



Hallenbeagle, Scorrier, Cornwall

Archaeological Impact Assessment of Cory Environmental proposals for a waste transfer station



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This study was commissioned by Russell Dodge of Business Location Services Ltd and carried out by Historic Environment Projects, Cornwall Council.

The views and recommendations expressed in this report are those of Historic Environment Projects and are presented in good faith on the basis of professional judgement and on information currently available.

Freedom of Information Act

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Cover illustration

A view across the travellers' site and smallholders' fields at Hallenbeagle towards the Listed engine houses at Reade's Shaft.

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Abbreviations

CRO	Cornwall County Record Office
EH	English Heritage
HER	Cornwall and the Isles of Scilly Historic Environment Record
HE	Historic Environment, Cornwall Council
NGR	National Grid Reference
OS	Ordnance Survey
PRN	Primary Record Number in Cornwall HER
RIC	Royal Institution of Cornwall

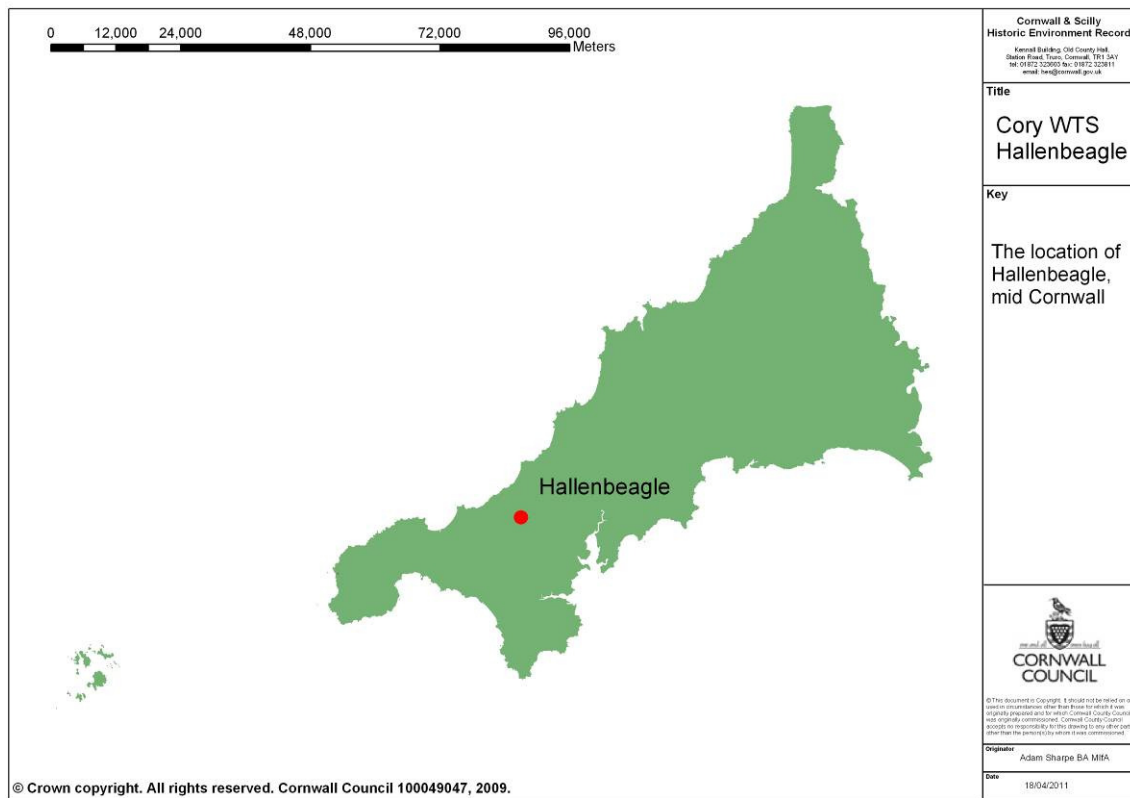


Fig 1. The location of Hallenbeagle.

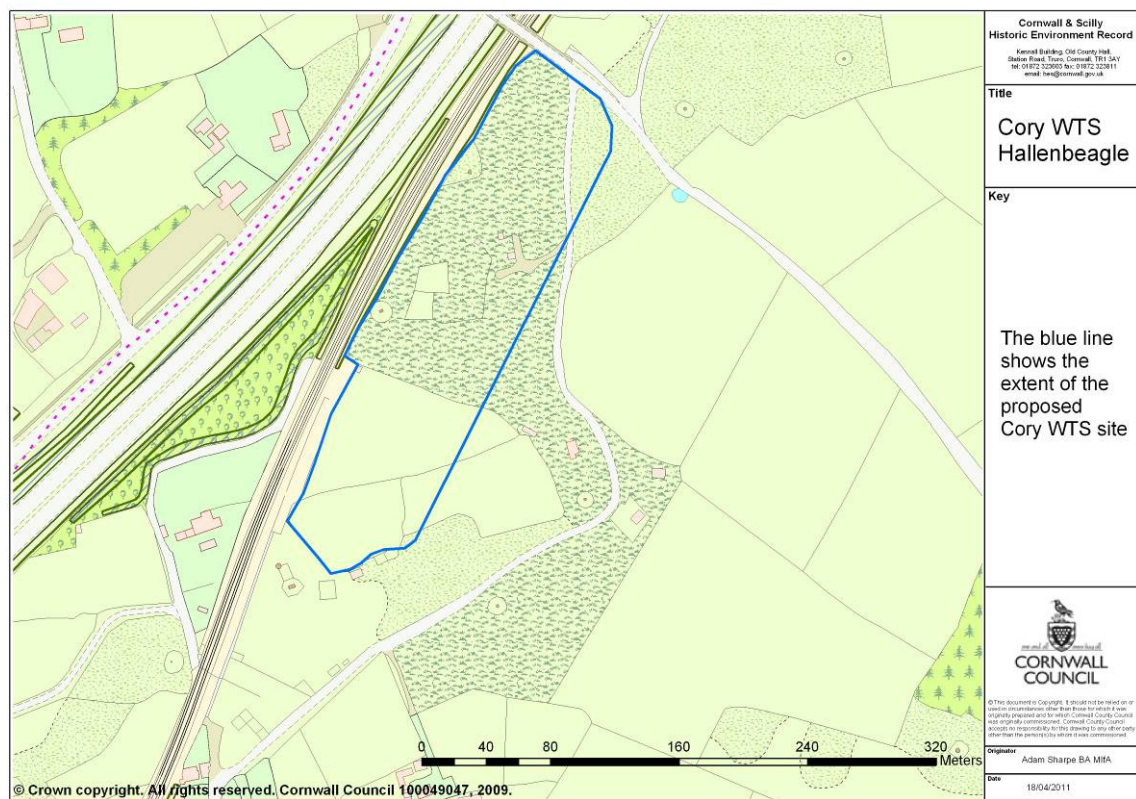


Fig 2. The extent of the area proposed for the Cory Environmental waste transfer station at Hallenbeagle.

10.1 INTRODUCTION

Historic Environment Projects were contacted by Russell Dodge of Business Location Services Ltd on 16 March 2011 with a request to provide costs for an archaeological chapter in an Impact Assessment to accompany a detailed planning application for the development of the Cory Environmental proposals for the western half of the eastern site (Zone 1 on the masterplan). Although a detailed brief was not provided, a chapter outline accompanied this request.

The development of the Cory Environmental zone of the wider Hallenbeagle site will entail the clearance of vegetation and the remains of mine spoil dumps, hedges associated with smallholders' fields, caravans and other temporary structures, large quantities of rubbish (including fly-tipped asbestos sheet) and substantial quantities of rubble, together with the excavation and capping of at least five mine shafts; should this work be undertaken as part of a general preparation of the wider site, this will entail the removal of the remains of two mine reservoirs and the making safe of a further nine mine shafts. The whole of the wider site will be landscaped and developed with the exception of a small area around Reade's Shaft. New access arrangements, service roads and other services will be constructed.

10.2 OBJECTIVES

The principal aim of this study is to gain a better understanding of the impacts of the proposed development of the Cory Environmental waste transfer station in Zone 1 of the Hallenbeagle development site during its construction and operational phases, and, following consultation with interested bodies, the identification of appropriate mitigation measures. The study will incorporate the further aim of identifying the impacts of the proposals on key heritage assets surrounding the site during both the construction and operational phases of the development.

The principal objective is the production of a section of an EIA statement (Chapter 10: Archaeology and the Historic Environment) to accompany an application for detailed planning consent for the Cory Environmental proposals.

10.3 PLANNING CONTEXT

Hallenbeagle was proposed as a suitable area for redevelopment for light industry and other commercial uses during the early 1980s, being included within the then proposed Truro Airport/Wheel Busy Business Park. This proposal did not come to fruition, though the Hallenbeagle site remained identified in the Carrick District Plan as being suitable for redevelopment for commercial/light industrial use as a Food and Energy Park.

An archaeological assessment of the redevelopment area was carried out by IHC Consultants, and was the subject of comments by the Cornwall and West Devon World Heritage Site Bid Team in the context of a masterplan for the site which achieved its current form in April 2009, when the development gained outline planning permission MC04/0836/07/B which relates to the development of industrial units and related development over the wider Hallenbeagle site.

In November 2010, Historic Environment Projects were contacted by Kim Dodge of CSA Architects with a request for an archaeological assessment and impact assessment of Zones 1 and 4 of the area proposed for redevelopment at Hallenbeagle, these being proposed for a waste transfer station to be operated by Cory Environmental Ltd. This proposal has now (April 2011) been re-located to Zone 1 of the redevelopment site, occupying an area to the west of the proposed service road subdividing this eastern part of the redevelopment site from north to south, stretching from just to the north of Read's engine houses to the south and being bounded to the north by the minor road from the Blackwater – Scorrier road to the north and the main railway line to the west (Fig 2). A detailed planning application is being prepared for this development, for which this EIA chapter is a part.

10.4 CONSULTATION

On completion of the DBA and fieldwork elements of the project, face to face, email and telephone consultations concerning the impacts of the proposal and suitable mitigation were made with the following:

- The Cornwall and West Devon World Heritage Site Office
- The Cornwall Council Historic Environment Planning Advice Officer (central area), Dan Ratcliffe

- Cornwall Council Planning Case Officer, Nigel Brabyn
- Cornwall Council Conservation Officer (central area), Jenny Gale

10.5 ASSESSMENT METHODOLOGY

10.5.1 Methods

All recording work has been undertaken according to the Institute for Archaeologists *Standards and Guidance for Archaeological Investigation and Recording*. Staff will follow the IfA *Code of Conduct* and *Code of Approved Practice for the Regulation of Contractual Arrangements in Archaeology*. The Institute for Archaeologists is the professional body for archaeologists working in the UK.

10.5.2 Desk-based assessment

During the desk-based assessment historical databases and archives were consulted in order to obtain information about the history of the site and the structures and features that were likely to survive. The main sources consulted were as follows:

- Cornwall HER
- Images of England online listed buildings database
- Early maps and photographs (see Section 10.13.1)
- Published histories (see Section 10.13.2)

10.5.3 Preliminary assessment

A review of available information has been carried out to inform the impact assessment. This comprised:

- Published sources
- Historic maps, including
 - Joel Gascoyne's map of Cornwall (1699)
 - Thomas Martyn's map of Cornwall (1748),
 - OS 1 inch survey (c1810)
 - Kenwyn Tithe map (c1840),
 - 1st and 2nd Editions of the OS 25 inch maps (c1880 and c1907)
- Modern maps
- Archive mine plans in the Cornwall Record Office (see Section 10.13)
- GIS databases recording geology, soil types, Historic Landscape Character, Designations, Rights of Way &c.
- The (undated) archaeological assessment of the site carried out by IHC Consultants.

10.5.4 Fieldwork

- A brief walkover survey was undertaken to check and record features indicated on historic maps and plans, and to record any previously undocumented elements of the site on a base map drawn up during the preliminary assessment. Features were located using a hand held GPS unit where required.
- Key views in and out of the site were noted and photographs of views and relevant site detail recorded using a high resolution digital camera.

10.5.5 Post-fieldwork

10.5.5.1 Archive deposition

An index to the site archive has been created and the archive contents prepared for long term storage, in accordance with HE standards.

The archiving comprises the following:

1. All correspondence relating to the project, the WSI, a single paper copy of the report together with an electronic copy on CD, stored in an archive standard (acid-free) documentation box
2. The project archive will be deposited initially at ReStore, and in due course (when space permits) at Cornwall Record Office. A copy of the digital archive, including photographs, will be incorporated into the Cornwall and Scilly HBSMR.

10.5.5.2 Report distribution

A paper copy and a digital (PDF) copy of the report, illustrations and any other files will be deposited in the Cornwall HER. A paper copy of the report will be distributed to the client together with a digital version for inclusion in the EIA document.

Once the application becomes part of an active detailed planning application, copies of the report will be distributed to local archives and national archaeological record centres.

10.6 BASELINE CONDITIONS

10.6.1 Location and setting

The site is located immediately to the east of the Cornwall main railway line just to the north-east of Scorrier. It is centred at SW 72740 44727 at an average height of 75m OD and is orientated between south and south-west. The underlying geology consists of the mid to late Devonian Porthtowan Formation, part of the Gramscatho Group of metamudstones and metasandstones with a dyke of Permian felsite traversing the northern part of the site; the soils are of the MANOD group – shallow loams over slates and siltstones.

10.6.2 Designations

The engine house and a detached chimney (formerly associated with a now-demolished whim engine house) in the southern part of the Hallenbeagle site are listed Grade II (Fig 13). Hallenbeagle is bordered to the east and south by the Cornish Mining World Heritage Site (Fig 14).

10.6.3 Site history

Hallenbeagle was a former copper mine near Scorrier in the parish of Kenwyn which also produced small amounts of tin and arsenic. It was probably first started in or around 1701, when this area of North Downs was being prospected (Hamilton Jenkin 1979), though work does not seem to have begun in earnest here until several decades later. Its heyday was during the late 18th century and early 19th century, when it was one of a group of important mines near Scorrier whose output of copper from relatively shallow levels was prodigious. The mine name appears to derive from the Cornish *Hal an bugel* – Shepherd's Moor.

The mine was re-worked, though much less successfully, during the mid 19th century, when it employed about 200 people; from 1835-46 the mine produced 30,850 tons of copper ore. Its sett was bounded by those of Wheal Rose, Wheal Chance and Boscawen Mine, and like these, it was drained via the Great County Adit, which at Hallenbeagle is reported by Cornwall Consultants to be at 24m OD. Collins (1912) reported that at the end of 1838 the mine was 'producing fairly' and around this time was employing about 200 men. The mine was shown as active in 1840 on the Kenwyn Tithe Map (Fig 4), when an engine house was depicted on Engine Shaft in the northern part of the development area. This may originally have housed a very unusual inverted double-acting beamless engine designed and installed by James Watt in 1795, though it is noted that Watt was building a further engine for Hallenbeagle in 1797. A 70" cylinder pumping engine at Hallenbeagle was for sale in 1848. The mine worked four lodes: North Lode, worked from King's Shaft (now beneath the A30), Engine Shaft (in the northern part of the proposal area), Stone Shaft and Eastern

Shaft (just to the north-east of the proposal area); Read's Lode was worked from Read's (Reade's or Reed's) Shaft where there are the remains of a pumping and winding engine house, as well as three un-named shafts and Jeffrey's Shaft (Read's Shaft being just to the south of the proposal area, two of the un-named shaft lying on its fringes; Jeffrey's Shaft and the other un-named shaft are just to its south-east). Other lodes worked were Oats Lode, worked from Oat's Shaft just to the south-east of the proposal area and South Lode, developed by a number of shafts to the south of the proposal area.

The mine had a somewhat patchy history during the 19th century, the mining historian Joseph Yelloly Watson in 1843 reported that Hallenbeagle '*... in Kenwyn, near Chacewater, is returning large quantities of ore, but barely paying the expenses of working; about two hundred persons are employed — the monthly cost averages £1,500 — and the machinery on the mine is valued at £4,500. From June 1834 to June 1842, the mine returned seventeen thousand one hundred and forty-eight tons of ore yielding £77,604 2s 5d*' (Yelloly Watson 1843).

Some twenty-two years later Thomas Spargo said of Hallenbeagle '*... in Kenwyn, Cornwall, in 6,000 shares. Secretary, Mr. Edward King, 22A Austin Friars. Manager, Captain Edward Richards, St. Agnes. Lord, Viscount Falmouth. Dues, 1-24th. Depth of adit, 50 fathoms. Under adit, 50 fathoms. Pumping-engine, 60-inch, at work. Winding-engine, 22-inch, at work. 70 men, 37 females, and 30 boys employed; total, 137 persons. Rocks, clay-slate, and elvans. Copper Ore Sold in 1864 - 737 tons 14 cwt. 0 qrs sold for £4,282 10s. 6d.*'

'The present Company commenced operations in 1864, and the time has been occupied in preliminary works chiefly. This sett was a part of Great Wheal Busy United. The prospects are good. The name "Hallenbeagle" was, a few years ago, the name of the mine now called "Boscawen." Great Wheal Busy 'was so very large as to render a tripartite division desirable, and that has been accomplished. This seems to be a fair speculation in a great mining county; nevertheless, the granites are rather too far in the background to render this site a fancy locality; scientific geology seems to point to depth as the goal of success for the Great Busy range of mines.' (Spargo 1865).

Mine plans for Hallenbeagle are few and event these do not provide complete information about the surface layout of the mine. A redrawn version of the 1840 Kenwyn Tithe Map is amongst papers dating between 1728 and the 1820s forming part of a mid-19th century dispute between the Laurence family and Lord Falmouth over the rights to tin dues from Creegbrowse (LR82). Hallenbeagle is shown on this map and appears to include an engine house and other structures in the northern part of the site adjacent to Engine Shaft.

Abandoned Mine Plan R151A/2 in the County Records Office shows an arrangement of pumping and whim engine houses (together with another L-shaped building) in the area around Reed's Shaft. Notably, the whim engine house is shown sited to the south of the shaft, rather than to its east. This plan dates to 1859. A further plan showing the shafts, levels and adits at Hallenbeagle (MRO 96B) drawn by James Henderson at 10 fathoms to the inch is also clearly drawn up post-1859, as it includes the route of the West Cornwall Railway near Reade's Shaft. The L-shaped building to the south of the shaft was shown, but not any of the engine houses.

Hallenbeagle continued to work during the later 19th century, at times as part of Boscawen Mine and in the later part of the mid-19th century as part of Great Wheal Busy. By 1870, Collins (1912) reported that the lower levels of the mine had been abandoned and that only ten miners were being employed, these retrieving copper, tin and arsenical ores from the adit or from waste dumps.

By 1878 the mine was depicted by the OS as abandoned (Fig 5), its landscape covered with spreads of mine waste and accompanied by a number of ruined engine houses. By 1907 (Fig 6), the northern engine houses had been demolished and the north-eastern part of the site had been reclaimed to agriculture. A sawmill which had developed on the southern part of the site during the late 19th century remained active into the early years of the 20th century, the area around Read's Shaft subsequently being modified to site a small-scale concrete plant.

An extensive area within the Hallenbeagle mine complex in which spoil tips, shafts and any other mining features have been bulldozed flat is visible on air photographs (particularly those taken in 1946 by the RAF) and was plotted as part of the NMP. This type of wholesale clearance of this type found between Chacewater, St. Day and Scorrier. At Hallenbeagle it seems mainly to have been confined to the northern part of the site, though is identical to that at Wheal Busy and United Downs where landscaping of this type is associated with the establishment at those sites of temporary bell tent camps accommodating troops in the build-up to D-Day. At Hallenbeagle wartime aerial photos

show no sign of any tents or buildings so it seems likely that the site was cleared as a proposed camp but in the event was never used.

By 2005 (CCC aerial photographic evidence, Fig 7) the central and north-eastern areas of the wider site had been reclaimed to agriculture and the southern parts of the site were in scrubby heathland (Figs 20-21). The north-eastern part of the wider mine site (Zone 4 on the site development proposals dated 01/10/2010) remained in agricultural use, whilst the north-western part of the site (the northern part of Zone 1 on the October 2010 plan) and the central eastern part of the site (Zone 5) were occupied by a number of static caravans and their curtilages (Figs 16-19); the southern part of Zone 1 was occupied by a number of smallholders' fields first shown on the 1809 OS mapping (Figs 26, 27). The south-eastern part of the site (Zone 6) had scrubbed in, as had the southern corner of the site (Zone 3) and the area around Read's engine houses (Zone 2) (Figs 27-29).

Mapping undertaken by Cornwall Mining Services Ltd for a previous assessment of the site shows the locations of the shafts in and surrounding this site (see Fig 8), there being runs of shafts on Reed's Lode and Oats Lode to the south; Pininger's Shaft in the middle part of the site, like Kings' Shaft to its west is on a further lode, whilst Engine Shaft in the northern part of the site (together with its near neighbours, Flat Shaft to the west and Stone's Shaft to the east) is on Hallenbeagle Lode. It should be noted that there is some disagreement in sources which name the lodes at Hallenbeagle, Dewey (1923) citing the Hallenbeagle Lode (also worked in Wh. Rose, Wh. Hawke and Wh. Messar), South Lode, Raby's Lode and Williams' Lode, whilst Dines (1953) mentions North Lode, South Lode, Reed's Lode and Oats Lode. Dines indicates that North Lode was worked from the following shafts: King's, Engine (to 67fm below adit), Stone's and Eastern. No shafts are mentioned on South Lode, but Reed's Lode was worked from Reed's Shaft and Veffrey's (Jeffrey's) Shaft. Oats' Lode was worked from Oats' Shaft and by crosscuts.

The Cornwall Historic Landscape Character mapping (Fig 12) shows the site as lying within a very extensive tract of Recently Enclosed Land – an area of former downland bounded by Truro, St. Agnes and Redruth which was brought into cultivation as miners' smallholdings during the late 18th and early 19th centuries during the very rapid expansion of copper mining which occurred during this period, resulting in a massive increase in the mining population requiring dwellings. Parts of the site are shown as Upland Rough Ground, though this should probably be mapped as formerly industrial land.

10.6.4 Previous archaeological work

The Hallenbeagle site was the subject of a recent archaeology and cultural heritage chapter in an Environmental Impact Assessment undertaken by IHC Consultants (Williams, n.d.).

The area at and surrounding Hallenbeagle was also included within a study of the wider Wheal Busy landscape (Sharpe 1989 ECO331), the Mineral Tramways scoping project (Sharpe et al 1990), the Mineral Tramways Conservation Management Plan (Buck 2006 ECO1185), the World Heritage Site mapping, nomination document and management plan (WHS team 2005); it was also considered in the light of the proposed English Nature HEATH Project (ECO2644) and during the consideration of development proposals for the site (ECO1333 and ECO3081).

Engine houses noted at Hallenbeagle by Ken Brown for the Mineral Tramways Project are as follows (those within the development site are bolded). The list includes some early (pre-1800) and technically interesting examples, most particularly the inverted double-acting Watt engine which may well have been installed on Engine Shaft at the north of the site:

HALLENBEAGLE/EAST DOWNS/BOSCAWEN

- 554. Reade's Whim with crusher, 22", for sale 1867. Located just to the south of the development site.
- E555. Reade's 60", constructed by Harvey and Co about 1864 and moved to Perran Wh. Virgin 1870 (Barton 1969). Located just to the south of the development site.
- 556. **70" reported Lean 1839. Assumed to be the engine whose house appears on 1st edition OS 25" at Engine Shaft. Within the development site.**
- 557. **Watt's 52" DA erected 1796 (Barton 1969). An very unusual engine with the cylinder set over the shaft. Location somewhat uncertain, but very likely within the northern part of the development site adjacent to Engine Shaft.**

- 558. Watt's 52" ex Wh. Chance, 'worn out' 1794 (Barton 1969). There was a third Watt engine on site, the 45" ex Trevaskus, which had replaced 558, and was presumably in the same house (Dickinson and Rhys Jenkin). Location somewhat uncertain, but very likely within the northern part of the development site adjacent to Engine Shaft.**
559. 70" ex Wheal Busy (Black Dog Shaft), 1861 to Boscawen, later Van Mine. Located to the north of the development site.
- 560. Whim on 1st edition OS 1:2500, presumed contemporary with 556. Located in the northern part of the development site adjacent to Engine Shaft.**
579. Boscawen whim, loadings visible on 25" 1st edition OS. 20", for sale with 70" engine, August, 1865. Located to the north of the development site.
580. Engine house evidence uncovered during the construction of the Blackwater Bypass. Probably the 66" pumping engine for sale August, 1846. Located to the east of the development site.
- 761 18" whim for sale 1846, assuming not the same whim as shown on the 25" 1st edition OS. Possibly located near Engine Shaft.**
- 1157 New engine shaft being sunk on East Downs in 1862 (Collins). Not known what drained it, but the site is topographically unsuitable for a waterwheel.

10.6.5 Findings of site walkover survey

A site walkover survey was undertaken on 19 April 2011, on which date parts of the site were still occupied by a number of temporary dwellings and their curtileges (Figs 16-19). As a result, full access to the site was not possible, though it was not considered that any significant areas could not be viewed.

The survey confirmed that several phases of levelling and other groundworks have taken place within the area proposed for the Cory Environmental development (Figs 16-17, 20-21). Over the whole of the site some degree of reworking of dumps is recorded as having taken place during the final years of operation of the mine (Collins 1912, as noted above in Section 10.6.3); the northern part of the site is recorded by the NMP as having been levelled by the US Army in 1944 in preparation for a temporary camp prior to D Day, access roads also having been created at this date. Further localised disturbance is likely to have taken place during the mid-1980s when some of the shafts on the site were made safe under the Carrick District Council's Operation Minecap project. The eastern section of the northern part of the site exhibits evidence for a further, more recent phase of mechanical levelling and the creation of roadside ditches, presumably in order to prevent travellers gaining access to this part of the site.

The northern section of the site

With the exception of an undisturbed heathy 20m buffer strip flanking the main line railway, the ground at the north-western end of the site consists of levelled mine waste from which the covering scrub has recently been removed (Figs 20-21). As a result there are no surface traces of the whim engine houses known to have served Engine Shaft beyond a scatter of early bricks and some coal in the general location occupied by the whim engine houses. The levelled ground immediately to the east of the remains of the Engine Shaft dump does, however, include an area measuring 7m x 3m which is exhibiting indications of subsidence – probably an indication of an undocumented shaft or an area of imminent stope collapse similar to that found immediately to the south-west of Engine Shaft, where a very large area is subsiding (Figs 24-25). This north-western part of the site is also notable for pieces of copper slag, this suggesting that some processing of the ore may have taken place on site, possibly during the 18th century. The northern hedge defining the smallholding fields, created between 1840 and 1878 (Tithe and OS map evidence) includes further substantial amounts of copper slag in its build which tends to confirm this hypothesis.

The north-eastern corner of the site (to the east of the site entrance) includes the remains of a large dump of material. This is located over the strike of Hallenbeagle Lode between Engine Shaft to the west-south-west and Stone's Shaft to the east-north-east, though does not seem to be associated with either and may indicate the location of an undocumented shaft. Alternatively, this may alternatively represent spoil bulldozed from the surrounding area and heaped up in this corner of the

site during 1946. Recent excavation into this material to create the site fence and gate show the dump to consist of mixed material and not wholly mine waste. There are very considerable amounts of fly-tipped rubbish in this area, but no surface indications of archaeological features (Fig 16).

The central part of the site

The central part of the northern end of the site is currently occupied by mobile homes, sheds and temporary dwellings (Figs 16-19). As well as a number of horses, there are a large number of tethered dogs in this area. On its western edge are the remains of the large waste dump associated with one of the shafts of the mine (Figs 20-21) – the (probable whim) shaft itself being enclosed within the remains of a low safety hedge constructed of mine waste, whilst the shaft itself was covered with a Clwyd Cap during the 1980s, and is blocked (Fig 22). The eastern part of the spoil dump has been excavated away, and this may have removed part or all of the pumping engine houses formerly sited here, together with associated structures such as boiler houses, chimneys, coal yards, boiler ponds, leats, store buildings &c.

Immediately to the south-west of Engine Shaft a very substantial collapse of ground has occurred, presumably through the deterioration of old support work in near-surface stopes (Figs 24-25) and of Engine Shaft itself. The ground here continues to subside, and has been used as a rubbish disposal site. The presence of this area of collapsed ground indicates the likelihood that extensive areas of the Hallenbeagle Lode were mined away very near to surface and that there is a strong potential for ground instability along the lode strike to the east-north-east.

Pininger's Shaft is located at the south-western corner of this part of the site. The shaft itself was covered with a very large Clwyd Cap during the 1980s, but this has been adapted as a children's den by being covered over with a blue plastic tarpaulin, and it is not clear whether the shaft is open under this or is blocked (Fig 23). The remains of a substantial waste dump surround the shaft opening; material from the dump has been partially removed on its eastern side. No structures are documented as being located near this shaft though the substantial amount of spoil in the adjacent dump indicates that it would have been served by a nearby whim, though whether this was horse operated or steam operated is unknown.

Within the area occupied by the mobile homes, no evidence was noted for archaeological features. It should be noted, however, that the mobile home at SW 72796 44674 in the south-eastern part of this area (just to the east of the proposed Cory Environmental development site) is located directly over a mine shaft documented on modern OS maps as being enclosed within a shaft hedge (Fig 19). No surface indications of the mine shaft could be seen at this location. There is some potential for other undocumented mine shafts or for large near-surface stopes (mined out areas of lodes) within other parts of the northern half of the site.

The southern section of the site

The southern part of the site is occupied by miner-smallholder's fields which were first documented on the 1809 OS 1" to the mile mapping, and were shown on the 1840 Kenwyn Tithe Map (Fig 4) as being associated with the cottage immediately to the west of the railway line. The holding would have been bisected during the construction of the West Cornwall Railway line in 1852, and an occupation crossing was installed to allow the farmer to access his land to the east of the railway. This is still in use today.

The fields are defined by low (average 1.25m high x 1.6m width) Cornish hedges whose facings are predominantly of mine waste, though which incorporate substantial amounts of copper slag in some stretches (particularly the hedge defining the northern field which was added between 1840 and 1878). They were laid out on former heathland unaffected by mining activity which lay between the outcrops of Hallenbeagle Lode to the north and Reed's Lode to the south, hence their general orientation parallel to the lode strikes. To the south, adjacent to the spoil dump created through the sinking and working of Oats Shaft, Jeffrey's Shaft and an un-named shaft, the boundary of the fields curves to accommodate this feature, indicating that the shafts were in use prior to 1809. Along their western edges the fields are bounded by modern stock fencing, there being a strip of scrubby ground between this fence and the adjacent railway cutting. An overgrown railway siding lies immediately to the west of the fields, this having been the site of a small, single platform station serving Scorrier which was constructed during the 1890s and which was formally abandoned during the 1960s Beeching cuts.

The interiors of the fields are level, being close-grazed horse pasture (Figs 26-27). With the exception of two linear ditches 0.5m wide and 0.2m deep which run across the northern field roughly

parallel to the nearby northern hedge and from Reade's whim engine house northwards across the two adjoining fields to the boundary of the railway line, they are featureless. The function of these two shallow trenches is uncertain, though the westernmost might represent the course of a former leat serving the boilers at the engine house (Fig 29).

The remains of Reade's whim engine house form part of the site boundary for the Cory Environmental development (Figs 27-29). This Grade II Listed Building survives in part, the surviving components being the full height, brick-topped chimney, the low remains of parts of the boiler house and the rear section of the engine house itself. Whilst ruinous and currently rendered somewhat invisible by the surrounding scrub vegetation and by covering ivy, what remains of the engine house is generally stable, though would certainly benefit from consolidation and improved presentation. The CSA Architects plan for the proposed development (Fig 15) does not show any significant buffer between the waste transfer station boundary and this Listed engine house. It is therefore recommended that an adjustment to the adjacent section of boundary should be made to provide a suitable curtilage for the engine house.

10.6.6 Site inventory

See Fig 30.

1. Site of whim engine house SW 72772 44892

A possible whim engine house was shown at this location on the 1840 Kenwyn Tithe Award mapping (Fig 4), though is not identified as such in the associated apportionment. A whim engine house (marked as 'Ruin') was shown aligned on one of the shafts (3) to its south-west on the 1st Edition of the OS 25" mapping dating to 1877. Its boiler house had already been demolished and the engine house had also been demolished by 1907. Its site is marked by a scatter of bricks amongst bulldozed rubble, though there may be some potential for the survival of its foundations.

2. Site of pumping engine house SW 72732 44866

A possible pumping engine house was shown at this location on the 1840 Kenwyn Tithe Award mapping (Fig 4). A substantial pumping engine house (most probably for a 70" engine (Ken Brown's No 556) was shown on the 1st Edition OS 25" mapping aligned on a shaft immediately to its north-east. Its boiler house had been demolished by this date and the engine house had also been levelled by 1907. Engine Shaft is now marked by the site of a very substantial subsidence hollow, and there are no indications of a building ever having been sited to its south-west, though there may be some potential for the below-ground survival of its foundations. Ken Brown's research suggests that Engine Shaft was the site of a number of installations, possibly as many as four, including a very unusual and early beamless 52" double-acting engine installed directly over the shaft. As it is possible that these were not necessarily on the same sites (though serving the same shaft), the remains of more than one engine house may survive within the area adjacent to Engine Shaft.

3. Whim shaft SW 72732 44883

Set on the top of a remnant dump of heathy spoil between the edge of the development site and the railway cutting, a small Clwyd Cap marks the site of the shaft worked by the whim engine depicted on the 1st Edition OS 25" mapping. This appears to be separate from Engine Shaft, which seems to have been sited just to the south, adjacent to the pumping engine house. The shaft is filled at surface, and its depth and condition below ground are unknown.

4. Pumping shaft SW 72731 44873

The principal pumping shaft for the mine appears to have been sited immediately to the north-east of the pumping engine house shown on the 1st Edition 25" mapping, and was therefore at the location currently marked by a very substantial subsidence of ground adjacent to the whim shaft spoil dump. This subsidence suggests that the shaft collar has run in at surface. The shaft appears to have been used as a rubbish dumping site for many years, and the outline of the shaft opening has now been lost.

5. Pininger's Shaft SW 72647 44788

Pininger's Shaft is set between Engine Shaft and Reade's Shaft on the western boundary of the site. The shaft does not seem to have been worked by an adjacent engine. It is now marked by a large cone within a partly-surviving spoil dump, and has been covered with a large Clwyd Cap, presumably during the 1980s Carrick District Council 'Operation Minecap'. This in turn has been

covered with a blue tarpaulin, and may be currently in use as a children's den (Fig 23). The condition of the shaft beneath the cap is unknown.

6. Smallholders' fields centred SW 77684 44683

Smallholdings appear to have been developed across North Downs during the late 18th century as a response to the need to house the greatly enlarging mining population as copper mining activity within this area began to expand exponentially during this period. This group of fields were shown on the 1809 OS 1" mapping (Fig 3). They were again shown in 1840 on the Kenwyn Tithe mapping, consisting of eight fields aligned west-south-west to east-north-east (following the trend of the strike of the local lodes), and surrounding a smallholders' cottage, outbuildings, yards and gardens.

By 1877, the railway had cut through this smallholding, and perhaps in response to this, an additional field had been added to the group on its northern side to the east of the railway line (field 185 on Fig 5). The arrangement of fields and structures remained unaltered in 1907 (Fig 6).

The cottage survives (as 'Tregargus') to the west of the railway line, though some of the outbuildings have gone, but the field arrangement remains the same today as it did a century ago. It may be notable that copper smelting waste (slag) has been incorporated into the facings of the western end of the northernmost hedge defining these fields.

10.6.7 Significance

The Hallenbeagle site was formerly part of an extensive area of almost wholly unenclosed downland which extended from the west of Redruth northwards to St. Agnes and eastwards to the outskirts of Truro. During the 18th century, rich copper mines developed on the southern parts of this area, and the rapidly expanding mining population was initially accommodated in smallholdings scattered across the downs. The exploitation of the copper lodes continued throughout the 18th century, some pioneering beam engines being established at these mines, which were eventually linked up by the Great County Adit drainage system. During the 19th century, however, the principal focus for industrial activity moved westwards to the mines around Camborne-Redruth, and although some significant activity continued at sites such as Great Wheal Busy or Hallenbeagle, the southern part of the downs became fossilised in its late 18th century form.

Despite some minor changes, this continued to be the case until the 1940s, when some former mine sites were levelled to accommodate camps for US Army servicemen in transit to the D Day beaches. In the post-war years, improvements to the transport infrastructure, the landscaping of former mine sites to create industrial estates and a golf course, together with the re-working of spoil dumps has eroded much of this late 18th century landscape character, leaving islanded blocks of smallholdings, scattered miners' cottages and scrubby areas containing shafts, remnant mine dumps and occasional ruined engine houses. These areas, Hallenbeagle being a typical example, have become prone to fly tipping and occupancy by travellers, and are often targeted for 'improvement' to agriculture, or as sites for industrial estates; parts of the landscape containing these mixes of smallholders' fields and cottages, mining features and reverting downland are increasingly rare within the modern landscape of Cornwall.

Given that they were amongst the relatively small group of copper mines which were exploited at the dawn of the industrial era, such sites also have considerable (sub-surface) potential for the preservation of archaeological evidence relating to early phases in the development of steam technology – several early beam engines are documented as having been sited at Old Engine Shaft, Hallenbeagle.

The presence of significant quantities of copper slag within landscaped spoil near Old Engine Shaft and incorporated into the facings of the northern boundary of the smallholders' fields suggests the presence of an undocumented copper smelter in the northern part of the Hallenbeagle site. Given that, from the late 17th century, most Cornish copper was being transported to, at first Bristol and south Gloucestershire and subsequently to Swansea for smelting, this is likely to be an early site. Only a few copper smelters are documented within Cornwall itself, these being at Polrudden near St. Austell and at St. Ives during the 1690s, at Penpoll, Phillack between 1710 and 1735, at Lenobrey, St. Agnes for a few months in 1721 and at Carn Entral, Camborne between 1750-1756, this being relocated to Copperhouse, Hayle 1756-1819. Early copper smelting also evidently took place at Roundwood, Feock. Given that it took 30 tons of coal to smelt one ton of copper ore it became clear that it was far more economic to transport the ore to Swansea for smelting than to bring huge amounts of coal to Cornwall for this purpose.

(Source for information concerning the history of copper smelting in Britain http://eprints.worc.ac.uk/293/5/5._Ch_4.pdf)

It is clear, however, from the field evidence at a number of early copper mines in Cornwall that some undocumented smelting activity took place, Hallenbeagle evidently being amongst these. The site of the smelter is unknown, though it seems likely to have been in the northern part of the project area, whilst the amount of slag found on site suggests that it would have been small-scale and probably short-lived. If the remains of this smelter survives as sub-surface archaeology at Hallenbeagle, these represent an important and little-studied site type.

10.7 IMPACTS ON THE HISTORIC LANDSCAPE

Two general types of archaeological impact associated with developments of this type have been identified: those during the construction phase and those during the operational phase.

10.7.1 Scale and duration of impact

The impacts of a development on the historic environment may include positive as well as adverse effects. For the purposes of assessment these impacts are evaluated on a seven-point scale:

positive/substantial

positive/moderate

positive/minor

neutral

negative/minor

negative/moderate

negative/ substantial

Additionally **negative/unknown** is used where an adverse impact is predicted but where, at the present state of knowledge, its degree cannot be evaluated satisfactorily (this is usually applied to sub-surface archaeological features, or to documented features which have not been previously evaluated by trenching and/or geophysical survey techniques).

The assessment also distinguishes where possible between **permanent** and **temporary** effects, or between those that are **reversible** or **irreversible**, as appropriate, in the application of the scale of impacts.

10.7.2 Potential and residual impacts

Potential adverse impacts may be capable of mitigation through archaeological recording or other interventions. Where appropriate, both 'potential' and 'residual' impacts are given; that is, expected impacts 'before' and 'after' such work. A proposed mitigation strategy is outlined below in Section 10.10.

10.7 ASSESSMENT OF IMPACTS DURING CONSTRUCTION

Site preparation works will include capping or other safety works to mine shafts within the site, the removal and disposal of rubbish and other waste materials presently on site and the landscaping of the site prior to the installation of roadways, services and foundation works for structures on the site.

Given that most of the shafts on this site have, in the past, coned in due to the collapse of the collaring which supported loose ground above bedrock, capping operations to stabilise them and make them safe are likely to extend beyond the footprint of their original openings, and have the potential to result in the destruction of any surviving remains of engine houses or other associated surface structures. There are known to have been several phases of engine house construction at Hallenbeagle, though not all of these are well documented. No remains of the documented engine houses (other than those serving Reade's Shaft) survive at surface, though their locations are mapped.

The impacts on the surface remains directly associated with the mine shafts are judged to be **negative/unknown/permanent** without mitigation (see below) and **negative/ minor/permanent** should appropriate mitigation be carried out.

The landscaping and other associated works proposed for the site are likely to result in the loss of stratified archaeological deposits, the remains of engine houses and other documented and undocumented structures such as leats, ponds, horse whims, dressing floors, mine buildings and a copper smelter.

The impacts on these other buried remains within the development site are judged to be **negative/unknown/permanent** without mitigation (see below) and **negative/minor/permanent** should appropriate mitigation be carried out.

The proposals will also result in the removal of surviving elements of a miners' smallholding dating to the late 18th century or early 19th century which is shown on the 1809 OS mapping (Fig 3). These impacts are judged to be **negative/moderate/permanent** without mitigation and **negative/minor/permanent** should appropriate mitigation be carried out.

10.8 ASSESSMENT OF POTENTIAL IMPACTS DURING OPERATION

Immediately bordering, as it does to the north and east, the boundary of the Cornwall and West Devon Mining Landscape World Heritage Site, it is inevitable that the development at Hallenbeagle will have some impact on this significant landscape, inscribed in 2005. These impacts will be primarily visual. Although the engine houses on Reade's Shaft were not included within the boundary of the World Heritage Site given that proposals for the development of this site had already been drawn up by the time of the WHS Bid process, they are considered to be significant components within the surrounding landscape which contribute to the Outstanding Universal Value (OUV) of the WHS. The development will also result in changes to the setting of the World Heritage Site as defined by English Heritage's guidance on settings for heritage assets (English Heritage 2010).

The visual impacts on the World Heritage Site will be limited, however, by topography (given the location of the development area) and the screening provided by existing woodland and scrub vegetation, existing agricultural boundaries and the vegetation growing on them, and by the tree screening proposed around the periphery of the development site. The impacts on the WHS are thus classed as **negative/minor/permanent**.

Impacts on Listed Buildings will be limited to those at Reade's Shaft immediately to the south of the development area. Despite proposed tree screening around the periphery of the WTS, the chimney and remains of the whim engine house will immediately adjoin the boundary of an open car parking area forming the south of the WTS, whilst the pumping engine house will lie only a short distance to the south again. The development will very substantially remove the context for and alter the setting of these designated buildings, occupying as it will, much of the site of the former Hallenbeagle Mine, of which they were constituent parts. The proposals will not only result in the removal of the former mine dumps and open space adjoining the engine houses, but also the miners smallholdings which are very much part of their contemporary landscape. This will result in visitors being less able to read this landscape as one moulded by mining activity, whilst the engine houses will be islanded as decontextualised monuments.

The linear screening proposed for the southern end of the WTS will introduce a boundary type not hitherto found in this area and one which will not refer to the former heathland character of the site. Given that there will be no direct physical impact on the Listed Buildings, these are judged to be **negative/moderate/permanent** (given that the eventual reversion of the Cory WTS site at the end of its life to heathland is unlikely).

10.9 ASSESSMENT OF IMPACT ON HISTORIC LANDSCAPE CHARACTER

The development of this site as a waste transfer station will inevitably result in a significant change of character for part of the mosaic of heathland, smallholdings and mining features which formerly characterised this area. However, industrial and other recent development within the neighbouring landscape has resulted in a gradual transformation of the character of this area through the

construction of large sheds for light industry and retailing, together with elements relating to the upgrading of the transport infrastructure. As a result, only relatively small pockets of landscape which retain the former character of the area now survive – one of these being centred on Hallenbeagle.

The construction of a large, covered waste transfer station with its associated services, parking and other open space areas at Hallenbeagle will remove a significant area whose appearance still partially reflects its landscape history as downland, mining land and miners' smallholdings. Although poorly treated by its occupants over the past five decades still retains its open, undeveloped character and, in its present state, retains the potential to revert to heathland. This will no longer be possible once the development takes place; the original Historic Landscape Character of this site will thus be lost. This impact is assessed as **negative/moderate/permanent**.

It should also be noted that the Cory WTS proposals are but one element in a masterplan for further areas of the Hallenbeagle site to the east and south which will result in the loss of further areas of former industrial landscape, heathland and smallholders' fields, as well as development in areas to the east and south of the Reade's Shaft site with its surviving engine houses.

10.10 AGREED MITIGATION MEASURES

Given that it is known that the area of Hallenbeagle mine proposed for development sited at least two 18th century Watt-designed engines, one of these being of a highly unusual design, together with a pair of mid-19th century engines (one for pumping, one for winding), it is recommended that an archaeological watching brief is undertaken during any shaft capping or other safety works on site. Although levelling of the site by the US Army in 1944 has removed what remains of the surface evidence for structures adjacent to the shafts, the foundation levels of these buildings may well survive. There have been very few opportunities to record and study the physical remains of 18th century engine houses to date, and the works proposed at Hallenbeagle provide a rare opportunity to increase our understanding of the development of steam technology on Cornish mines as well as for early small-scale copper smelting in Cornwall.

Following discussion with consultees (see above), the following mitigation measures are proposed:

- An archaeological watching brief should be allowed for in relation to any ground preparation or safety works at and adjacent to mine shafts and areas of ground collapse on the Hallenbeagle site. Due allowance should be made for the recording of any buried structures which may be revealed within these areas.
- An allowance should be made for an archaeological watching brief during landscaping works within the north-western part of the site with the aim of locating and recording the early copper smelter which it seems likely was sited here.
- A record should be made of the cross sections of sample hedges making up the smallholders' fields at Hallenbeagle, including those incorporating copper slag.
- Archaeological evaluation of the shallow trench traversing the fields adjacent to Reade's whim should be undertaken using a number of trial trenches.
- Adjustments to the site boundary of the waste transfer station should be made in the area adjacent to the Grade II Listed Reade's whim engine house to provide it with a suitable buffer zone against the new development and to reduce impacts on its setting.
- Careful design of boundary and screening features associated with the waste transfer station site will be necessary to limit impacts on the nearby Cornish Mining World Heritage Site.

10.11 RESIDUAL IMPACTS

Evolving changes to the Historic Landscape Character of this area are described in Sections 10.6.6 and 10.9 above. Whilst the particular characteristics of this part of the Hallenbeagle site which reflect its former HLC have been significantly eroded by developments which have taken place since 1944, some of these are theoretically reversible (by the relocation of the travellers' site, clearance of fly-tipped rubbish and heathland reversion measures on the former mining land). The development of the waste transfer station removes this possibility.

The Cornish Mining World Heritage Site relies on its integrity, authenticity and the retention of its Outstanding Universal Value (OUV) through the appropriate management not only of key structures, sites and landscapes within its boundaries, but also those which form its landscape context. Within the landscape adjacent to the Hallenbeagle site the boundary of the WHS is formed by the main line railway, to the west of which the landscape is characterised by evolved 18th century smallholdings, amongst which there are a small number of modern industrial or retail sites. The development of the waste transfer station (and the other developments proposed for the remainder of the Hallenbeagle site) will form a substantial block of modern landscape immediately abutting the WHS. Although it is important that the boundary between the development and the WHS is carefully designed to reduce these impacts, some degree of residual impact is inevitable.

Given the scale and type of the groundworks which will be required to prepare the Hallenbeagle site for its new use, all near-surface archaeology within the site will be destroyed. Given that it seems probable that Hallenbeagle contains evidence of this type for undocumented sites, it is unlikely that any watching briefs during landscaping and safety works will be able to record all significant evidence for the development of the site. A permanent loss of archaeological information relating (in particular) to early mining activity and for small-scale copper smelting at Hallenbeagle is therefore inevitable as a residual impact.

10.12 SUMMARY

Until 1944, the Hallenbeagle site typified the local mining and smallholding landscape, having evolved during the 18th and 19th centuries as a significant focus for copper mining and allied activities, including small-scale copper smelting. During the later 19th century, these activities finally ceased at Hallenbeagle and for half a century most of this site, like much of the surrounding landscape, became fossilised.

At Hallenbeagle, however, landscaping and dump removal during 1944 and subsequently have substantially eroded many of the above-ground elements which give such sites their character and importance. The site eventually became a vector for fly-tipping and became settled by travellers and for the past few decades has been identified as a preferred site for industrial and retail development. Given this zoning within former local plans, Hallenbeagle was excluded from the Cornish Mining World Heritage Site in 1985.

Despite the rather poor quality of the site and the erasure of most upstanding historic features, the development of the Cory Environmental waste transfer station (and the other proposed adjacent developments) will have relatively significant impacts on the remaining sub-surface archaeology, on local Historic Landscape Character and on the setting of the immediately adjacent WHS. Whilst a range of measures have been recommended to mitigate some of the impacts of the development on the historic environment, there will inevitably be some residual impacts.

10.13 REFERENCES

10.13.1 Primary sources

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Ordnance Survey, 2007. *Mastermap Digital Mapping*

Tithe Map and Apportionment, c1840. *Parish of Kenwyn* (microfiche copy at HE)

Plans held by the Cornwall Record Office

- LR/82 – 1728 plan of the Hallenbeagle and Wheal Chance setts (not locatable in the archive)
- MRO/R96B – Mine plan of East Downs in the mid-late 19th century (photo negatives only available)
- MRO/R151A – Mine plans of Great Wheal Busy and Hallenbeagle (mid-late 19th century)
- MRO/R151A/2 – Surface and underground plan of Hallenbeagle (mid-late 19th century)

- MRO/258/1 – Surface and underground plan of Hallenbeagle in the mid-late 19th century (not locatable in the archive)

10.13.2 Publications

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10.13.3 Websites

- <http://www.imagesofengland.org.uk/> English Heritage's online database of Listed Buildings
- www.cornish-mining.org.uk The website of the Cornwall and West Devon World Heritage Site
- <http://eprints.worc.ac.uk/293/5/5. Ch 4.pdf> - A useful history of copper smelting in Britain

10.14 PROJECT ARCHIVE

The HE project number is **2011044**

The project's documentary, photographic and drawn archive is housed at the offices of Historic Environment, Cornwall Council, Kennall Building, Old County Hall, Station Road, Truro, TR1 3AY. The ultimate destination of the paper archive will be CRO, Truro, but it will be stored at ReStore until it can be accessioned. The digital record will be stored as part of the Cornwall and Scilly HBSMR. The contents of this archive are as listed below:

1. A project file containing site records and notes, project correspondence and administration.
2. Digital photographs stored in the directory R:\Historic Environment (Images)\SITES.E-H\Hallenbeagle WTS 2011044
3. English Heritage/ADS OASIS online reference: cornwall2-100979
4. This report text is held in digital form as: G:\Historic Environment (Documents)\HE Projects\Sites\Sites H\Hallenbeagle WTS 2011044\Hallenbeagle EIA archaeology chapter.doc



Fig 3. The area of downland, mines and miners' smallholdings at North Downs as shown on the 1809 OS 1st Edition 1" mapping.

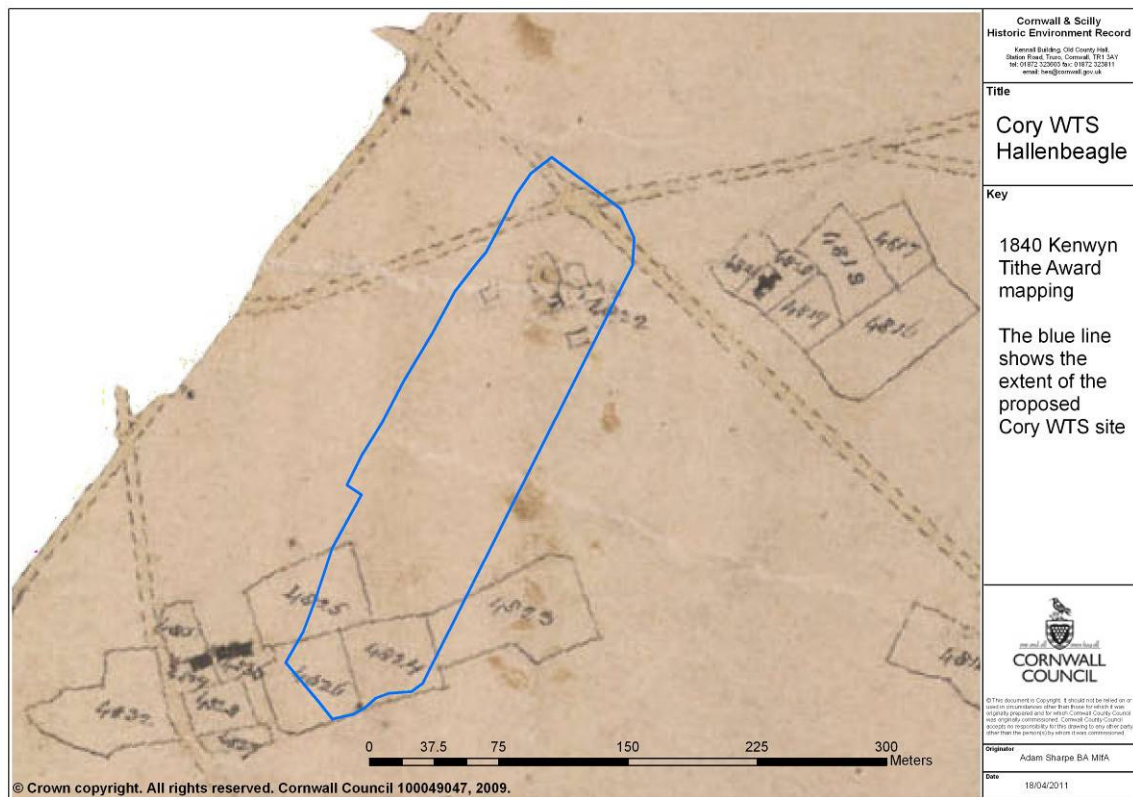


Fig 4. The area proposed for the Cory Environmental development superimposed on the 1840 Kenwyn Tithe Map, showing the smallholding to the south and mine buildings to the north.

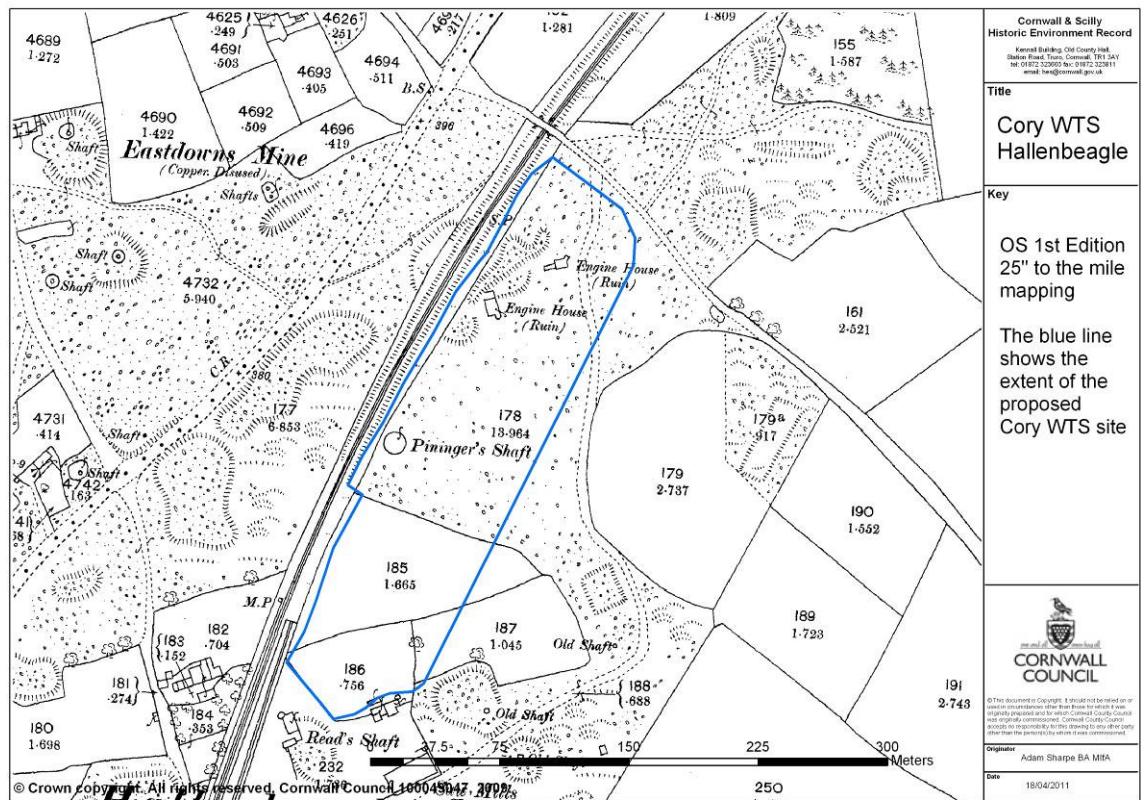


Fig 5. The proposed development site as shown on the 1878 1st Edition OS 25" mapping. The pumping and winding engine houses serving Engine Shaft are shown in the northern part of the site.

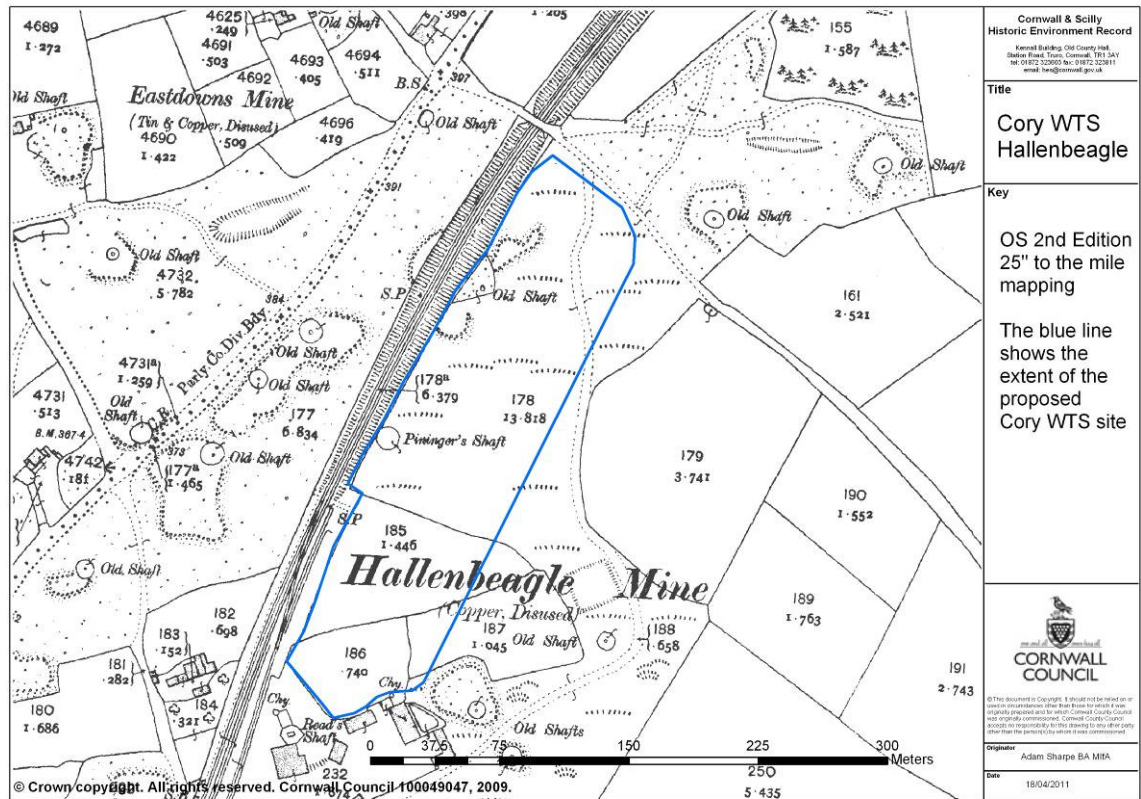


Fig 6. The proposed development site shown on the 1907 2nd Edition OS 25" mapping, indicating that the engine houses had been demolished by this date.

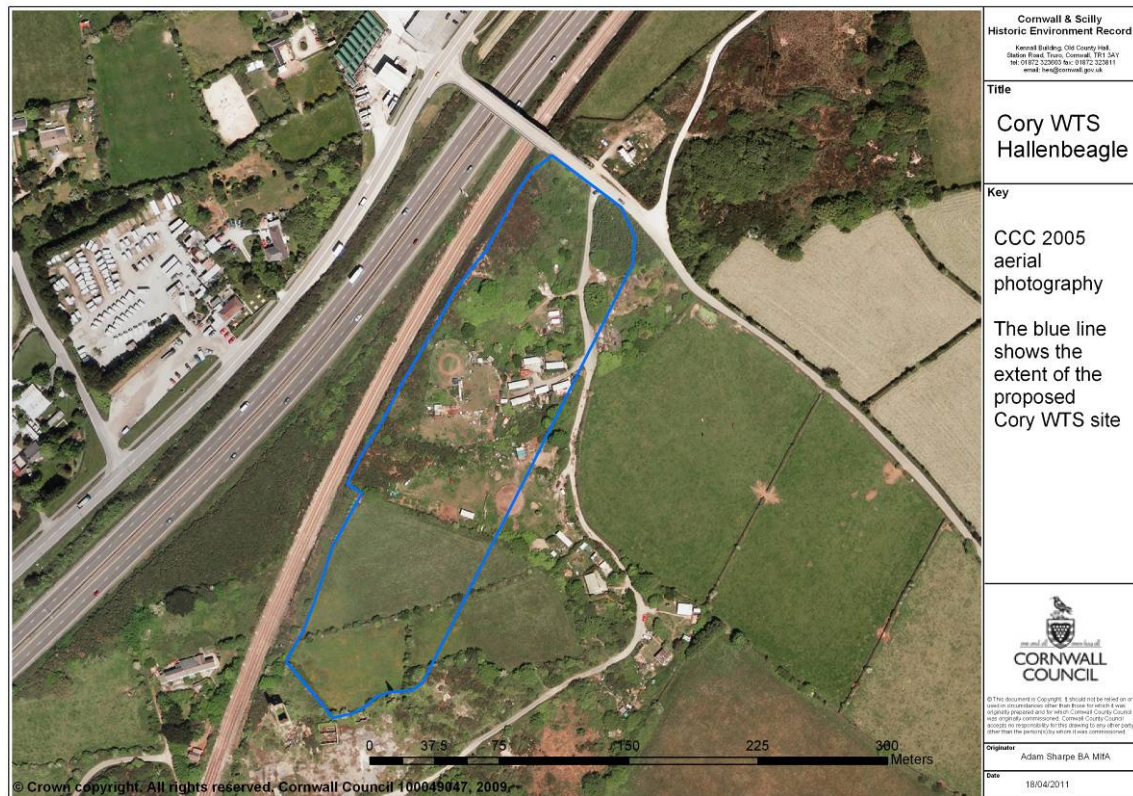


Fig 7. The development site as shown on the 2005 CCC aerial mapping. The central part of the site is occupied by travellers' mobile homes and sheds.

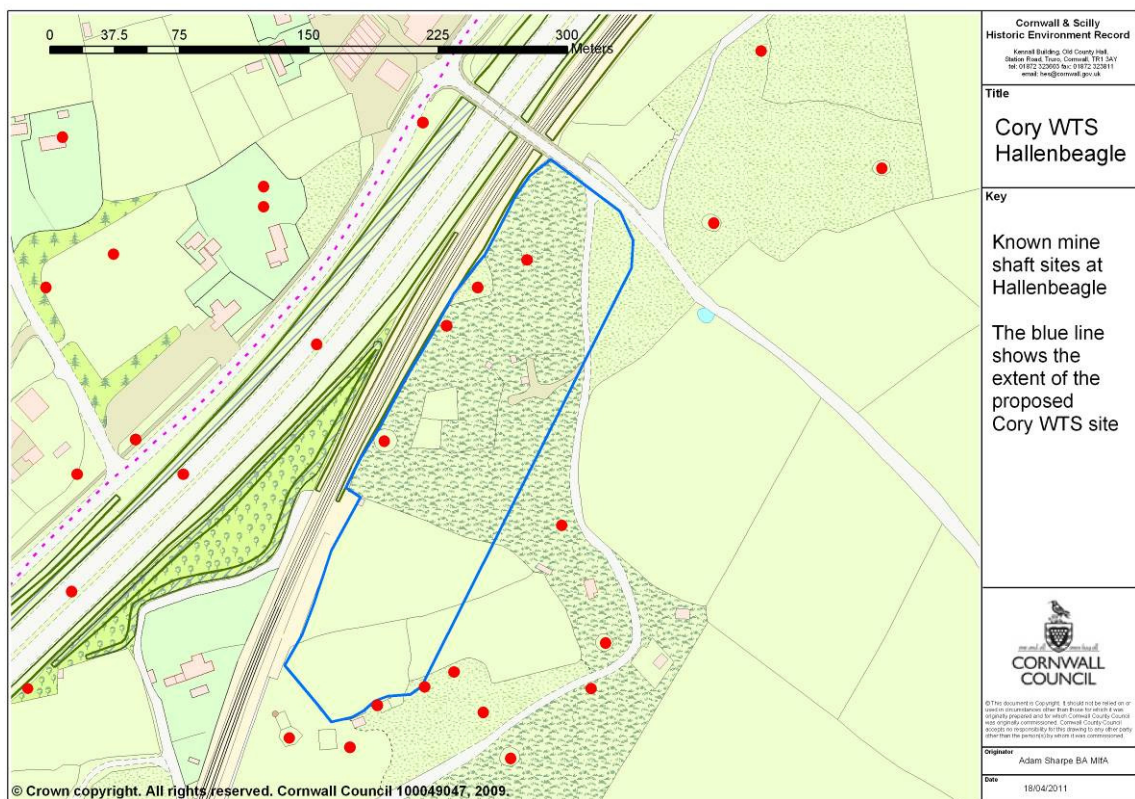


Fig 8. Documented mine shafts within and surrounding the proposed development site.

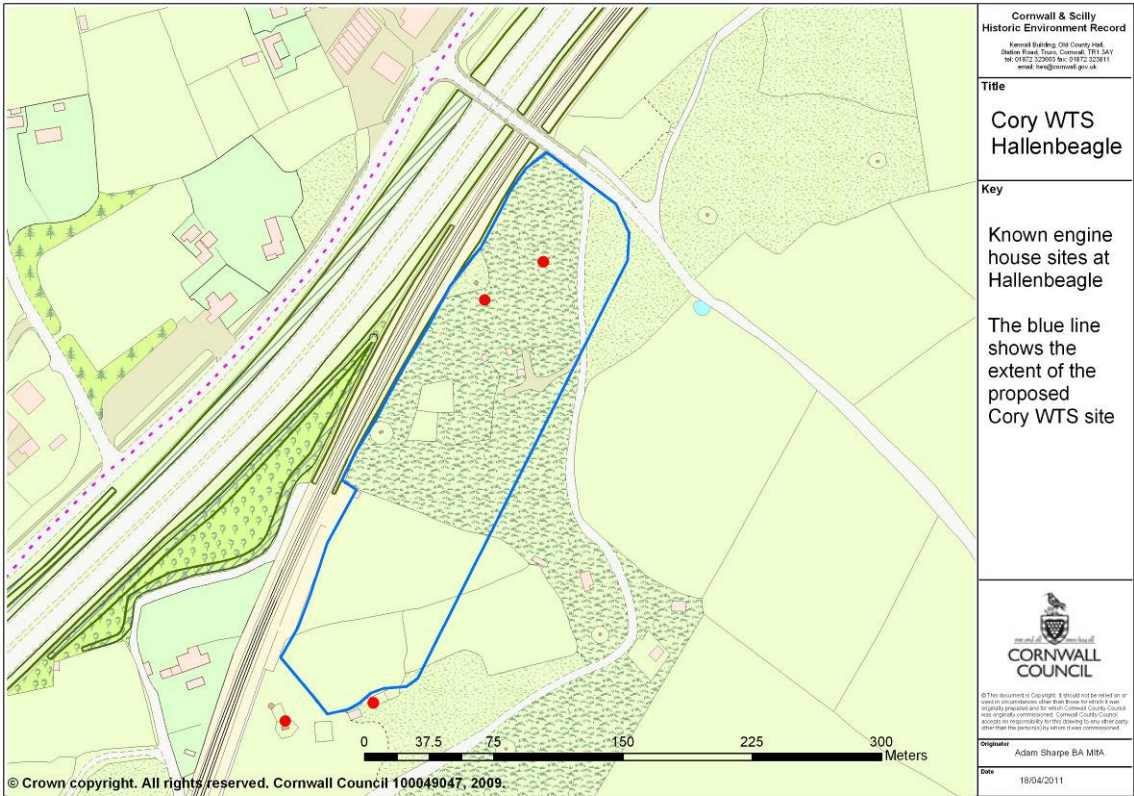


Fig 9. Documented engine house sites within and adjoining the development site. At least four (and possibly five) engines are known to have served Engine Shaft in the northern part of the site.

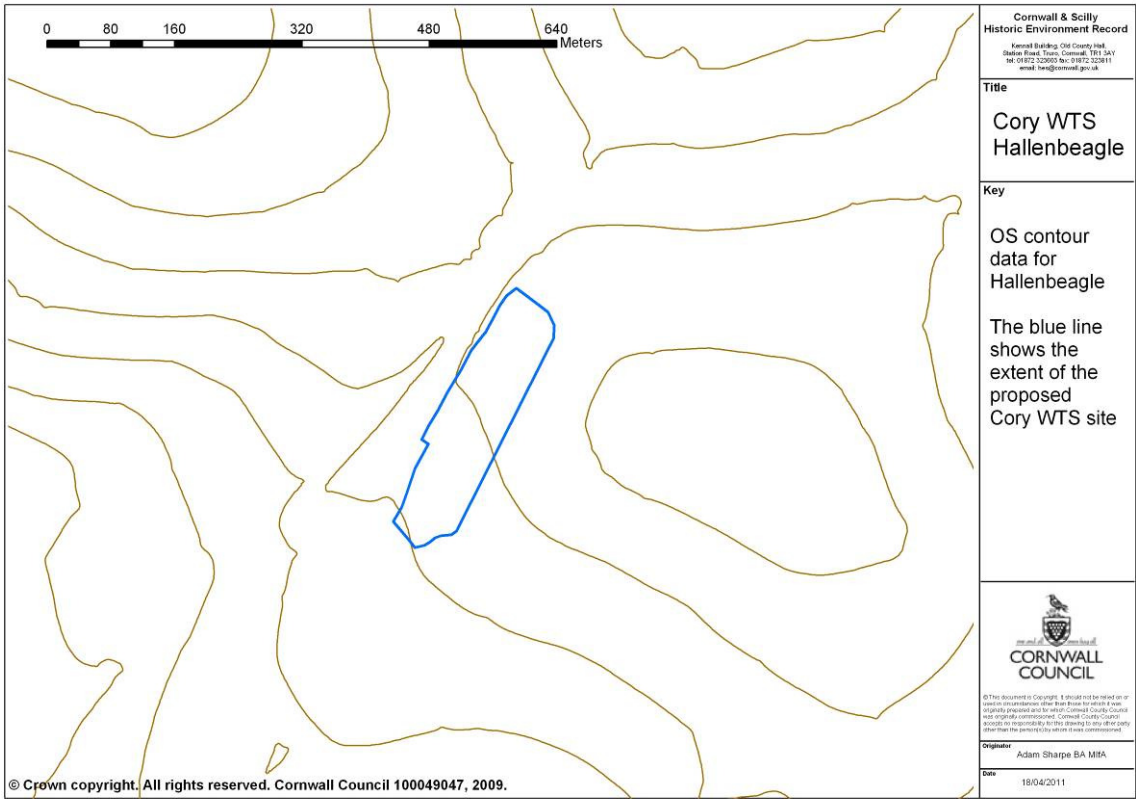


Fig 10. OS contour data for the Hallenbeagle site, showing its location at the head of a shallow valley trending south-westwards.

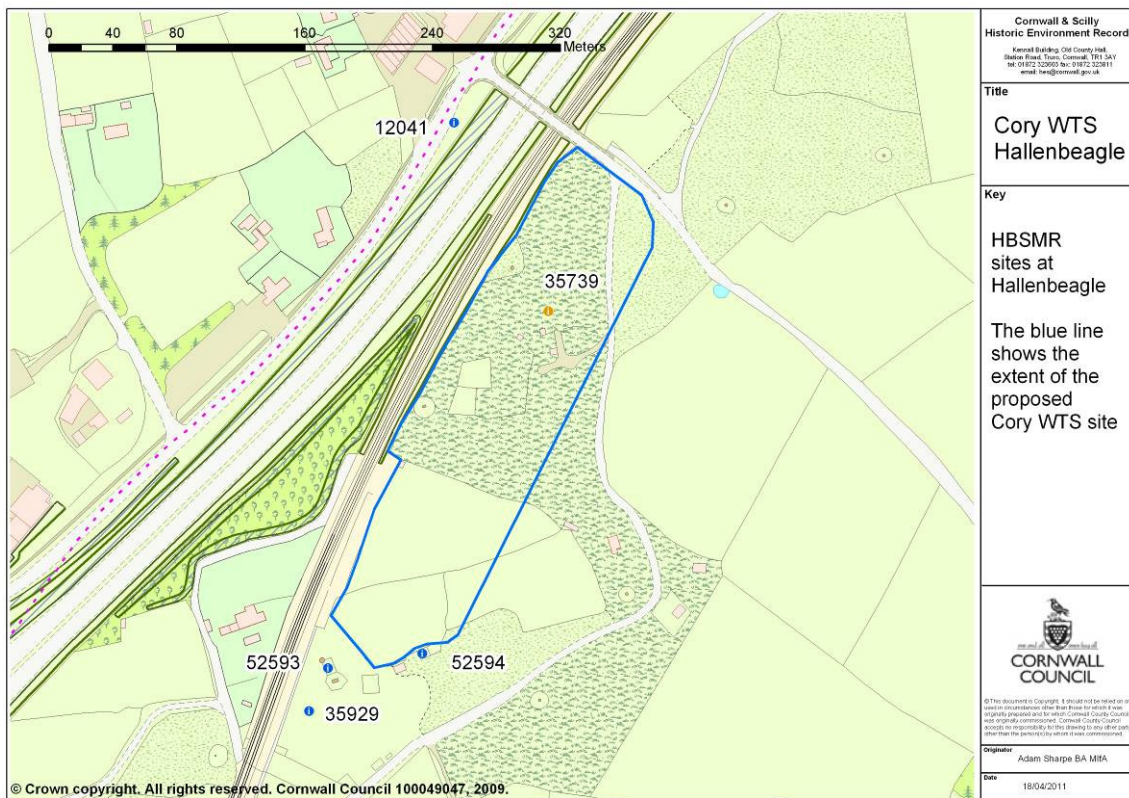


Fig 11. Cornwall and Scilly HBSMR sites recorded within or adjacent to the development site.

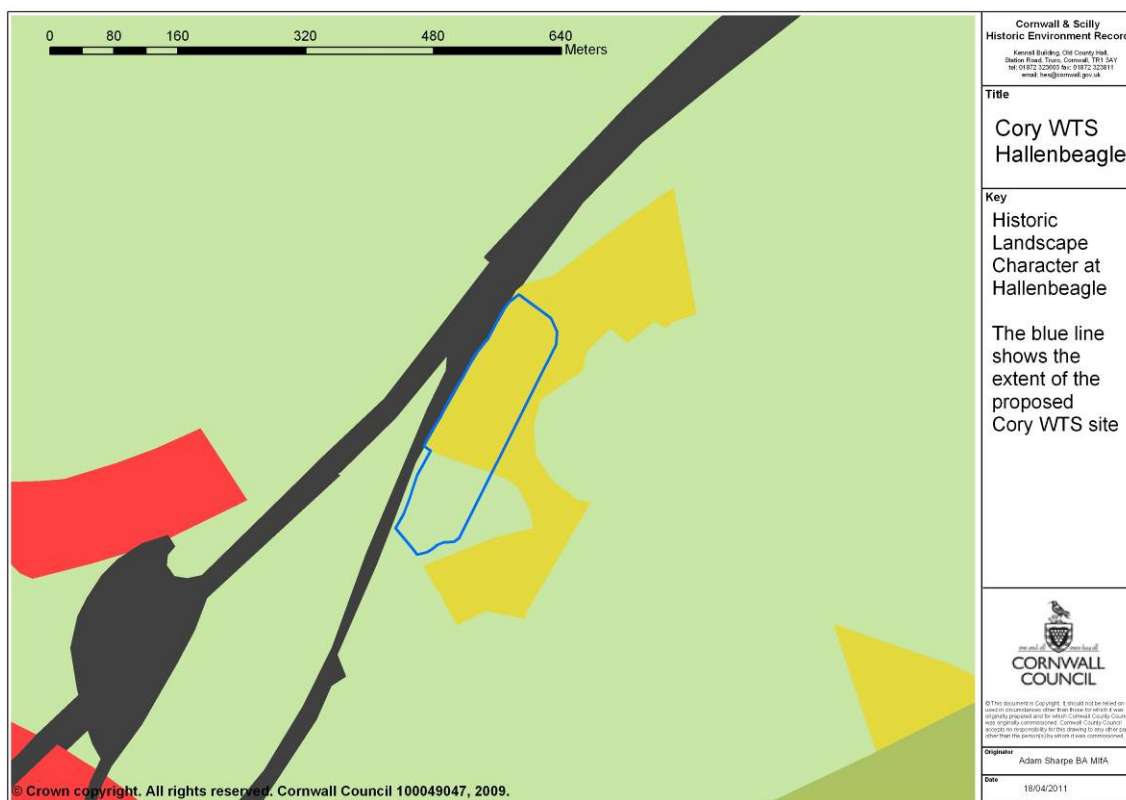


Fig 12. Historic Landscape Character areas at Hallenbeagle. Pale green indicates areas which owe their present character to their development from miner-smallholdings created in the late 18th century; yellow indicates upland rough ground on former mining land.

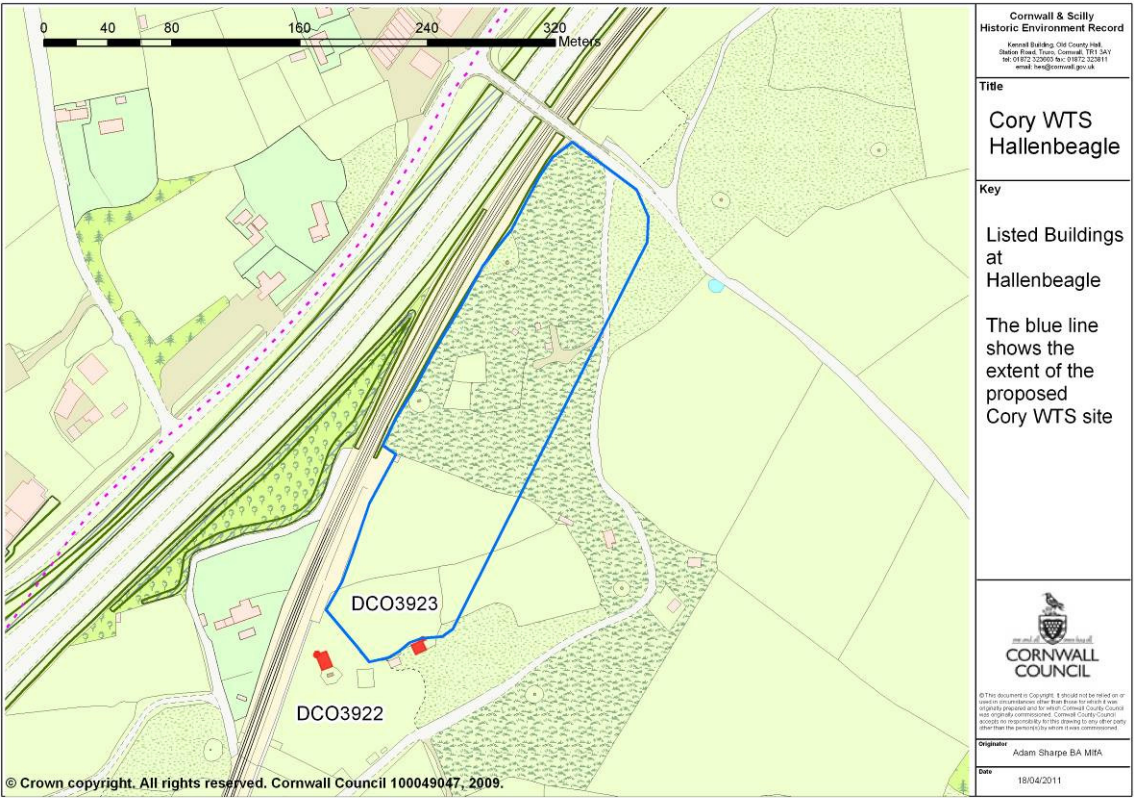


Fig 13. Listed buildings (at Reade's Shaft) adjacent to the development area.

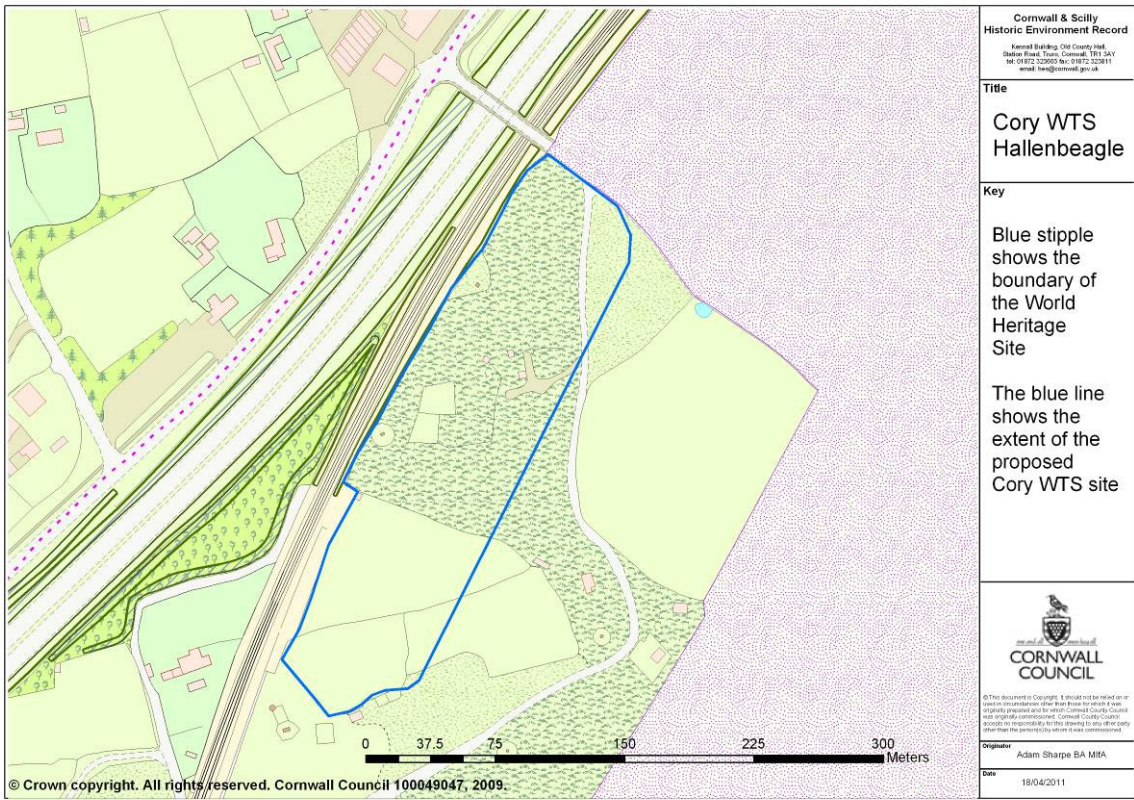


Fig 14. The location of the boundary of the Cornish Mining World Heritage Site in relation to that of the proposed development area.



Fig 15. The CSA Architects plan showing the proposed layout of the Cory Environmental site.



Fig 16. Looking south-west from the site entrance towards the travellers' site.



Fig 17. Looking south from the site entrance down the access track.



Fig 18. Looking south-west from the travellers' site across the smallholders' fields towards the Reade's Shaft engine houses.



Fig 19. A mobile home sited on top of a documented mine shaft on the east of the central part of the site.



Fig 20. Looking west across the northern part of the site towards the location of Old Engine Shaft. The former pumping engine house was sited in the left part of this view.



Fig 21. The remains of the Old Engine Shaft spoil dump from approximately the location of the former pumping engine house.



Fig 22. The Clwyd Cap on Whim Shaft, together with the safety hedge surrounding it.



Fig 23. The blue tarpaulin covering the large Clwyd Cap over Piningers Shaft.



Fig 24. The south-western edge of the spoil dump at Old Engine Shaft. Immediately adjacent to this, a massive stope collapse has occurred, the hollow created at surface having been filled with rubbish.



Fig 25. The southern edge of the stope collapse, where subsidence is continuing to occur.



Fig 26. Looking north across the smallholdings towards the travellers' site



Fig 27. Looking west along the southern boundary of the smallholdings towards the Reade's Shaft engine houses.



Fig 28. The Grade II Listed engine house serving Reade's Shaft, which will form part of the boundary of the waste transfer station.



Fig 29. Reade's whim engine house, seen from the adjacent smallholdings. One of the shallow trenches crossing the fields can be seen running from lower right to lower centre.

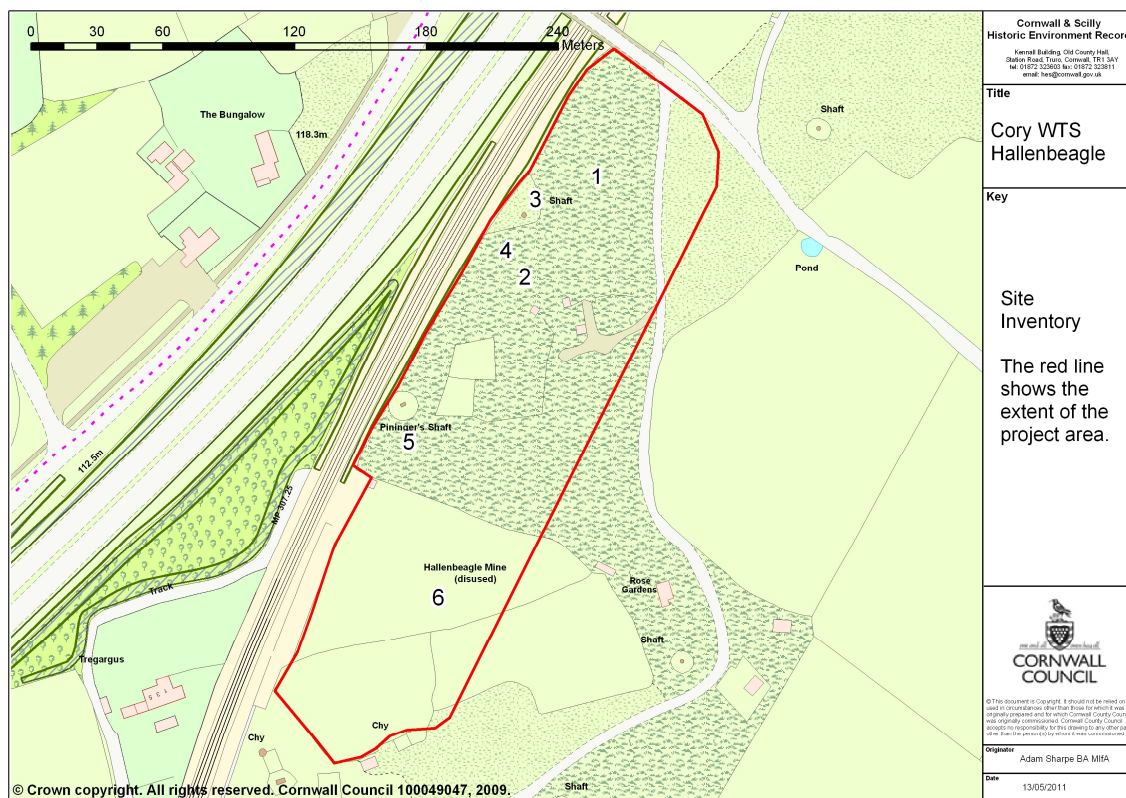


Fig 30. Inventory key map.