



The Cobb, Lyme Regis Dorset

Archaeological Watching Brief
Geoarchaeological Monitoring of Site Investigation Works



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Summary

Wessex Archaeology was commissioned by West Dorset District Council (WDDC), under guidance from Jeremy Benn Associates Ltd (JBA Ltd) to undertake archaeological and geoarchaeological monitoring of site investigation works at the Grade I Listed man made harbour known as the Cobb, Lyme Regis, West Dorset. Monitoring was required due to the potential for site investigation works to reveal archaeological remains, or deposits of palaeoenvironmental and/or geoarchaeological significance.

The work included the monitoring of GI works, which included five machine dug trial pits and six borehole/window samples. Site work was carried out between 5th and 7th November 2018.

No deposits of palaeoenvironmental or geoarchaeological significance were found to be present; with storm beach deposits (aka marine beach shingles) found to overlie sedimentary mudstones. However, earlier phases of the Cobb itself were observed and recorded.

The monitoring of the machine dug trial pits recorded a section of 16th century Cowstone foundations on the north side of the Southern Arm and a single displaced Portland Limestone block with characteristic dovetail joint dating it to a repair of 1785. No other archaeological artefacts or features were found. However, this study has shown that future work close to the existing Cobb walls will need to be carried out with care.

The first mention of a breakwater at Lyme, built of timber and boulders, was in 1328 in the reign of Edward III. The oldest part still standing today may date from about 1550. Most of the principal breakwater currently visible was built between 1785 and 1826. From the 1680's, the Cobb was gradually converted from its earliest form via intermediate stages of dry bedding up-ended Cowstones. From the mid-18th century the Cowstones were squared and set horizontally in mortar to form a rigid, heavy and carefully shaped structure designed by military engineers, with later repairs and additions using Portland Stone.



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The Archaeological monitoring was carried out for Wessex Archaeology by Bob Davis, with geoarchaeological input and support from David Norcott and Alex Brown.

This report was compiled by Bob Davis with additional contribution by Dave Norcott, who also managed the project on behalf of Wessex Archaeology. Illustrations were prepared by Jennie Anderson.



The Cobb, Lyme Regis

Archaeological and geoarchaeological monitoring of site investigation works

1 INTRODUCTION

1.1 Project background

- 1.1.1 Wessex Archaeology was commissioned by West Dorset District Council (WDDC), under guidance from Jeremy Benn Associates Ltd (JBA Ltd), to undertake an archaeological watching brief and geoarchaeological monitoring of site investigation works at the Cobb, Lyme Regis, West Dorset.
- 1.1.2 The Cobb is a Grade I listed building described as 'Stone sea-wall of medieval origin with rebuilding taking place between 1783 and 1829. Victoria was added between 1824 and 1852 with the north wall constructed in 1849'. It is located at Lyme Regis within the Dorset and East Devon Coast World Heritage Site. Site investigation works involved seven hand dug test pits, five machine dug test pits and four window sampled boreholes located in and around the harbour.
- 1.1.3 Archaeological and geoarchaeological monitoring was required due to the potential for site investigation works to reveal archaeological deposits associated with earlier phases of the construction of the Cobb, the potential for associated archaeological deposits, or deposits of palaeoenvironmental and/or geoarchaeological significance.
- 1.1.4 The archaeological monitoring was carried out in accordance with a Written Scheme of Investigation (WSI) (Wessex Archaeology 2018) which was agreed in advance of the work by West Dorset District Council.

1.2 Site location and description

- 1.2.1 Lyme Regis is located in west Dorset, 40km west of Dorchester and 40km east of Exeter. It is situated at Lyme Bay on the coast of the English Channel, on the Devon Dorset border. The town has grown around the mouth of the River Lyme and the Cobb is a man-made artificial harbour with the first reference to its existence in 1328. The Cobb is centred on National Grid Reference (NGR) 333912 91573 (**Figure 1**).
- 1.2.2 The Cobb structure has various named parts. The principal part is the long west 'High Wall' which connects the Cobb to the mainland. The adjacent 'Causeway' with a quayside, runs parallel to and below the high wall on its east side. The High Wall runs south and curves to the east, the curved section is known as the 'Roundabout' and continues east to form the 'Southern Arm'. At the east end of the Southern Arm is a line of large boulders known as 'Beacon Point'. All of these elements together are known as the Cobb Breakwater.
- 1.2.3 Steps to the walkway are located along the east side of the High Wall at a midway location, these are known as 'The Gin Shop'. A further set of steps are located in the curve of the roundabout and are known as 'Granny's teeth'. There is a third set of steps along the Southern Arm.



1.2.4 The 'Landing Quay' runs east from the Roundabout and Cobb buildings are located along this section of wall. These buildings include former warehouses, now a marine aquarium and marine college with fisherman's shelters. At the end of the landing quay is a pier extension known as 'Victoria Pier'. There is a beach between the east side of the landing quay and the north side of the Southern Arm called 'The Pool'.

1.2.5 The north-east side of the harbour is protected by the 'North Wall' with an armour stone rockery protecting the main beach. The shingle beach known as 'Monmouth beach' lies to the west of the Cobb.

1.3 Solid and superficial Geology

1.3.1 This section provides an overall background to the geoarchaeology within the proposed study area. Where age estimates are available these are expressed in millions of years (MA), thousands of years (Ka), and within the Holocene epoch as either years Before Present (BP), Before Christ (BC) and Anno Domini (AD).

1.3.2 The Solid Geology within the Site is mapped by the British Geological Survey (BGS) as sedimentary mudstones of the Charmouth Mudstone Formation, formed approximately 183 to 199 MA during the Jurassic period.

1.3.3 The superficial deposits across the Site comprise sand and gravel marine beach deposits to the east of the Cobb with gravel storm beach deposits mapped by the BGS along the coast running to the west and east. These deposits are of low geoarchaeological potential but may contain reworked and redeposited archaeology or seal underlying stratigraphy of higher geoarchaeology and palaeoenvironmental potential (e.g. peat deposits with potential to contain palaeoenvironmental remains and material for scientific dating).

2 AIMS AND OBJECTIVES

2.1.1 The principal aims of the project, as set out in the WSI was to:

- *Describe the sequences revealed in hand dug test pits, machine dug test pits and (where practical) boreholes;*
- *Identify and record any archaeological remains;*
- *Make a judgement as to the significance of any archaeological remains or deposits; and*
- *Make suitable, proportionate recommendations for further action.*

2.1.2 The project aims were addressed by the following objectives

- *Archaeological monitoring of seven hand dug test pits, five machine dug test pits and four window sample boreholes;*
- *Record any archaeological remains;*
- *If significant deposits are present, record appropriately;*
- *Deposit model of site investigation data to map extent and depth of deposits;*



- *Make specific recommendations for further work, where appropriate, which may include palaeoenvironmental assessment and dating.*

3 ARCHAEOLOGICAL BACKGROUND

3.1 Introduction

3.1.1 In the 2015 publication *Lyme's Battle with the sea: Part 1: The Cobb Breakwater*, the author, Richard Bull, provides a very detailed account on Lyme's sea defences and draws on extensive historical research and local geological references. The following historical and geological backgrounds are taken from this report.

Medieval

3.1.2 The exact age of the original Cobb is unknown, but it appears to have been in existence by about 1254, if not before. The Cobb was first mentioned in 1294. But a construction date before 1250 is likely, following possible loss of access to the old Roman port in the Axe Estuary through shingle baring the entrance. We do not know what the Cobb looked like before 1539, when it was the same size as today, but without the later pier extensions. The first breakwater of timber and boulders was constructed before 1328, having been mentioned as '*beaten down and quite destroyed by the sea*' in a petition for funds to Edward III in that year.

3.1.3 Since Edward III's time successive storms damaged or destroyed the Cobb. On 11th November 1377 the Cobb was totally ruined. King Richard II set up a commission of inquiry which reported that the damage occurred by '*a sudden storm and horrible flux and reflux of the deep sea rolling up to the town*'. Repairs were estimated to cost over £300. In 1410 the 'port' was destroyed again. King Henry IV had to grant the town special favours to ensure its repair. The same happened again in 1481 '*the tempest and wasting by tides and overflowing of the sea*'.

Post medieval

3.1.4 In 1526 Cobb repairs were approved by Henry VIII at charge to the town, granting liberties in recompense. The earliest surviving image of the Cobb was probably drawn in 1539 when invasion was threatened. It was shown in stylised form as two rows of wooden piles infilled with Cowstones forming a curving half-moon structure (Bull 2015, P.12). 'Cowstones' are large rounded boulders of natural calcareous cemented micaceous grey Upper Greensand taken from the foreshore both sides of the Lyme and named after their resemblance on the beach to cows lying in a field. In 1545 the oak walls of this structure had to be repaired with 61 trunks being brought from eight miles away.

3.1.5 A narrow Landing Quay may have been built in 1547. The timber and boulder construction used hitherto could not provide a rolling surface, so a new form of construction was used to enable carts to access the Quay. This consisted of vertically arranged Cowstone boulders, interlocked, but laid without mortar, on a prepared base. This must have been a success, because its seaward face of massive weathered Cowstones is still visibly supports the buildings on the Quay.

3.1.6 In 1585 the Cobb was thrown down by violent storms and two years repairs lost. A year later Sir Thomas Walsingham reported to Queen Elizabeth I the need for '*an exceeding number of great piles to protect the town from the violence and fretting of the sea, which otherwise would in a short time eat out both the town and the land thereunto adjoining*'. The repairs would cost £2000 and that regular repairs costing £100 per year could not be afforded by the town.



- 3.1.7 Charles II charter of 1610 gave the Borough the power 'to dig stones and rocks in the town, parish, sea shore for the reparation and new making of the port or haven known as pier Peere quay or Cobb'. Portland stone may have been first used by 1619, but the evidence seems scant and there was reluctance to use Portland when recommended in 1762 by the Board of Ordnance.
- 3.1.8 In 1644 the Cobb would have proved its military value during the Civil War Siege of Lyme, had it not come under artillery fire from Holmbush. Some barges were sunk. Nevertheless Parliamentary supplies delivered by sea kept the Royalists at bay and £800 was provided by Parliament for Cobb maintenance or defence out of sequestered funds of Royalists. Afterwards, the Commonwealth Parliament allowed the Navy to spend £2000 on the Cobb and other sea walls. What was done is not certain, but it probably involved the conversion of the structure from timber and boulders to interlocked, vertically set boulders.
- 3.1.9 The first Southern Arm was possibly built in 1697. As this provided protection for the Landing Quay, the Cobb buildings were built at about the same time. In 1697 the Borough spent £122 2/5d on the Cobb. A remaining fragment by Grannies Teeth shows that it was probably built of vertically-placed interlocking Cowstones.
- 3.1.10 In 1700 a causeway was built to link the Cobb to the land. This causeway suffered a chequered history of indecision, when it was realised that easy access from the shore had to be balanced against the need to maintain longshore drift of shingle and allow currents to scour the basin of silt. This was no immediate worry, as the causeway was destroyed by storms in 1702. In late November of 1703 an intense depression tracked across southern England. It is thought to be the worst storm that Britain has experienced in recorded history. It was reported by Daniel Defoe in 1704 and it resulted in the loss of 8,000 lives and 1/5th of the Royal Navy. Five boats were driven out of the Cobb and many houses were damaged in Lyme.
- 3.1.11 In 1722 the Cobb was 'Injured' and in 1736 200ft of the Southern Arm was lost in a storm with parts ruined elsewhere, possibly the heads of the old North Wall and Landing Quay at Crab Head. The repair cost was estimated at £4,800. There were further repairs throughout the 1740's and the Board of Ordnance granted money for 'repairation of the Cobb' in 1744. The Board paid a further £1,200 in 1746, £400 in 1748 and £500 in 1749 (£0.4m in 2014).
- 3.1.12 The mid-18th century also saw a change in building technique and materials. The Board of Ordnance wished to achieve a more precise, designed structure and so designed 'Biscuit work'. This was Cowstones squared and set horizontally in mortar.
- 3.1.13 In 1762 more of the Southern Arm was lost. A report and plan by Col Patoun RE for the Board of Ordnance shows 50ft breaches near Granny's Teeth and halfway along the Southern Arm, which he describes as *quite demolished*. Patoun suggested that Portland Stone should be used instead of the local Cowstone and that it should be laid *in terras* made of blocks 2ft 6" deep and 5-6ft long, dovetailed and bound with iron. *In terras* must mean stepped horizontal coursing. It was finished in 1763 and the Board paid £1,988 that year.
- 3.1.14 In around 1766 the tip of the Southern Arm was extended by about 31 yards from the 1763 roundhead to a new roundhead. In May 1783 this latest extension and its roundhead were severely damaged to foundation level at the tip and on the outer foundation still survive. Major D'Aubant RE, for the Board surveyed the damage and estimated the repair
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at £3003 2/11d. The repair survives and is in Portland Roach ashlar as proposed. This is probably the first major use of Portland Stone at the Cobb. Portland Roach stone is a creamy coloured hard shelly limestone with voids where fossils have been dissolved out. Regarded as waste, Portland Stone was only suitable for docks and harbours.

- 3.1.15 The Southern Arm suffered another catastrophic destruction on 24/5th January 1792, after which only D'Aubant's tip survived. Captain D'Arcy was the engineer for the repair and a worn plaque is still located west of D'Aubant's repair and dated 1795. D'Arcy's ashlar blockwork is keyed against Cowstone work on the inside face, dating from 1746. Now, 316ft of the Southern Arm is completely rebuilt in Portland ashlar and is still standing 220 years later. The government paid £10,000 2s 5d (1.24m in 2014).
- 3.1.16 The apparent unrelenting damage to the Cobb continued into the early 19th century and in 1817, a severe storm made a 192ft breach in the High Wall. This time Captain George Fanshawe R, for the Board, surveyed the damage. He found that the base of the old wall was made of massive vertically-arranged Cowstones founded on marl, but he later discovered that it was founded on shingle in places. For his new wall he used Portland Roach ashlar blocks for both inner and outer face throughout. The wall was set on a bed of massive Portland blocks secured in front by short piles. The inner face was formed in two steps forming a walkway 10ft wide and 18ft above the foundations. He insisted that the filling should be of dressed Cowstone carefully laid horizontally on beds of mortar, without the use of rubbish such as rubble or quarry waste.
- 3.1.17 In 1824, whilst the breach was still open, a truly great storm hit the Cobb. It occurred on the night of 22/23rd November 1824. The wall of water created was so high that it overtopped the new, but unfinished High Wall of the Cobb creating a new breach 232ft long to the landward. The North Wall was damaged for 190ft to a depth of 4ft over a width of 16ft. In addition Crab Head was damaged and a breach was made in the seaward face of the Landing Quay near its junction with the Southern Arm. The Cob buildings were all but destroyed. This damage was repaired in 1825 and is marked with a commemorative plaque placed within the Gin Shop.
- 3.1.18 Other work carried out in the rest of the 19th century included widening the Landing Quay in 1829, in 1834 the Roadway was built to admit carts to the Landing Quay, in 1837 the Borough voted to extend Crab Head by 80ft and in 1841-2 Crab Head was extended but, by 100ft and renamed Victoria Pier. In 1843 43ft of the Biscuit work was wedged, jacked and pointed by the Borough. Work continued throughout the latter part of the 19th century which also included opening a tramway to link the Cobb to the new cement works in 1853, raising the causeway in 1857, extending the North Wall landward in 1861/2. In 1874 a group of northern industrialists proposed a major Cobb expansion but, this scheme never took place. In 1875 part of the causeway was removed to allow shingle through and stones arranged as a bridge of sorts, as it had been in 1813.
- 3.1.19 In 1906 removal of the Causeway was mooted, but three small sluices or ports were left until finally blocked up in the 1930's to 1940's, probably because they were always choked with shingle.
- 3.1.20 During the Second World War, the Cobb was defended by pillboxes on Victoria Pier, just south of the Gin Shop and at the end of the Southern Arm, a gun emplacement on Monmouth Beach, dragons teeth tank traps on the Causeway and barbed wire entanglements.



- 3.1.21 Other 20th century work on the Cobb included pressure grouting of a 380ft length of the breakwater, the Southern Arm and the Roundabout area of the High Wall. In 1954 the low parapet wall which connects the High Wall landward was raised by 1ft 8" of mass concrete to restrain shingle spillage from Monmouth Beach.
- 3.1.22 In 1969 a rockery extension was added to the unfinished tip of the North Wall, in 1973 the rockery at the end of the Southern Arm was replenished with stone and in 1986/7 Victoria Pier and its roundhead were strengthened with sheet steel and reinforced concrete.
- 3.1.23 In the 21st century a new wide slipway was built for the Lifeboat Station in 2004, in 2005 the original Portland Stone rockery at the end of the Southern Arm was moved to extend the rockery protecting the northern end of the North Wall. A new rockery of massive Larvikite blocks from Norway was built to extend the Southern Arm.
- 3.1.24 There has been subsequent minor repairs and much more needs to be done under a planned Phase 5 of the Environmental Improvements, including re-cobbling tarmacked areas and the Landing Quay and more importantly, securing the Cobb for the longer term by addressing various cracks and other signs of stress.

Geological location of the Cobb

- 3.1.25 The first High Wall of the Cobb probably followed the underlying stone ledges running around the rim of a natural basin in the 'Shales-with-beef' Formation. Shales-with-beef is a deep sequence in the Lower Lias Formation of the Dorset Coast and refers to mudstones with thin hard bands or seams of fibrous calcite called 'beef' by the Officers of the Geological Survey. These overlie the Blue Lias formation and form a rather soft and insecure foundation for the Cobb.
- 3.1.26 The strata dip southwards towards the Cobb Syncline, the axis of which runs NNE-SSW a short way to the east of the Cobb, so that the northern end of the High Wall crosses the thin Devonshire Head Limestone, then runs south over progressively younger mudstones, including the thin Spittles Limestone, turning to join the Landing Quay on mudstones. Only the Southern Arm can be truly said to be founded on a harder bed for much of its length as it turns to follow the strike of a thin limestone band just below the top of the Shales-with-beef.
- 3.1.27 The Shales-with-beef formed a good substrate for medieval pile driving; being soft enough to readily accept the iron-shod wooden piles of the day without them having to penetrate hard limestones, as would have been the case had the Cobb been sited on the Blue Lias ledges Off Cobb Gate and Gun Cliff. The boulder fill of the early High Wall would have, to an extent, settled into this substrate and become locked in place, only having to be topped up if settlement occurred.

4 METHODOLOGY

4.1 Introduction

- 4.1.1 Site investigation works involved the intended monitoring of seven hand dug test pits, five machine dug test pits and four window samples. The programme was flexible to react to on site conditions, tide times and access issues which meant that the location, order and methods used were adjusted as required. Ultimately, five machine dug trial pits were dug, one hand dug trial pit and six borehole/window samples were taken after initial hand dug test pits.



- 4.1.2 A percussive window sampling rig (Terrier type) was used for the coring work, whilst machine dug trenches were dug by a tracked excavator fitted with a 0.50m wide toothed bucket. These works were monitored between 5th and 7th November 2018.

5 RESULTS

5.1 Introduction

- 5.1.1 The intended locations of machine dug trial pits were assessed at low tide. Although beach deposits of shingle and some sand had created deep deposits, potential archaeologically sensitive foundation remains were identified. A discussion with geotechnical engineers about the possible damage to archaeological remains resulted in some of the trial pits being moved to avoid any damage to possible remains.

- 5.1.2 Most of the intended hand-dug pits were attempted but stopped due to the ingress of water. Hand-dug pits HP101 and HP103 were not dug due to the level of the sea. A full set of trial pit and Windows sample logs is shown in the appendix.

5.2 Southern Arm Cowstone foundation

- 5.2.1 Along the north side of the Southern Arm, and at low tide, the north face of the Southern Arm and Rockery was fully exposed (**Plate 1**). Here can be seen the various build types identified and discussed by Richard Bull. At the base of the existing wall is the characteristic Cowstone boulder construction of vertically placed blocks attributed by Bull to the 16th century (**Plate 2**). There are two sections of 'Biscuit Work' visible along the north face which date to 1762-3. Toward the east end of the Southern Arm there is a tall section of 'Biscuit Work' consisting of squared Cowstones set horizontal in mortar with Portland Stone copings (**Plate 2**). Further to the west there is a second probable section of Biscuit Work (**Plate 3**). Between these two distinct sections is a curving section of Portland Ashlar dating to 1793-5 (**See Plate 1**).
- 5.2.2 The earliest phase of Cowstone built walling (16th century) would appear to have been originally built with a straighter north edge. Clearly visible at low tide is the upper face of a Cowstone foundation marked by a section of exposed Cowstones and a partly buried east-west line of stones (**Figure 1, Plate 4**). Although the beach deposits rise to the west and eventually bury the line of Cowstones, occasional stones are exposed suggesting that this alignment runs to the west to join with the line of Biscuit Work at the west end.
- 5.2.3 Due to the clear potential of damage to these remains trial pits 101 and 102A were moved further to the north to avoid the Cowstone foundation.

5.3 Trial Pits

Trial Pit 101

- 5.3.1 This trial pit was located on the north side of the Southern Arm and close to the level of low water (**Figure 1, Plate 5**). Machine excavated to a maximum depth of 1.80m below existing ground level. The pit measured 3.70m long and 1.40m wide (**Plate 6**). The deposits mapped here consisted of 0.40m of sand, cobbles and the occasional Cowstone boulder which had been displaced by the tide from the earlier foundation to the south. Below the beach deposits was a well-defined compact layer of brown/orange sand and gravel to a depth of 1.40m. This overlay distinctive well-defined black coloured gravelly sand to the base of the pit. No artefacts were recovered from this pit.

Trial Pit 102A

- 5.3.2 This trial pit was located approximately midway along the north face of the Southern Arm and within the section of Ashlar Portland Stone walling (**Figure 1, Plate 7**). Machine excavated to a maximum depth of 2.50m below existing ground level. The pit measured 4.20m long and 1.40m wide. The sand at the south end of the trench was carefully removed by machine and it became apparent that there was a strong possibility that there were surviving Cowstones from the 16th century foundation here so; the trench was extended further to the north in order to dig down the north side of the early foundation.
- 5.3.3 The deposits mapped here consisted of 0.20m of beach sand. Below this was a layer of black gravelly sand containing many cobbles to a depth of 0.80m. A deep layer of dark brown gravelly sand with many cobbles lay underneath the black sand and extended to the bottom of the trench (**Plate 8**). No artefacts were recovered from this pit.

Trial Pit 103

- 5.3.4 This trial pit was located at the western end of the north face of the Southern Arm (**Figure 1, Plate 9**). Machine excavated to a maximum depth of 1.90m below existing ground level. The pit measured 3.80m long and 1.50m wide. The south end of the pit was up against the north face of the Southern Arm wall in this location and approximately 1.0m below ground level a step was encountered. This extended approximately 1.90m from the face of the wall and may represent the earlier 16th century Cowstone foundation observed at the surface further to the east (**Plate 10**).
- 5.3.5 The deposits mapped here consisted of beach sand and gravel to a depth of 0.45m overlying black gravelly sand with cobbles to a depth of 1.60m. Below this a similar black layer of gravelly sand was recorded but the sand quantity increased and appeared to be finer.

Trial Pit 104

- 5.3.6 This trial pit was located on the south side of the High Wall and in the deep shingle of Monmouth Beach (**Figure 1, Plate 11**). Machine excavated to a maximum depth of 2.90m below the level of the beach. The pit measured 3.50m long and 1.50m wide. This pit was dug against the west side of the High Wall which is constructed from Ashlar Portland Roach Stone and built in 1825-6. The deposits mapped in this pit were entirely of layers of beach shingle and gravel. The upper layers, to a depth of 1.50m below existing ground level were made up of varying beach cobbles and sand. These were very loose causing the sides of the pit to collapse in. Below 1.50m the layers got progressively darker and more compact and stable. At approximately 2.10m below ground level the gravel turned very black to the base of the pit (**Plate 12**). No artefacts were recovered from this pit.

Trial Pit 105

- 5.3.7 This trial pit was located on the south side of the causeway and within the existing boat storing area to the east of the RNLi building (**Figure 1, Plate 13**). Machine excavated to a maximum depth of 1.80m below the existing ground level. This pit measured 3.50m long and 1.50m wide. The deposits mapped within this pit consisted mainly of 'made ground' of a mixture of sand, gravel and cobbles to the base of the pit.
- 5.3.8 A single block of Portland Stone was recovered close to the surface (**Plate 14**). The block measured 1.20m long 0.40m wide and 0.40m deep. On one surface, probably the original top, was a dovetail recess and two iron 'pins' or rods (**Plate 15**). The stone was definitely not in-situ and is thought to relate to one of the construction phases of the Cobb. It is possible that this stone is part of the late 18th century repairs. In his publication, Richard

Bull describes the repair of the Southern Arm in 1873. 'The Board of Ordnance adopted a much higher standard of repair using skins of massive ashlar blocks of Portland Roach Stone in regular courses. The blocks were un-mortared, tight fitting, oak-dovetailed and iron-cramped'. The ends of the two iron rods had been crudely cut and it is possible that they represent the remains of iron railings. The stone was re-buried within Trial Pit 105.

5.4 Hand-dug pits and Window sampling

5.4.1 The location of the window samples is shown on **Figure 1**. The draft results of all trail pits and window samples is shown in the appendix and discussed below. Hand-dug pits were all abandoned in favour of window samples due to water ingress and collapse.

Borehole/window sample WS102a

5.4.2 This window sample was located in the harbour base close to the west side of the Landing Quay (**Figure 1, Plate 16**). The initial hand dug pit (HP 102) was abandoned and two window samples taken

5.4.3 The subsequent window sample 102a was bored to a depth of 2.0m. The general deposit sequence consisted of 1.40m of soft dark brownish grey gravel and sandy silt. This overlay firm dark grey laminated sandy silt clay increasingly stiff with depth.

Borehole/window sample WS102b

5.4.4 Located in the harbour base close to WS102a and bored to a depth of 2.90m (**Figure 1**). The sequence of deposits consisted of loose gravels and sands to a depth of 1.40m overlying firm brownish grey gravelly sand to a depth of 2.30m. Below this was firm grey very clayey sand giving way to stiff dark grey very laminated sandy clay.

Borehole/window sample WS103b

5.4.5 Located in the beach close to the position of Trial Pit 103 on the north side of the Southern Arm (**Figure 1**). Bored to a maximum depth of 2.0m. The sequence of deposits consisted of 0.50m of greyish brown loose gravelly sand overlying medium dense grey clayey slightly gravelly sand.

Borehole/window sample WS104

5.4.6 Located in the beach close to Trial Pit 102 on the north side of the Southern Arm (**Figure 1**). Bored to a maximum depth of 2.0m. The sequence of deposits consisted of layers of greyish brown soft sand increasingly dark in colour with depth to 1.80m. Below this was stiff dark grey laminated slightly sandy clay.

Borehole/window sample WS105

5.4.7 Located in the harbour base, on the east side of the High Wall and close to the Gin Shop (**Figure 1, Plate 17**). Bored to a maximum depth of 1.0m. The deposits consisted of thin layers of dark brownish grey soft silt, dark grey soft silty sand and grey sand to a depth of 0.95m. This overlay stiff dark grey laminated sandy clay.

Borehole/window sample WS106

5.4.8 Located on the harbour base, on the east side of the High Wall and close to the Gin Shop (**Figure 1**). Initially bored to a maximum depth of 1.10m where it was terminated due to concerns about a possible service strike. The single deposit here consisted of loose grey sandy silt to the base of the borehole. The window sample was therefore moved and recut as WS106a.

Borehole/window sample WS106a

- 5.4.9 Location, see above. Bored to a maximum depth of 2.20m. The deposits consisted of 1.0m of loose light brownish sandy silt. This overlay thin bands of dark blackish grey clay, sandy clay and soft dark brown grey sandy clay to a depth of 1.80m. At the base of the borehole a deposit 0.40m deep of stiff dark grey laminated sandy silt was recorded.

Borehole/window sample WS107

- 5.4.10 Located in the harbour base, on the east side of the Causeway and the south side of the Slipway (**Figure 1, Plate 18**). Bored to a maximum depth of 1.50m. The deposits consisted of bands of greyish brown silty sand, loose dark brownish grey silty sand, dark grey sandy clay to a depth of 1.10m. This overlay firm dark grey laminated sandy clay becoming stiff and laminated with depth to base of borehole.

6 DISCUSSION

- 6.1.1 The monitoring of the geotechnical trial pits at the Cobb, although limited in scope, has highlighted the archaeological potential for significant archaeological remains. The history of the Cobb is well documented and very detailed, and we therefore have a good understanding of its development, including repairs from the 16th century onwards.
- 6.1.2 Given its location, it is no wonder that it has been repeatedly attacked and destroyed by severe storms for most of its recorded history. This has meant that there are many recorded references and physical evidence of the constant repair. This has taken place in stages and different sections of the Cobb have suffered at different times which have resulted in the present monument with its mixture of traditional stone building techniques and more military style to some parts.
- 6.1.3 The earliest surviving parts of the Cobb, described as 16th century, are constructed in a characteristic local style using locally sourced Cowstones. This was identified in-situ at the base of the north face of the Southern Arm and along the east face of the Landing Quay. It would appear that this early phase of construction along the north face of the Southern Arm formed a straighter edge, as a line of Cowstone boulders could be part traced under the beach sand. For some reason the later ashlar Portland stone build of 1793-5 has been laid in a curve. Excavation of the beach deposits within the Landing Quay beach area did not reveal any other archaeology.
- 6.1.4 The two machine excavated trial pits on the west side of the High Wall and Causeway revealed some evidence of buried archaeology. The trial pit dug against the west face of the High Wall exposed the lower courses of Portland Roach stone. However, the base of this wall was not seen and the shingle on Monmouth Beach has buried the lowest course for an unknown depth at this time.
- 6.1.5 The trial pit on the west side of the Causeway did reveal evidence of a discarded limestone block. It could be expected that, due to many repairs to the Cobb walling, that various stones were reused, discarded or used elsewhere from their original positions. So, any future excavations may find other historic stones.
- 6.1.6 In terms of geoarchaeology observations suggest that BGS mapping is accurate, with storm beach deposits (aka marine beach shingles) being found to overlie sedimentary mudstones. These deposits do not have intrinsic geoarchaeological potential.



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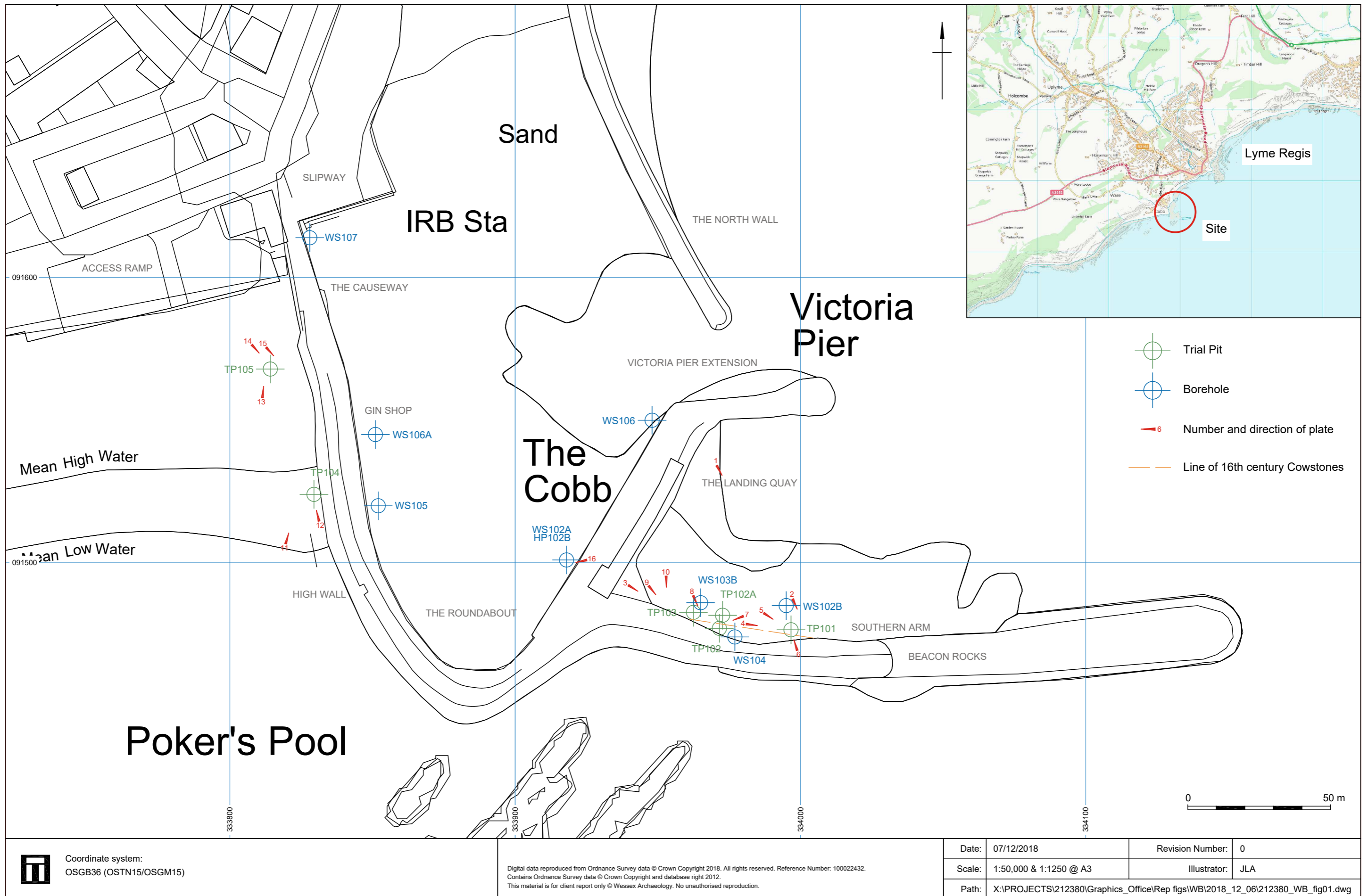
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Bull, Richard and Lyme Regis Museum 2015. *Lyme's Battle with the sea: Part 1: The Cobb Breakwater*.

Wessex Archaeology 2018. *The Cobb, Lyme Regis. Written Scheme of Investigation for archaeological and geoarchaeological monitoring of site investigation works*. Unpublished client report reference 212380.1.

Appendix

Geotechnical trial pit and window sample log sheets



Coordinate system:
OSGB36 (OSTN15/OSGM15)

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Path:	X:\PROJECTS\212380\Graphics_Office\Rep figs\WB\2018_12_06\212380_WB_fig01.dwg		

Site location, trial pit, hand-dug pit & borehole & photograph locations

Figure 1



Plate 1: Southern Arm, north side at low tide, showing various wall builds and Rockery.



Plate 2: Southern Arm, north face walling, 16th century vertical Cowstones at centre base, 1860's squared Biscuit Work to left, and 1890's Ashlar Portland Stone to right.


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	Scale:	Not to scale	Illustrator:	JLA
	Path:	X:\PROJECTS\212380\Graphics_Office\Rep figs\WB\2018_12_06\212380_WB_plates.ai		



Plate 3: Southern Arm, west end, 1860's Biscuit Work below contractors.



Plate 4: 16th century Cowstone foundation on earlier alignment, with later curving Ashlar Portland Stone above.


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Plate 5: Location of Trial Pit 101.



Plate 6: Excavation of Trial Pit 101.



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Plate 7: Location of Trial Pit 102A.



Plate 8: Excavation of Trial Pit 102A.

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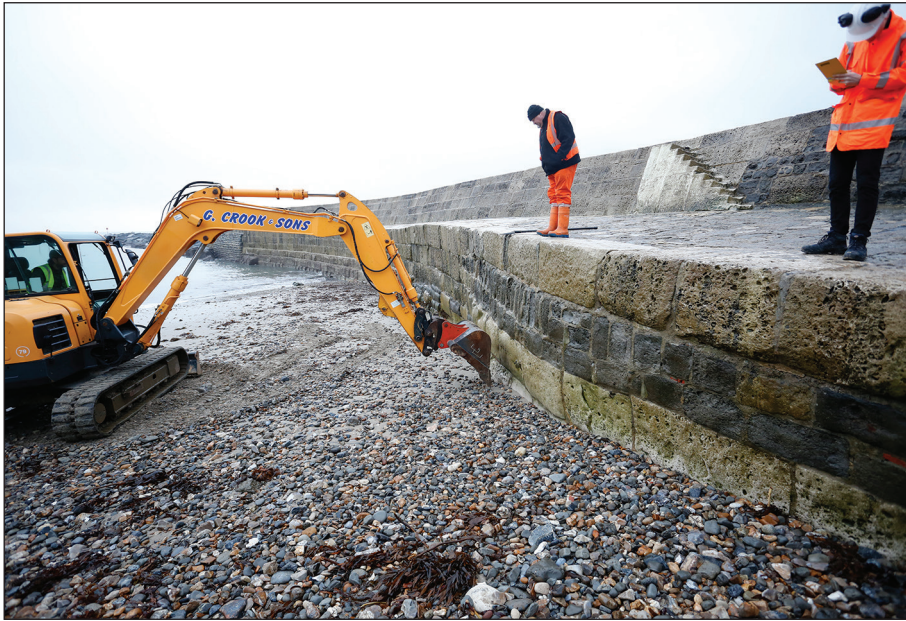


Plate 9: Location of Trial Pit 103.



Plate 10: Excavation of Trial Pit 103.t


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Plate 11: Location of Trial Pit 104.



Plate 12: Excavation of Trial Pit 104.


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	Scale:	Not to scale	Illustrator:	JLA
	Path:	X:\PROJECTS\212380\Graphics_Office\Rep figs\WB\2018_12_06\212380_WB_plates.ai		



Plate 13: Location of Trial Pit 105.



Plate 14: Limestone block from upper layers of Trial Pit 105.


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	Scale:	Not to scale	Illustrator:	JLA
	Path:	X:\PROJECTS\212380\Graphics_Office\Rep figs\WB\2018_12_06\212380_WB_plates.ai		



Plate 15: Detail of limestone block from Trial Pit 105.



Plate 16: Hand-digging HP102a.



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	Scale:	Not to scale	Illustrator:	JLA
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Plate 17: Window sample 105, percussive technique.



Plate 18: Window sample 107, percussive technique.

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	Date:	07/12/2018	Revision Number:	0
	Scale:	Not to scale	Illustrator:	JLA
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Trial Pit Log

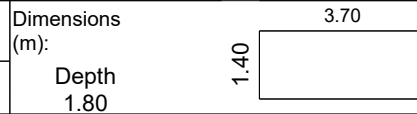
Project Name: The Cobb, Lyme Regis

Project No.
YE6285

Co-ords: 333996.69 - 91476.51
Level: -0.41

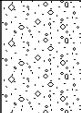
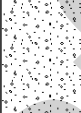
Date
06/11/2018

Location: Lyme Regis



Scale
1:25
Logged

Client: WDDC

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	D		0.40	-0.81		Dark brown very cobbly gravelly SAND. Cobble is fine to medium, sub-rounded of limestone and sandstone. Gravel is medium to coarse, sub-angular to sub-rounded of flint, mudstone and mixed lithology. Sand is medium to coarse.
	0.70	D					Orange brown cobbly sandy GRAVEL. Cobble is medium. Gravel is fine to coarse, sub-angular to sub-rounded of limestone, mudstone and mixed lithology. Sand is coarse.
	1.50	D		1.40	-1.81		Black gravelly SAND. Gravel is angular to sub-angular, of limestone and mudstone. Sand is medium to coarse.
				1.80	-2.21		End of Pit at 1.80m

Remarks:

Trial Pit Log

Project Name: The Cobb, Lyme Regis

Project No.
YE6285

Co-ords: 333971.59 - 91477.02
Level:



Date
06/11/2018

Location: Lyme Regis

Dimensions (m): 3.96
0.45
 Depth
0.40

Scale
1:25
Logged

Client: WDDC


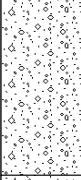
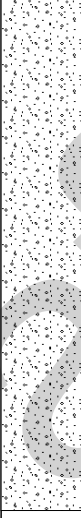
Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.20			Brown gravelly SAND. Gravel is medium to coarse, sub-angular to sub-rounded of flint, mudstone and mixed lithologies. Sand is medium to coarse.
				0.40			Black gravelly slightly cobbly SAND. Cobble is fine to medium, sub-rounded to sub-angular. Gravel is fine to coarse, sub-rounded to sub-angular, of flint and mudstone. Sand is medium to coarse.
End of Pit at 0.40m							

Remarks: Relict foundation of old harbour discovered, position of trial pit stepped back to 102A.

Trial Pit Log

Project Name: The Cobb, Lyme Regis	Project No. YE6285	Co-ords: 333972.70 - 91481.60 Level: 0.72	Date 06/11/2018
------------------------------------	--------------------	--	--------------------

Location: Lyme Regis	Dimensions (m): 1.40 x 4.20	Scale 1:25
Client: WDDC	Depth 2.50	Logged

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.15	D		0.20	0.52		Brown gravelly SAND. Gravel is medium to coarse, sub-angular to sub-rounded of flint, mudstone and mixed lithology. Sand is medium to coarse.
	0.60 0.60	B D		0.80	-0.08		
	1.30 1.30	B D		2.50	-1.78		Dark brownish grey gravelly SAND with occasional cobbles. Cobble is medium of limestone and mudstone. Gravel is fine to coarse, angular to sub-rounded of limestone and mudstone. Sand is medium to coarse. Hard rock noted at bottom of pit.
End of Pit at 2.50m							

Remarks:

Trial Pit Log


Project Name: The Cobb, Lyme Regis

Project No.
YE6285

Co-ords: 333962.50 - 91482.64
Level: 1.33

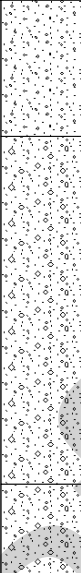
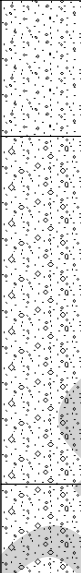
Date
06/11/2018

Location: Lyme Regis

Dimensions (m): 3.80

 Depth 1.90

Scale
1:25
Logged

Client: WDDC

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
	0.20	D					Soft brown gravelly SAND. Gravel is medium to coarse, sub-rounded to rounded.
	0.45	B		0.45	0.88		Black slightly cobbly slightly silty gravelly SAND. Cobble is medium, sub-rounded to rounded. Gravel is fine to coarse, sub-angular to sub-rounded. Sand is medium to coarse.
	0.70	B					
	1.60	D		1.60	-0.27		Black slightly cobbly slightly silty gravelly SAND. Cobble is medium, sub-rounded to rounded. Gravel is fine to coarse, sub-angular to sub-rounded. Sand is medium to coarse.
				1.90	-0.57		End of Pit at 1.90m

Remarks: Foundation discovered at 450mm and second ledge at 650mm , position of trial pit stepped back. Trial pit collapsing at 1.60m to 1.60mbgl.

Trial Pit Log

Project Name: The Cobb, Lyme Regis	Project No. YE6285	Co-ords: 333829.47 - 91524.01 Level: 0.87	Date 05/11/2018
Location: Lyme Regis		Dimensions (m): 1.50 x 3.50	Scale 1:25
Client: WDDC		Depth 2.90	Logged

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.50	0.37		Slightly cobbly slightly sandy GRAVEL. Cobble is fine, sub-angular to rounded. Gravel is fine to medium, sub-rounded to rounded of flint, mudstone and sandstone.
				0.80 0.85	0.07 0.02		Brownish grey brown sand. Sand is medium to coarse.
	0.90	D					Sandy slightly cobbly GRAVEL. Cobbly is fine to coarse, gravel is medium to coarse, sub-angular to sub-rounded. Greyish brown cobbly gravelly SAND, gravel is medium to coarse, angular to sub-angular. Sand is coarse.
	1.70	D		1.50	-0.63		Dark grey very gravelly SAND. Gravel is fine to coarse, angular to sub-rounded of flint. Sand is medium to coarse.
	2.40	D		2.10	-1.23		Dark blackish grey sandy GRAVEL of black flint. Sand is medium to coarse. Gravel is fine to coarse, angular to sub-angular. Grainsize of gravel increases with depth.
	2.90	B		2.90	-2.03		End of Pit at 2.90m

Remarks: Foundation base not found.

Trial Pit Log


Project Name: The Cobb, Lyme Regis

Project No.
YE6285

Co-ords: 333814.16 - 91567.96
Level: 5.26



Date
05/11/2018

Location: Lyme Regis

Dimensions (m): 3.50

 Depth 1.80

Scale
1:25
Logged

Client: WDDC

Water Strike	Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
	Depth	Type	Results				
				0.20	5.06		Made Ground: Reddish brown slightly cobbly very gravelly SAND. Gravel is fine to coarse, angular to sub-rounded of concrete, tarmacadam, sandstone and mixed lithologies. Sand is medium to coarse.
	0.35	D					Brown gravelly SAND. Gravel is fine to medium, sub-angular to sub-rounded of flint, sandstone and mudstone. Sand is fine to medium
	0.50	D					
	1.20	B					
				1.80	3.46		End of Pit at 1.80m

Remarks:

Borehole Log

Project Name: The Cobb, Lyme Regis

Project No.
YE6285

Co-ords: 333918E - 91501N

Hole Type
WS

Location: Lyme Regis

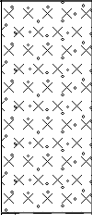
Level: -0.68 m AOD

Scale
1:50

Client: WDDC

Dates: 06/11/2018

Logged By
CS

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description					
		Depth (m)	Type	Results									
		0.50	D	50 (13,12/50 for 105mm)	1.40	-2.08		Soft dark brownish grey gravelly slightly sandy SILT. Gravel is fine to medium, angular to sub-rounded of flint and chert. Sand is fine to medium.	1				
		1.00 1.00	D C										
		2.00	B						2.00				2
								Firm dark grey firm laminated slightly sandy silty CLAY, increasingly stiff with depth. Sand is fine to medium.					
								End of Borehole at 2.00m					
									3				
									4				
									5				
									6				
									7				
									8				
									9				
									10				

Remarks

Hand pit with window sample follow on.



Borehole Log

Borehole No.

WS102B

Sheet 1 of 1

Project Name: The Cobb, Lyme Regis

Project No.
YE6285

Co-ords: 333995E - 91485N

Hole Type
WS

Location: Lyme Regis

Level: -0.51 m AOD

Scale
1:50

Client: WDDC

Dates: 07/11/2018

Logged By
CS

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.10			0.10	-0.51 -0.61		Brown loose gravelly slightly silty SAND. Gravel is fine, angular to sub-rounded of flint, chert, sandstone, mudstone and mixed lithologies.	
		0.50	D					Dark grey loose gravelly SAND. Gravel is medium and coarse, sub-angular to rounded of mixed lithologies. Sand is medium to coarse.	1
		1.00	C	N=4 (1,2/1,1,1,1)					
		1.50	D		1.40	-1.91		Firm brownish grey gravelly SAND. Gravel is medium to coarse, sub-rounded of flint, chert, sandstone, mudstone and mixed lithologies. Sand is medium to coarse.	2
		2.00	D						
		2.00	C	N=44 (6,6/8,11,12,13)					
		2.30			2.30	-2.81		Firm grey very clayey SAND with occasional gravel. Gravel is fine to medium, sub-angular of flint. Sand is medium to coarse.	
		2.60			2.60	-3.11		Stiff dark grey very laminated slightly sandy CLAY. Sand is fine.	
		2.90	B		2.90				3
		2.90	C	50 (25 for 75mm/50 for 200mm)					
		3.00	D					End of Borehole at 2.90m	

Remarks



Borehole Log

Project Name: The Cobb, Lyme Regis

Project No.
YE6285

Co-ords: 333965E - 91486N

Hole Type
WS

Location: Lyme Regis


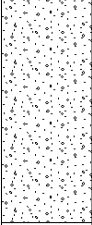
Level: 1.11 m AOD

Scale
1:50

Client: WDDC

Dates: 06/11/2018

Logged By
CS

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.50	D	N=43 (3,4/8,11,12,12)	0.50	1.11		Greyish brown loose gravelly SAND. Gravel is medium to coarse, sub-rounded of flint, chert, sandstone, mudstone and mixed lithologies. Sand is medium to coarse.	1
		1.00 1.20	C D		0.61				
		2.00	B		2.00			End of Borehole at 2.00m	2
									3
									4
									5
									6
									7
									8
									9
									10

Draft

Remarks



Borehole Log

Project Name: The Cobb, Lyme Regis

Project No.
YE6285

Co-ords: 333977E - 91474N

Hole Type
WS

Location: Lyme Regis

Level: 0.42 m AOD

Scale
1:50

Client: WDDC

Dates: 07/11/2018

Logged By
CS

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.42		Light greyish brown soft SAND. Sand is fine to medium.		
		0.70	B	N=28 (4,7/8,7,7,6)	0.50		Greyish brown soft slightly silty SAND. Sand is fine to medium. Increasingly dark with depth.	1	
		1.00	C		1.30				
		1.30	D		1.80		Grey soft SAND. Sand is fine to medium. Slightly clayey between 1.5m to 1.8m. <i>Organic dark red brown decomposed wood.</i>		
		2.00	B	50 (11,14/50 for 200mm)	2.00		Stiff dark grey laminated slightly sandy CLAY. Sand is fine.	2	
		2.00	C				End of Borehole at 2.00m		
								3	
								4	
								5	
								6	
								7	
								8	
								9	
								10	

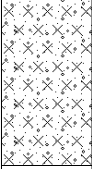
Remarks

Hand pit with window sample follow on.



Borehole Log

Project Name: The Cobb, Lyme Regis	Project No. YE6285	Co-ords: 333948E - 91550N	Hole Type WS
Location: Lyme Regis		Level: -0.47 m AOD	Scale 1:50
Client: WDDC		Dates: 07/11/2018	Logged By CS

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.50			1.10	-0.47		Loose light brownish grey sandy slightly gravelly SILT. Gravel is fine to medium, sub-angular to sub-rounded of mudstone and chert.	1
								End of Borehole at 1.10m	2
									3
									4
									5
									6
									7
									8
									9
									10

Draft

Remarks
 Hand pit with window sample follow on. Possible service at 1.1m, assessed from driller's note of bouncing drill, and bubbling water inflow filling the hole to 0.4mbgl. Following assessment from the harbour master and site engineer, damage was deemed non-significant and the hole is back-filled.



Borehole Log

Project Name: The Cobb, Lyme Regis

Project No.
YE6285

Co-ords: 333851E - 91545N

Hole Type
WS

Location: Lyme Regis

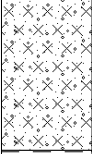





Level: -0.46 m AOD

Scale
1:50

Client: WDDC

Dates: 07/11/2018

Logged By
CS

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.50	D			-0.46		Loose light brownish grey sandy slightly gravelly SILT. Gravel is fine to medium, sub-angular to sub-rounded of mudstone and chert.	
		1.00	C	N=28 (5,4/6,6,6,10)	1.00	-1.46		Soft dark blackish grey CLAY.	1
		1.10	B		1.20	-1.66			
		1.50	D		1.40	-1.86		Soft dark grey slightly gravelly sandy CLAY. Gravel is fine, sub-angular to sub-rounded of flint and mixed lithologies.	
					1.80	-2.26		Soft dark brownish grey sandy CLAY. Sand is fine to medium.	
		2.00	C	N=50 (4,9/50 for 235mm)	2.20			Stiff dark grey laminated slightly sandy CLAY. Sand is fine.	2
								End of Borehole at 2.20m	
									3
									4
									5
									6
									7
									8
									9
									10

Remarks

Hand pit with window sample follow on.



Borehole Log

Borehole No.

WS107

Sheet 1 of 1

Project Name: The Cobb, Lyme Regis

Project No.
YE6285

Co-ords: 333828E - 91614N

Hole Type
WS

Location: Lyme Regis

Level: 0.56 m AOD

Scale
1:50

Client: WDDC

Dates: 06/11/2018

Logged By
CS

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.56		Loose greyish brown gravelly slightly silty SAND.	
					0.20		Gravel is fine to medium, sub-rounded to sub-angular of flint and sandstone. Sand is fine to medium.	
					0.30		Loose dark brownish grey silty SAND. Sand is medium to coarse.	
		0.60	D					
					0.85	-0.28	Loose greyish brown gravelly slightly silty SAND. Gravel is fine to medium, sub-rounded to sub-angular of flint and sandstone. Sand is fine to medium.	
		1.00	C	N=12 (1,0/0,2,3,7)				
					1.10	-0.54	Loose dark grey slightly sandy CLAY. Sand is fine to medium.	
					1.50		Firm dark grey laminated slightly sandy CLAY, becoming stiff and laminated with depth. Sand is fine.	
		1.50	B	50 (25 for 145mm/50 for 175mm)			End of Borehole at 1.50m	
		1.50	C					

Remarks
Hand pit with window sample follow on.





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