

**Browsea Island coastal archaeology
Poole Harbour
Dorset**

NGR: SZ 01984 87989
CITIZAN region: South West

Report on a CITIZAN site survey

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Summary

This report presents the results of several survey and training sessions carried out by CITiZAN, the Coastal and Intertidal Zone Archaeological Network, on Brownsea Island in collaboration with the National Trust. The surveys focussed on coastal sites, now at risk from erosion, related to industrial activities from the 18th and 19th centuries. These include a brick kiln, a brick-lined tank, a pit and several clay shafts.

As part of the national CITiZAN programme to prepare surveys of key zones and features which are threatened by coastal erosion and tidal scour, a photographic survey was carried out on an eroding brick kiln on the southern shore of the island on the 24th July 2015 as part of an outreach event on the island for the Festival of Archaeology. The site was re-visited as part of a training session with National Trust volunteers on 20 and 21 October 2016 when a second photographic survey of the brick kiln was carried out alongside two off-set surveys of features eroding from the cliff to the west of the kiln. The site was again re-visited on 13 November 2017 to undertake a third photographic survey of the kiln. During this visit a rapid survey of features on the north coast was also carried out that involved plotting in ten clay shafts which are dotted along the foreshore and slightly inland.

In addition to these site visits the island was also visited as part of the filming for *Britain at Low Tide* television series with an initial reconnaissance visit on 7 June 2017 and final filming of the sites and features on 10 July 2017. This included the initial identification of the clay shafts on the northern shore and led to the subsequent visit and survey later in 2017.

The three consecutive years of photographic survey on the brick kiln have now been modelled photogrammetrically. These three 3D-models can now be compared to look at the rate and scale of change over time of the brick kiln, which lies at the high-water mark on the southern shore of Brownsea Island. A brick-lined tank and a pit, also on the south shore, are eroding out of the small cliff on the coast above the high-water mark and the survey of these resulted in the creation of section drawings and a photographic record. The clay shafts, found on the northern shore, are located around a tidal marsh called Seymer's, with two of the shafts on the water's edge and the remaining several meters inland. All features were photographed and plotted using GPS to create a site plan. All features were also added to the CITiZAN Interactive Coastal Map.

Acknowledgements

The work of CITIZAN would not be possible without the support of our volunteers, sponsors and project partners.

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1 Introduction

1.1 Site background

Located within Poole Harbour, Dorset, Brownsea Island covers approximately 300 ha. It is part of the Dorset Area of Outstanding Natural Beauty (AONB), designated as a RAMSAR site, and a Special Protection Area (SPA) and is within the Dorset Heath Special Area of Conservation (SAC). The site is owned by the National Trust with 100ha of the Nature Reserve leased to the Dorset Wildlife Trust. The centre of the site lies at National Grid Reference SZ 01984 87989 (see Figure 16).

Previous work has been carried out on the archaeological remains on Brownsea Island by National Trust archaeologists and volunteers. In 1992 an archaeological survey was carried out which recorded the condition of sites across the island (Papworth, 1992). A more detailed survey of the remains on the southern shore was carried out in 2005 which included extensive clearing of vegetation to record the features (Papworth, 2005). In 2008 the Poole Harbour Heritage Project undertook more detailed survey work of the pits and brick lined tank as part of the Dorset Alum and Coppers Project (Bellamy et al., 2014).

In 2011 the southern shore of Brownsea Island was included in the National Trust Shoreline Restoration Project to remove failing sea defences (Flux, 2012) and now falls within a No Active Intervention (NAI) shoreline management policy. In 2014 a Rapid Coastal Zone Assessment (RCZA) was undertaken by Cornwall Archaeological Unit and Bournemouth University covering the area of the site (Johns et al. 2015).

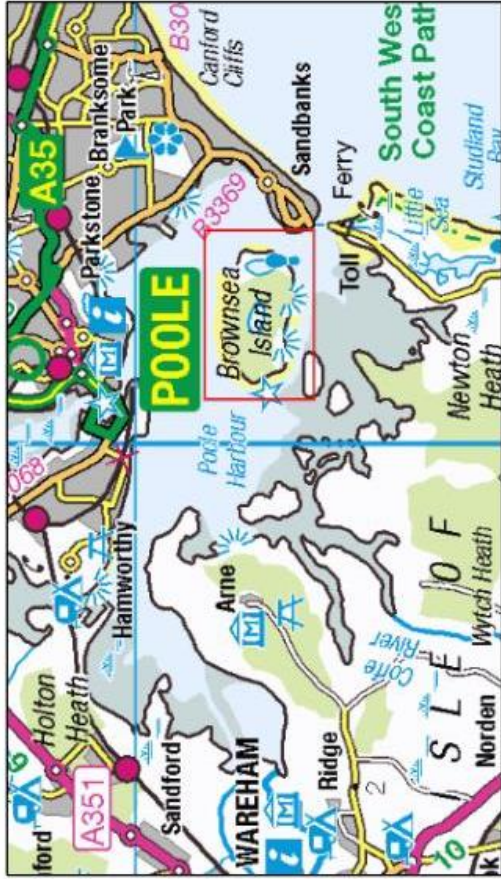
The documents listed above should be referred to for information on the natural geology, archaeological and historical background of the site (and the initial assessment of its archaeological potential).

An archaeological survey around the coast of Brownsea Island of the industrial remains currently at risk from coastal erosion and storm damage was carried out by CITIZAN. This consisted of several surveys over a period of three years to record and monitor three sites on the southern shore and ten clay shafts on the northern shore of the island.

The remains on the southern shore were initially visited by CITIZAN on 24–25 July 2015. This was part of a two-day outreach event for the Festival of Archaeology. The island was re-visited on 20–21 October 2016 as part of a two-day training event with staff and volunteers from the National Trust, and again on 13 November 2017 as part of a monitoring visit by CITIZAN staff. The *Britain at Low Tide* television series featured Brownsea Island, with CITIZAN assisting in the identification of sites and features to be used in the episode and initially visited the clay shafts on the northern shore of the island as part of this in June and July 2017.

This document is the report on work on four features:

- Barnes Brick kiln on the southern shore,
- A brick lined tank on the southern shore,
- A kiln pit on the southern shore,
- Clay shafts on the northern shore.



Location of the four features presented in this report.
 Bottom Left: CCO Aerial photography 2016. All others: OS Open Data.
 Contains OS data © Crown copyright and database right (2014)
 CITIZAN Brownsea Island Project © MOLA

Figure 16: Site Locations

1.2 Research frameworks

All work has been undertaken within the research priorities established in the South West Archaeological Research Framework Research Strategy 2012-2017 (Grove and Croft 2012). Particularly Theme F: Widening Access and Interpretation, engaging the public, accessing resources. Section 4: Encourage wide involvement in archaeological research and present modern accounts of the past to the public (Grove and Croft 2012:36).

Furthermore, as part of the Phase One Rapid Coastal Zone Assessment undertaken by Cornwall Archaeological Unit and Bournemouth University the remains of the clay industry within Poole Harbour were identified as requiring further research to ‘assess significance, the degree to which it is at risk, and the priorities for recording’ (Johns, 2015: 95). The work carried out on Brownsea Island is contributing to this particularly through the use of 3D modelling to assess the degree of risk through ongoing monitoring of the rate and scale of loss, linking also to work on the nearby site at Middlebere Quay in Poole Harbour, an early 19th-century clay works (see Tidbury 2018).

The surveys were also carried out within two of the CITiZAN themes and research priorities developed for the project:

- Coastal settlement and industries
- Coastal erosion

1.3 Aims and objectives

The following research aims and objectives were established:

- What is the extent of erosion of the three features identified on the southern shore?
- Can 3D modelling be used over a period of time to assess the rate and scale of change to coastal archaeological features?
- How many clay shafts survive on the northern shore and what is the current condition of the shafts?

The work carried out on Brownsea Island was also planned to answer broader CITiZAN theme questions:

- What is the nature/condition/date/significance of coastal industry surviving on the site?

1.4 Scope of the survey

A CITiZAN survey is not the same as full excavation. It is designed to locate and identify significant archaeological features currently exposed on the coast or foreshore and highlights those that are under threat from erosive forces. These surveys provide a baseline dataset so that their condition can be effectively monitored in the future.

1.5 Related outreach events

Brownsea Island was used as part of a large outreach event for the Festival of Archaeology in July 2015. This two-day event consisted of a marquee located in the main field on the island containing information about CITiZAN as well as several other local archaeological projects, including:

- Forgotten Wrecks of the First World War- an HLF-funded project led by the Maritime Archaeology Trust.

- MAD About the Wreck- an HLF-funded project led by Bournemouth University.
- The Portable Antiquities Scheme- the Dorset Finds Liaison Officer also joined the event.

The aim of the event was to raise awareness about our coastal heritage and each day a guided walk down to the southern shore was conducted. Members of the public were taken down to Barnes brick kiln and introduced to several archaeological survey techniques (Figure 17) including offset survey and levels. This was followed by a walk along the southern shore to Maryland Village, a mid-19th-century village built for the pottery workers by Colonel Waugh, now lying in ruins.

Although not a formal training session the aim of the event was to also demonstrate a few of the archaeological survey techniques used by CITIZAN to act as a 'taster session' for people to sign up to training sessions in the future. As well as engaging members of the public we also worked with National Trust staff proving a valuable basis to organise future training events on the island.

The event was attended by the CITIZAN project evaluator Esther Gill who wrote a short blog which is available online at <https://citizan.org.uk/blog/2015/Aug/07/esthers-archaeology-road-trip/>.



Figure 17: Outreach event in 2015, recording Barnes Brick Kiln during the Festival of Archaeology.

2 Background research

A detailed description of the geology, archaeology and history of the site was provided in the earlier reports: West 2016, Bellamy et al. 2014, Papworth 2005, Papworth 1992 and the Dorset Rapid Coastal Zone Assessment (Johns et al 2015). The following is a summary of the topographic, historical and archaeological data for the coastline of Brownsea Island.

2.1 Topography

A description of the topography and underlying geology is detailed in *Brownsea Island in Poole Harbour, Dorset; Geology of the Wessex Coast of Southern England* (West, 2016). In summary:

Brownsea Island is approximately 2.2km long and 1.2km wide. It is the largest of the five main islands located in Poole Harbour, which is one largest natural harbours in the world. The formation of the harbour itself is discussed in *The Book of Poole Harbour* (Dyer and Darvill, 2010). The bedrock is of the Poole Formation and consists of sand, silt and clay.

Barnes brick kiln is located at the high-water mark on a small promontory on the southern shore and is eroding from the cliff face which is approximately 2m high. The brick lined tank and the kiln in section are both eroding from the cliff to the west of Barnes brick kiln. The height of the cliff varies between 1m and 3m high and is approximately 12m from the high-water mark. Two of the clay shafts are located on the high-water mark at 1m OD, the remaining are all within 50m of the high-water mark on a level plateau around Seymer's Marsh.

2.2 Archaeology and documentary evidence

Brownsea Island has a rich and colourful history, particularly during the Medieval and Post-Medieval periods. The archaeological background of the island is covered in detail in other reports (including Papworth 1992, Papworth 2005, Bellamy et al. 2014, Andrews 2010). This section provides a brief summary.

Prehistoric and Roman

Despite the extensive evidence of Iron Age activity on nearby islands the only evidence from this period relating to Brownsea Island is the Poole Logboat found through dredging in 1964 (Peers 1964; Markey et al. 2002) 75m east of the island. Off the north-east corner of Brownsea a Roman site was discovered in 1973 (Bowen, 1975). By 1988, however, it was reported as having been destroyed by tidal action (Papworth, 1992).

Early Medieval and Medieval

There is very little mention of Brownsea Island in medieval documents; it is not mentioned directly in the Domesday Book of 1086 except as part of the Studland estate. It is thought there was a chapel on the island in the medieval period belonging to Cerne Abbey. Several graves were found beneath the current farm buildings on the island, one of which dates to the medieval period which may be connected to the chapel (Papworth, 1992: 9).

Post Medieval

It was not until the post-medieval period that Brownsea Island started to play a key role in both the defence of the harbour and in industrial activities, utilising the many natural resources of the island which included alum, copperas and clay. The island changed ownership several times in this period.

Brownsea Castle was first built by Henry VIII as part of a string of block forts to protect the south coast of England against invasion. It gradually became adapted and extended with the addition of wings and several storeys.

During the 16th and 17th centuries copperas production was established on Brownsea Island. Copperas was used by the textile industry as a dye fixative. The Dorset Alum and Copperas Project funded by Historic England was undertaken in 2008 and 2009 by the Poole Harbour Heritage Project and included investigations on the south shore of Brownsea Island. One of the features surveyed by CITIZAN (see section **Error! Reference source not found.**) was previously recorded in detail as part of the Alum and Copperas project, during which the feature, thought to be associated with Copperas production, was found to be more likely to be related to late 18th- to early 19th-century brickworks (Bellamy et al. 2014).

The four sites recorded by CITIZAN and detailed in this report relate to the 18th- and 19th-century brickworks and pottery production. These industries were first noted along the southern shore on the 1770 Isaac Taylor map; during this time the industrial activities were relatively small scale. This changes in the 1850s when the island was owned by Colonel William Petrie Waugh. Although he owned the island for less than ten years the Colonel left a large archaeological footprint. Believing that the clay was suitable for making fine china and therefore would make him a fortune, he invested huge amounts of money in building a three-storey pottery works (**Error! Reference source not found.**), a village and tramway. This venture, however, failed and the Colonel and his wife fled to Spain bankrupt. The clay shafts on the northern shore (see section **Error! Reference source not found.**) are remnants of this enterprise and failed attempts to prospect for the valuable clay.

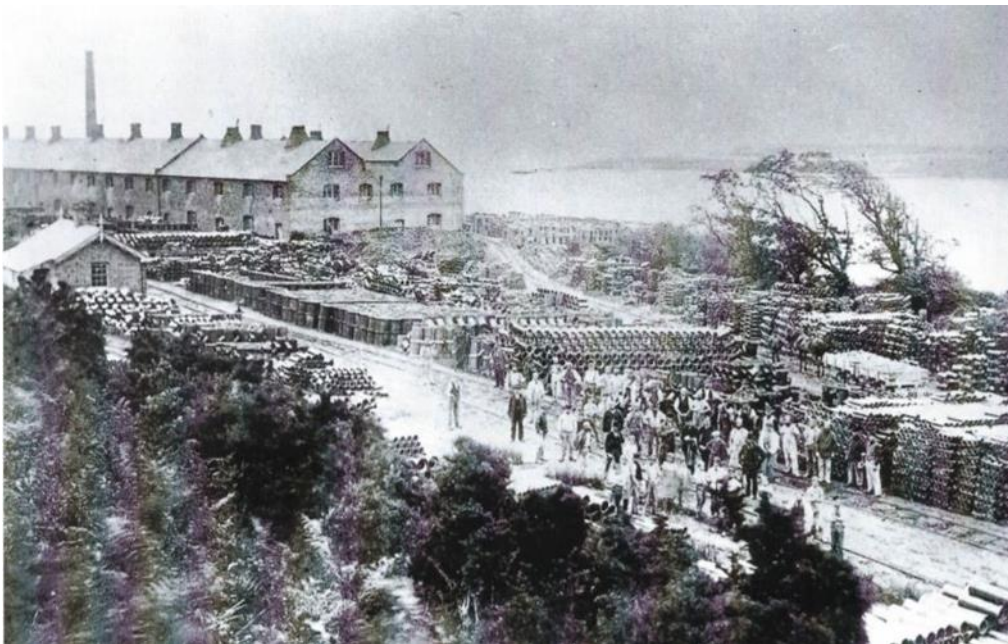


Figure 18: 1880's Photograph of the pottery works on the south-west shore of Brownsea Island.

Modern (from 1901)

In 1901 the island was purchased by Charles Van Raalte. It was during this period that Baden Powell visited the island and set up his first scout camp in 1907. In 1927 the island was purchased by Mrs Bonham Christie, a recluse who ordered the many residents to leave the island. During the Second World War the island played an important role in the defence of the harbour against German bombing campaigns. A decoy site was established on the island to prevent bombs hitting the nearby cordite factories. By 1962 the island was sold to the National Trust.

3 Survey methodology

3.1 Training methodology

The surveys were conducted as part of a 2-day CITiZAN outreach event in 2015 (Figure 4), a 2-day training event in 2016 and numerous monitoring visits in 2017.

Two-day CITiZAN training sessions normally comprise of one day off-site briefing on site background, health and safety and methodologies and one day of on-site practical work as in section 3.2. All volunteers must adhere to Health and Safety assessments (CITiZAN, 2015c) and the CITiZAN code of conduct (CITiZAN, 2015a). Learnt skills are recorded in the CITiZAN Archaeology Skills Passport.



Figure 19: Undertaking an offset survey during the 2015 training and outreach session.

3.2 Field and recording methodology

During the 2015 outreach event Barnes brick kiln (Feature 1) was recorded using offsets from an arbitrary baseline and subsequently tied to the OS grid by GPS survey of the baseline using a handheld Garmin eTrex 10. As this was part of a ‘taster session’ within an outreach event no final drawings were completed; the aim was to simply introduce members of the public to the principals of offset survey.

Due to the complexity of the site and the time constraints of tides and site conditions it was decided to record the kiln using photogrammetry in order to produce a 3D model of the kiln. This technique, ideal for the rapid recording of archaeological sites and features, was undertaken annually from 2015

to 2017. Recent advances in processing software and image acquisition have led to a huge increase in the use of photogrammetry for recording cultural heritage. Guidance on photogrammetry is now provided by Historic England (Historic England, 2017).

Photographs were captured using a Nikon Coolpix AW130 point and shoot camera with built-in GPS. Images were captured perpendicular to the brick kiln at regular intervals with at least a 60% overlap, shooting in landscape. Images were taken at three elevations to cover the top, middle and base of the kiln. Measurements were taken of the bricks and added to the model to allow for scaling.

In 2015 the images were processed by the Maritime Archaeology Trust using their software. The models from 2016 and 2017 were processed in-house by CITiZAN staff. All models were created using AgiSoft Photoscan and have been published through the Sketchfab website.

A brick lined tank and a kiln pit (Features 2 and 3) were exposed in section on the small cliff located along the southern shore. The cliff varies between 1 and 3m high and both sections were drawn at a scale of 1:20 using offsets from an arbitrary baseline and subsequently tied to the OS grid by GPS survey of the baseline using a handheld Garmin eTrex 10. These plans were then digitised.

The clay shafts on the northern shore (Feature 4) were plotted using a handheld Garmin eTrex 10. One central point for each shaft was taken and plotted into ArcGIS to create a plan showing the distribution of the shafts.

All features were also photographed to record the current condition. A written and drawn record of features was carried out using the CITiZAN app. This was then uploaded to the project database and is available to view online through the interactive coastal map.

4 Results and interpretation

For area and feature locations see Figure 16.

4.1 Feature 1 – Barnes Brick Kiln

Barnes brick kiln is the most visible archaeological feature along the southern shore. It was first recorded archaeologically by the National Trust in 1988 then again in 1992 (Papworth 1992). In 2005 the National Trust undertook extensive clearing of the site to draw and photograph it. Part of the site was also excavated to show the firing chamber of one of the kilns (Papworth 2005).

The site was protected from coastal erosion in 1994 using gabions and timber posts, however these failed and in 2011 were removed as part of a larger project to remove all failing sea defences along the south and south-west shore of the island (Flux 2012).

A brickworks was shown in this area on the 1770's Isaac Taylor map of the island. It consisted of three buildings and an identical arrangement was shown on the 1853 map, this time referred to as lime kilns. By 1859, when Colonel Waugh left the island, the arrangement of buildings was labelled as Barnes brickyard and two kilns for burning 28,000 bricks each in the sales particulars (Papworth 1992: 17).

In 1988 the kiln was recorded as being 14m long with 4m width exposed on the beach. By 1992 this was 5m. Wooden piles directly to the south were also noted and thought to be the remains of a jetty (Papworth 1992). Clearance by the National Trust in 2005 showed the remains of three rooms, two to the south which survive at floor level and one to the north which was partially covered by an earth bank (**Error! Reference source not found.**). The southerly rooms were thought to be for storage, with the westerly of the two having been converted from an earlier kiln (a blocked flue was recorded here). The northerly room contained a brick lined firing chamber, and contained evidence that lime was fired in the kilns as well as brick (Papworth, 2005). The area surveyed in 2005 covered 14m east west and 10m north south. The jetty was also noted as being 8m wide and 30m long in plan.

CITiZAN first recorded the site in 2015. During the ten years since the last survey the sea defences had been removed and the site had deteriorated markedly. Due to the complexity of the site and the time constraints of tides and site conditions it was decided to record the kiln using photogrammetry.

Initial comparisons between the 1992 and 2005 plans can be seen in Figure 21. In 1992 the earth bank was several meters further seawards and only elements of the two southerly rooms were exposed. By 2005 the earth bank had eroded by up to five metres exposing the firing chamber. Comparing the 2005 site plan to the 2015 model shows that by 2015 the southerly rooms have been completely destroyed (Figure 22). All that remained was the north-east room which contained the brick lined kiln. The whole area to the west of this room was covered in an earth bank in 2005. This had eroded by at least 4m so any remains which were covered by that bank have since been lost. Timber posts in the intertidal zone were still visible which were probably the remains of the jetty. By 2016 the brick lined kiln in the north-east room had partially collapsed (**Error! Reference source not found.**); this may be due to the vegetation growth above the structure as opposed to damage from the sea.

The same process of modelling the kiln was carried out in 2016 and 2017 in order to create three consecutive years of 3D models. Due to the increased use of this technique particularly in recording coastal features the three models are allowing us to assess whether such a technique can provide detailed information on the rate and scale of loss. CITiZAN is currently working on a process to quantify the loss and this will be published in a later report.

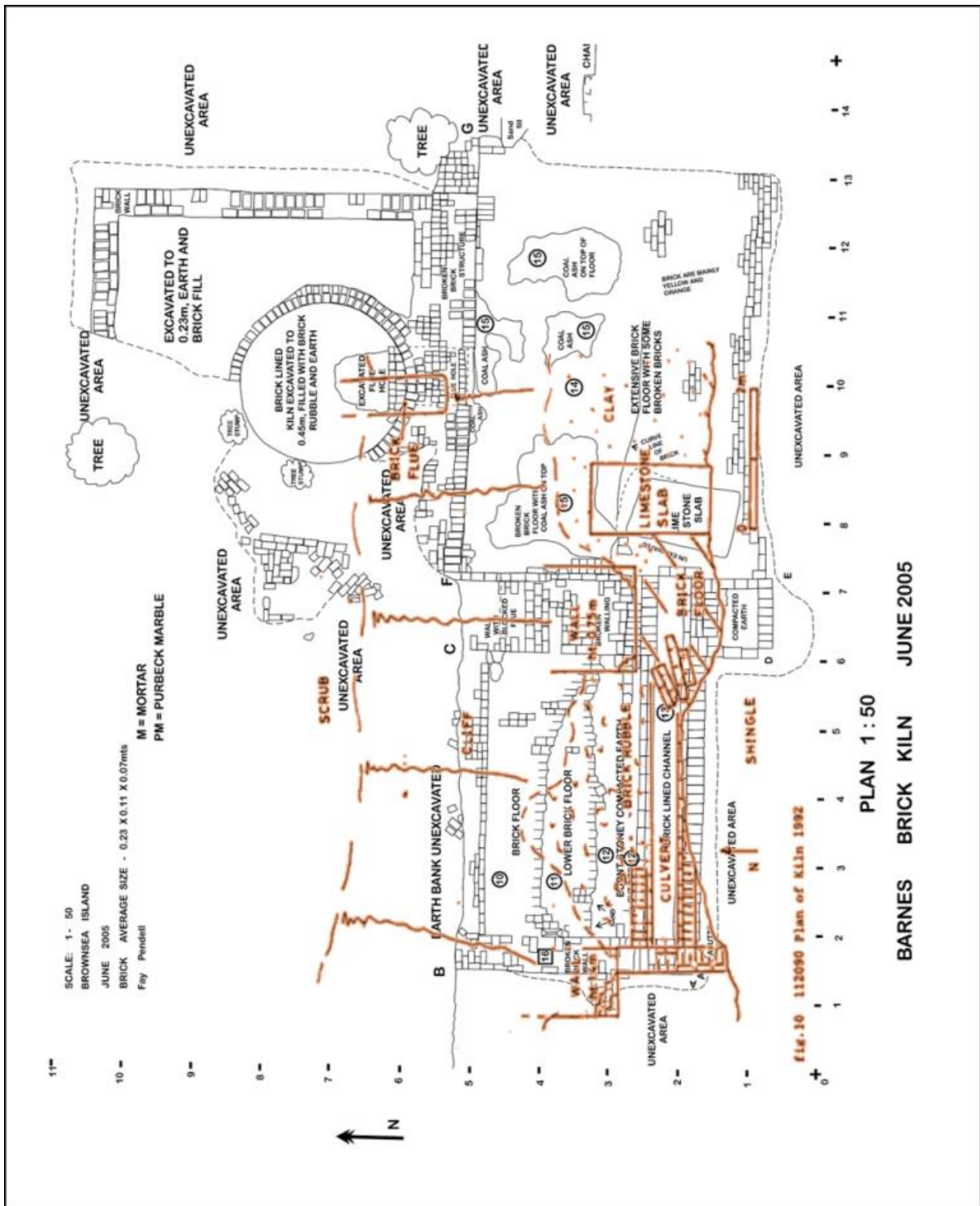


Figure 21: 2005 site plan of Barnes Brick Kiln overlaid with 1992 site plan (Red). Both plans created by the National Trust. This figure shows how far the cliff has eroded back exposing more of the structure.

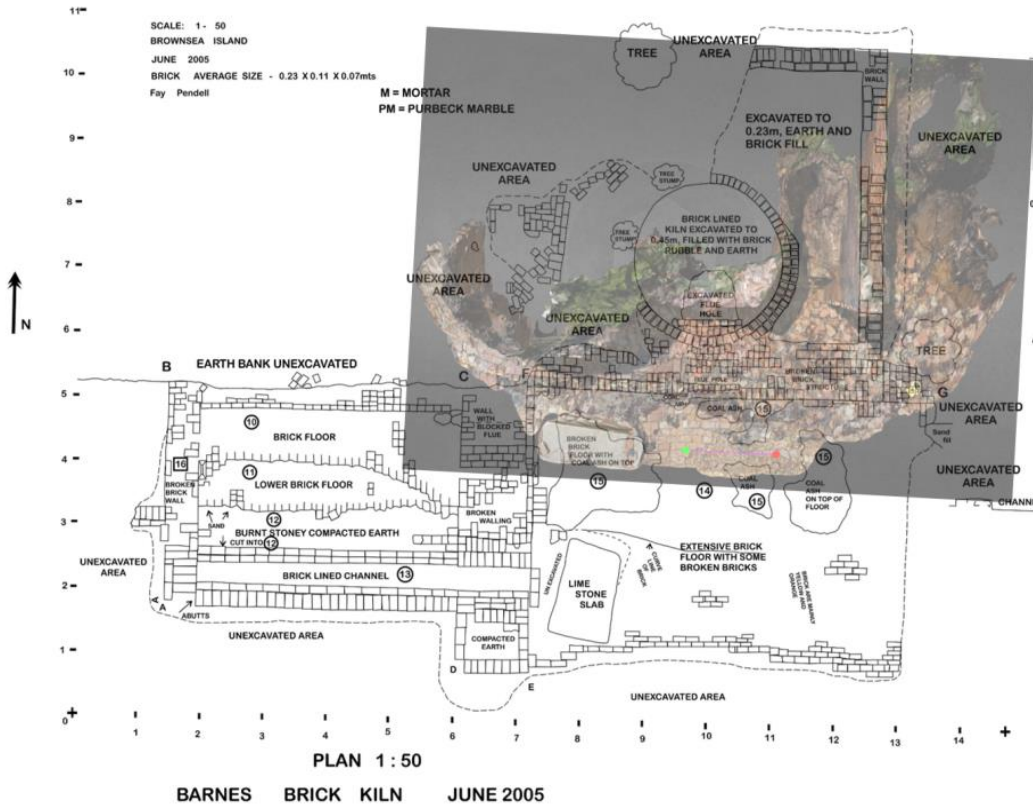


Figure 22: 2005 site plan of Barnes Brick Kiln overlaid with plan view of the 2015 3D model, the two southerly rooms have been destroyed, all that remains is the firing chamber.



Figure 23: Comparison of the 2015 3D model of Barnes Brick Kiln (top) with the 2016 model (bottom). The main brick lined kiln has collapsed in the time between the models being created.

4.2 Feature 2 – Brick lined ‘tank’

The brick lined pit/tank was also recorded by the National Trust in 2005. At the time it was recorded as a 3m wide pit with vertical sides 0.9m deep and a flat base (Papworth 2005). The walls were made of hollowed out bricks which were thought to have been used to channel heat. This interpretation connected it with the Copperas industry as a potential evaporation tank and it was recorded in more detail as part of the Dorset Alum and Copperas Project (Bellamy et al 2014). However, further investigations in 2008 and 2009 concluded that this was not the case and it was more likely to have formed part of the brickworks (Bellamy et al 2014).

The feature was recorded in 2016 as part of the two-day training session with National Trust volunteers. A baseline was set up and the feature was drawn using offsets to a scale of 1:20 (Figure 24). Due to time constraints the feature was only recorded in section. However, in 2005 and in 2008, the site was also drawn in plan view which showed over 1m of the tank survived into the cliff with an adjacent brick surface surviving up to 2m into the cliff. The adjacent brick surface has since been lost, as has most of the feature.

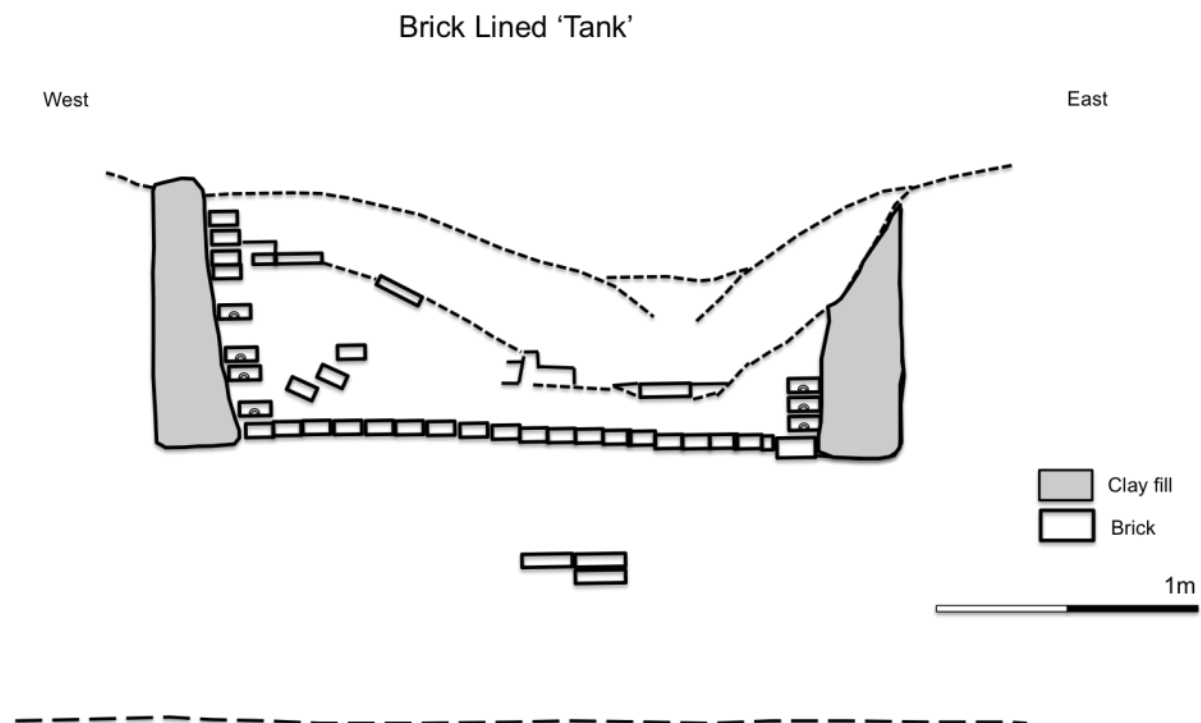


Figure 24: Section drawing of the Brick lined tank (Feature 2). Created during the 2016 CITIZAN training event by National Trust volunteers using offset survey.

Figure 25 and **Error! Reference source not found.** compare the 2005 and 2008 drawings with the 2016 drawings and photographs. Photographs taken during a monitoring visit in 2017 show the site to have deteriorated even further, however it is thought this is primarily due to visitor erosion rather than natural processes. All of the hollowed-out bricks had been pulled out of the cliff face and piled onto the foreshore.

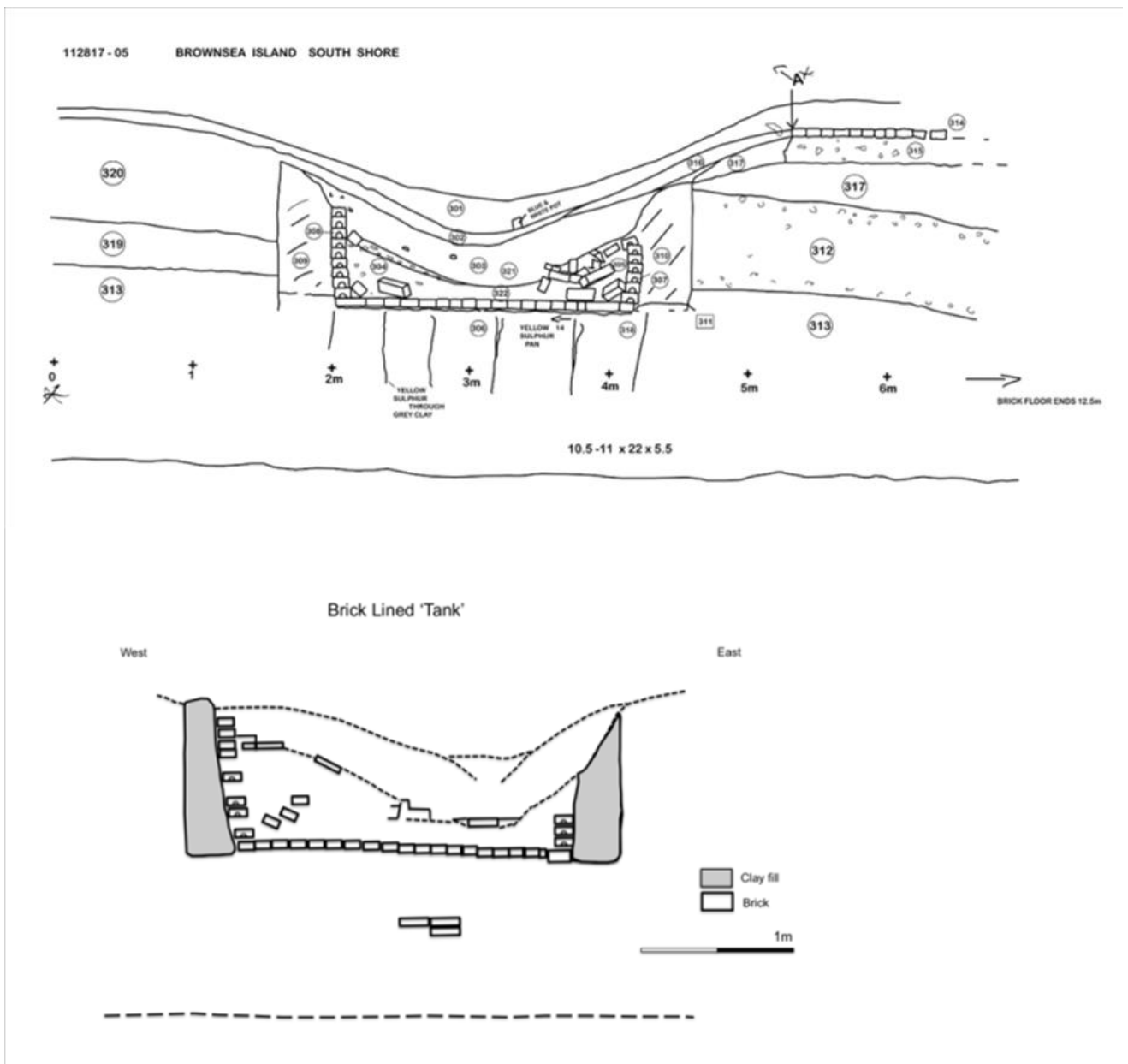


Figure 25: 2005 section drawing of the Brick Lined Tank (above, drawn by the National Trust and digitised by CITiZAN) compared to the 2016 CITiZAN survey drawing.



Figure 26 Left: Photograph of the Brick Lined Tank in 2005 (National Trust). Right: Photograph of the Brick Lined Tank 2016.

4.3 Feature 3 – Kiln in section

Recorded in 2005 as 2.3m wide and cut from the natural clay, the kiln contained a central square ridge with square cut troughs either side containing a lower filling of organic materials. Debris within the kiln included clay roof tile fragments and lime, suggesting these were other products of this early kiln (Papworth 2005).

In 2016 the feature was recorded during the two-day training session with National Trust volunteers. A baseline was set up and the feature was drawn using offsets to a scale of 1:20 (Figure 27). Again, due to time constraints the feature was only recorded in section.

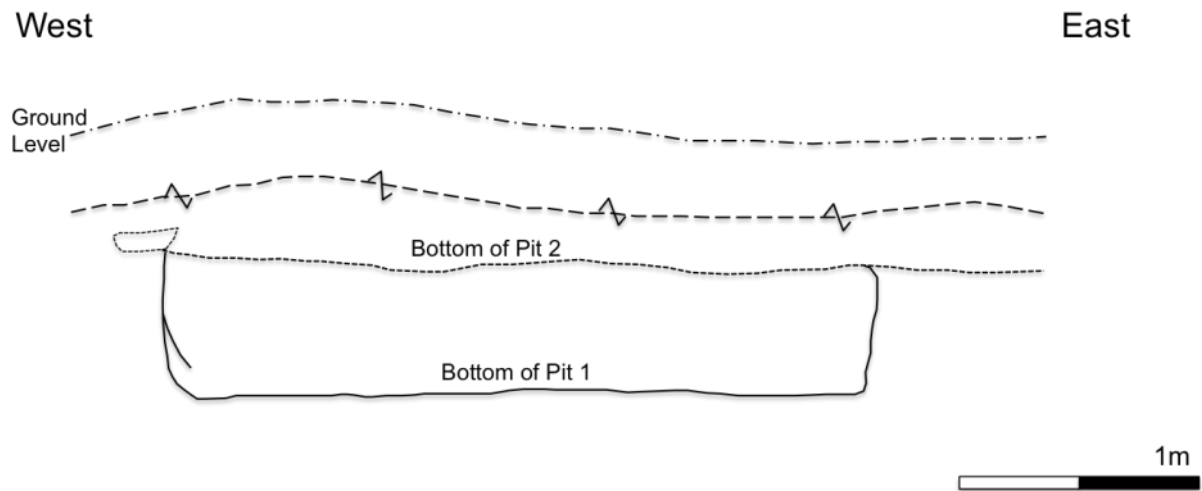


Figure 27: Section drawing of the Kiln (Feature 3) created during the 2016 training event by National Trust volunteers.

Comparisons between the 2005 and 2016 surveys show that this has suffered from some erosion and the square ridges are no longer visible (**Error! Reference source not found.**). There is also increased vegetation at the top of the cliff which may also impact the feature.



Figure 28: Left: Photograph of the kiln in section (2016). Right: Photograph of the kiln in section (2005, National Trust).

4.4 Feature 4 – Clay shafts

On the northern shore of the island within the area of Seymer's marsh are ten clay shafts. These were plotted and photographed during a 2017 site visit (**Error! Reference source not found.**). The three most northerly shafts are visible above ground as upstanding brick lined circular shafts. The

remaining are at ground level and as such have been cordoned off by the Dorset Wildlife Trust who manage the land. All are circular and brick lined except one which is square and timber lined.



Figure 29 Shaft locations (Feature 4).



Figure 30 Photographs of the shafts at Seymers taken in 2017. Top left demonstrates the spalling on the bricks caused by the sea. Bottom left shows a circular ground level shaft and bottom right shows the timber lined square shaft.

The bricks on the upstanding shafts have been heavily spalled (Figure 30), particularly on the shafts which are partially submerged. Despite this the shafts are in relatively good condition; this may also be due to the area being located with the conservation zone and rarely visited.

Also within the area of the shafts are the remains of clay pits cut into the cliff below Seymer's Cottage. These were photographed during the 2017 site visit (Figure 31). Within Seymer's marshes are some upstanding metal remains which were also photographed (Figure 32). Comparing the location of these with historic maps shows that it could be related to the route of the tramway and associated pier (**Error! Reference source not found.**). Further work is needed to clarify this.



Figure 31: Photograph of one of the clay pits at Seymers taken in 2017.



Figure 32: Photograph of the metal remains at Seymers, this is along the route of the tramway and may be associated. Image taken in 2017.

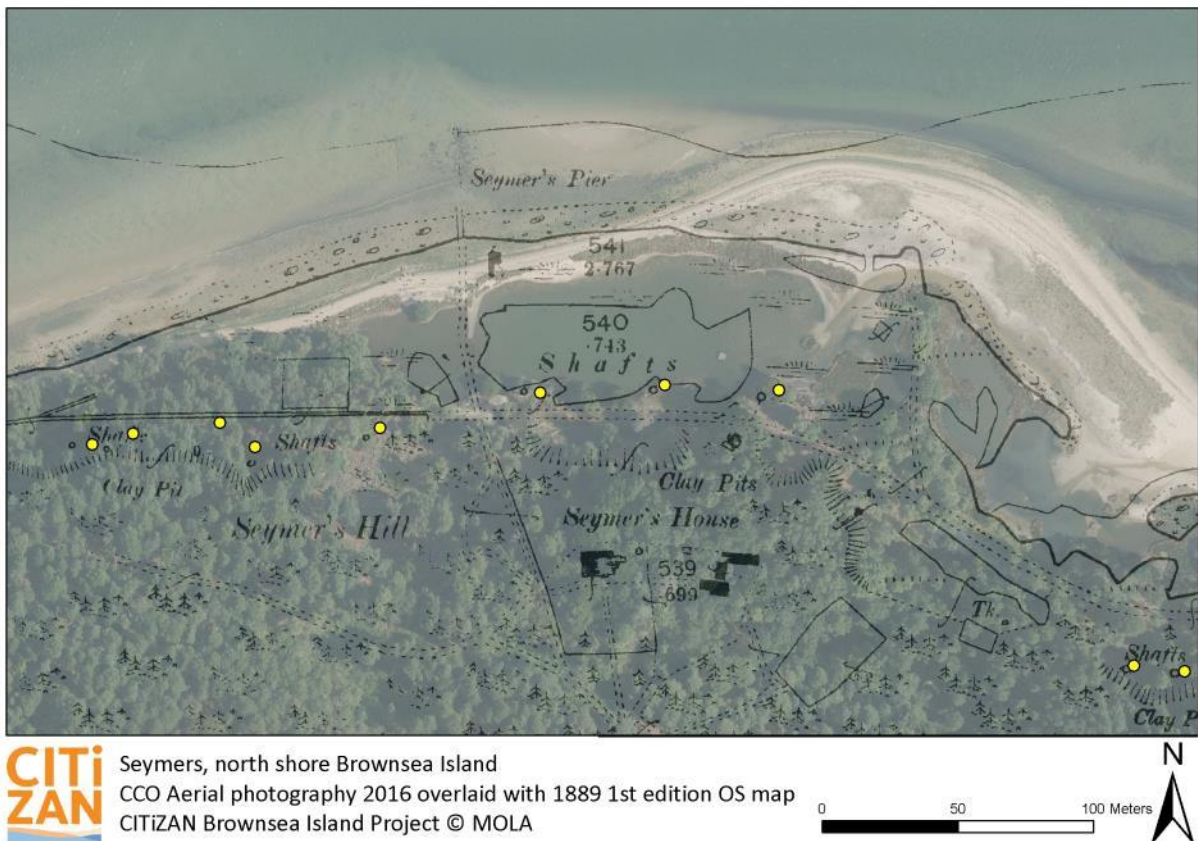


Figure 33: Current aerial photograph of Seymers with 1889 OS mapping overlaid showing the location of the tramway and pier. Further work is required at low tide to see what may survive of these features.

4.5 The finds

CITIZAN records and monitors structures, landscapes and archaeological features, and does not systematically collect artefacts. Any artefacts encountered were dealt with in accordance with the CITIZAN finds policy (CITIZAN, 2015b). No artefacts were recovered.

4.6 Training results

The work carried out on Brownsea Island in 2015 was part of an outreach event with informal training. 90 people attended the event over the course of the weekend, including visitors to the marquee, and 9 people attended the informal training session on the foreshore.

During the 2016 training event for National Trust volunteers, 6 people attended and assisted with the creation of the site plans for Features 2 and 3 (Figure 34).

Evaluation forms were handed out and evaluation is being undertaken by an external evaluator – see Gill 2018 (in prep).



Figure 34: Photograph of the 2016 team of volunteers.

5 Conclusions and recommendations

5.1 General discussion of the survey

All three of the features recorded on the southern shore are deteriorating rapidly. This is due partly to the removal of sea defences in 2011 which has led the features to be exposed to high tides and extreme weather events. Alongside this all three of these features, especially 1 and 2, are deteriorating due to visitor erosion. The bricks are regularly removed by visitors and the features are often climbed on. Vegetation above the features has also encroached the bricks and caused them to become more fragile. It is likely that the features will soon completely disappear. In ten years approximately three quarters of feature 1 has been lost. The site is extremely fragile and another major storm event is likely to cause it to be totally destroyed.

CITiZAN are working on new techniques to compare 3D models in order to quantify the volume of sites that are lost. The aim is to set up a static reference plane from which the 3D models can be compared and the quantity of loss calculated. This will also allow us to understand the rate and scale of loss. The majority of loss to the brick kiln has occurred since the removal of the sea defences in 2011; understanding the rate and scale of loss since will help with the future management of this site.

The work carried out on the northern shore showed Feature 4 to be in relatively good condition, with general decay caused by weathering and water damage to the bricks. The nature of the shoreline has also led to better rates of preservation compared to the southern shore as it is more protected from the prevailing winds and the marsh protects the intertidal shafts from storm damage.

5.2 Answering original research aims

- What is the extent of erosion on the three features identified on the southern shore?

Almost three quarters of Barnes Brick Kiln (Feature 1) has been lost in the ten years between the 2005 and first CITiZAN survey, including both storage rooms identified in 2005 (Figure 22).

Due to time constraints the brick-lined tank (Feature 2) was only drawn in section so it is not possible to measure how much of the cliff has eroded. However, in 2005 there were 16 hollowed out bricks visible compared to just 7 in 2016. By 2017 these had all been removed (probably due to visitors). The brick floor recorded to the east of the feature in 2005 has also since been lost. See Figure 25 for a comparison of the 2005 and 2016 section drawings.

The kiln pit (Feature 3) was only drawn in section, but comparisons to the 2005 drawings and photographs has shown that the feature is being gradually eroded as the cliff retreats. It is also being affected by vegetation. See Figure 28 for a comparison. The 2005 photograph also shows the sea defences still in place.

- Can 3D modelling be used over a period of time to assess the rate and scale of change to coastal archaeological features?

It is certainly possible. The three models created of Barnes Brick Kiln in 2015, 2016 and 2017 are all measurable and comparable. It has also been possible to compare these with the 2005 site plans to understand the scale of loss. As mentioned above, CITiZAN are working on a new technique to quantify the volume lost and this will be published shortly.

- How many clay shafts survive on the northern shore and what is the current condition of the shafts?

Ten clay shafts were identified and the current condition noted. Clay pits were also discovered. Further work is required to survey the rest of this area and understand the relationship between the shafts, the tramway and the possible pier. One of the shafts was square and timber lined. All others were circular and brick lined. Further work on this feature is required to understand why it is different and whether it perhaps had a different function. See Figure 29 for a map of the distribution of the shafts. Several photographs are also shown in Figure 30.

5.3 New research aims

Brownsea Island is an intriguing landscape, and the four features recorded by CITIZAN and volunteers provide more information about what was once a busy industrial landscape. Long-term monitoring is being carried out by National Trust volunteers. However, further work on the Barnes brick kiln is recommended. This includes the creation of annual 3D models to continue comparisons over time and to preserve the feature by record. A more detailed plan of the associated jetty is also recommended. Assessment of historical maps suggests that there was a lime kiln here before the brick kiln. This may have since been lost to the sea but monitoring of the eroding cliff is recommended in case any earlier features are exposed.

The brick-lined tank and kiln pit will inevitably be lost through continued erosion, and monitoring of this is recommended, particularly with ongoing photographic survey to record the change over time. The exact purpose of the brick-lined tank has been debated, so further research to compare this with potential similar features exposed on our coastlines would prove valuable. Continued field walking along this section of shoreline is also recommended in order to identify potential further sites exposed as the small cliff retreats. Other features were also recorded during the 2005 survey such as the kiln at Hitchcocks (Papworth, 2005). These are being monitored by National Trust volunteers but would benefit from 3D modelling and/or offset survey to understand and quantify the extent of change over time.

The northern shore requires further survey work with the Dorset Wildlife Trust, including a visit during an extreme low tide to search for the pier remains and to track any potential remains of the tramway. Further up the cliff overlooking Seymer's marshes are the remains of Seymer's Cottage, built by Sir Charles Chad in the 19th century and re-used as a home for the pottery manager. Due to its location in a conservation area it has not been demolished like Maryland Village, but it is deteriorating rapidly due to general structural decay. It is recommended that a 3D model of the cottage and associated outbuildings be created to preserve the site by record.

6 Dissemination

The results of the survey will be made publicly available on the CITIZAN website:

<http://www.citizen.org.uk/>. The feature data will be uploaded to the CITIZAN interactive database, to allow ease of future long-term monitoring of the site via the CITIZAN online interactive map and smart phone app and to permit inclusion of the data in any future academic researches into coastal and intertidal archaeology. This can be found at <http://www.citizen.org.uk/interactive-coastal-map/>.

Records created by this survey will be deposited with the Archaeology Data Service (ADS) where it will make up a part of the archive of all data and materials created by CITIZAN. It will be deposited with appropriate local repositories via the ADS.

A short note on the results of the survey will be submitted to the appropriate journals to be included in annual county and period fieldwork round-ups.

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