project archive is:

Buxton Museum and Art Gallery
Terrace Road
Buxton
Derbyshire
SK17 6DA

The archive will be deposited in accordance with the document entitled *Procedures for the Transfer of Archaeological Archives: Museums in Derbyshire*.

Archaeological Project Services Site Code: TLM 07

The discussion and comments provided in this report are based on the archaeology revealed during the site investigations. Other archaeological finds and features may exist on the development site but away from the areas exposed during the course of this fieldwork. *Archaeological Project Services* cannot confirm that those areas unexposed are free from archaeology nor that any archaeology present there is of a similar character to that revealed during the current investigation.