Report No: 2015R065

Tregargus China Stone Mills
St. Stephens, Cornwall
Archaeological recording

Cornwall Archaeological Unit

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Client	**Tregargus Valley Trust**
Report Number	**2015R065**
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Report author	**Colin Buck**
Checked by	**Andy Jones**
Approved by	**Andrew Young**

Cornwall Archaeological Unit
Cornwall Council
Fal Building, County Hall, Treyew Road, Truro, Cornwall, TR1 3AY
Tel: (01872) 323603
Email: cau@cornwall.gov.uk Web: www.cornwall.gov.uk/archaeology

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Within Cornwall Archaeological Unit (CAU), the project manager was Colin Buck and figures reproduced in this report were compiled by Colin Buck and 'as built' survey drawings by pdp Green Consulting. Nigel Thomas (CAU) annotated survey drawings used throughout the project. The report was edited by Andy Jones.

The structural engineer was Mark Gendall of pdp Green Consulting and the project site architect manager was Claire Newman of pdp Green Consulting.)

The views and recommendations expressed in this report are those of the Cornwall Archaeological Unit and are presented in good faith on the basis of professional judgement and on information currently available.

This project would not have proceeded without the Higher Level Stewardship funds allocated by Natural England (David Hazlehurst).

Freedom of Information Act

As Cornwall Council is a public authority it is subject to the terms of the Freedom of Information Act 2000, which came into effect from 1st January 2005.

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Cover illustrations

Front cover images (© CC CAU C Buck) of before (15/7/2014 – after vegetation clearance) and after (14/5/2015) conservation works at Trevear China Stone Mill.

Contents

List of Figures

Abbreviations

CAU	Cornwall Archaeological Unit
CC	Cornwall Council
HE	Historic England
HEP	Historic Environment Projects
HLS	Higher Level Stewardship
NE	Natural England
NGR	National Grid Reference
OS	Ordnance Survey
PO	Project Officer
TT	Tregargus Trust

1 Summary

The Tregargus Valley is of exceptional importance for the history of china stone extraction and processing in Cornwall.

China stone was quarried and milled in the Valley from *c*1870 until 1965, when the market for lower grades of china stone collapsed and the mills were abandoned. The site includes the remains of five china stone mills, which together with their associated stone quarries, are the finest assemblage of stone mills in Western Britain. They include **Wheal Arthur** at the northern end of the Valley, with its quarry, stone mill and pan-kiln; the partial remains of **Blacksmith's Shop Mill** and **Big Wheel Mill** in the middle Valley with their associated infilled quarries, mills, associated tramways and leats; **Trevear Mill** to the south with its attached pan-kiln and miller's cottage; and **Lower Tregargus/Mica Mill** with tramway and leat at the southern entrance to the Valley. All of these important sites are extant to varying degrees. The Tregargus Valley Trust has for many years, been attempting to preserve these important remains.

Small capital grant schemes have funded a number of reports about the valley and its heritage – all seeking to inform and guide future conservation proposals to conserve, protect, manage and enable safe public access to all the sites within the valley. An archaeological assessment was produced (Cole and Smith 2002), a structural survey in 2009 (Knevitts), a Conservation Management Plan in 2011 (Sharpe and Pilkington), and a prioritization summary in 2014 (Buck). The latter project was a preliminary stage to inform a larger Natural England funded project to consolidate and conserve high priority structures within the Tregargus Valley; namely limited consolidation and conservation works to Wheal Arthur Mill and Big Wheel Mill, whilst all of Trevear Mill and the adjacent cottage were conserved. The underlying philosophy being to undertake minimal structural works to the first two sites, in advance of a larger project in the future to carry out complete conservation of the extant china stone mills, but also to conserve all of the Trevear mill building (which had structural defects to two of the pans), as there were insufficient funds to conserve all the buildings in the Tregargus Valley to the same degree.

This report details the findings of an archaeological record taken before, during and after these works. Pdp Green Cons. Eng. produced surveys and building conservation recommendations for the project once the building prioritisation (Buck 2014), was accepted by the Tregargus Valley Trust. Heritage Cornwall (formerly Darrock & Brown) were the site contractors from mid July to the end of December 2014. In addition, historic building site consultancy ensured that each site's special qualities and importance were mitigated, preserved and enhanced by the building conservation project. The project was funded by NE through government grant aid provided through the Higher Level Stewardship Scheme.

2 Introduction

2.1 Project background

The Tregargus Valley, in the parish of St Stephen in Brannel in mid-Cornwall (Fig 1), is of exceptional importance for the history of china stone extraction and processing in Cornwall. It is the principal and best-preserved example of the small number of sites at which this industry was pursued in Britain. Remains in the valley include many buildings and structures in need of consolidation to preserve and present them, as well as a network of trackways and leats. Most of the site is covered by mixed deciduous woodland, which is a Biodiversity Action Plan habitat, with its own management requirements.

The valley is leased from the landowner, IMERYS, by the Tregargus Trust (TT), a group of local people united by their care for the valley and its remnants of the china stone industry. Some of the Trust's stated aims are:

- *To conserve and protect the built natural heritage of the Parish of St Stephen in Brannel.*
- *To preserve the former mills and other buildings of Tregargus Valley as structures of architectural merit and historic importance forming part of the national heritage.*
- *To manage the land and buildings of The Tregargus Valley for other charitable purposes.*

Since 2002, a number of detailed archaeological reports have been undertaken by Cornwall Archaeological Unit (formerly Historic Environment Services): an archaeological assessment of the valley and its buildings (Cole and Smith 2002), a Conservation Management Plan (Sharpe and Pilkington 2011), and a structural assessment of all buildings in the Tregargus Valley (Knevitts 2009). These reports detailed the site history and significance, whilst making recommendations for future site management through a programme of vegetation management and building conservation works.

Following a successful tender from a brief supplied by NE (March 2013), Cornwall Archaeological Unit of Cornwall Council (CC) and pdp Green Cons. produced information to inform and advise Natural England of the costs and timetabling of measures to undertake a programme of building conservation in the valley. The Cornwall Archaeological Unit component of that work included a study to prioritise building conservation works within the Tregargus Valley (Buck 2014), taking into account recommendations from all the previous reports. The project reviewed the Management Plan and following a site visit to view all the structures, prioritised building conservation works within the Tregargus Valley in order for a further application to be made to Natural England under its Higher Level Stewardship fund for capital works, as part of a long term strategy to help the Tregargus Valley Trust to manage and conserve the very significant array and variety of china stone mill buildings and features within the valley (see Fig 2 and Appendix 1 – excerpt).

This report provides information on the building conservation works to the prioritised three sites in the Tregargus Valley, namely: Wheal Arthur Mill (SW 94943 54522), Big Wheel Mill (SW 94914 53931), Trevear Mill (SW 94977 53846), and a nearby cottage (SW 94986 53819), which took place in 2014-15. All of the sites are leased by the Tregargus Valley Trust from Imerys, with permitted public access throughout. All the works were funded through a Higher Level Stewardship (HLS) agreement co-ordinated by Natural England (NE) and Cornwall Council's (CC's) Historic Environment Countryside Advice Service (HECAS), with some possible additional funding from Historic England (HE) (formerly English Heritage) to help support the water wheel at Big Wheel Mill, in the near future.

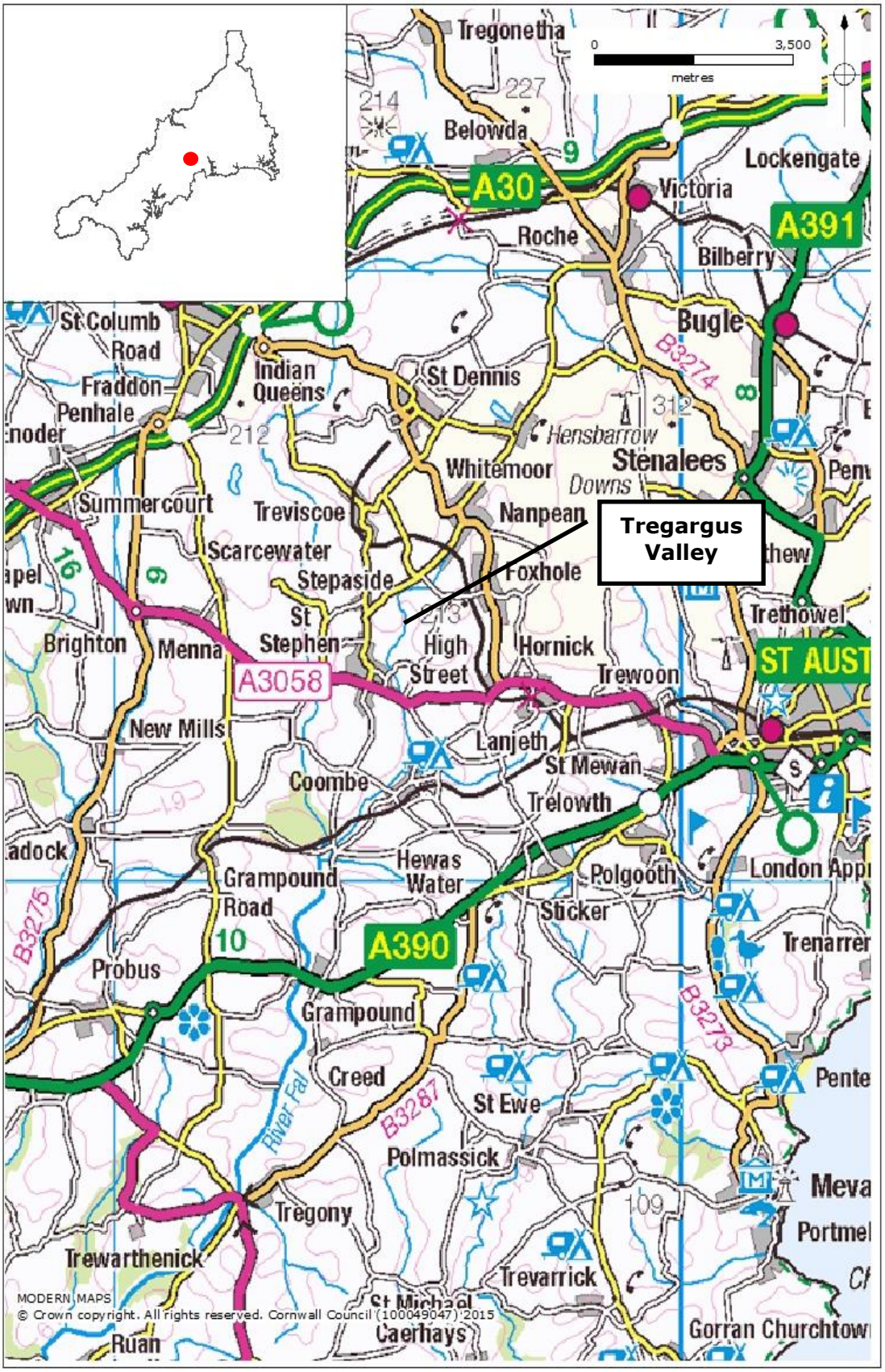


Fig 1 Location map.

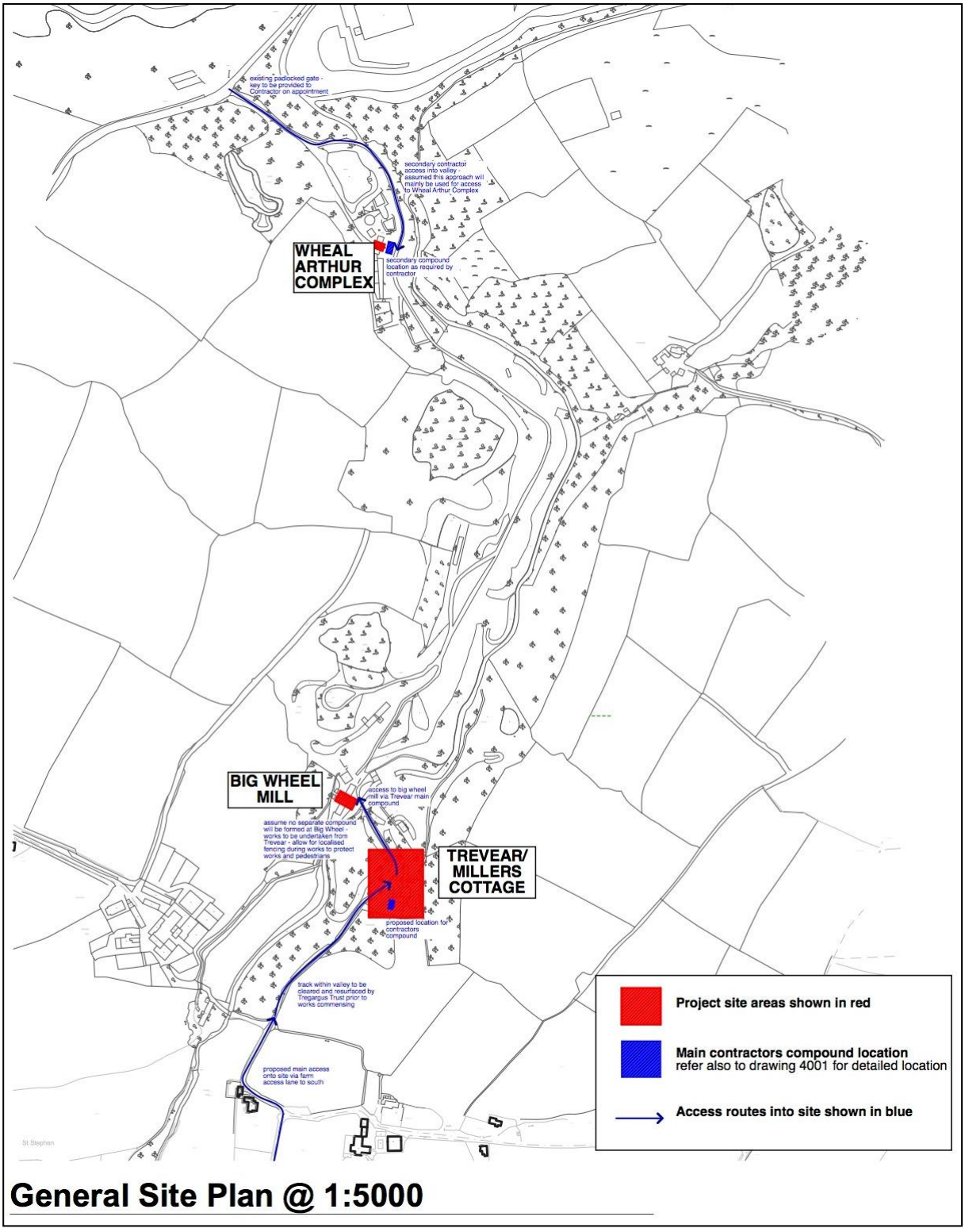


Fig 2 General site plan showing main project locations (excerpt from pdp Green Dwg. No. J13047-4100).

2.2 **Aims and objectives**

The purpose of the historic buildings consultancy, historic buildings recording and archaeological recording was:

- To ensure that site works were undertaken in such a way as to maintain the integrity and authenticity of the historic resource, minimising adverse impact upon the resource.
- To ensure that the highest possible standards of workmanship were maintained during the conservation works, which must be carried out to recognised current best standards in this discipline.
- To ensure that works were undertaken in such a way as to allow adequate recording of remains affected by building conservation.
- To ensure (through site and monitoring meetings), that the methodologies and techniques of all aspects of the site works accord with the method statements and agreed methodologies outlined in the schedule of works and specifications.
- To ensure that there was an agreed appropriate communication link strategy for progress and any issues, etc with the valley trust, HECAS and Historic England (HE) throughout the duration of the project.
- To record sites, features, deposits and artefacts affected by or uncovered by the works for Cornwall's Sites and Monuments Record.
- To disseminate the results of the project appropriately and arrange for the deposition of the project archive in an accredited archive repository.

3 Project methodology

All archaeological recording work was undertaken according to the Chartered Institute for Field Archaeologists *Standards and Guidance for Archaeological Investigation and Recording.* Staff followed the CIFA *Code of Conduct* and *Code of Approved Practice for the Regulation of Contractual Arrangements in Archaeology.*

3.1 **Historic buildings consultancy**

Prior to the start of works, pdp Green Cons. architect project manager agreed with representatives of the valley trust; the scope of works, site access, the location of site compounds and stockpile areas. In the pre-contract meeting Pdp Green Cons., Cornwall Archaeological Unit project archaeologist (and site contractors (Heritage Cornwall), agreed a working programme, details of contracts, site constraints, the location/preparation and number of mortar test panels, working methods and any changes to proposed work programme, health and safety issues and other access requirements, to provide safe access and to minimise damage to known or unknown sub-surface archaeological features.

- The CAU project officer (PO) and architect/engineers (pdp Green), regularly liaised (via email) with the TT and NE.
- The CAU PO provided historic building conservation advice to the site engineer and site contractor in line with Historic England guidelines during regular site visits. The CAU PO photographed the buildings before, during and after works took place (digital and archive B/W).
- A regular monthly site meeting was held for site and progress updates. The meetings also discussed ongoing site conservation work methods, detail of repairs and resolved any ongoing conservation work problems requested by the site contractor. Both the structural architect/engineer and site contractor have a proven track record in historic building conservation.

- The CAU PO ensured that site conservation works were carried out to standards recommended by Historic England best practice, and had the opportunity to halt inappropriate or sub-standard work and to inform the trust and NE as appropriate.

3.2 **Historic building recording**

Given the degree of vegetation growing over, within and under the prioritised buildings, a vegetation clearance contract was specified and supervised by pdp Green in advance of building survey work. Following fieldwork by CAU, the survey drawings were annotated by Cornwall Archaeological Unit to show significant features and function. These drawings were used as part of the tender drawings and information for the site specifications.

Detailed archaeological recording was undertaken for all newly exposed architectural features and any additional features revealed through excavation. Recording also included the extent of repointing and rebuild (see relevant 'as-built' survey plans and elevations produced by Pdp Green)..

- As well as new detail, the nature and extent of all conservation works has been added to the existing archaeological/engineering building survey drawings by the structural engineer as part of the CDM Regulations (provision of 'as-built' survey drawings).
- Measured survey was carried out by hand measurements (using offset techniques at a scale of 1:50), using a paper copy of the survey supplied by the Client. This record was then added to the original survey using CAD (or equivalent) software.
- The resulting survey output is a revised measured survey drawing showing all conservation works that have been undertaken. This has been reproduced at a suitable scale of either 1:50 or 1:100 (appropriate to the size of area recorded) and forms part of the Historic Buildings archive watching brief report.
- The project archaeologist adhered to Health and Safety policies (see below), under the direction of the designated Site Safety Officer.

3.3 **Site recording (general)**

Site drawings (plans, sections, locations of finds) were made by pencil (4H) on drafting film; all plans were linked to the Ordnance Survey landline map and all drawings include standard information: site details, personnel, date, scale, north-point.

- The site archaeologist undertook archaeological building recording in line with recommendations given by CIFA. Where appropriate sections and plans were drawn on site at appropriate scales to adequately record structures or features at appropriate levels of detail.
- All features and finds have been accurately located by means of a National Grid reference.
- A location plan has been made which will allow site detail to be accurately placed within the context of the Ordnance Survey Landline mapping and produced within either the assessment and/or this archaeological recording report.

3.4 **Treatment of finds**

Assessment and recording during site works did not produce any artefactual material.

3.5 **Photographic recording**

Black and white scaled photography used a 35mm camera and fine grain archive quality film (400ASA). Each shot was carefully composed, focused and lit appropriately with a flash if necessary.

The photo record comprised:

- General views.

- Examples of structural and architectural detail.

Methodology for the archive standard photography is set out as follows:

- Photographs of details was taken with lenses of appropriate focal length.
- Difficulties of back-lighting was dealt with where necessary by balancing the lighting by the use of flash.
- A range of appropriate photographic scales was used and a metric scale included in all archive recording photographs, except where health and safety considerations made this impractical.
- Selected digital images have been scanned into the archive reports.
- Black and white photographs will be archived to HER standards and incorporated into the CAU photo database.
- Supporting colour photographs will be taken with a high resolution digital camera (3MP or higher), to illustrate the report and for possible presentation purposes. This will be archived electronically onto each report CD.
- Care was taken that each shot was focused and that with delayed shutter action camera shake did not occur. Each shot was of appropriate quality and used for reports and/or power-point presentation.

3.6 **Project archives**

A paper copy of all relevant correspondence relating to the project, the project design, and a single paper copy of the report has been stored in an archive standard (acid-free) documentation box. The project archive will be temporarily deposited in paper form with Restore, and in the long-term with the Cornwall Record Office. All digital records will be filed on the (backed up) Cornwall Council network.

- An electronic version of all relevant correspondence relating to the project, the project design, the report and digital photographs has been stored on the CC network.
- Black and white photographic prints will be stored in archive standard print holders within an archive box. If appropriate, other photographic records will be supplied with written captions and subject to appropriate batch archiving to be held in safe archival storage.
- Digital colour photographs will be stored according to the Cornwall Archaeological Unit, CC guidelines. Copies of the images will be provided to the client on CD.
- Photographic material will be archived and then stored in archive standard negative holders and archive print holders at the RIC Museum, Truro.

4 Site description

4.1 **Location, settings and historical background of the three sites**

The Tregargus Valley is located in St Stephen Brannel, on the south-western edge of the Hensbarrow granite area, the hub of Cornwall's china clay industry. The project area which is the subject of this report (Fig 2) extends over a distance of just over one kilometre, and a width of approximately 170m, from approximately SW 9493 5457 to SW 9476 5367, along the north-south valley of the Barn River, east of the village of St Stephen. The valley is relatively open at its northern end, but deepens as the river flows south so that below the village of St Stephen (where the geology changes from granite to softer killas) it is a steep-sided, tree-filled and secluded place which feels remote from nearby industrial and nearby semi-urban landscapes. Tregargus Valley is named from the farm adjoining the southernmost mill in the valley.

The following text is summarised from the 2002 assessment (Cole and Smith 2002), and focusses on site development of the mills affected by conservation works.

The St Stephen Tithe Map of 1840 records a china clay pit within the study area, but this may date from the first decade of the 19th century. It was not until the mid 19th century that companies were large enough to fund 'industrial' sized china quarries, and their associated mills. In 1849, the china stone producers came together with a scheme which attempted to regulate the price of their raw material. A scheme was agreed in which they agreed to control output in order to maintain a good price in November of that year. By 1858, Wheal Arthur was recorded as producing 800 tons of potting clay each year.

The arrangement of china stone quarries and mills within the valley and their supporting infrastructure continued to grow during the early 20th century, revisions of the Ordnance Survey 25" maps dating to 1907 and 1930 demonstrating this process. In the post-war years, however, quarrying and milling within the Valley seems to have gone into a rapid decline as the demand for second grade china stone fell away, the last mill closing down in the mid-1960s. Most redundant mills were stripped of their roofing slates, doors and windows and most of their iron components. Abandoned to the elements, they soon began to deteriorate, whilst parts of the site were used by local people for rubbish disposal.

Subsequent to the abandonment of the Tregargus mills, mica waste was disposed of into Higher and Lower Tregargus Quarries by pipeline (this process being virtually complete by the mid 1980s), a haul road was laid down through the upper section of the Valley and the mica lagoons were blanketed with sand and stent to allow them to revegetate, this process burying (or almost completely burying) two mills (Long Incline and Short Incline), partly burying a third (Blacksmith Mill), destroying parts of the settling tanks to the south of Wheal Arthur and obscuring sections of original roadways and leats.

The agreement of a lease between the china clay companies and the Tregargus Trust a decade ago laid the foundations for tackling some of the issues affecting the valley and its sites, the trust attempting to arrest structural decay and dilapidation, whilst enhancing access to and enjoyment of the Valley as a whole.

Following preliminary project development, informed by CAU (CC) and Pdp Green Cons. three distinct high priority sites were agreed to be subject of limited or in-depth building conservation (see Appendix 1): Wheal Arthur Mill, Big Wheel Mill, Trevear Mill, and a nearby cottage, which took place in 2014-15 (see Fig 2).

'A total of seven china stone mills have been documented within the Tregargus Valley, of which five survive (with limited fragments of a sixth). The earliest two mills are likely to be the complexes of Wheal Arthur and Trevear, both of which had their own attached pan-kilns. Wheal Arthur had its own quarry at the northern end of the Valley, whilst the remaining mills were supplied from two quarries (Higher and Lower Tregargus) in the central part of the Valley'. This and the following text is summarised from Sharpe and Pilkington (2011, 23-24), and from Smith and Cole (2002).

Wheal Arthur China stone Mill

This mill is located in the top, or northern, part of the Tregargus Valley (SW 94943 54522). In existence by 1880, this is one of the earliest mill complexes in the valley. Its age is demonstrated by the fact that it has its own pan kiln associated whereas after a certain date all arising slurry from the grinding pans was piped off site for drying elsewhere. The complex includes mill and waterwheel, pan kiln, settling tanks, quarry, tramways and small loading bays for the carts that once transported the final product away from the site. Here, in microcosm, the entire process of china stone production from quarry via processing to export can be seen in one place.

The site has suffered to a degree from fly tipping and the effects of the construction of the ECLP haul road nearby, together with scrub growth, but is generally intact.

However, there have been concerted efforts by the trust to manage the vegetation that grows every year – prior to the trust's involvement, the unchecked growth of trees have affected the structural stability of a number of walls and features.

Big Wheel China stone Mill

This stone mill was constructed in 1898. This is the largest mill in the valley (SW 94914 53931), and had six grinding pans, in fact it was one of the largest such mills in Cornwall. It is also distinguished by the fact that it retains its original, massive, wrought iron waterwheel - now in an advanced state of deterioration. This complex includes the mill, the later winder house, tanks, leat and a tramway. In the general area to the south and east of the mill, there are a series of buildings including a blacksmith's shop and an associated chimney.

This mill is located in the lower central part of the valley, adjacent to the River Barn and is both Scheduled and Listed. Some small-scale stabilisation works have already been undertaken to elements of the structure (Cole 2004). Much vegetation clearance has been done although there has also been a significant level of re-growth. The major elements of work still required following the 2014-15 works are to consolidate the building's stonework and repair lintels, however, the immediate need is one of stabilising the wrought iron wheel – which appears to be close to imminent collapse. Grant fund applications are underway in an attempt to mitigate or permanently stabilise the wheel in its present position.

Trevear China stone Mill

First recorded on the 1880 OS map along with its attached processing works, this china stone mill (SW 94977 53846), was recorded as working china stone, while all that time remaining in the ownership of the Olver family. By the 1930s, the OS map recorded this mill as 'disused.' The Trevear Mill complex includes the mill, pan kiln, building and a remote chimney, plus the Miller's Cottage (SW 94986 53819), as well as the tramway leading to it from the quarries near Big Wheel Mill.

Although this complex is in fair condition, some of its walls and structures are deteriorating through the growth of unchecked vegetation and in particular, trees. Although numerous attempts by the valley trust volunteers have been made, it was necessary to employ professional tree surgeons and vegetation clearance specialists before any survey or site works could commence.

4.2 Statutory Designations

Despite its considerable significance, amply demonstrated by both Cole and Smith in 2002 (archaeological assessment), and latterly Sharpe and Pilkington in 2011 (Conservation Management Statement), there are very few designated heritage assets in the Tregargus valley.

4.2.1 National

Big Wheel Mill is a Scheduled Monument (SM No. 1003101), and a Grade 2 Listed Building (LBS No. 71464). Big Wheel Mill is also on Historic England's Heritage at Risk (HAR) register.

The quarry north of Big Wheel Mill is a geological Site of Special Scientific Interest (SSSI).

4.2.2 Regional/County

The entire valley is recorded in the previous county structure plan as an Area of Great Historic Value (AGHV 19, designated in Sept. 2007 by Restormel District Council), although until the new Cornwall County Policy is agreed by central government, the 'saved' district policies of Restormel District will have more precedence.

4.3 Historic Environment Record sites

The sites within the study area have all been identified from Cornwall's Historic Environment Record (**Bolded** sites had conservation works in 2014/15):

MCO No.	Site name	Site description	OS NGR (SW)
25643	Wheal Arthur	Post med. Quarry	94800 54580
25644	Wheal Arthur	Post med. Tramway	94838 54613
25604	Wheal Arthur	Post med. Water wheel	94937 54563
25602	**Wheal Arthur**	**Post med. China stone mill/water wheel**	**94942 54523**
25603	Wheal Arthur	Post med. China clay dries (pan kiln)	94947 54491
25605	Tregargus	Post med. China stone mill	95085 54258
25516	Recrowsa	Post med. Corn Mill	95096 54213
26800	Recrowsa	Modern mica drag	95025 54197
25640	Tregargus	Post med. China stone quarry (north)	94927 54097
25641	Tregargus	Post med. China stone quarry (south)	94882 54021
25642	Tregargus	Post med. China stone mill	94943 54021
38433	**Tregargus**	**Post med. China stone mill (Big Wheel)**	**94911 53931**
25646	Tregargus	Post med. Tramway (Tregargus-Trevear)	94887 53893
9734	Trevear	Post med. Bridge/tramway	94961 53912
26801	**Trevear**	**Post med. China stone mill**	**94976 53847**
38434	**Trevear**	**Post med. Mill house**	**94983 53820**
26802	Tregargus	Post med. China stone mill (Mica)	94764 53702
29301	Tregargus	Post med. Aqueduct/tramway	94757 53732

5 Archaeological recording results

5.1 General comments

Reproduction of an excerpt of Sharpe and Pilkington's Conservation Management Statement (2011, 33-34, Section 5.2 - Repair/consolidation of built structures):

'The structures proposed for conservation consist of a series of 19th and early 20th century china stone mills and associated structures, including a miller's cottage. Following the progressive abandonment of milling within the Tregargus Valley, all work ending in 1965, and the removal of water wheels and other equipment, the recovery of roofing and other materials for re-use from some buildings, structures in the valley were left unmanaged. Some were subsequently over-dumped or demolished during the after-use of the valley by IMERYS and Goonvean Ltd, or were affected by the creation of access roads. Parts of the site have also been used by local people for fly-tipping.

Exposure to the elements and, in particular, the decay of the remaining incorporated timber elements and the surviving iron components, together with a degree of vandalism and theft, and the effects of encroaching vegetation has led to progressive dilapidation and destabilisation. Whilst the buildings were originally robustly constructed, over four decades of abandonment have taken their toll on their integrity and stability.

The rarity of these structures and their group value in particular establish a requirement that conservation approaches adopted respect their authenticity whilst meeting the requirements of the project to stabilise and consolidate them, so that they are assured a sustainable long term future. The range of interventions adopted must be appropriate to their building type, age and importance and the works undertaken should be limited to those required to achieve these ends. This work will involve the relaying of wall heads to prevent water ingress, repointing in lime mortar, some rebuilding where structural stability has been compromised, replacement of rotten or missing timber lintels in hardwood and the stabilisation of corroded iron components. Some temporary propping of unstable masonry will probably be required and some of these props may need to be made permanent. It is also very likely that permanent props, struts or other repairs to waterwheels will be required to prevent their collapse.

Given the rarity and importance of these structures, it is particularly important that they are recorded in detail before any works take place, and that all interventions arising from the conservation works programme are also recorded.'

General notes:

- It should be noted that vegetation/tree removal occurred at all three high priority sites (see Appendix 1), prior to measured and structural surveys which defined and informed the project parameters. The measured surveys were annotated following an archaeological survey of significant features and correct building terminology. These drawings were then used for the tender package, which was won by Heritage Cornwall.
- All identified structures and sites are located by a 10-figure grid reference (NGR). In most instances these relate to a point at the centre of the feature/structure. Site location plans for all sites within the valley are reproduced in Fig 2.
- Specifications for all building conservation works were agreed with the Pdp Green Cons. and the valley trustees prior to tenders being sought. The historic buildings consultant was part of the project team, to advise on the nature and extent of the works and to undertake archaeological and building recording.
- Only summary site details (and selective images) are given in this report, more detailed site specifications of works undertaken are given in the Method Statement, Repair philosophy, Schedule of Works, and Tregargus Specification (Pdp Green Cons. Project Ref. J13-037). These are not reproduced in this report. However, 'as-built' survey drawings produced by Pdp Green are reproduced within each relevant section of this report.
- The historical and archaeological background for each site is given in detail in the archaeological assessment report (Cole and Smith 2002). The archaeological recording site inventory reproduces excerpts from the relevant conservation management statement recommendations (Sharpe and Pilkington 2011), followed by a description of the 2014-15 conservation works undertaken, and their impacts.
- Refer to Figures 3 - 11 for Wheal Arthur Mill, Figures 12 - 18 for Big Wheel Mill, Figures 19 - 38 for Trevear Mill, and Figures 39 – 49 for Trevear Mill cottage.

5.2 **Wheal Arthur China Stone Mill** SW 94942 54523 MCO 25602

Recommendation (Sharpe & Pilkington 2011, 42 - excerpts)

The Wheal Arthur complex (Figs 3-11) includes the northernmost surviving structures in the Valley and includes a group of settling tanks, a pumping shaft and waterwheel, the china stone mill, with attached pan kiln, dry, linhay and chimney… The mill is in fair condition structurally, requiring only relatively small scale works, though access into and through the mill is difficult at present. Its water wheel is in imminent danger of

collapse, its cast iron rims being retained in position only by two rotting timber spokes, and should be either propped or carefully dismantled as a matter of urgency.

The Wheal Arthur mill complex is the most complete and potentially accessible of all of the sites in the Valley, and also incorporates the widest range of elements. Works are required to enhance its structural stability and provide safe access to its components will include the following (China stone mill only):

- Clear vegetation from mill (priority 1).
- Install temporary props/support to prevent the collapse of the waterwheel (priority 1).
- Either dismantle and store or reconstruct waterwheel (priority 2).
- Install access scaffold (priority 2).
- Stabilise walling affected by root infiltration (priority 1).
- Relay wall capping and repoint external and internal wall elevations (priority 2).
- Assess condition of grinding pan floor in southern section of the mill (priority 1).
- Stabilise southern grinding pan floor (priority dependent on results of assessment).
- Assess and if necessary replace timbers supporting waterwheel bearings (priority 1).

Description of works (2014)

Conservation works to this china stone mill focussed on remediation of the condition of the water wheel itself – it was thought that the building structurally, following a great deal of vegetation clearance prior to the works contract, was structurally sound and did not merit immediate works (see Appendix 1). However, prior to works, Cornwall Archaeological Unit undertook a monochrome photographic survey and measured survey of the wheel in its deteriorating condition. These images and survey images are not reproduced in this report.

In early August, the site contractors undertook to temporarily prop the wheel with scaffolding to ensure support to the wheel, both of whose outer rims are broken. One

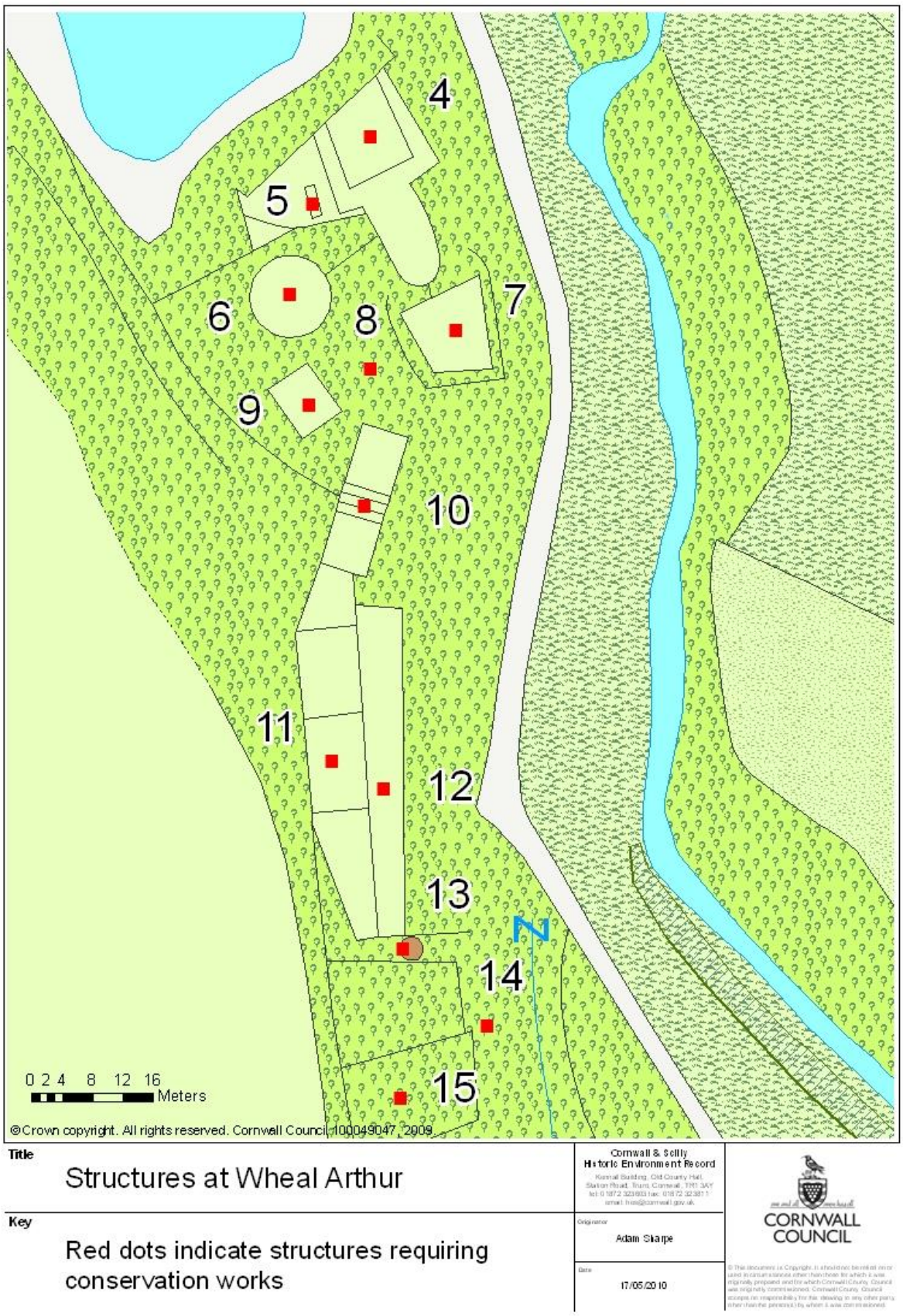


*Fig 3. Wheal Arthur site plan: Sites: **4**. Settling tank, **5**. Pumping water wheel, **6**. Settling tank, **7**. Settling tank, **8**. Pumping shaft, **9**. Settling tank, **10. Wh. Arthur China stone mill**, **11**. Dry, **12**. Linhay, **13**. Chimney, **14**. Tramway, **15**. Settling tanks. Features 4 and 5 lie just to the north of the boundary of the area managed by the Tregargus Trust (Sharpe & Pilkington 2011, Fig 11)*

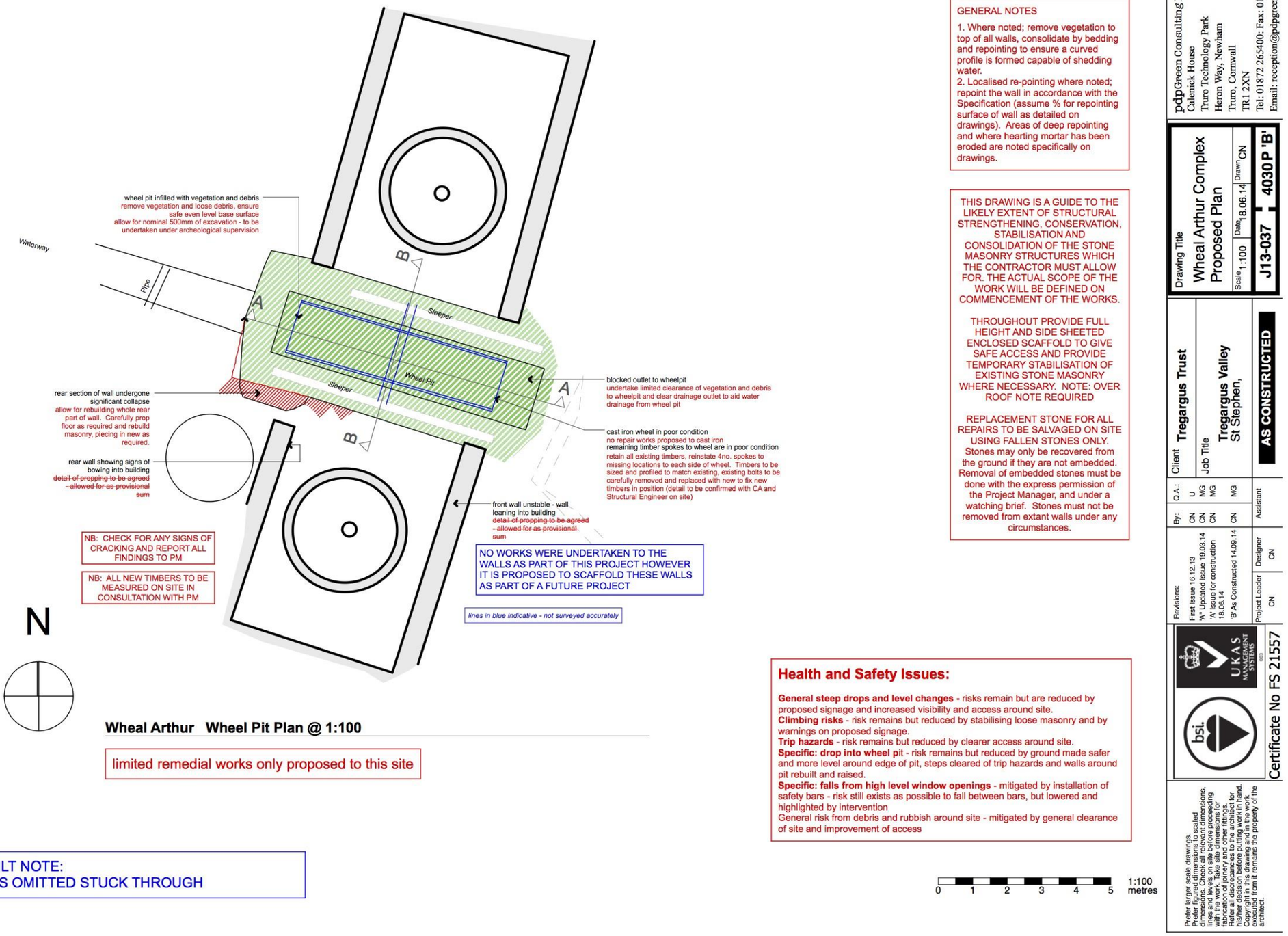
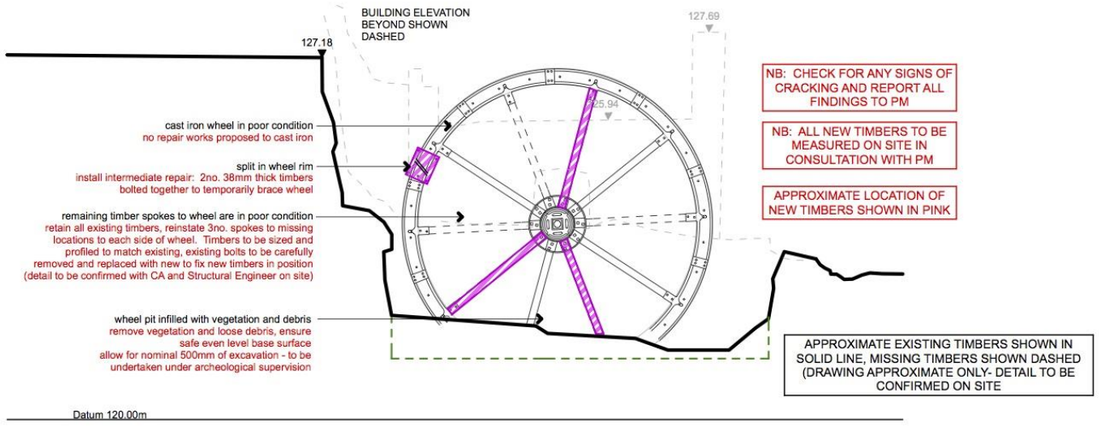


Figure 4 Wheal Arthur conservation works 'as-built' plan of the Wheal Arthur water wheel (© Pdp Green Dwg. No. J13037-4030B, 14/9/15).



Wheal Arthur Section A-A @ 1:50

pdpGreen Consulting Ltd.
Calenick House
Truro Technology Park
Heron Way, Newham
Truro, Cornwall
TR1 2XN
Tel: 01872 265400: Fax: 01872 276356
Email: reception@pdpgreen.co.uk

Drawing Title
Wheal Arthur Complex
Proposed Sections

Scale 1:100 | Date 18.06.14 | Drawn CN

J13-037 | 4034 P 'B'

Client **Tregargus Trust**

Job Title
Tregargus Valley
St Stephen,

AS CONSTRUCTED

By:	Q.A.:
CN	U
CN	MG
CN	MG
CN	MG

Revisions:
First issue 16.12.13 CN
'A' Updated issue 19.03.14 CN
'A' Issue for construction 18.06.14 CN
'B' As Constructed 14.09.14 CN

Project Leader	Designer	Assistant
CN	CN	

Certificate No FS 21557

0 1 2 3 4 5 1:100 metres

Figure 5 Wheal Arthur conservation works 'as-built' Section A-A of the water wheel (© Pdp Green Dwg. No. J13037-4034B, 14/9/15).

rim was broken away close to the earth/vegetation/fly-tipped infill level in the base of the pit and the other rim broken higher up (see Fig 8). It was also noted at the time that there would also be issues fitting new spokes as the hub spoke holes did not align with those on the shrouds/rims. It appeared the hub/axle would need to be turned slightly to fit the new timber spokes. In addition, it was noted that additional steel bars would need to be made and fitted to the wheel to keep the outer rims equidistant, so keeping the wheel stable.

Pdp Green Cons. had prepared the basic site surveys and annotated an approximate works specification (Figs 2 and 3). In early October 2014, Heritage Cornwall stabilised the water wheel with temporary scaffolding to allow sub-contractors (Martin Welsh – metal fabricator), to closely inspect the wheel to make recommendations for its future stabilisation and conservation. Heritage Cornwall cleaned out the wheelpit of its debris and vegetation (compare Figs 6 -before works and 7 - after works). Site meetings were held to discuss the specifications and methodology of carrying out repairs. Following clearance of the wheelpit, and re-positioning/re-centring of the wheel rims using scaffold bars and timber it was decided to attach a plate (Fig 11), to securely hold the two sections of broken rim at the rear of the wheel (compare Figs 8 (before works) and 9 (after works), as unfortunately, the wrought iron could not be welded.

Once the wheel was stabilised in position (albeit with another broken section of rim on the other side set in the pit), the other conservation works proceeded. This included the insertion of three pairs of oak struts to replace rotted equivalents as shown on Figure 5, and in detail on Figure 10. It should be noted that the nuts, bolts and flat washers mirrored the original specification. This now securely connected the wheelpit axle/hub to the outer rims. Ten steel bars were then added by Martin Welsh around the wrought iron rims to support the rims equidistant from each other to further support the wheel *in situ* (see Fig 10). The supporting scaffold was then removed.

Figure 8 shows not only the broken state of the wheel rim, but also the condition of the mill building south side wall beyond the wheel pit, and the precarious nature of the foundation support for the adjacent south east wall. A void was found under the wall, of unknown origin and function, whose possible (timber/stone) outer lintel had now gone, had caused the collapse seen in Figure 8. The inner void was infilled with stone and the front face rebuilt as a dry-stone wall (compare Fig 9).

Figure 4, the Pdp Green 'as-built' plan describes the leaning inward walls of the front and rear elevations of the south mill walls next to the wheelpit (also see Figs 6 and 7). Unfortunately there were insufficient project funds at the end of the contract period to undertake structural remediation works to support both of these walls; however, it was never the intention to take down the walls and reinstate them in a more vertical position. Wall stabilisation here may well be a future project, as well as general conservation and consolidation to the entire Wheal Arthur china mill complex (subject to capital funding from other grant applications).

Figure 6 View (from the east) of the Wheal Arthur water wheel before works © CAU, CC 23/7/2014.

Figure 7 Similar view of the Wheal Arthur water wheel after works © CAU, CC 16/12/2014.

Figure 8 View (from the north) of Wheal Arthur water wheel rim break and south wall collapse before works © CAU, CC 23/7/2014.

Figure 9 Similar view of the Wheal Arthur water wheel and south wall after repair works © CAU, CC 16/12/2014.

Figure 10 Detail view of the Wheal Arthur water wheel new cross rod steel replacements and new oak timber struts after works © CAU CC 14/5/2015.

Figure 11 View of the steel clamp plate to repair the water wheel rim © CAU, CC 21/10/2014.

5.3 **Big Wheel China Stone Mill** SW 94911 53931 MCO 38433

(SM No. 1003101), and a Grade 2 Listed Building (LBS No. 71464). Big Wheel Mill is also on Historic England's Heritage at Risk (HAR) register (Figs 9-18).

Recommendation (Sharpe & Pilkington 2011, 45-6 excerpts)

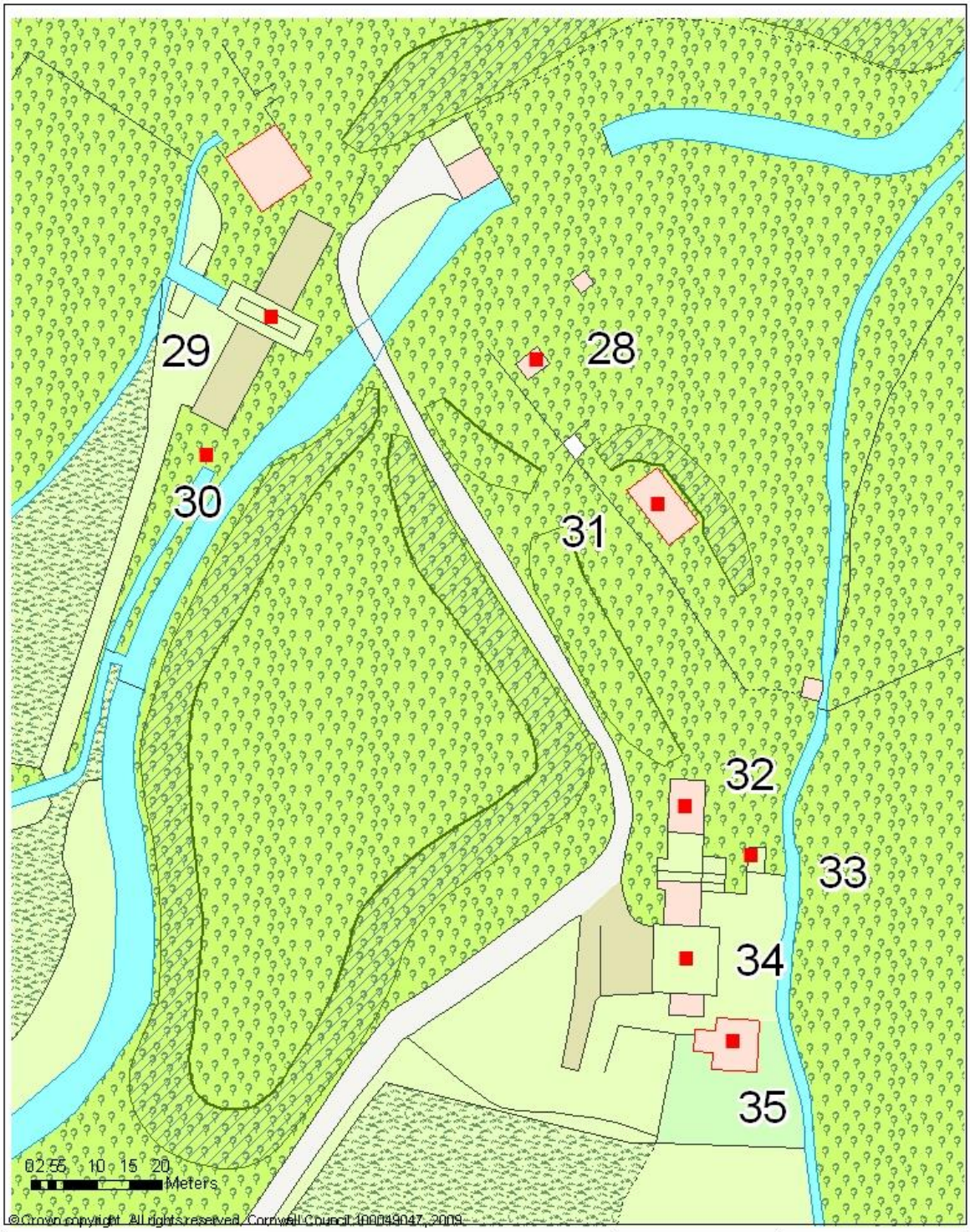
Although some of the grinding pans have been removed and others have been partly demolished, the majority of the structure is intact, and the mill retains its central water wheel and iron feed launder, supported by a rare brick flying arch. The roof structure, which remained intact until the mid 1980s, has now collapsed.

Some works have already been undertaken to elements of this complex, including emergency repairs to the leat bridge to its west and some vegetation clearance in and around the mill, in particular to its east between the mill and the river. Discreet safety barriers will be required to the openings on the upper floor on its eastern side to safeguard the existing dangerous drops. The most urgent and substantial works required on this structure relate to the water wheel, however.

The cast iron rim sections are connected to the cast iron hub by means of fifteen pairs of T-section iron spokes and circular section tie rods. Almost all of the spokes have corroded very extensively, some having failed completely and the structural integrity of the wheel must now be severely compromised, with the total collapse of the rim and the breakage of its components being a very real possibility in the near future. The stabilisation of this important element of the structure is an urgent priority, which will require either the installation of supporting scaffolding or the careful dismantling of the water wheel pending its repair. Given the extent of deterioration of the spokes it is likely that most of these will need to be replaced with modern equivalents. Although this will be an expensive, complex and intrusive operation, it is considered that the loss of integrity to this scheduled site which would result from allowing the collapse of the wheel would be significant and ought to be averted. Discussions will be required with English Heritage to approve this course of action and specialist advice will be needed to establish how best to achieve the stabilisation of the water wheel. It is also recommended that some conservation is undertaken to the iron launder to confer structural stability, much of the base of the launder having corroded away, making it prone to distortion or collapse. Should the launder become unstable this might result in the unusual brick flying arch which supports it being severely damaged or destroyed.

The conservation of the other peripheral elements of the site will entail only minor works and is considered to be a low priority. Following the conservation of the mill, thought will need to be given to some access and safety works, in particular the provision of fencing or a barrier to prevent falls into the deep wheelpit and from the openings on the upper floor of the eastern elevation of the building.

- Clear vegetation from building and from the area to its east between the mill and the river. Treat all stumps to prevent regrowth (priority 1).
- Provide temporary props or scaffolding to support waterwheel (priority 1)
- Agreement of final works specifications (priority 1).
- Install access scaffold (priority 2).
- Clear debris and install temporary props under southern grinding pan floor (priority 1).
- Repoint external and internal masonry (priority 2)
- Re-set wall capping masonry (priority 2).
- Repoint wheelpit wall facings (priority 2).



Title

Big Wheel and Trevear Mills

Key

Red dots indicate structures requiring conservation works

Cornwall & Scilly Historic Environment Record

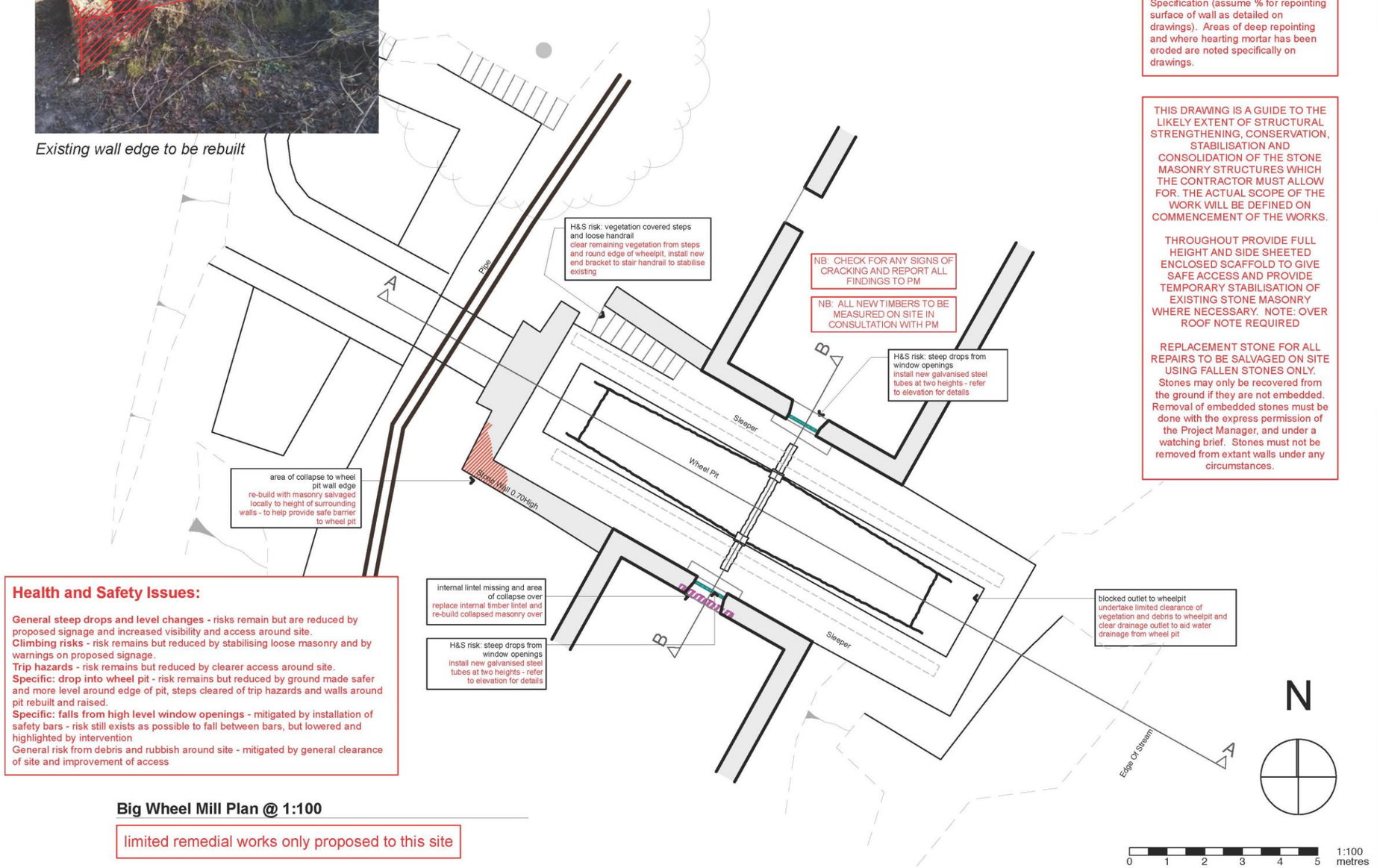
Originator: Adam Sharpe

Date: 17/05/2010

CORNWALL COUNCIL

Fig 12 Big Wheel and Trevear Mill site plan. Sites: ***28****. Blockwork structure,* ***29 Big Wheel china stone mill****,* ***30****. Adit,* ***31****. Crib hut,* ***32****.* ***Trevear china stone mill****,* ***33****. Water tank,* ***34****. Trevear pan kiln,* ***35****.* ***Trevear Cottage*** *(reproduced from Sharpe and Pilkington 2011, Fig 11).*

Existing wall edge to be rebuilt



Health and Safety Issues:

General steep drops and level changes - risks remain but are reduced by proposed signage and increased visibility and access around site.
Climbing risks - risk remains but reduced by stabilising loose masonry and by warnings on proposed signage.
Trip hazards - risk remains but reduced by clearer access around site.
Specific: drop into wheel pit - risk remains but reduced by ground made safer and more level around edge of pit, steps cleared of trip hazards and walls around pit rebuilt and raised.
Specific: falls from high level window openings - mitigated by installation of safety bars - risk still exists as possible to fall between bars, but lowered and highlighted by intervention
General risk from debris and rubbish around site - mitigated by general clearance of site and improvement of access

Big Wheel Mill Plan @ 1:100

limited remedial works only proposed to this site

GENERAL NOTES

1. Where noted; remove vegetation to top of all walls, consolidate by bedding and repointing to ensure a curved profile is formed capable of shedding water.
2. Localised re-pointing where noted; repoint the wall in accordance with the Specification (assume % for repointing surface of wall as detailed on drawings). Areas of deep repointing and where hearting mortar has been eroded are noted specifically on drawings.

THIS DRAWING IS A GUIDE TO THE LIKELY EXTENT OF STRUCTURAL STRENGTHENING, CONSERVATION, STABILISATION AND CONSOLIDATION OF THE STONE MASONRY STRUCTURES WHICH THE CONTRACTOR MUST ALLOW FOR. THE ACTUAL SCOPE OF THE WORK WILL BE DEFINED ON COMMENCEMENT OF THE WORKS.

THROUGHOUT PROVIDE FULL HEIGHT AND SIDE SHEETED ENCLOSED SCAFFOLD TO GIVE SAFE ACCESS AND PROVIDE TEMPORARY STABILISATION OF EXISTING STONE MASONRY WHERE NECESSARY. NOTE: OVER ROOF NOTE REQUIRED

REPLACEMENT STONE FOR ALL REPAIRS TO BE SALVAGED ON SITE USING FALLEN STONES ONLY. Stones may only be recovered from the ground if they are not embedded. Removal of embedded stones must be done with the express permission of the Project Manager, and under a watching brief. Stones must not be removed from extant walls under any circumstances.

pdpGreen Consulting Ltd.
Calenick House
Truro Technology Park
Heron Way, Newham
Truro, Cornwall
TR1 2XN
Tel: 01872 265400; Fax: 01872 276356
Email: reception@pdpgreen.co.uk

Drawing Title: Big Wheel Complex Existing Plan
Scale 1:100 | Date DEC 13 | Drawn CN
J13-037 | 4040 P 'A'

Client: Tregargus Trust
Job Title: Tregargus Valley St Stephen,

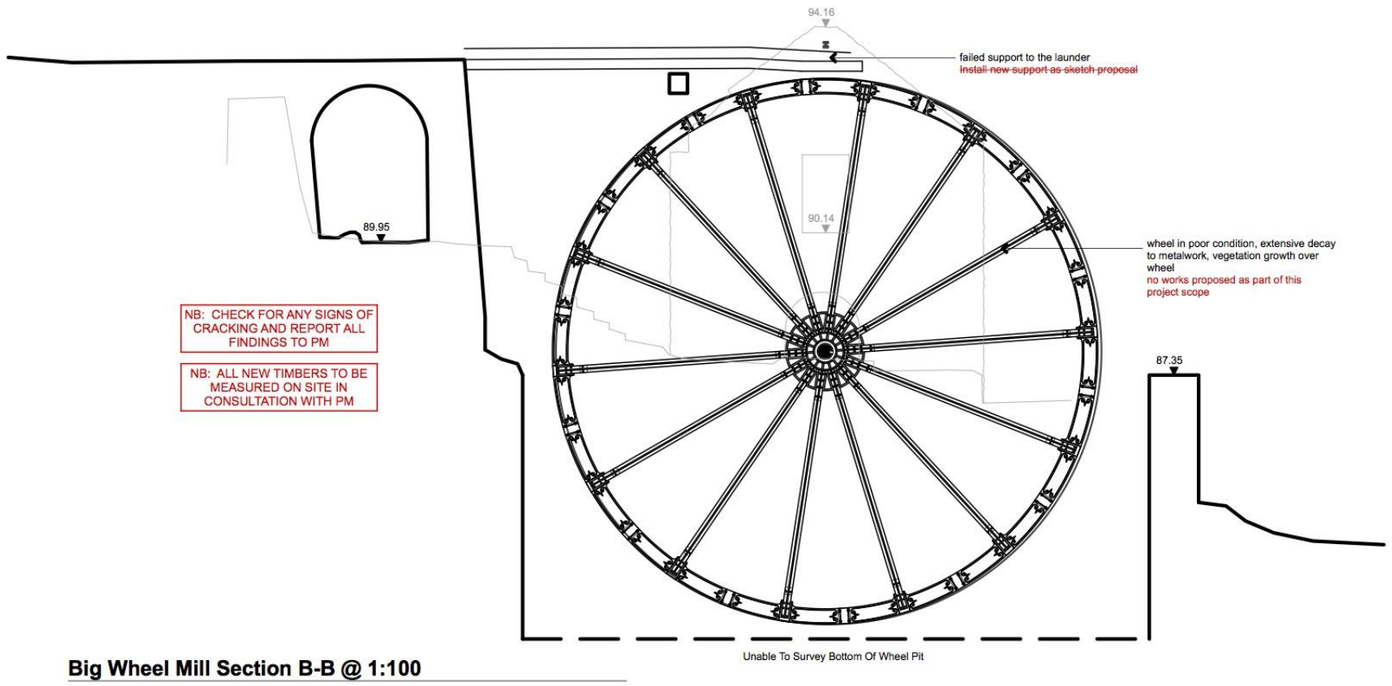
SURVEY

Revisions:	By:	Q.A.	Project Leader	Designer	Assistant
First issue 16.12.13	CN	U	CN	CN	
'A' Updated issue 19.03.14	CN	MG			

Certificate No FS 21557

Prefer larger scale drawings.
Prefer figured dimensions to scaled dimensions. Check all figured dimensions, lines and levels on site before proceeding with the work. Take site dimensions for fabrication of joinery and other fittings. Refer all discrepancies to the architect for his/her decision before putting work in hand. Copyright in this drawing and in the work executed from it remains the property of the architect.

Figure 13 Big Wheel mill conservation works 'survey' plan of the water wheel (© Pdp Green Dwg. No. J13037-4040P'A', 14/9/15).



Big Wheel Mill Section B-B @ 1:100

AS BUILT NOTE:
WORKS OMITTED STUCK THROUGH

0 1 2 3 4 5 1:100 metres

pdpGreen Consulting Ltd.
Calenick House
Truro Technology Park
Heron Way, Newham
Truro, Cornwall
TR1 2XN
Tel: 01872 265400: Fax: 01872 276356
Email: reception@pdpgreen.co.uk

Drawing Title: Big Wheel Complex Section B-B
Scale 1:100 | Date 18.06.14 | Drawn CN
J13-037 | 4044 P 'B'

Client: Tregargus Trust
Job Title: Tregargus Valley St Stephen,
AS CONSTRUCTED

Revisions:	By:	Q.A.:
First Issue 16.12.13	CN	U
'A*' Updated Issue 19.03.14	CN	MG
'A' Issue for construction 18.06.14	CN	MG
'B' As Constructed 14.09.14	CN	MG

Project Leader: CN | Designer: CN | Assistant

Certificate No FS 21557

Prefer larger scale drawings.
Prefer figured dimensions to scaled dimensions. Check all relevant dimensions, lines and levels on site before proceeding with the work. Notify this office immediately of discrepancies or inconsistencies.
Refer all discrepancies to the architect for his/her decision before putting work in hand.
Contractors must work to figured dimensions only.
This drawing is the copyright of the practice and may not be reproduced or loaned without the written consent of pdp Green. It must not be scaled. Any information required which is not contained on this drawing should be obtained from the architect.

Figure 14 Big Wheel conservation works 'as-built' Section A-A of the water wheel (© Pdp Green Dwg. No. J13037-4044P 'B', 14/9/15).

- Undertake anti-corrosion treatment and any necessary repairs to waterwheel (priority 2).
- Clear debris from, undertake anti-corrosion treatment to and undertake repairs to launder (priority 2).
- Reinstate timber lintels in gable and other walls where required (priority 1).
- Clear vegetation and debris from access area to grinding pans and install temporary props if required (priority 1).

Description of works (2014)

Conservation works to this china stone mill focussed on attempts at remediation of the condition of the water wheel itself – it was thought that the building structurally, following some vegetation clearance prior to the works contract, was sound and did not merit immediate works (see Appendix 1). However, prior to works, Cornwall Archaeological Unit undertook a monochrome photographic survey and measured survey of the wheel in its deteriorating condition. These images are not reproduced in this report. Scheduled Monument permission for the proposed works was received from English Heritage. The limited scope of the works is shown on Figure 13, and included the desire to re-support the tray of the iron water shute that is nearly resting on the wheel, and to insert missing lintels to the window openings from each side of the mill overlooking the wheel. Figure 14 shows the works achieved. Prior to the start of the contract some vegetation clearance was undertaken by separate contractors.

In mid August, the site contractors undertook to clean surface vegetation around the side of the wheelpit, in advance of entering the pit to clean some of the material in advance of considering works to the wrought iron and steel wheel itself. However, a close inspection of the wheel itself brought up issues of the structural stability of the wheel and hence the safety of the contractors working below/adjacent to the wheel in the wheelpit (see Figs 15 and 16). This followed the collapse of a small section of the outer rim (cast-iron shroud). A meeting was subsequently arranged with Historic England civil and structural engineering team, on 19th September to review the structural stability of the corroded wheel. The following recommendations were made by Toby Murphy:

'Conclusions

1. The wheel is in extremely poor condition.

2. The mild steel spokes are likely to require complete replacement due to the extent of corrosion.
3. The cast iron outer rims have fractured at a number of locations. The cracking could be the result of the loss of a number of spokes leading to bending within the cast iron under self-weight. It is also possible that the cracking is the result of the original casting faults.
4. The wrought iron ties will need to be removed and if possible relocated due to the connection detail with the mild steel spokes. In a number of other places complete replacement will be required where the wrought iron has snapped.
5. The launder is in better condition but would require treating to prevent further corrosion. A number of the base plates will require replacement due to corrosion. Corrosion in the connection to the RSJ has led to failure which would require repair.
6. Access to the wheel pit and the paths to either side will be extremely precarious in the wheels current state. Sections of the wheel have already collapsed and further collapse is highly likely.

Recommendations

Meaningful repair to safeguard the wheel will require significant work. It is likely that deconstruction of the wheel will be required to undertake this work. Until work can be carried out access should be limited via hoarding/fencing and signage. In the short

term the wheel defects could be recorded element by element. At the same time architectural detailing on the wheel could be recorded in order to help reconstruct/recast any elements lost in the future. In the medium term the following options may be considered:

1. Restrict access and allow the wheel to deteriorate in its current location, collecting fallen sections over time.
2. Dismantle the wheel and store for future repair.
3. Prop the cast iron ring in its current location with scaffolding. Sheet and roof the scaffold to reduce the rate of corrosion on the mild steel though replacement is likely.'

Remediation of the above recommendations were far beyond the remit or finances of the HLS project. As a result, in terms of the current project it was decided to remove any proposed works to the wheel, and simply for the site contractors to reinstall missing internal timber lintels to the window openings either side of the wheelpit at the grinding pans floor. These works included the insertion of steel bars across the former window openings as a safety measure (compare Figs 17 and 18). The aggregate:lime mix used was 2.5:1, and the sand aggregate for the repointing was CLS No. 32 and appropriate amounts of coal dust to match up with existing.

Currently, funds are being sought from HE for scaffolding the water wheel, in case of imminent collapse. The HLS has funded fencing of the water wheel, which is yet to be installed. However, the existing HLS scheme has funded a more detailed survey of the wheel by CAU, the detail information to be used if more funds are subsequently made available from HE for conservation of the Big Wheel mill. The scheme has also funded the obtaining of quotes for the design and erection of structural scaffolding by Pdp Green to support the wheel in case of collapse. These should be viewed as temporary works in advance of a possible capital works scheme (possibly funded by HLF) for conservation of this important Scheduled Monument.

Figure 15 View of the Big Wheel china stone mill 'intact' water wheel from the east after clearance works around the wheelpit © CAU, CC 21/10/2014.

Figure 16 View of the Big Wheel china stone mill 'intact' water wheel from the north west after clearance works © CAU, CC 21/10/2014.

Figure 17 View of the upper northern mill window collapsed lintel before works © CAU, CC 23/7/2014.

Figure 18 View of the upper southern mill window replaced lintel after works © CAU, CC 14/5/2015.

5.4 **Trevear China Stone Mill** SW 94976 53847 MCO 26801

Recommendation (Sharpe & Pilkington 2011, 48 – 49, excerpts)

Sites 32-34, Figure 12

This china stone mill is sited in the south-eastern part of the Valley, stone originally being trammed to it from the Tregargus Higher and Lower Quarries. The mill (32) is asymmetric, originally having had two grinding pans to the north of the wheelpit and one to the south. A substantially demolished pan kiln (34) is attached to the south of the mill, its linhay having become completely overgrown with privet. Some vegetation clearance has taken place around the mill, though most of the cut area has now revegetated.

The condition of the mill is the poorest of any of those which survive to any substantial degree in the Valley, there having been substantial collapses of parts of its floor structure. This appears to be substantially due to the rotting out of some of the timbers which supported the vaulting under the grinding pan floor. The replacement of the remaining failing timbers and the reinstatement of those which are now missing are required to prevent further collapse. Temporary propping of the floor should be undertaken in advance of any other works. Rubble, rubbish and ivy will also need to be removed from the building and from the wheelpit in advance of consolidation works, which will include re-setting the top courses of the walls, the replacement of failed pointing and the installation of some safety barriers where dangerous drops exist. The condition of the flying arch which originally supported the launder over the wheelpit should also be examined, given the particular rarity of these features (only two examples survive in the Valley).

The pan kiln and its linhay are covered in rubble and dense scrub, including privet which has spread from the nearby miller's garden. This will require clearance before the scope of the works required to this part of the complex can be assessed. To the east of the mill, trees roots growing into the water tank (33) have already destabilised a section of its masonry; this tree is likely to fall soon and will cause severe damage to walls of the adjacent mill. The tree should be carefully felled as a matter of urgency, as should a second leaning tree immediately to its south.

- Vegetation clearance works, including removal and stump treatment of trees growing from masonry, especially those growing on the masonry water tank immediately to the east of the mill (priority 1).
- Repoint internal and external elevations and wheelpit masonry where required (priority 2).
- Re-lay wall topping courses (priority 2).
- Install temporary props under grinding pan floor (priority 1).
- Replace timber bearers under grinding pan floor arches (priority 2).
- Remove vegetation and debris from waterwheel pit (priority 1).
- Fell trees immediately to the east of the mil growing out of or adjacent to the water tank (priority 1).
- Install safety barriers (priority 2).
- Replace steel plates over pan kiln furnace opening and stabilise masonry over opening (priority 1).
- Remove and stump treat trees growing from steps leading to furnace room (priority 1).
- Re-lay wall heads and repoint walls of furnace room (priority 1).

Description of works (2014) (Figs 19-38)

Conservation works to this china stone mill complex focussed on remediation and consolidation of the entire Trevear complex (except the pan kiln chimney); the mill buildings and wheelpit, the adjacent water tank and the cottage. The cottage is separately described below (section 5.5). With the exception of the grinding pan floors, it was thought that the building structurally, following a great deal of vegetation clearance prior to the works contract, was structurally sound, but the water tank building and the grinding pan floors did merit immediate works (see Appendix 1) – hence the reason why this complex was prioritised and resulted in detailed structural and consolidation works. However, prior to works and after substantial vegetation clearance, Cornwall Archaeological Unit undertook a monochrome photographic survey and annotated survey drawings to define significant features, as part of producing the detailed site specification with Pdp Green Cons.

In mid July 2014 Heritage Cornwall cleared an area west of Trevear mill for two portacabins, one for the storage of materials, the second for working accommodation (see Fig 2). The latter was large enough for the regular on-site progress meetings. The material removed by the JCB wheeled digger included asbestos, remnants of a building dating from the 1940s, rubble and tree stumps around the lower part of the site. With the exception of the asbestos, this was formed into a linear bund at the south (bottom) end of the site boundary, west of the cottage.

Site work proceeded from late July to remove further vegetation (especially from the water tank and the wheelpit masonry sides), where stumps were further cut back and treated with root killer. Consolidation works started on the water tank whilst the cottage was being scaffolded (see section 5.5below). Following careful removal of the large tree trunk, and its associated roots (a difficult exercise), stone was sourced from the site (and within the tank which was cleared out), to rebuild the outer west wall of the tank – keeping the wrought iron strap *in situ*. Mortar panels had previously been assessed and CLS No. 32 was chosen with variable amounts of coal dust to darken the mortar as necessary to match with existing – the same sand aggregate was used for all consolidation works at the Trevear complex. The wall tops were also repointed and 'capped'. Figure 19 shows images and specifications for these works 'as constructed'.

The general site plan of this complex is shown on Figure 20. Works to the other Trevear Mill buildings started in earnest in late August – following scaffolding erection after removal from the cottage. Following the earlier clearance of the wheelpit of fly tipped debris and vegetation, the masonry collapse to the west was rebuilt, and the west end of the wheelpit surround surface consolidated (compare Figs 28 and 29). Trees had been growing out of the east upper side of the wheelpit surround, which were also further cut back with a chainsaw and treated (see Figs 35 and 36). The internal sides of the wheelpit were also patch repointed where necessary.

The first floor grinding pans and floor were cleared of vegetation build up and rubble (a build-up of approximately 0.1m in height – compare Figs 24 and 33). The stone floors were then left following clearance. The walls were patch repointed internally and externally where necessary after root and vegetation clearance, and the walls 'capped' by rebuilding and re-setting the top of the masonry to a depth of 0.3m (see Figs 25, 34 and 36). A granite lintel was replaced on its original site at the north east corner of the north side of the mill (see Figs 21, 23, 24 and 36), following its collapse onto the adjacent floor. The parapet walls overlooking the wheelpit had deteriorated (see Fig 32), so these were consolidated and a new layer of lime mortar placed on the top surface – copying the original style (compare Figs 24, 32 and 33). These will darken in time. New galvanised tubes were inserted horizontally into three window openings to minimise the possibility of falls to the ground below (see Fig 21 (as built' survey drawing), and Figures 34 and 36 for site images.

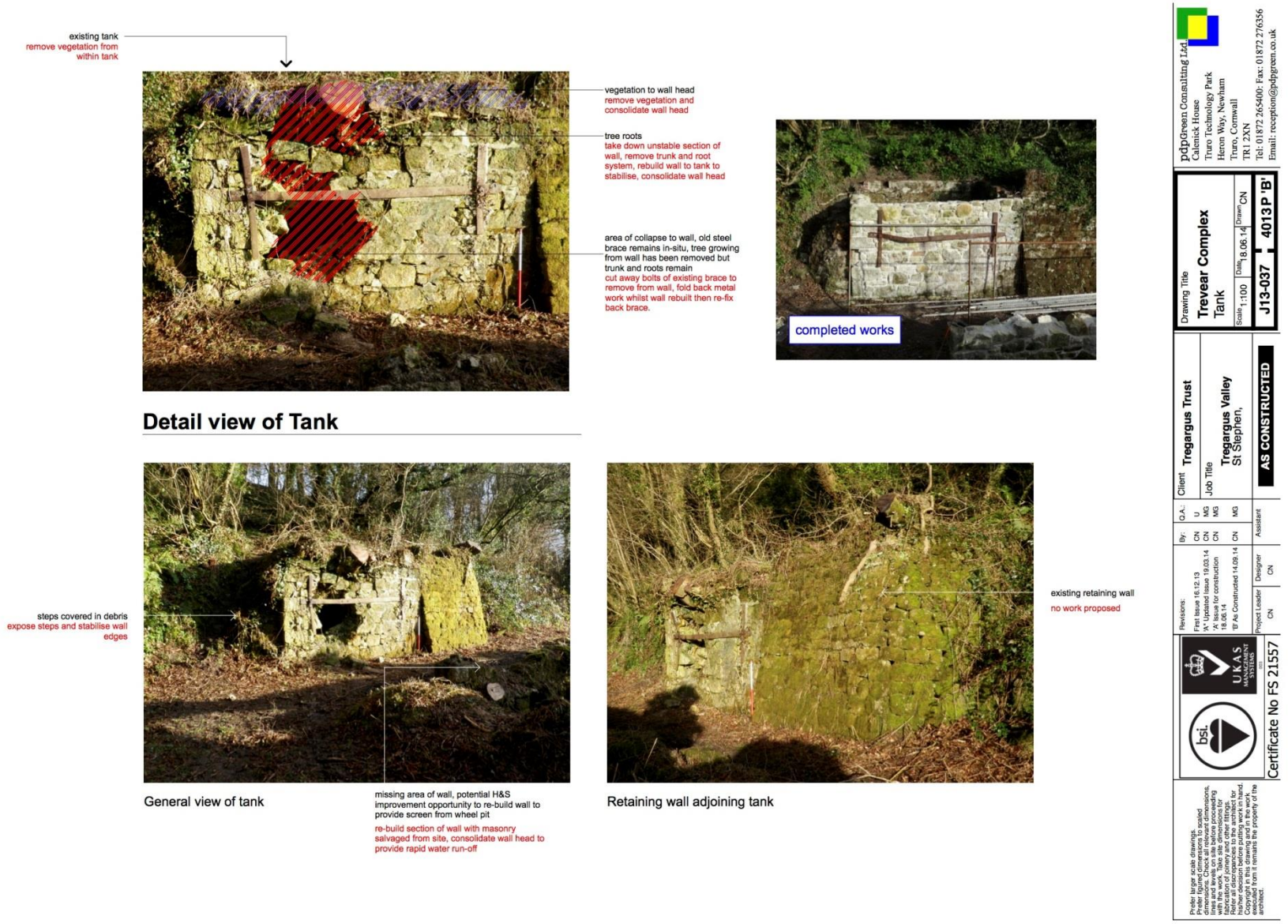
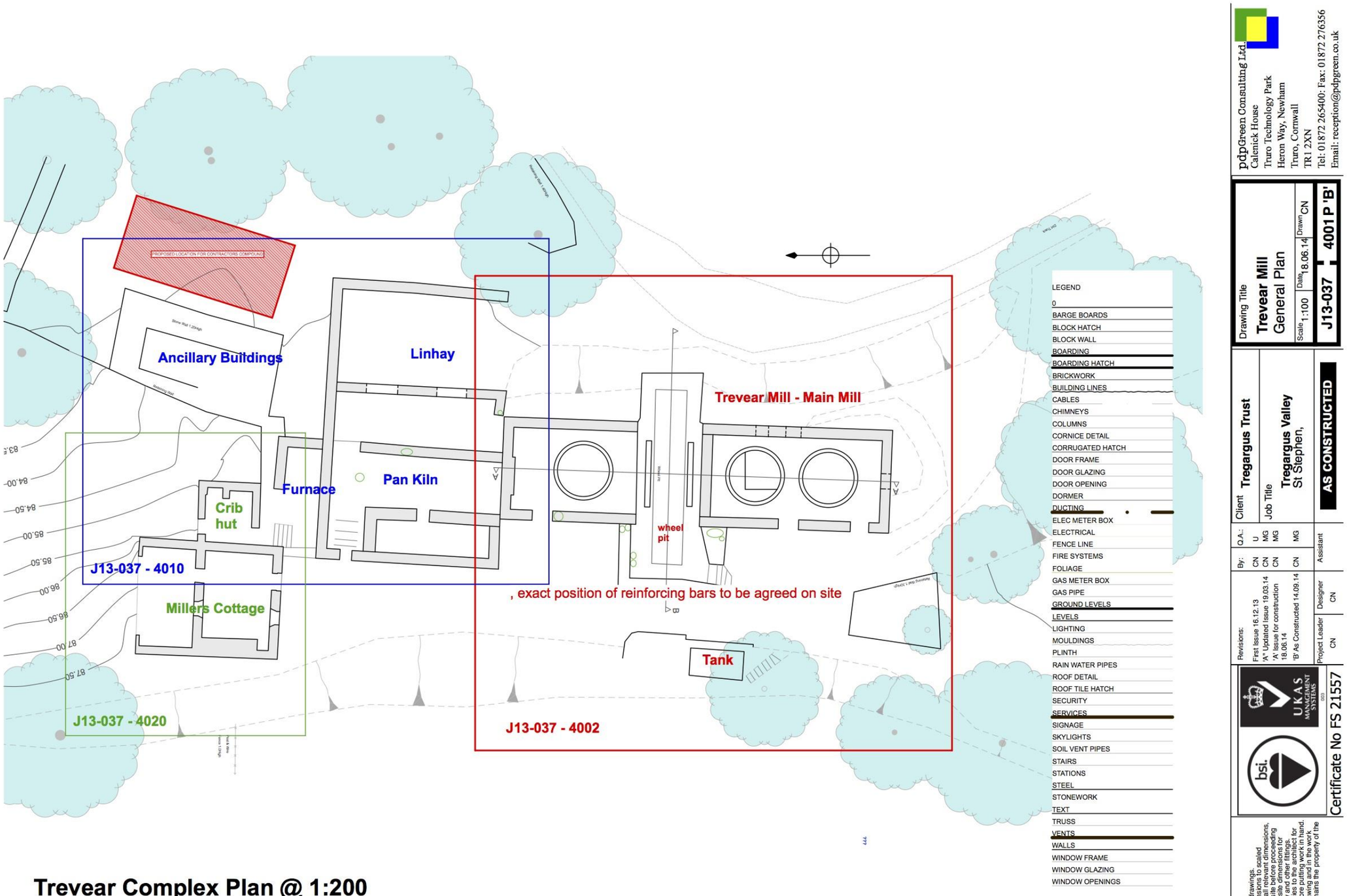


Figure 19 Trevear Mill water tank conservation specifications and images (© Pdp Green Dwg. No. J13037-4013P, 14/9/15).



Trevear Complex Plan @ 1:200

Figure 20 Trevear mill complex general plan (© Pdp Green Dwg. No. J13037-4001P'B', 14/9/15).

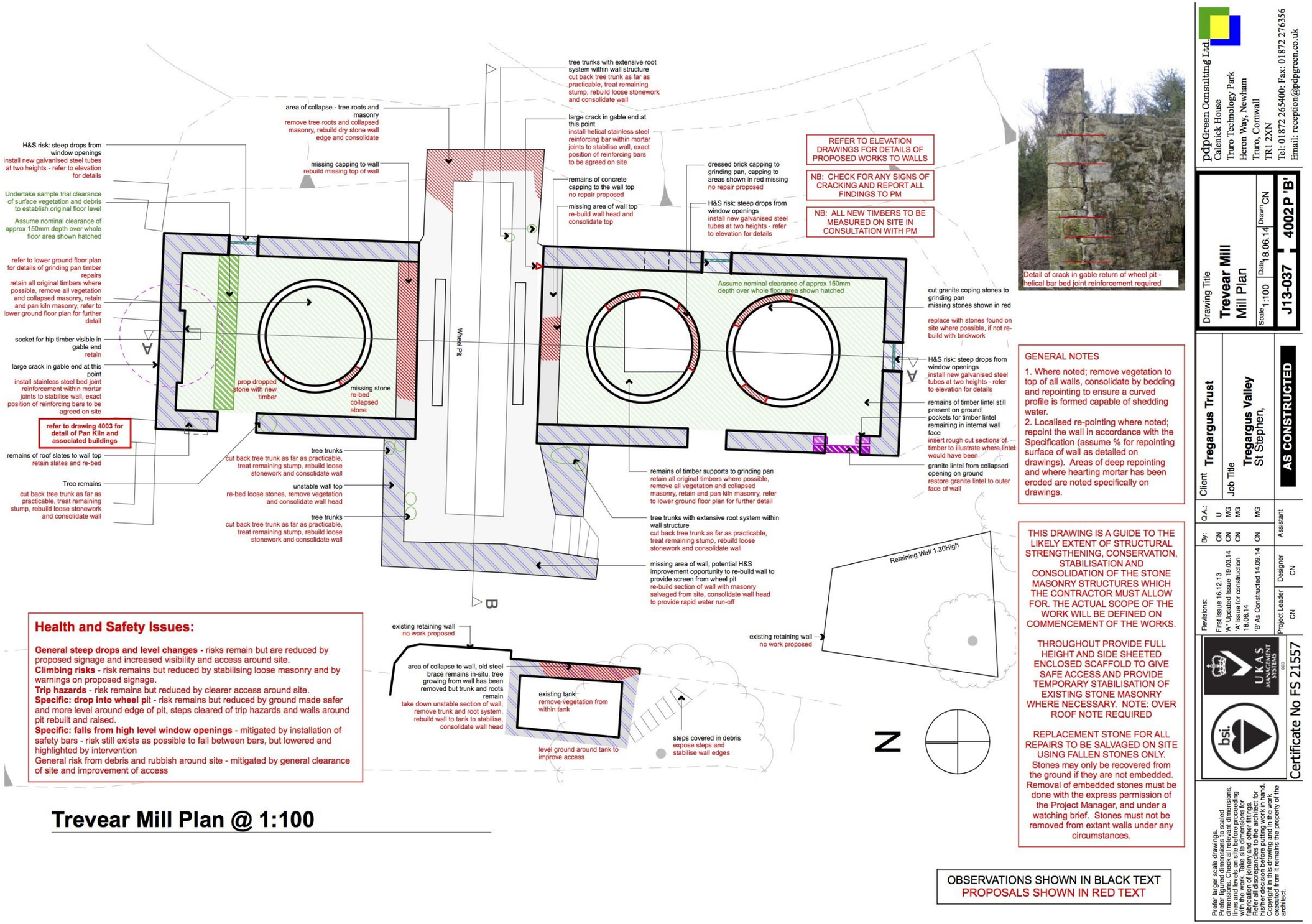


Figure 21 Trevear china stone mill 'as constructed' specifications upper level plan (© Pdp Green Dwg. No. J13037-4002P'B', 14/9/15).

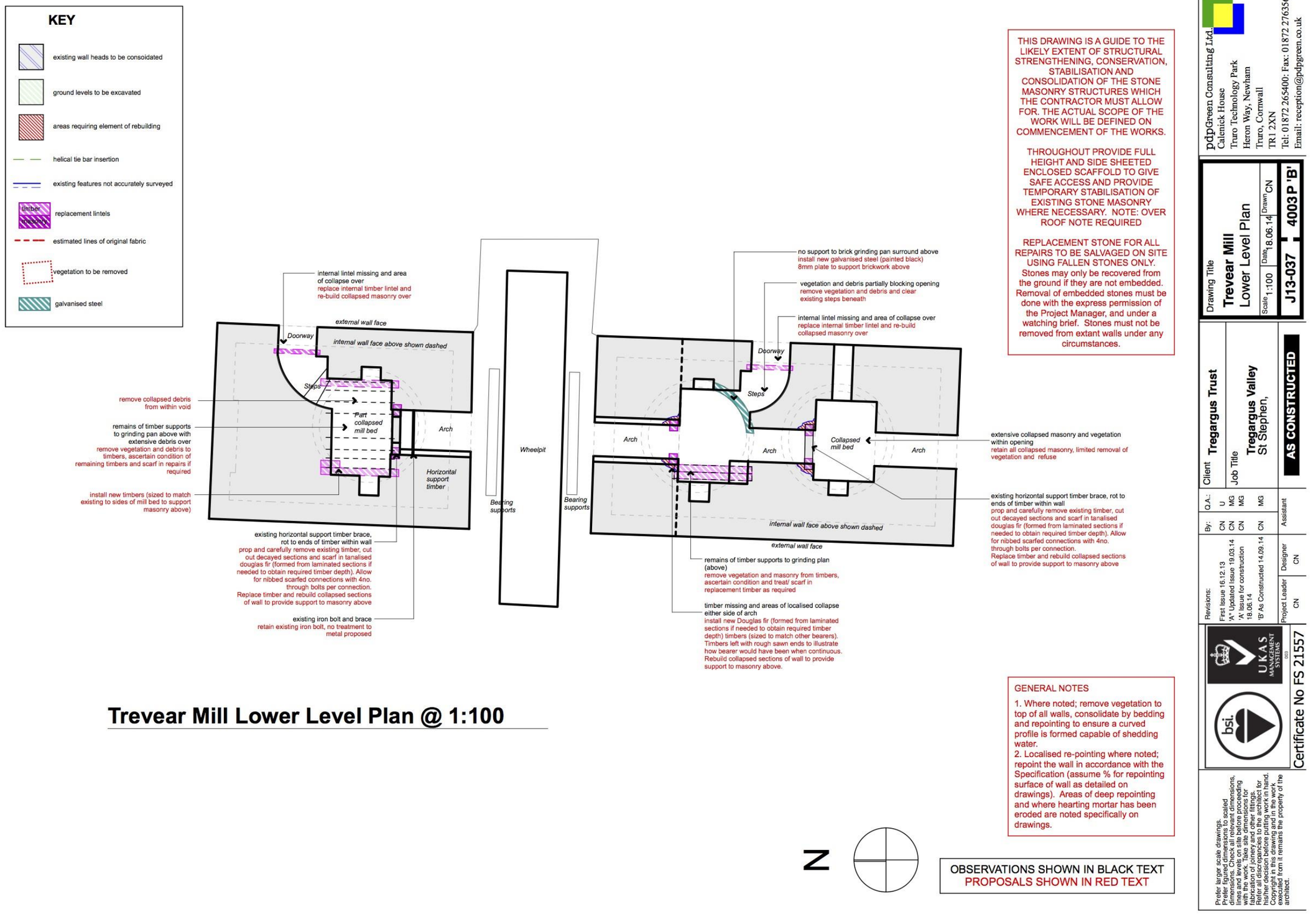
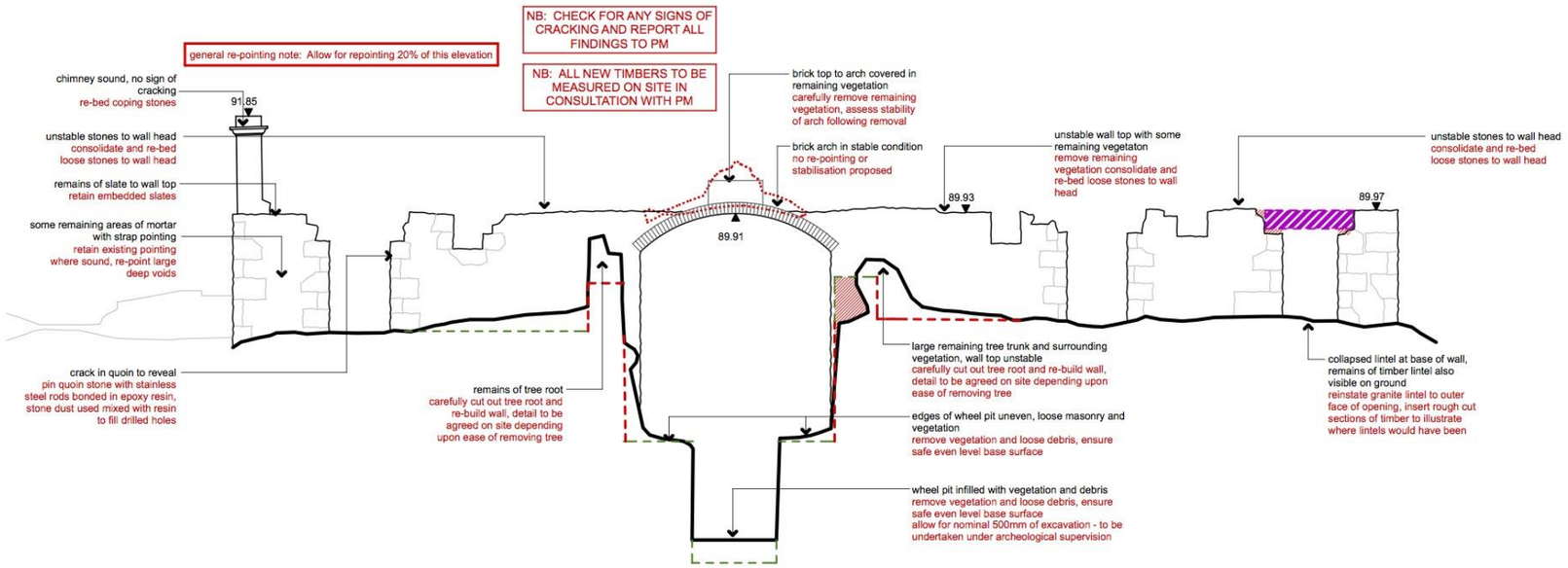


Figure 22 Trevear china stone mill 'as constructed' lower level specifications plan (© Pdp Green Dwg. No. J13037-4003P'B', 14/9/15).



Trevear Mill East Elevation (External) @ 1:100

Trevear Mill East Elevation (Internal) GENERAL NOTES:

consolidate wall heads, remove vegetation and re-bed loose stones.
allow for repointing 50% of internal face of wall, retain pointing where sound

GENERAL NOTES

1. Where noted; remove vegetation to top of all walls, consolidate by bedding and repointing to ensure a curved profile is formed capable of shedding water.
2. Localised re-pointing where noted; repoint the wall in accordance with the Specification (assume % for repointing surface of wall as detailed on drawings). Areas of deep repointing and where hearting mortar has been eroded are noted specifically on drawings.

Internal view of opening - note remaining pockets for timber lintel and granite lintel on ground

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THROUGHOUT PROVIDE FULL HEIGHT AND SIDE SHEETED ENCLOSED SCAFFOLD TO GIVE SAFE ACCESS AND PROVIDE TEMPORARY STABILISATION OF EXISTING STONE MASONRY WHERE NECESSARY. NOTE: OVER ROOF NOTE REQUIRED

REPLACEMENT STONE FOR ALL REPAIRS TO BE SALVAGED ON SITE USING FALLEN STONES ONLY. Stones may only be recovered from the ground if they are not embedded. Removal of embedded stones must be done with the express permission of the Project Manager, and under a watching brief. Stones must not be removed from extant walls under any circumstances.

OBSERVATIONS SHOWN IN BLACK TEXT
PROPOSALS SHOWN IN RED TEXT

pdpGreen Consulting Ltd.
Calenick House
Truro Technology Park
Heron Way, Newham
Truro, Cornwall
TR1 2XN
Tel: 01872 265400: Fax: 01872 276356
Email: reception@pdpgreen.co.uk

Drawing Title **Trevear Mill East Elevation**
Scale 1:100 | Date 18.06.14 | Drawn CN
J13-037 | 4005 P 'B'

Client **Tregargus Trust**
Job Title **Tregargus Valley St Stephen,**
AS CONSTRUCTED

Revisions:	By:	Q.A.:
First Issue 16.12.13	CN	U
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Project Leader CN | Designer CN | Assistant

Certificate No FS 21557

Prefer larger scale drawings.
Prefer figured dimensions to scaled dimensions. Check all relevant dimensions, lines and levels on site before proceeding with the work. Use stated dimensions for fabrication of joinery and other fittings.
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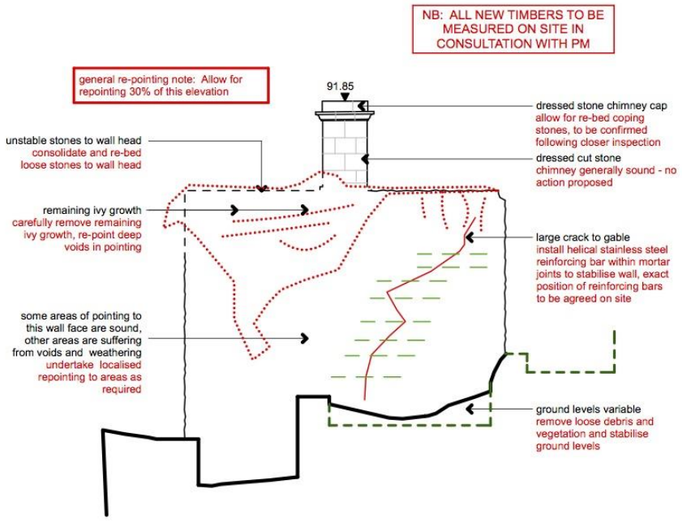
Figure 23 Trevear china stone mill 'as constructed' east elevation (© Pdp Green Dwg. No. J13037-4005P'B', 14/9/15).



Trevear Mill South Elevation (External) @ 1:100

Trevear Mill South Elevation (Internal) @ 1:100

consolidate wall heads, remove vegetation and re-bed loose stones.
allow for repointing 10% of internal face of wall, retain pointing where sound

GENERAL NOTES

1. Where noted; remove vegetation to top of all walls, consolidate by bedding and repointing to ensure a curved profile is formed capable of shedding water.
2. Localised re-pointing where noted; repoint the wall in accordance with the Specification (assume % for repointing surface of wall as detailed on drawings). Areas of deep repointing and where hearting mortar has been eroded are noted specifically on drawings.

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pdpGreen Consulting Ltd
Calenick House
Truro Technology Park
Heron Way, Newham
Truro, Cornwall
TR1 2XN
Tel: 01872 265400: Fax: 01872 276356
Email: reception@pdpgreen.co.uk

Drawing Title **Trevear Mill** South Elevation
Scale 1:100 | Date 18.06.14 | Drawn CN
J13-037 | 4006 P 'B'

Client **Tregargus Trust**
Job Title **Tregargus Valley** St Stephen,

AS CONSTRUCTED

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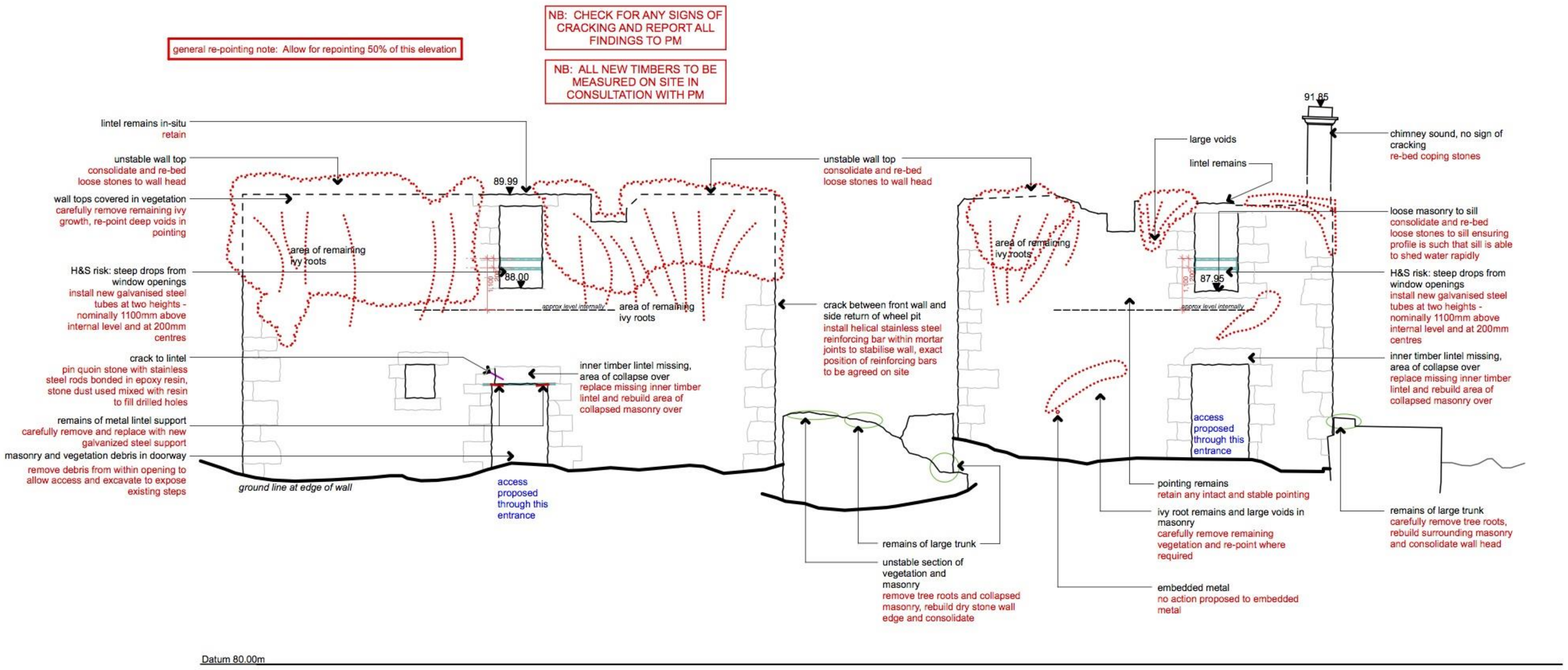
'A' Issue for construction 18.06.14	MG	CN
'B' As Constructed 14.09.14	MG	CN

Assistant
Project Leader: CN
Designer: CN

Certificate No FS 21557

Figure 24 Trevear china stone mill 'as constructed' south elevation (© Pdp Green Dwg. No. J13037-4006P'B', 14/9/15).



Trevear Mill West Elevation (External) @ 1:100

View of internal face of west elevation (south side)

consolidate wall heads, remove vegetation and re-bed loose stones.
allow for repointing 50% of internal face of wall, retain pointing where sound

View of internal face of west elevation (north side)

consolidate wall heads, remove vegetation and re-bed loose stones.
allow for repointing 50% of internal face of wall, retain pointing where sound

Trevear Mill West Elevation (Internal)

pdpGreen Consulting Ltd.
Calenick House
Truro Technology Park
Heron Way, Newham
Truro, Cornwall
TR1 2XN
Tel: 01872 265400: Fax: 01872 276356
Email: reception@pdpgreen.co.uk

Drawing Title: Trevear Mill West Elevation
Scale 1:100 | Date 18.06.14 | Drawn CN
J13-037 4007 P 'B'

Client: Tregargus Trust
Job Title: Tregargus Valley St Stephen,
AS CONSTRUCTED

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'A' Issue for construction 18.06.14	CN	MG
'B' As Constructed 14.09.14	CN	MG

Project Leader CN | Designer CN | Assistant

Certificate No FS 21557

Figure 25 Trevear china stone mill 'as constructed' west elevation (© Pdp Green Dwg. No. J13037-4007P'B', 14/9/15).

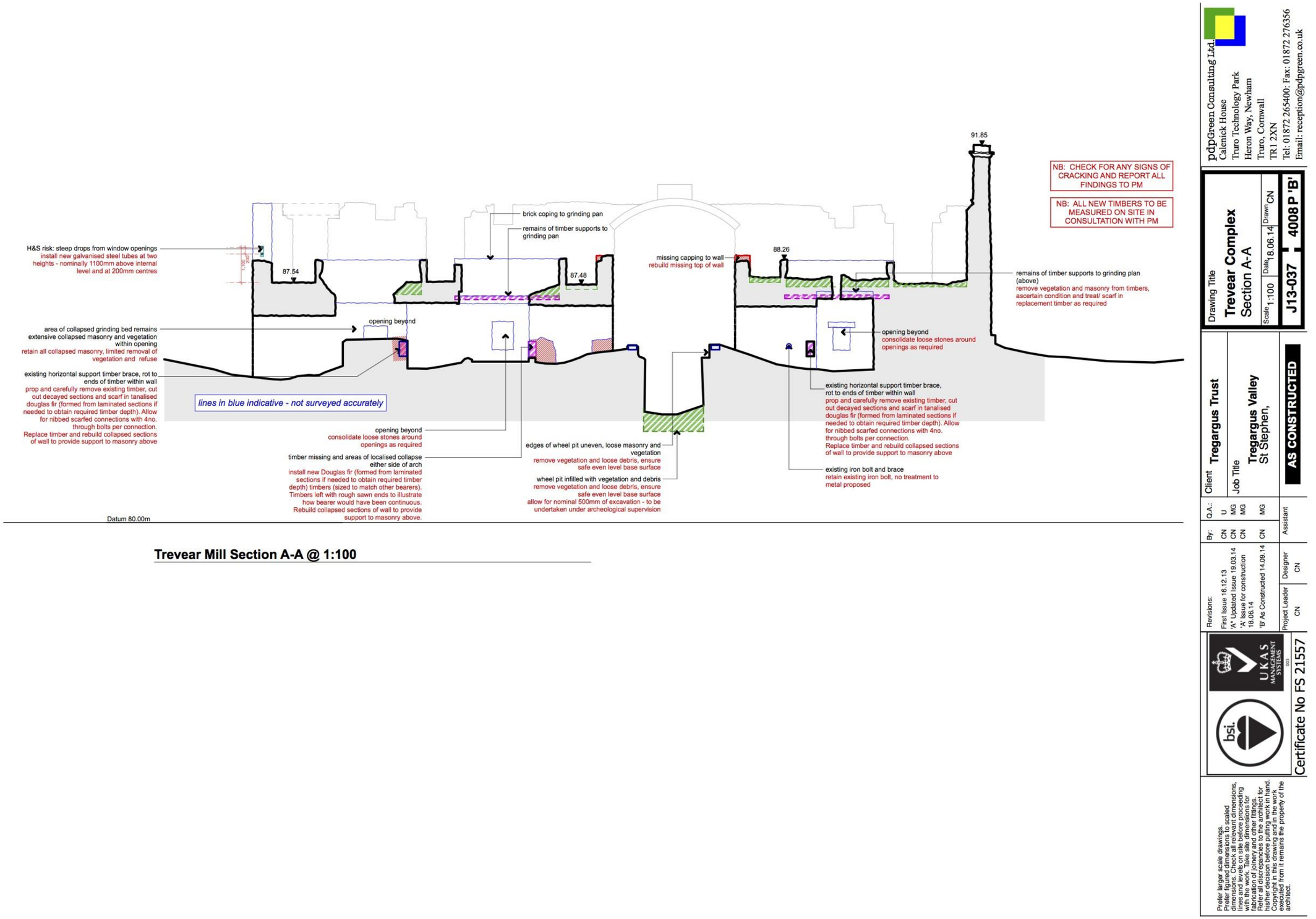


Figure 26 Trevear china stone mill 'as constructed' Section A-A (© Pdp Green Dwg. No. J13037-4008P'B', 14/9/15).

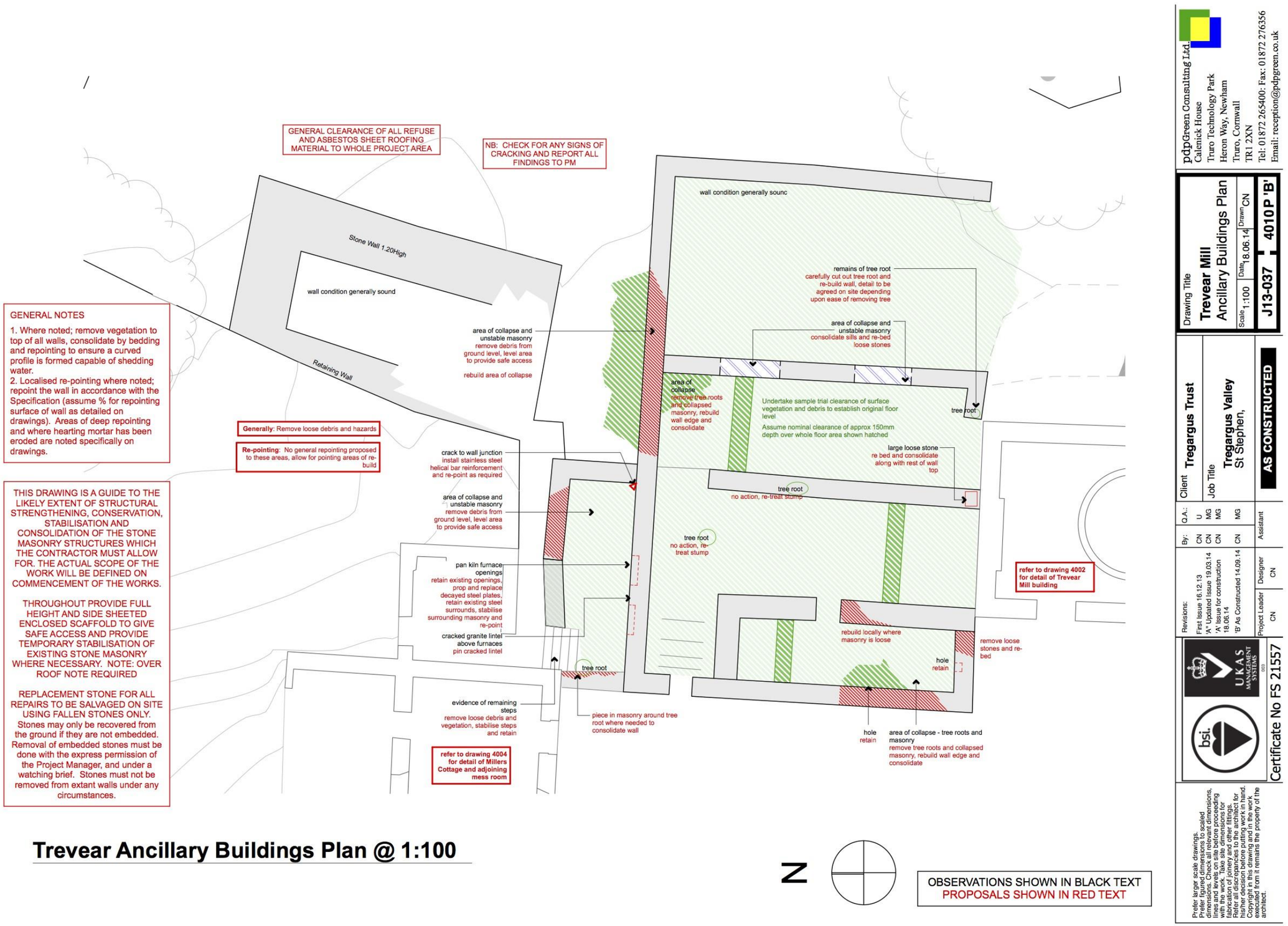


Figure 27 Trevear china stone mill 'as constructed' ancillary buildings plan (© Pdp Green Dwg. No. J13037-40010P'B', 14/9/15)

Figure 28 View of the west side of the Trevear wheelpit before works © CAU, CC 15/7/2014.

Figure 29 View of the west side of the Trevear wheelpit after works © CAU, CC 14/5/2015.

Figure 30 View of the Trevear power arch transmission tunnel before works (looking south) © CAU, CC 23/7/2014.

Figure 31 View of the Trevear power arch transmission tunnel after works (looking north) © CAU, CC 14/5/2015.

Figure 32 View of the first floor grinding pans and walls before works (looking south) © CAU, CC 23/7/2014.

Figure 33 View of the first floor grinding pans and walls after works (looking south) © CAU, CC 14/5/2015.

Figure 34 View of Trevear mill first floor south side (from the east) after works © CAU, CC 14/5/2015.

Figure 35 View of Trevear mill wheelpit (from the east) after works © CAU, CC 14/5/2015.

Figure 36 View of Trevear mill first floor north side (from the east) after works
© CAU, CC 14/5/2015.

Figure 37 View of the pan kiln, linhay and cottage before works © CAU, CC 15/7/2014.

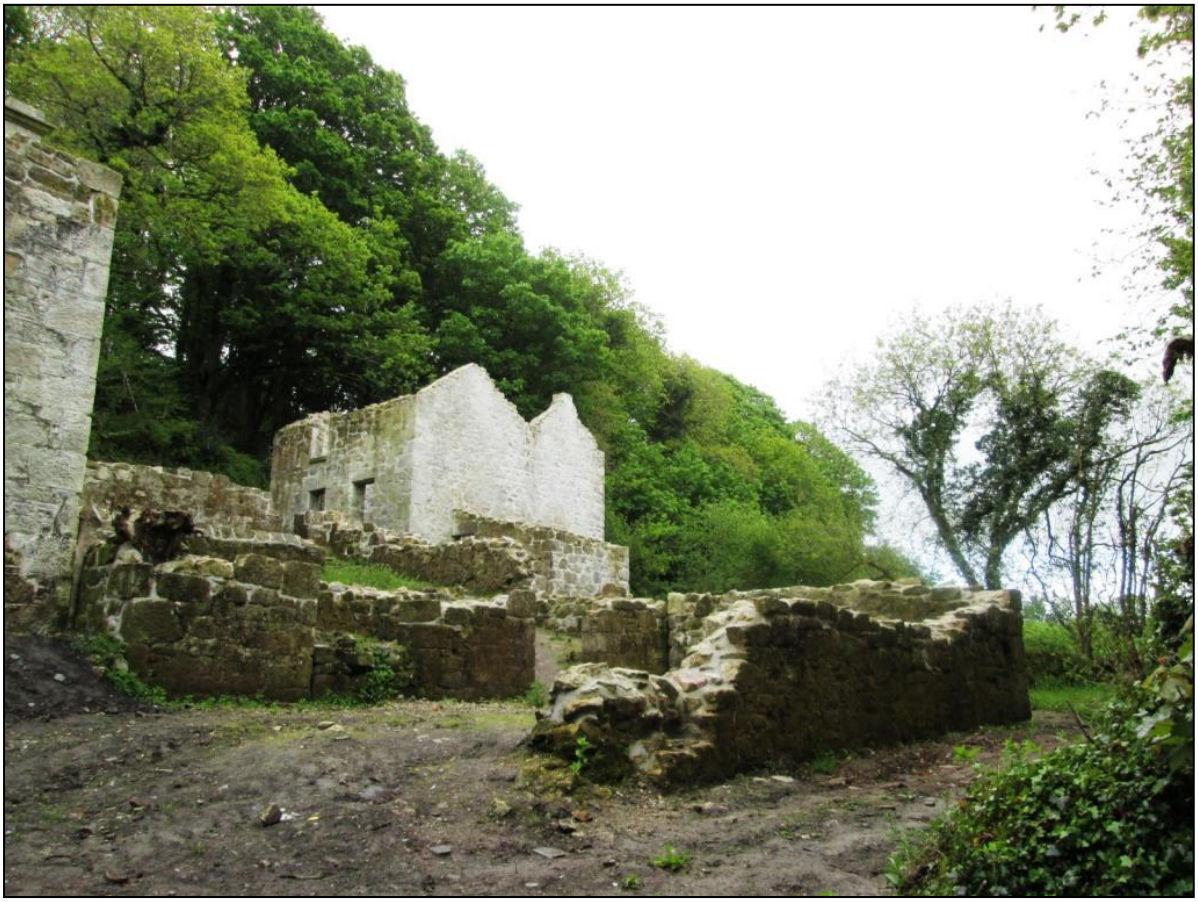


Figure 38 View of the pan kiln, linhay and cottage after works © CAU, CC 14/5/2015.

The fallen/vandalised upper chimney masonry at the south end of the south section of the mill was found on-site. This was replaced into its original position and attached firmly with steel pins and re-mortared *in situ* (compare front cover images and Fig 34).

The grinding pans presented a number of structural problems. The grinding pan sides (see Figs 32 and 33) and bases (see Fig 24-completed photos), took a tremendous amount of knocks and downforce during its working life – and so regularly broke, especially given the soft nature of the stone. It was obvious that sections had been regularly replaced and repaired. The entire (very heavy) circular structure was built upon large timber lintels (see Figs 21, 22 and 26), approximately 0.3m X 0.3m, 2.5m long. Of the northern mill pair of pans, timbers supporting the northern grinding mill pan were stable – but two large lintels supporting the adjacent southern pan were replaced on the eastern side (see Fig 22), and a section of rounded galvanised steel reinforcement added to support the western side. The southern mill pan timbers were perhaps in a worse state, with main timbers on both sides being replaced, and short sections added adjacent to support the vertical sides of the pans (which had dropped/moved in places). These replacement timbers were left visible on purpose (from above and below), as an interpretative aid for its structural construction (Fig 22).

A comparison of Figures 32 and 33 for the northern pair of grinding pans shows that vertical sections of both had previously broken away – and had been subsequently repaired with brick whilst in use. However, sections of repairs to both pans had again collapsed (or had been subsequently vandalised). Replacement brick found on site was again used to patch repair the vertical sections of both pans, however, additional galvanised steel reinforcement was necessary for the northern pan, to form a foundation for the brick repair. The reinforcement was hidden behind a mortar covering – mimicking the colour and texture of the adjacent (intact) original vertical pan stone sections. It should be noted that the smooth stone base of both these pans was missing – only the western half of the pan base in the southern mill section is still extant – with the new structural timbers visible at its eastern side (see Figs 21, 22 and 26).

Structural works were also necessary to the ground floor power arch transmission tunnel (from each side of the water wheel). Figures 22 and 26 show the sites of timbers that traverse the floor of the arced tunnel. These provided a secure mounting/bearing for the power shaft coming from the water wheel to connect to a vertical spindle which turned each grinding pan. These substantial timbers (0.5m² X 1.2m length) are set under each north and south sides of each pan masonry support, but most have perished where the timber is set under each masonry side. Figures 22 (plan) and 26 (elevation) is indicative of the nature and extent of the replacement timbers. The one remaining example of an original timber being *in situ* was rotted in places. The contractors scarfed in new timber to the edges (where they had softened and become compressed), and retained the original central section. The internal timber lintels over the two west facing access doorways were also replaced (see Fig 22). The floors were cleared of rubble to allow public access.

Towards the end of the contract period, it became obvious that the state of the pan kiln and linhay walls would detract from the quality of conservation to the rest of the site – including the cottage, and that vandalism to these walls could permanently damage these low walled features. It was decided to use the remaining contingency within the project to partially clear the pan kiln drying areas and cap the top of the walls (repairing some wall ends as necessary). Figure 27 shows this site on plan (as an 'as-built' survey drawing), and Figures 37 and 38 are a 'before' and 'after' works view of the site. The eroded thin iron lintels above the furnace openings at the south ends of the pan kiln were replaced with similar steel equivalents, and the wall repointed where necessary.

5.5 **Trevear Miller's Cottage** SW 94983 53820 MCO 38434

Recommendation (Sharpe & Pilkington 2011, 49-50, excerpts)

Site 35, Figure 12

Trevear china stone mill is unusual amongst the mills of the Tregargus Valley in that it is accompanied by an adjacent miller's cottage. Constructed on two storeys, this building has apparently been modified during its life, the northernmost of the paired fireplaces in the eastern ground floor wall having been blocked in, the southernmost having been substantially reduced in size. There are two extensions – a substantial two storey lean-to attached to the south whose external wall has substantially collapsed and a smaller wash house to the west. The building is roofless, and has been heavily overgrown with ivy externally. Internally, much of the wall plaster survives. The removal or failure of internal lintels has caused localised wall collapse, whilst some structural movement in the northern wall has led to cracks extending the full width of the surviving granite lintels.

Despite immediate appearances, this building is in fair condition and could be rescued from collapse with some fairly simple remedial works. The ivy growing on the walls has been cut off above ground level, and should be removed before its roots infiltrate too deeply into the walls in search of moisture and minerals. The wall heads will need to be capped, the lost lintels and masonry reinstated and the cracked lintels should be secretly pinned using stainless steel rods and epoxy resin. It might be possible to retain much of the internal plaster by filleting its broken edges to prevent water ingress, though in the long term exposure to the elements will probably result in its gradual loss. Broken ends where walls have collapsed will need to be pointed, as will areas of failed pointing on the external elevations. Some minor rebuilding may also be required to reinstate necessary levels of stability in some areas of the walling.

- Remove vegetation, including residual ivy, two mature sycamores to the immediate east of the cottage which threaten to collapse onto it, and selected vegetation from around adjacent pan kiln (priority 1).
- Stabilise rear wall of extension through re-laying wall heads, repointing of masonry, including broken wall ends (priority 1).
- Re-lay wall heads to main building and repoint internal and external elevations with the exception of areas where sound plaster has survived (priority 1).
- Undertake limited reconstruction of chimney masonry (priority 1).
- Install stainless steel bedjoint reinforcement across cracking in gable wall and across junction between original building and extension (priority 1).
- Install stainless steel bar reinforcement to pin cracks in both granite lintels on the front elevation (priority 1).
- Reinstate all lost internal lintels, pin to existing lintels and make good lost masonry above lintels (priority 1).
- Stabilise rear wall of original cottage through limited reconstruction using recovered materials and reinstatement of missing lintels (priority 1).
- Re-lay wall heads and repoint internal and external elevations of single storey extension to the right of the cottage (priority 1).

Description of works (2014) (Figs 39-49)

The cottage was the first site to be scaffolded in late July 2014. Figures 39 to 41 show the nature and extent of the planned works and the 'as built' results, whilst Figures 42 to 49 show 'before' and 'after' works views of the same elevations. Following scaffolding

the dense ivy was removed (see Figs 42, 44 and 46), and the wall tops 'capped' and the walls repointed where necessary. The stub of the small chimney at the south west corner of the cottage was rebuilt and a slate inserted to restrict bird nesting within the chimney. Where sections of intact lime plaster remained on the walls – the edges were filleted to preserve the edges in an attempt to minimise further weathering. On a general note, the inner (and outer) gable walls of both the west and east sides were repointed where necessary and the original plaster surface preserved where possible. All the walls were virtually 100% repointed.

The south elevation of the south side of the cottage in the recent past had both its corner return quoin stones removed (see Fig 44). It was structurally necessary to strengthen both ends to support each full height gable wall, by reinstating appropriate masonry from site – preferably with a cut face to match the remainder of the building. However, the south wall western end needed additional support by building back part of the wall face above a collapsed window opening. The masonry was built back both sides of the window opening – its dimensions gleaned from the footings of the masonry at ground level. New lintels were inserted to support the new masonry above, a new cut granite lintel on the outside face and a new timer lintel internally (see Figs 41 and 45). Both of the window openings had partially bayed footwells – which were reinstated at ground level.

The dividing south/north wall (previously the original cottage south wall before it was extended), was also in a precarious structural state (see Fig 46). Again, structural rebuilding was necessary to stabilise this wall – given that the lintels had collapsed, as a result of the original stone lintel probably having been robbed. A new granite lintel was cut and inserted on the south side of the wall (the buildings original south external wall), and timber lintel added internally (see Fig 41). Reclaimed stone from site was used to rebuild the masonry stone above the new lintels (compare Figs 46 and 47), rebuilding the west side of the splayed window opening.

The north wall (see Figs 40, 42, 48 and 49), had the common structural issue of timber components failing through old age and weathering following collapse/removal of the roof; namely the internal timber lintels. New Douglas fir lintels were installed and the masonry above rebuilt from site-won reclaimed stone. In addition, both of the granite lintels had vertical cracks in their centre – both of which were strengthened by using stainless steel pins. Figures 42 and 43 demonstrate 'before' and 'after' views of the north (exterior) wall, whilst Figures 48 and 49 show the internal north wall.

The small stone built crib hut building attached to the lower west side of the cottage also had structural conservation needs – namely the timber/granite lintels had failed - or been robbed. This had made the rest of the building (ie, the west wall), unstable. The outer (south wall) lintel was replaced with a granite faced equivalent, and a timber lintel added to the inside face. The north wall had an intact outer granite lintel, but was missing its internal timber equivalent, this was also added. The remainder of the building was repointed, after remnants of the rusted corrugated iron roof was removed.

The stone access steps down the north-west side of the cottage leading to the crib hut (with the remnants of an iron bar handrail), had been disturbed by vegetation growth and structural movement. Accordingly, the site contractors re-laid the stone surfacing to make it easier for the visiting public to use the steps – both to access the Crib Hut, and to view the furnace and pan kiln site from the south.

Following the additional works of repointing and consolidating the wall tops of the pan kiln (section 5.4) in early December, by the end of the month the porta-cabins had been let off hire as all originally specified works with Tregargus had finished. After Christmas 2014, a wheeled digger was brought in to tidy up the loose ground rubble from an area to the south of the cottage, the lower pan kiln, the linhay and from the pan kiln site. All the rubble was formed into a linear mound marking the southern boundary of the site. This fascinating site is now open to interested members of the public, whilst under the management of the Tregarus Valley Trust.

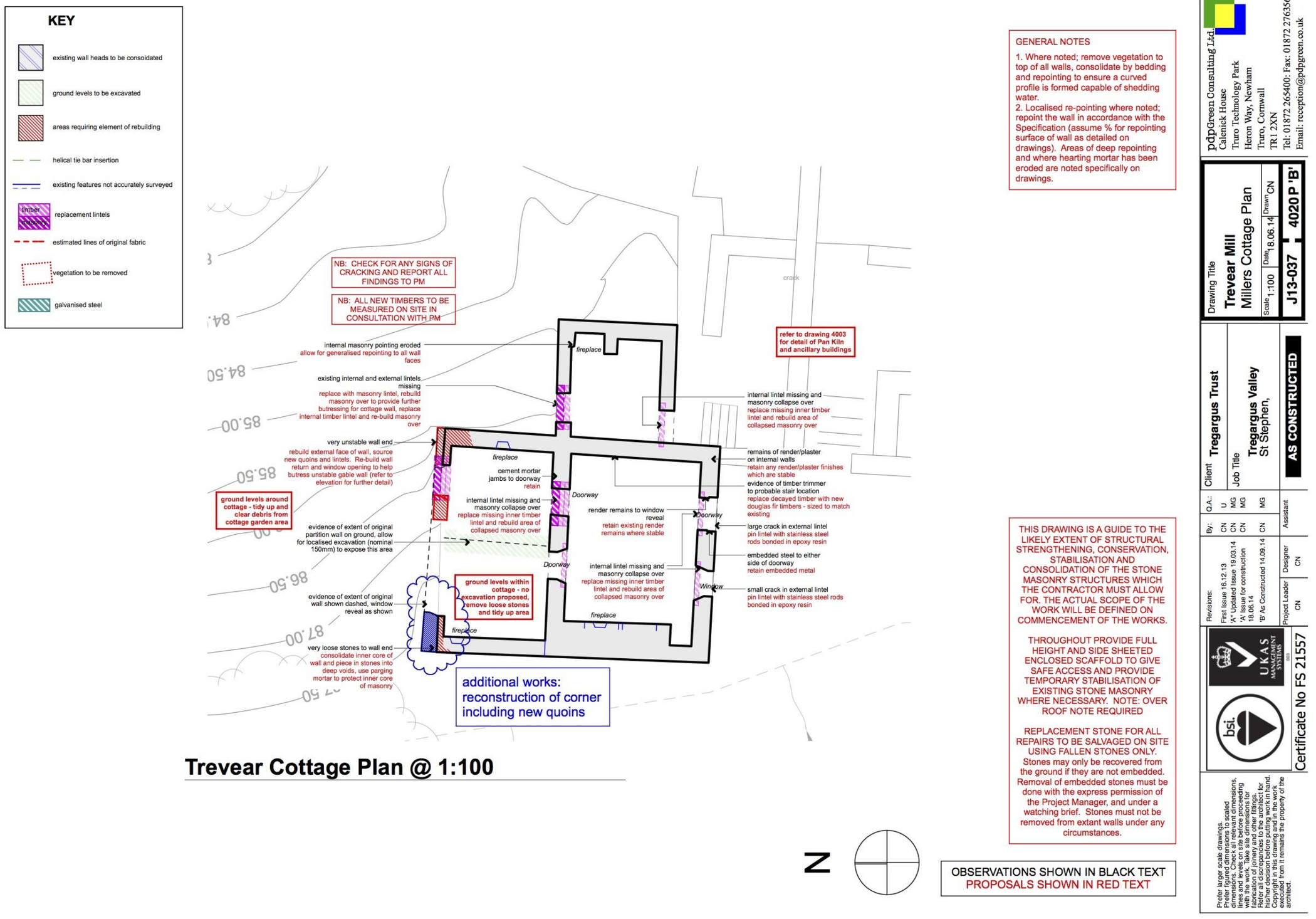
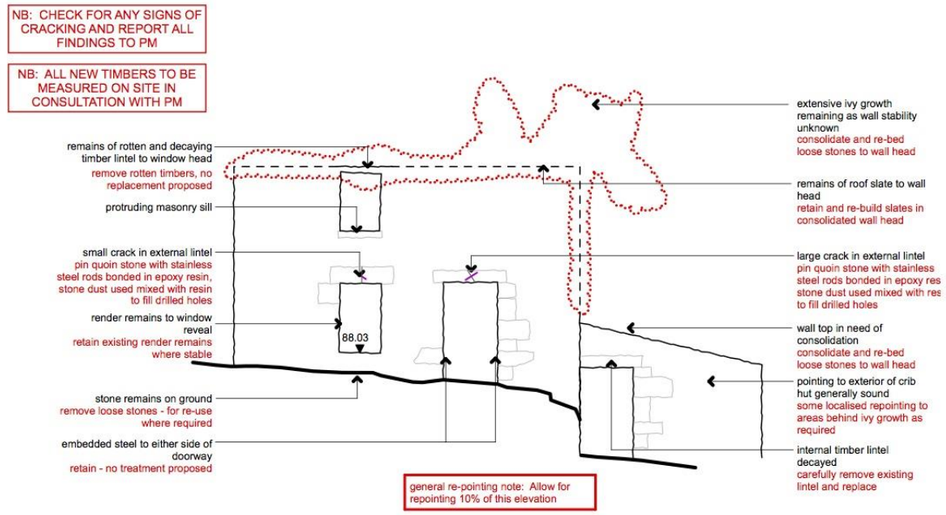


Figure 39 Trevear cottage 'as constructed' plan (© Pdp Green Dwg. No. J13037-4020P'B', 14/9/15).



Millers Cottage North Elevation @ 1:100

GENERAL NOTES

1. Where noted; remove vegetation to top of all walls, consolidate by bedding and repointing to ensure a curved profile is formed capable of shedding water.
2. Localised re-pointing where noted; repoint the wall in accordance with the Specification (assume % for repointing surface of wall as detailed on drawings). Areas of deep repointing and where hearting mortar has been eroded are noted specifically on drawings.

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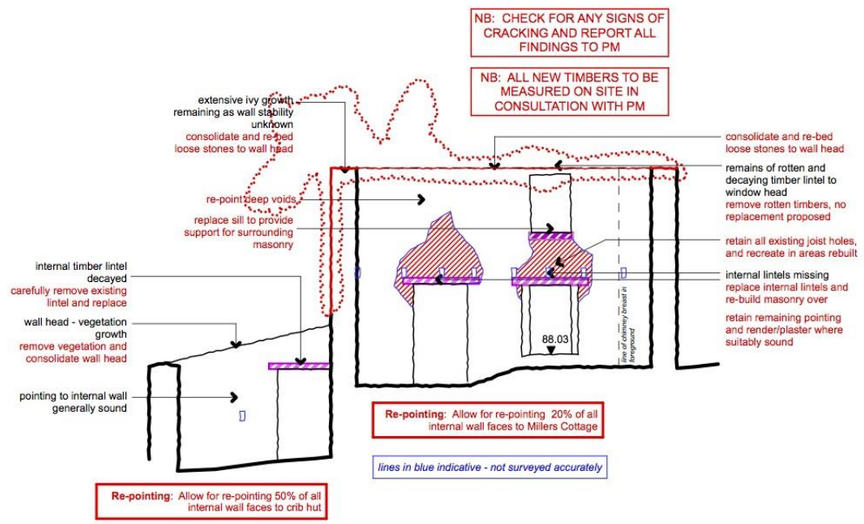

Millers Cottage North Elevation (Internal Face) @ 1:100

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pdpGreen Consulting Ltd.
Calenick House
Truro Technology Park
Heron Way, Newham
Truro, Cornwall
TR1 2XN
Tel: 01872 265400: Fax: 01872 276356
Email: reception@pdpgreen.co.uk

Drawing Title
Millers Cottage
North Elevation
Scale 1:100 | Date 18.06.14 | Drawn CN
J13-037 | 4021 P 'B'

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Job Title **Tregargus Valley**
St Stephen,
AS CONSTRUCTED

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Prefer figured dimensions to scaled dimensions. Check all relevant dimensions, lines and levels on site before proceeding with the work. Refer to dimensions for fabrication of joinery and other fittings.
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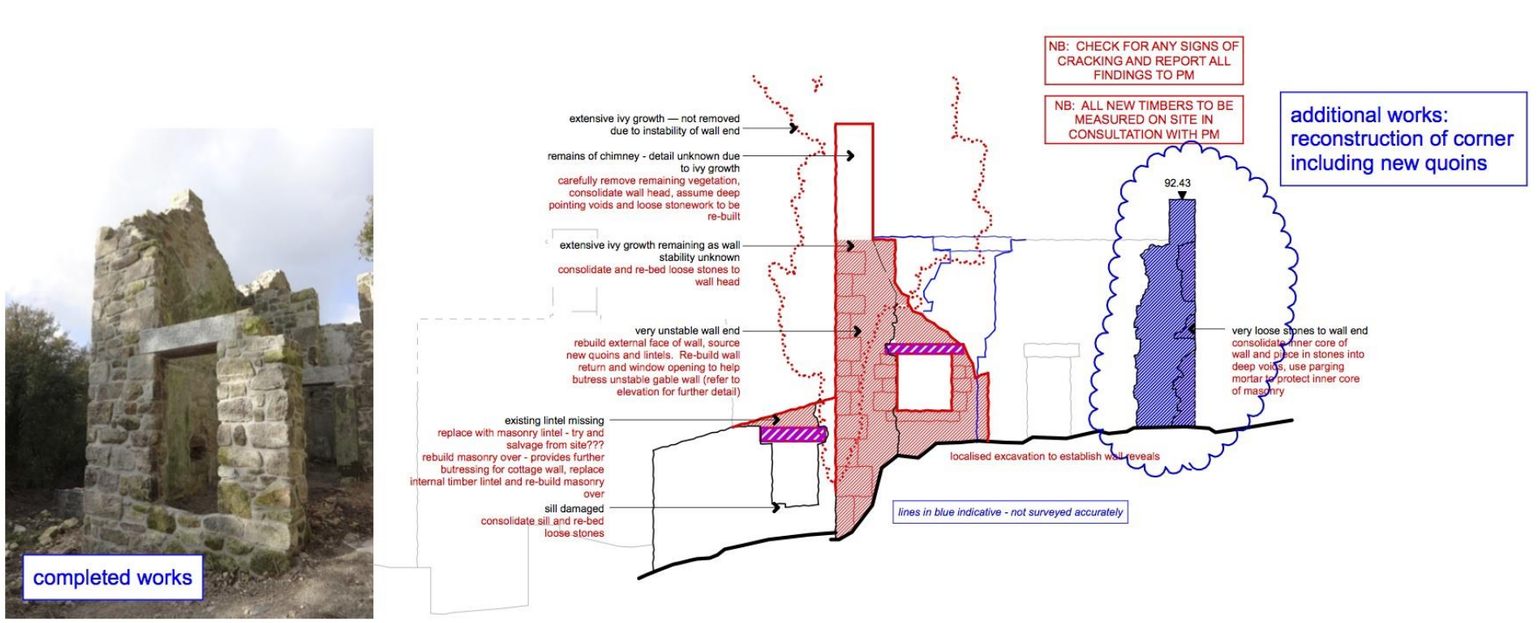
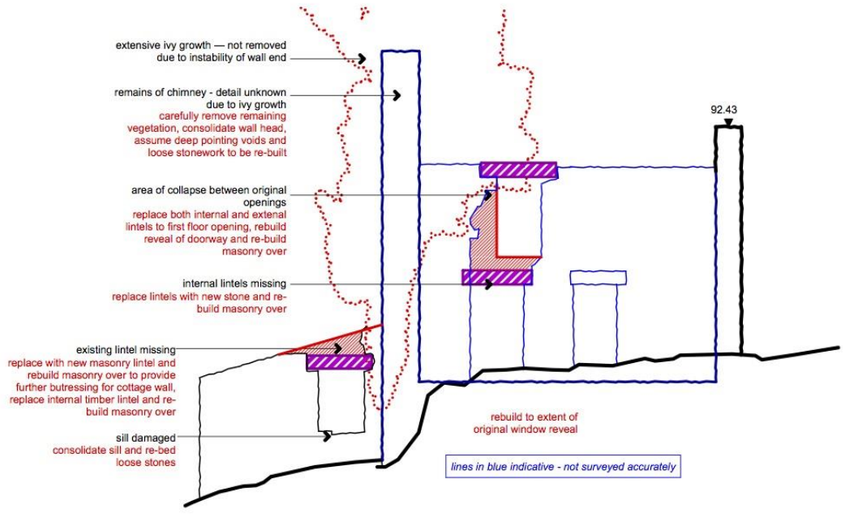
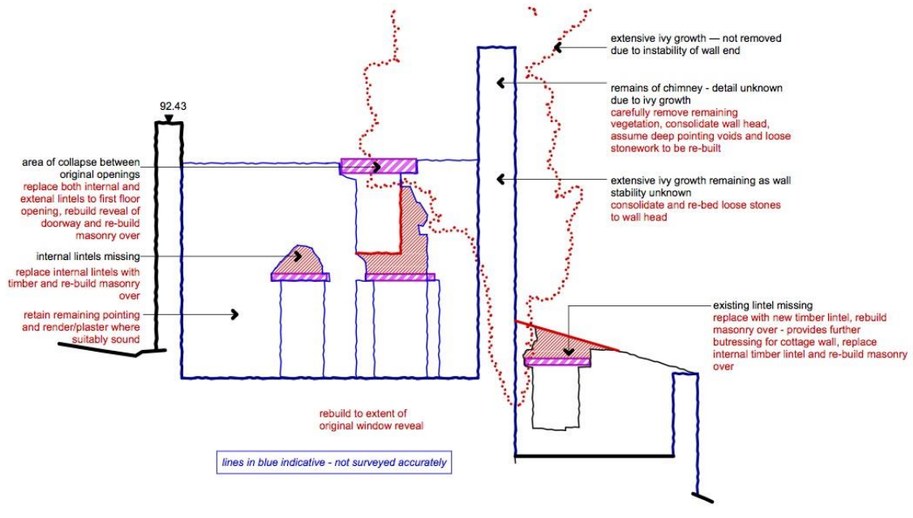
Figure 40 Trevear cottage 'as constructed' internal and external north elevations (© Pdp Green Dwg. No. J13037-4021P'B', 14/9/15).



Millers Cottage South Elevation @ 1:100



Millers Cottage Internal Face of Inner Wall Elevation (Viewed from North) @ 1:100



Millers Cottage Internal Face of Inner Wall Elevation (Viewed from South) @ 1:100

pdpGreen Consulting Ltd.
Calenick House
Truro Technology Park
Heron Way, Newham
Truro, Cornwall
TR1 2XN
Tel: 01872 265400: Fax: 01872 276356
Email: reception@pdpgreen.co.uk

Drawing Title: **Millers Cottage South Elevation**
Scale: 1:100 | Date: 18.06.14 | Drawn: CN
J13-037 | 4025 P 'B'

Client: **Tregargus Trust**
Job Title: **Tregargus Valley St Stephen,**
AS CONSTRUCTED

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Assistant
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Figure 41 Trevear cottage 'as constructed' internal and external south elevations (© Pdp Green Dwg. No. J13037-4025P'B', 14/9/15).

Figure 42 North view of Trevear cottage before works © CAU, CC 23/7/2014.

Figure 43 North view of Trevear cottage after works © CAU, CC 14/5/2015.

Figure 44 View of Trevear cottage south external elevation (from the south east) before works © CAU, CC 30/7/2014.

Figure 45 View of Trevear cottage south external elevation after works © CAU, CC 25/11/2014.

Figure 46 View of Trevear cottage inner south internal elevation (from the north) before works © CAU, CC 30/7/2014.

Figure 47 View of Trevear cottage inner south internal elevation (from the north) after works © CAU, CC 15/5/2015.

Figure 48 View of Trevear cottage internal north elevation before works © CAU, CC 30/7/2014.

Figure 49 View of Trevear cottage internal north elevation after works © CAU, CC 15/5/2015.

6 Future site management and maintenance requirements

Future management requirements will vary for each site. However, these broadly fall into specific categories depending on the size, nature and extent of each building or site.

- Big Wheel water wheel is in a precarious structural state. The rusting steel has now reached a stage where the wheel may collapse at any time. Given the site is a Scheduled Monument, it is hoped that HE funding may be available for emergency permanent safety scaffolding – to support the wheel *in situ* when it collapses.
- Buildings or masonry remnants that have been consolidated by repointing and wall capping (i.e, rebedding the top two masonry courses and mortar pointing to achieve run-off), will need little maintenance, although annual/biannual vegetation/weed growth checks and removal may be necessary.
- Masonry conservation sites which are prone to extremes of weather may need surface re-pointing at a greater incidence than slight patching (for wall capping) once every decade. However, it is expected that a high proportion of the sites within the project will not need to be patched.
- The former china stone mills and other sites within the Tregargus Valley have been impacted by vandalism in the past. Ongoing vigilance will be necessary to reduce this occurrence and perhaps publicity to minimise impact.

6.1 Suggested further work

It is important to ensure that a dialogue is set up for the continued managed preservation of these archaeological/historical sites (perhaps utilising further Environmental Stewardship Schemes).

- Both Wheal Arthur and Big Wheel China Stone Mills are in need of building conservation and consolidation, to preserve these iconic sites for the enjoyment and intellectual stimulation of future generations. In particular, the Big Wheel Mill is on HE's Building at Risk Register. It is hoped that time could be spent advising and assisting the Tregargus Trust to apply for building conservation heritage grants.
- The inclusion of all sites should be included in published material (guidebooks/leaflets-histories/web sites, etc). These should include detailed maps derived from research and surveys. It is possible that the conserved Trevear Mill cottage could house a permanent display. This would enable visitors to visit and learn the history and significance of these rare buildings.

7 References

7.1 Primary sources (Site reports)

Knevitts Consulting Engineers, October 2009 B6783, *Structural Appraisal Report: Tregargus Valley Structures: St Stephen, St Austell*

Pdp Green Consul. Eng. March 2014 J13037, *Specification for repair works: Trevear Mill Complex, Big Wheel and Wheal Arthur Wheelpits*

Pdp Green Consul. Eng. March 2014 J13037, *Schedule of Works: Trevear Mill Complex, Big Wheel and Wheal Arthur Wheelpits*

Pdp Green Consul. Eng. September 2014 J13037, A set of 'As built' survey drawings to accompany the CDM Health & Safety file.

7.2 **Secondary sources (Publications)**

Buck, C., 2013, *Tregargus Prioritisation Survey (Stage 1), List form of document* CC HEP

Cole, R., 2004, *Tregargus Valley, St Stephen, Repair work to two bridges*, CAU

Cole, R and Smith, J.R.S., 2002, *Tregargus Valley, St Stephen-in-Brannel, Cornwall* – Archaeological and Historical Assessment, CAU

Sharpe, A and Pilkington, J., 2011, *Tregargus Valley, St Stephen-in-Brannel, Cornwall – Conservation Management Statement,* Historic Environment (Projects)

8 Project archive

The CAU project number is **146329** (Tregargus Valley Conservation Works)

The project's documentary, digital, photographic and drawn archive is maintained by Cornwall Archaeological Unit, Cornwall Council, Fal Building, County Hall, Treyew Road, Truro, TR1 3AY.

Electronic data is stored in the following locations:

Project admin: G:\TWE\Waste & Env\Strat Waste & Land\Historic Environment\Projects\Sites\Sites T\Tregargus Valley HLS Works\Stage 2 2014 146329

Digital photographs: R:\Historic Environment (Images)\SITES.Q-T\Tregargus valley\Tregargus WB 2014 146329

Black & White Photos: GBP 2326/31-37; 2363/4-24; 2364/6-14, 18-21; 2365/29-37; 2367/19-31; 2369-20-37

Electronic drawings: R:\Historic Environment (CAD)\CAD Archive\Sites T\Tregargus Valley

English Heritage/ADS OASIS online reference: cornwall2-226302

9 Appendices

Buck, C., 2013, *Tregargus Prioritisation Survey (Stage 1), List form of document* CC HEP (excerpt)

Site	**Feature**	**Preliminary works issues** **(access/veg/struct/H&S)** (Vegetation/tree removal before any surveys/works to buildings!)	**Task 3b** **Level of record**	**Task 3a** **Consolidation options**	**Interpretation & Public access issues**	**Additional surveys?**	**Priority** **(H/M/L)**
32	**Trevear China Stone Mill**	Possible access to site by contractors from south ? Fence across first floors each side to wheelpit. Drop into wheelpit (GF and FF levels). Structural issues to first floor where supporting timbers above the lower arches have failed. Rubble, veg and fly-tipping should be removed.	Level 3 labelled survey (plans/elevations). Photo before/during & after works.	Tops of wall repointing and side walls where appropriate. Replace timber lintels where necessary. Structural works may be necessary following a re-survey by an engineer following veg/tree removal.	Good access via road. Structural remediation works should result in safe access to all parts of the building. Props may be necessary in the long term to permit safe public access.	Tree removal survey. Ecological consultancy. Once site cleared of debris internally at first floor level structural re-survey is necessary.	**H1**
29	**Big Wheel China Stone Mill**	Listed Scheduled building. Replace timber lintels where necessary. Fence across first floors each side to wheelpit. Tree removal in front and within building.	Level 3 labelled survey (plans/elevations). Photo before/during & after works.	Tops of wall and side repointing walls where appropriate. Replace timber lintels where necessary. Water wheel repairs if cost effective	Information board on wall or other more electronic versions (Options available). Good access via steep track.	SMC for conservation works conditional on production of IA report and detailed specifications. Ecological	**H1**

Site	Feature	Preliminary works issues (access/veg/struct/H&S) (Vegetation/tree removal before any surveys/works to buildings!)	Task 3b Level of record	Task 3a Consolidation options	Interpretation & Public access issues	Additional surveys?	Priority (H/M/L)
				(timber alternative ?). Overhead metal launder for the WW is corroded and should be recorded then replaced with an equivalent or internally sheathed		consultancy Specialist WW consultant?	
10	**Wheal Arthur China Stone Mill**	Replace timber lintels where necessary. Fence across first floors each side to wheelpit. Access issue to southern part of FF mill? Drop into wheelpit (GF and FF levels).	Level 3 labelled survey (plans/elevations). Photo before/during & after works.	Tops of wall repointing and side walls where appropriate. Replace timber lintels where necessary. Water wheel repairs.	Information board on wall or other more electronic versions (Options available). Good access via road.	Tree removal survey. Ecological consultancy Specialist WW consultant?	**H1**