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HOLYHEAD BREAKWATER

Level 4 Building Record

Ymddiriedolaeth Archaeolegol Gwynedd
Gwynedd Archaeological Trust

HOLYHEAD BREAKWATER

Level 4 Building Record

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Front cover image: View of Holyhead Breakwater from the west showing a ferry passing beyond the lighthouse (Archive Image: G2498_020)

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1 SUMMARY

Gwynedd Archaeological Trust was commissioned by Royal HaskoningDHV to carry out a historic building appraisal and record of Holyhead Breakwater, Ynys Môn. Holyhead Breakwater comprises a 2.4km long stone-built structure designed to provide maritime shelter at the Port of Holyhead, as well as protection from coastal erosion.

The breakwater was built between 1848 and 1873 and is a Grade II listed structure. In addition to the pier, which forms the main structure, the breakwater also includes a pier end three-storey lighthouse, built in 1873, a large stone quay from which the breakwater extends, built in 1847, and a late 19th century small stone building located at the end of the quay.*

The Level 4 building record provides a comprehensive analytical record and draws on the full range of primary and secondary sources of information about the breakwater and discusses its significance in terms of architectural, social, national and economic history. In particular, this includes its relationship with similar 19th century breakwaters and the impact on Holyhead socially and economically during construction and use.

The construction of the Holyhead Breakwater reflects governmental interest in the question of harbours of refuge, reflected in the work of a Royal Commission which in 1847 discussed the need for a harbour of refuge at Holyhead to protect shipping on its way to or from Liverpool as well as the safeguarding of the Holyhead packet boats, similar to that employed at Portland for Channel shipping. The Breakwater was also of international significance as technology and equipment were exported to overseas breakwater developments, including the breakwater at Ponta Delgada in the Azores.

The building of the breakwater had a great effect on the town itself. The population increased from 3,869 in 1841 to 8,863 in 1851. The larger population was particularly drawn to Holyhead after 1845 when preparatory work was started on the Great Breakwater. There was also much other work available from a host of employers,

which resulted in a move from rural Anglesey as men left farms and smaller communities for Holyhead with its offer of more profitable work.

The effect of these developments was, however, to result in the port becoming something of a 'through port' moving goods and people from England to Ireland, with more limited benefit for the town of Holyhead itself. The port and railway did however continue to provide significant employment in the town.

2 INTRODUCTION

Gwynedd Archaeological Trust (GAT) was commissioned by by *Royal HaskoningDHV* to prepare a historic building appraisal and record of Holyhead Breakwater, Ynys Môn (Primary Reference Number (PRN) 11821; NGR SH24008420; Figure 01). Holyhead Breakwater comprises a 2.4km long stone-built structure designed to provide maritime shelter at the Port of Holyhead/Holyhead, as well as provide protection from coastal erosion. The breakwater was built between 1848 and 1873 and is a Grade II* listed structure (ref. 5743). In addition to the pier, which forms the main structure, the breakwater also includes a pier end three-storey lighthouse (PRN 11822; NGR SH2567484751), built in 1873, a large stone quay from which the breakwater extends, built in 1847 (PRN 34000; SH23818388), and a late 19th century small stone building located at the end of the quay (PRN 34025; NGR SH23868389).

The historic building appraisal and record has been completed as part of a project appraisal report (PAR) for a flood risk management appraisal in line with Flood and Coastal Erosion Risk Management – Appraisal Guidance (FCERM-AG), which will appraise a range of options.

The historic building appraisal and record has been completed in accordance with the following guidance:

- Conservation Principles (Cadw, 2011);
- Guide to the conservation of historic buildings, BS7913:2013;
- Guidelines for digital archives Royal Commission on Ancient and Historic Monuments of Wales, 2015;
- Management of Archaeological Projects (English Heritage, 1991);
- Management of Research Projects in the Historic Environment: The MoRPHE Project Managers' Guide (Historic England, 2015);
- Standard and guidance for the archaeological investigation and recording of standing buildings and structures (Chartered Institute for Archaeologists, 2014); and

- Understanding Historic Buildings: A guide to good recording practice (Historic England, 2016).

The following sources of information have also been consulted as part of the record (as identified in the *Scope Holyhead Breakwater Project Appraisal Report*):

- Holyhead Breakwater Environmental Scoping Report, Black & Veatch Ltd., 2009;
- Outline design drawings and indicative landscape plan; Black & Veatch/Stena, 2009;
- Engineering report, Black & Veatch Ltd, 2009;
- High resolution aerial photographic survey undertaken on 28th September 2015 (1109 images), capable of being post-processed to provide a dense point cloud of the breakwater along with 3d mesh in AutoCAD format.

A copy of the draft report must be approved by Gwynedd Archaeological Planning Services (GAPS) and the Isle of Anglesey County Council (IOACC) Senior Planning and Conservation Officer prior to final issue.

3 AIMS AND PURPOSE

3.1 Level 4 Building Recording

This historic building appraisal and record has been completed in accordance with a Level 4 building record as described in *Understanding Historic Buildings: A guide to good recording practice* (Historic England, 2016).

Level 4 recording provides a comprehensive analytical record and draws on the full range of primary and secondary sources of information about the breakwater and discusses its significance in terms of architectural, social, national and economic history. In particular, this includes its relationship with similar 19th century breakwaters and the impact on Holyhead socially and economically during its construction and use.

The Level 4 record was completed using a combination of a photographic record, a drawn record and an analytical record.

4 SPECIFICATION, METHODS AND TECHNIQUES

4.1 Photographic Record

A photographic record of the breakwater was completed by *Civil Engineering Solutions* undertaken on 28th September 2015. A total of 1109 high resolution aerial photographic images were taken during the survey; the location of each image is detailed on *Civil Engineering Solutions* drawings CES391-1 to CES391-7. These images have been used by GAT as the core photographic record for the Level 4, as they include images in plan and elevation of the entire structure, including views that would not be possible from a landward record. Selected images have been used to illustrate the structural appearance, function and phasing of the breakwater, including any industrial remains. GAT has also prepared general views of the breakwater in its wider setting and landscape (GAT ref.: G2489_001 to G2489_060).

4.2 Drawn Record

The drawn record does not include additional plans and elevations prepared on site by GAT. The drawn record includes:

- A site plan based on the 1:10000 Ordnance Survey County Series locating the breakwater within the regional landscape;
- Reproduction of contemporary drawings that illustrate the construction and use of the breakwater;
- Reproduction of historic maps that illustrate the construction and use of the breakwater.

A list of primary and secondary illustrative source materials are included in the bibliography (see Section 10 below).

4.3 Analytical Record

The analytical record includes a detailed examination of available primary and secondary sources. Information was sourced from the following:

1. The regional Historic Environment Record (HER, Gwynedd Archaeological Trust, Craig Beuno, Garth Road, Bangor, Gwynedd LL57 2RT) was examined for information concerning the breakwater and a 100m area. This included an examination of the core HER, the 1:2500 County Series Ordnance Survey maps and any secondary information held;
2. Archive data and historic maps were consulted in the regional archives at Llangefni (Anglesey Archives, Industrial Estate Rd, Llangefni LL77 7JH) and at the Bangor University Department of Manuscripts (Bangor University, Bangor, Gwynedd LL57 2DG);
3. The National Monuments Record (NMR RCAHMW, National Monuments Record of Wales, Plas Crug, Aberystwyth SY23 1NJ) was checked for sites additional to those recorded in the HER.
4. On-line catalogue search of the National Library of Wales;
5. The National Archives (Kew, Richmond, Surrey TW9 4DU) was examined for primary sources.
6. The Welsh Newspapers Online portal curated by The National Library of Wales (http://www.llgc.org.uk/index.php?id=4723) was examined for contemporary newspaper articles.

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5 ARCHIVING

Upon final approval, a final copy of this report will be sent to the client and Gwynedd Archaeological Planning Services. It will also be sent to the Historic Environment Record located at the Gwynedd Archaeological Trust. Submission of digital information to the Royal Commission on the Ancient and Historical Monuments of Wales will be undertaken in accordance with the RCAHMW Guidelines for Digital Archives Version 1 (2015). Digital information will include the photographic archive and associated metadata.

6 RESULTS

6.1 Introduction

The Great Breakwater at Holyhead Harbour, constructed between 1847 and 1873 was a major engineering project, involving up to 1,300 workers at the height of its construction, along with many other workers in ancillary trades. The construction was also an element of wider developments and expansion at the port, along with the arrival of the railways at Holyhead. The broader history of the development of the port has been widely recorded, for example by Richard Scott Jones' *Holyhead Waterfront, Holyhead, Anglesey. Archaeology and Cultural Heritage Desk Based Assessment* (2010) and the *Holyhead Harbour Conservation Plan* (2003) produced by Donald Insall Associates, which includes a detailed chronology. Further published sources also give a historical overview of the development of the breakwater and the associated quarry, including Owens (1987) and Hughes and Williams (1981).

This report therefore concentrates on the social, national and economic history, architecture, development and significance of the Great Breakwater itself, with some contextualisation to help to explain its wider significance.

6.2 Historical Development of the Breakwater

Following the shift in marine transport from sail to steam ships operating between Holyhead and Ireland, which began in the 1820s, the existing pier had become over used, and it was also exposed in bad weather. As a result, plans for a new harbour and port were drawn up, including the construction of a Great Breakwater. The contract for the work was signed by Messrs J. and C. Rigby and others with the Lords of the Admiralty on 2nd February 1848 (National Archives, RAIL 837/2).

The engineer in charge of planning the developments was James Meadows Rendel. His proposals included the building of a new harbour, to be created by a long north breakwater leaving the shore at Soldiers Point, west of Salt Island, and an east breakwater running off the north end of Salt Island (National Archives, RAIL 837/81; Figure 02). A new pier for the railway and steam packets was to be built, and the railway was to run in a tunnel under Holyhead to emerge by the new pier. The first year of work involved laying down a seven foot gauge tramway from the proposed

quarries to the south-west to the start of the north breakwater, and along the shore to Salt Island to service the east breakwater. Small branch lines were constructed for the proposed railway pier, also linking a creosote works and sawmill. Work commenced on the north and east breakwater, however the latter was stopped because of dangerous working conditions, with the intention of continuing it when the north breakwater was long enough to offer protection. It was never restarted, and the railway pier was also never built when the Chester and Holyhead railway decided to withdraw from the arrangement. The north breakwater, however, was continued, and in view of the large number of vessels requiring refuge within it, was subsequently extended on two occasions.

The initial design of the breakwater was an 'L' shape with the shorter length attached to the land before turning east, measuring 5,100 feet long, from Soldier's Point to terminate at the Platter's Buoy, and a 2,100 foot pier from Salt Island, enclosing an area of 316 acres, three quarters of a mile long, at an estimated cost of £700,000. Two contracts were initially let to Messrs Rigby (National Archives, RAIL 837/2 and 837/4), the first took care of the preliminary works and consisted of walling around Soldier's Point and establishing the tramways between the quarry site, the north breakwater and the east breakwater on Salt Island. The second contract was for the construction of the two breakwaters and steam packet pier, which began in January 1848, with approximately 1,300 men employed on the project. Initially the works were described as 'getting on very slow' in a letter of February of that year, but the pace of work soon picked up (Anglesey Archives, WDAX/21). The north breakwater was designed to be formed 150 feet wide at low water. The building of the breakwater and the quarry works is described in detail in Edwin Owens *The Holyhead Breakwater and Quarries* (1987).

The work was hazardous, and more than 40 men died between 1849 and 1852 (Jones 2010, 33). The timber staging was constructed 150ft wide, on which ran five separate rail lines 20ft above high water. Some 250 waggons were employed, tipping an average of 4,000 tons of stone a day. Locomotives were used on the staging, though horses were used on the line to and from the quarry (Hayter 1876). Hayter describes in depth the technical details of the waggons and locomotives used and the details of their operation.

In February 1854 Commander Skinner, the harbourmaster, wrote to the Lords of the Admiralty urging them to consider enlarging the harbour. It was decided that the proposed entrance to the harbour, and the requirement for anchorage space, was too small for the safety of the sailing ships, which were the majority of the ships using the harbour. The proposed east breakwater and packet pier, shown on the 1852 plan, were abandoned (Figure 02). The north breakwater was extended by 2,500ft, with a dramatic turning north-east, making the breakwater one and a half miles long, at that time the longest in Europe, and giving the harbour three times the area and much deeper water. It is this change of plan that gave the breakwater its unique, peculiar and distinctive shape.

The decision to lengthen the initial structure by some 2,000ft, led Rendel to turn the breakwater back to the north, creating a 'z' shape, and a total length of 7,860ft thus making it the largest breakwater in Britain. James Rendel died on 21st November 1856, and his role as chief engineer was taken by John Hawkshaw. However the resident engineer was George Dobson, who was a brother-in-law to Rendel. In 1857 the breakwater was extended by a further 500ft by Messrs Rigby, using the same method as agreed in the initial build, for which the contractor was paid 2s 7d for every ton of stone deposited, an improvement on the previous 2s 4d a ton (National Archives, RAIL 837/10). In 1851, by which time 626,000 tons of stone had been deposited in the sea, 182 vessels took shelter in the harbour. By 1854 1,801 vessels were making use of the new harbour and in 1876 it was noted that an average of 3,500 vessels per annum used the new harbour and facilities (Owens 1987, 13 and 29).

The rubble used to form the foundations of the breakwater came from the northern side of Holyhead Mountain. The methodology employed in the rubble quarrying is described in detail by Harrison Hayter in 1876, but involved the improvement over time in blasting technique and consequently the volume of stone that could be quarried at any one time. Occasionally blasts were unsuccessful, and on July 2nd 1852 a blast caused the windows of the harbourmasters house to be blown out (Anglesey Archives, WM/18). Rubble quarrying reached a peak when 100,000 tons was removed in a single blast (Anglesey Archives, WDD/1731). This incident is described in detail (with a slightly lower estimate as to the volume of rock dislodged) by R.T. Williams, an eye-witness to the event, '*on 6th September 1854, 6,000lbs of*

explosive brought down 40,000 tons of rock, and on Friday 16th January 1857 the most tremendous explosion of all took place when 16,000lbs of explosive removed 90,000 tons of rock' (Hughes and Williams 1981, 89).

The stone was deposited on the rubble breakwater core from waggons running over a temporary wooden staging (Hayter 1876, 105-106). The railway system employed was completely isolated and was laid to the broad 7ft gauge. This ensured stability in operation on a very exposed and windswept site, and was used on a number of other locomotive-worked breakwater and harbour railways, such as Portland in Dorset (Neale 1997, 20).

The original specification for the works states that '*the stone is to be deposited in the works in layers of from 15 to 20 feet in thickness from wooden stages with railways laid upon them from which the waggons are to be emptied. In the lower layers of the work the stone which arises in opening the quarries on the mountain is to be used. In the succeeding layers the proportion of large stone must be increased, so that the top or upper layer shall have the largest proportion of large stone. But in each of the layers a proper proportion of small stone shall be deposited to insure the solidity of the whole mass, and the better to secure that important object, the quarries shall be kept clear by conveying to the work, day by day and in the same waggon, the various sized materials as they arise in the process of quarrying'* (National Archives, RAIL 837/4).

The staging for the breakwater was intended solely as a scaffolding for the work. Upon every fourth pile a cast iron bollard for ships mooring against the scaffold. During the process of forming the rubble core mound, '*the staging at the end of the work was frequently washed away by gales before it was well surrounded; but it was considered by the contractors better to adopt the staging described than to be at the cost of one of a more permanent and expensive character, especially as the timber removed during gales could, as a rule, be recovered'* (Hughes and Williams 1981, 106). A violent storm in 1856 caused £8,000 worth of damage to the staging. Timber was ripped off the structure and driven up on the Newry Beach. The contractors had vessels on site which collected the timber and it was re-used in the staging. The superstructure on the seaward side of the breakwater was constructed principally of

massive quartz-rock stone blocks from the Holyhead Mountain quarries (Figure 04-05, Plate 30).

Laying the foundations was the most difficult and dangerous part of the work, which was frequently hindered by storms, and it is recorded that 20 workmen lost their lives between 1849 and 1852. The depth of the water was in places 55ft, and the rubble mound, 250ft to 400ft wide at the base had to be continually reinforced owing to storm damage (Lane 1989, 53). In total it has been estimated that 7,000,000 tons of stone was laid in the construction of the breakwater (Hayter 1876, 105). A solid wall of stone was laid on top of the foundation, 39 ft high, of two decks, with a rail track laid on the lower, and a parapet on the seaward side.

The huge limestone blocks used for the plinths, cornices, parapets, paving, copings and other ashlar of the breakwater were of limestone and were brought from Moelfre on the east side of Anglesey by sailing boat. These were set in lime mortar (Figure 04). The specification stated that ‘ *the heads of the breakwaters are to be brought up with block work to the level of low water spring tides by the aid of diving bells. The bell work for the head of the North Breakwater to commence by levelling the rubble stone deposits to receive the square blocks at a level of 30 feet below low water spring tides. This levelling to be done by the deposit of a greater proportion of small stone which will readily admit of a bed being made fit for the reception of the first course of blockwork* (National Archives, RAIL 837/4). The rear of the ashlar blocks was to be left rough to make a good bond with the rubble core.

Some underwater walling was in sandstone brought from Runcorn in Cheshire (Davidson, *forthcoming*, Hayter 1876). A drawing of a section through the breakwater created after the completion of the works shows the relationship between the stone foundations, rubble core and superstructure (Figure 05).

The Breakwater Quarry (PRN 7165) is more than 500 feet wide all along its length, and in some parts very deep. Such was the demand for stone that during its operation huge blasting operations were carried out on a daily basis, sometimes up to three times a day (Lane 1989, 52). Following the completion of the breakwater in 1876, the quarry at Holyhead Mountain was leased to William Wild, who established a brickworks at the quarry. The Moelfre Quarry, used for the ashlar masonry was known as Jersey Quarry.

The lighthouse at the end of the breakwater was built between 1845 and 1873 and probably designed by John Hawkshaw, the Superintendent Engineer of the harbour works from 1857 to 1873. This three storied lighthouse has chamfered angles and a stepped plinth set on an oval platform on the breakwater, and has a roll-moulded string course projecting above the first floor level and is 22ft 3in square. A moulded cornice supports a walkway around the circular lantern (Denton and Leach 2011, 78-79). The lighthouse is designated a Grade II Listed Building.

The breakwater work was completed in 1873, at a cost of £1,285,000 (Hollands 1973; Haslam *et al.* 2009; Figure 03) and the Prince of Wales performed the opening ceremonies. A watercolour painted by G.H. Andrews conveys the scene at the time (Figure 06). An inscribed plaque on the wall of the lighthouse reads:

"*This Breakwater was commenced in 1845, and on August 19th, 1873,*

Albert Edward, Prince of Wales, declared the work to be complete.

Superintendent Engineers – James Meadows Rendel, 1845-56

John Hawkshaw 1851-73 G.C. Dobson, Resident Engineer.

J. & E. Rigby, Contractors."

The Great Breakwater today is regarded as the finest breakwater in the British Isles and is a Grade II* Listed Building (Figures 01 to 08).

6.2.1 Development and Modifications to the Breakwater

Work on the breakwater has been continuous since it was opened, with repairs frequently required due to damage caused by the gales that hit the coastline during winter (Plate 28). In 1878 William Williams, contractors of Holyhead, were paid £1,100 by the Treasury for repairing the foundations, and further huge amounts of rubble were deposited in 1880, 1886, 1887, 1889-1890 (National Archives, RAIL 837/23) and 1904 (National Archives, RAIL 837/30; Figure 07). In 1911 and 1913 S. Pearson and Sons, contractors of Westminster added 267,000 tons to the foundations from the quarry, and in 1914, 24 steel cases filled with concrete were placed around the north-east end of the breakwater, which remain clearly visible today (National Archives, RAIL 837/32, Figure 08; Plate 12). A 'Breakwater Gang'

who carried out continuous maintenance to the breakwater was maintained up to and including the time that British Rail owned the breakwater from 1948 to 1993 (Roberts 2002, 16-27).

6.3 Technical Specification and Construction associated with the Breakwater

6.3.1 The Great Breakwater

The Great Breakwater is 2.4 miles long and is z-shaped in plan, and was constructed between 1848 and 1873. It was designed by J.M. Rendel, who was replaced by John Hawkshaw after the former's death on 21st November 1856. The resident engineer, who oversaw the day to day work on the breakwater, was John Dobson, and the contractors were J and C Rigby. The breakwater was, in engineering terms, a very significant development, and several new techniques were pioneered during its construction. The breakwater was built by dumping stone from Holyhead mountain to form a rubble mound, upon which was erected a massive wall faced with limestone blocks (Plate 26).

The seaward side rises nearly 40 ft above high tide, ending in a parapet wall which protects a walkway some 3m wide and a lower quay 13m wide. The latter carried a railway along its length for maintenance, and at the end of the breakwater marks are visible of the former rails, some apparently of the 7ft gauge tramway (Plate 23). Every 183 metres (200 yards) pairs of steps go down to the water, with a mooring post alongside (Plate 21). Another set of steps leads to the higher parapet, with an arched opening alongside (Plate 22). Interspersed equally between each set of steps are refuge shelters built into the breakwater wall between the upper and lower stages, consisting of three small chambers, with two outer square headed doors and a central round headed one (Plate 20). Many are now blocked but it would appear that the two outer chambers contained benches at each end, whereas the central chamber may have been for animal shelters (Plate 19). Towards the north-east end of the breakwater, a wider section of parapet housed two store rooms and a former latrine (Plates 24). The breakwater ends in a large oval platform with a square lighthouse. This is reached from the lower quay by large steps, at one side of which is a round drum pillar with rope-moulded decoration around a horizontal band - a similar pillar can be seen at the start of the breakwater (Plate 18).

6.3.2 Breakwater Lighthouse

The lighthouse was built to a design by John Hawkshaw to mark the end of the Breakwater (Plates 14, 25). It was built in 1873 and was square in plan, with chamfered angles, and a stepped plinth. It has horizontal roll moulding at first floor level. There is a walkway around circular lantern, on moulded cornice supports and with iron railings. Inside there are three floors and a basement entered through the lower stage of the breakwater.

The interior of the lighthouse was not observed, but the following description is taken from Davidson (*forthcoming*).' A *Central pillar runs up from basement to light workings. Basement has storage tanks etc and ladder up to ground floor. Ground floor now largely empty with stairs up to first floor which has three bunks built into cupboards against the walls, and a base where stove was situated. Second floor has large dresser - turntable for light visible in roof. Slate steps up to third floor - parapet walls c. 1m high surmounted by circular glass walls in large diamond panes and iron glazing bars. The light has been removed, but a large turntable is supported on rollers, with two sets of gears to turn it in a glass fronted cylindrical cabinet below*'.

6.3.3 Breakwater Quay

A large quay survives, which formed the first stage of the construction of the breakwater, following the start of the construction work in 1847. It is still in use for storage, and has steps down to the sea at the north end, and a single stone structure of uncertain use (PRN 18137) remains from the 19th century (Plates 01-02, 29). It is a small square building of stone, with large blocked openings in the wall, and a fireplace inside, which is probably a guard or watchman's hut. The building is shown on the 1887 Ordnance Survey map. The structures built on the breakwater quay are shown on an LNWR plan of late 19th century date (Figure 09).

6.3.4 Kilns and Associated Structures Soldier's Point

Now all demolished, but they werestill standing in 1890, when there were two ranges of buildings, both with chimneys. A brick platform still survives which may be one of the chimney bases. A kiln was constructed as early as 1850 (shown on Rendel's

map), and this was referred to as "old kiln" on the 1900 OS 1:500 scale plan, second edition sheet V.14.

6.3.5 Engine Shed, Breakwater

A large engine shed, built soon after the start of works, sometime between 1850 and 1857. This is far too large and well-built to be simply a loco shed, and is almost certainly the core part of an engineering complex that included the repair and maintenance of the locomotives and probably the wagons and cranes. The building was burnt down in the 1970's, and has been entirely re-roofed, but nonetheless it is an important survivor, both as an essential part of the breakwater construction site, and on a wider scale as a rare example of a construction company's repair facilities. The building is some 74m long by 13m wide. It is divided into a series of bays by wide piers and long windows between each pier, starting about 1m above the ground, and continuing to eaves heights. The front is divided into two openings by a single pillar, and all built of local rubble. Rails of standard gauge are visible in front of the shed. The building has a right-angled wing at the east end, which appears to be original, but was originally longer.

6.3.6 Breakwater Tramway

A 7ft gauge tramway was built 1848-9 to carry stones from a quarry to the proposed breakwater off Soldier's Point. An extension was also built to Salt Island, though that scheme was later abandoned. Special wagons designed by the resident engineer Dobson were used to tip stones from a timber staging to create a wide mound upon which the breakwater was subsequently built. Written records testify to their being five parallel tracks running along the staging (Davidson, *forthcoming*). The tramway continued to be used for maintenance, though in 1910, when a contract for major repair works was let to S Pearson and Son, a new standard gauge line was laid alongside, and following 1913 only this gauge was used. Rail marks visible at the end of the breakwater are 7ft in width, though sleepers which remain in situ close by (laid longitudinally not across the track) are of standard gauge width. Remains of the standard gauge rails are visible outside the Engine Shed (PRN 18110), and further north, where the track to the breakwater crosses the fence line (Plate 17; Figure 09).

6.3.7 Breakwater Tramway to Salt Island

The original tramway from the quarries to the proposed pier off the north end of Salt Island (PRN 18109) was constructed 1848-9. It was built to a broad 7ft gauge, primarily because the broader footprint allowed greater stability for the very heavy weights to be transported. The rails were taken up sometime after 1853, and the line of the tramway is now followed by the main access route to the Breakwater Quarry Country Park to the west, and underlies much of Beach Road to the east. A section may remain buried east of the coastguard station, though the area is now grassed over. There were two branches from it, one to the creosote works, and one to a proposed pier off Newry beach which was never constructed (Figure 09). An archaeological evaluation, involving two trenches cut across this tramway, was carried out north of Hibernia Row, Holyhead in 2004 (Smith, 2004). This identified that the track bed survives intact in many places, together with its sleeper stones, although without the iron chairs, fixing pins and rails (*ibid.* 3).

6.3.8 Soldier's Point

The house at Soldier’s point was built in 1849 by Rigby, the contractor for the Breakwater. Built to impose with considerable use of towers and turrets, it is, perhaps, a natural successor to the work carried out by Rigby at Swindon and Bristol Temple Meads, where castellated ornamentation is much in evidence. It is now in a dilapidated and decayed state. Similar work was carried out by Jesse Hartley for Point Lynas lighthouse.

7 HISTORICAL CONTEXT AND SIGNIFICANCE

7.1 National and International Significance

The 1840s were a period of unprecedented maritime development in the United Kingdom and in 1845 the government set up the Tidal Harbours Commission. They were concerned about the state of many harbours around the British coastline, and the Admiralty considered that Holyhead, with an ever increasing number and size of vessels using the port as a harbour of refuge, required further improvements. The port was also of significance as it was used by the Irish Mail packet boats, having been furnished with the Admiralty pier by John Rennie Senior in the 1820s.

The construction of the Holyhead Breakwater reflects governmental interest in the question of harbours of refuge, reflected in the work of a Royal Commission which in 1847 discussed the need for a harbour of refuge at Holyhead to protect shipping on its way to or from Liverpool, as well as the safeguarding of the Holyhead packet boats, similar to that employed at Portland for Channel shipping. At the same time as the construction of the breakwater at Holyhead the Liverpool dock system was expanding rapidly and was of crucial importance to Britain's growing dominance in world trade. The docks at Liverpool are a World Heritage site as a supreme example of Britain's pre-eminence as a world maritime trading power. Holyhead breakwater was a massive undertaking which reflected the importance with which the protection of shipping was viewed, and was closely connected to the expanding trade from Liverpool (Insall 2003, 56). The importance of harbours of refuge, very current in the mid-19th century at the time the breakwater was constructed, had declined by the time the breakwater was finished, owing to the dominance of steam ships for maritime trade at this slightly later time.

The Holyhead breakwater is amongst the largest ever constructed in Britain and Ireland, with Plymouth, Portland and Dublin breakwaters being constructed at around the same time. All these examples, with the exception of Dublin, were constructed with rail tipped stone. The Holyhead and Portland breakwaters were amongst the most important works designed by the engineer James Meadows Rendel. It is considered that he himself wished to be remembered for Holyhead and Portland

harbours, which he considered his greatest works and which were unfinished at the time of his death. His sons George and Stuart later attempted to get plaques placed in both ports naming Rendel as the creator of them. They had by then become established as major port installations, which reflected the importance with which they were viewed (Rendel 1998, 79).

Certainly Rendel's work at Portland provides the clearest parallels for his work at Holyhead, and it is clear that he designed the same type of breakwater for both locations. Very similar construction methodologies were also used also at the two breakwaters, except convict labour was used at Portland whereas free labour was used at Holyhead (Legg 2000; Jackson 1999, 63-73). The Brunel gauge railway, cranes, wagons and timber staging used during the construction were a clear parallel with Holyhead. It must also be borne in mind that Portland was a strategic fortified port, whereas Holyhead was unfortified. However it is clear that Portland forms a close parallel, not only in terms of personnel and methods involved but also in terms of surviving historic remains.

The construction of breakwaters on an industrial scale can be traced back internationally to the fortified breakwater at Cherbourg, begun in 1783, which as late as 1847, when the Holyhead Breakwater was being constructed, was '*the greatest piece of hydraulic engineering ever executed*', though this was followed by substantial breakwaters at Le Harve and Marseilles (Kirkpatrick 1998, 13). The first example of this kind of breakwater in England is at Plymouth, built in 1811, and the main characteristic of this and its successors is the use of forms of contractors' railways to ensure a regular flow of stone to the work site (Naish 1992, 37-56).

The locomotives and engineering material used in the construction of the Holyhead Breakwater were in great demand owing to the state of the art nature of the equipment being used. Joseph and Charles Rigby Ltd. also acted as agents for the supply of machinery and equipment for the breakwater at Ponta Delgada on the island of São Miguel in the Azores, which was finally completed in the early 1900s, although work had commenced in 1861. At least two broad gauge locomotives were sent from Holyhead to the Azores. This resulted in the use of the broad gauge for the harbour railway there, and its introduction to European rail systems. A large cast iron water tank and two lathes were also supplied from Holyhead. Plaques to this effect

were attached to at least one of the engines and are thought to have survived until the 1960s. A cement mixer, mounted on a broad gauge wagon frame has a plaque inscribed:

J. & C. RIGBY

HOLYHEAD HARBOUR
WORKS

This machinery survives today at Ponta Delgada, along with a large raised water tank for locomotive use with the above inscription but dated to 1862. These indicate the significance of the engineering links worldwide that the creation of harbours of refuge in the mid-19th century were to have on harbour engineering worldwide (Ponta Delgada and the Broad Gauge Harbour Railways, seen at www.internationalsteam.co.uk/trains/azores01.htm and www.churcher.crcml.org/Articles/Article2010_08html). Equipment from the work at Portland Harbour also found its way to Ponta Delgada. These worldwide links demonstrate the international nature of major engineering projects, and the reach of British commercial interests and trade at the height of the British Empire in the mid to late 19th century.

7.2 Local Significance

The building of the breakwater had a great effect on the town of Holyhead itself. The population increased from 3,869 in 1841 to 8,863 in 1851 (figures from census returns, quoted in Hollands 1973; Owens 1987, 11-12). The larger population was particularly drawn to Holyhead after 1845 when preparatory work was started on the Great Breakwater. Messers Rigby as the main contractors sub contracted a certain amount of the work, and men from Parys Mountain near Amlwch were employed on Holyhead Mountain to quarry the quartzite. There was much other work available from a host of employers, which resulted in a move from rural Anglesey as men left farms and smaller communities for Holyhead with its offer of work (Owens 1987, 12). As the town grew rapidly, more infrastructure was required, and in 1866 water was piped into the town from Traffwll Lake near Caergeiliog, and drainage was installed. Many of the new port working householders were not wealthy enough to pay to have the water piped into their home, but would have collected it from taps placed at street corners (*ibid.* 106). The town developed such that there were 58 public houses, inns and hotels by 1897, and historic map evidence shows that development in the area of the New harbour and Newry beach was expanding at this time (Ordnance Survey 1st edition 25 inch map of 1887-89).

The harbour of refuge was largely redundant for its original purpose by the time it was completed, as steam power dominated on the Irish Sea by 1873 (Jackson 1983, 95). However the harbour improvements under Rendel were mirrored by the improvement of land communication. The railway, masterminded by George and Robert Stephenson was fast approaching Holyhead. When the Llanfair to Holyhead section of the railway opened on 1st August 1848, complementing the already completed Chester to Bangor section, the Admiralty Packets were sent on the first train to Holyhead. The government steamers from Birkenhead were now instructed to take up their new stations on the Holyhead to Dublin route. Four new packet ships were built for this service by the government, though the Chester and Holyhead Railway had been hoping to receive a contract for carrying the mails, and had ordered new steamers ready for the Holyhead to Dublin service. Thus began a dual service of rail passengers and mails by rail and steamer that came to characterise the nature of the port of Holyhead well into the 20th century. In 1856 the port of Holyhead was described as being an '*extensive and commodious one*' and was now

fully linked with the railway connection (Hughes and Williams 1981, 99). The construction of the Great Breakwater considerably affected the layout of the port, enabling it to develop these characteristics.

The effect of these developments was, however, to result in the port becoming something of a through port moving goods and people from England to Ireland, with more limited direct benefit for the town of Holyhead itself. The port and railway did, however continue to provide significant employment in the town. The Royal and the Castle Hotels served passengers through the railway and port, and were considered high class hotels in the 1850s. However in 1859 '*the uncomfortable looking fishing village of Holyhead [was] full to repletion and woe betide the unlucky voyageur* (sic) *that comes down by the night train in the expectation of getting a bed. Paltry little dens and roadside alehouses command a price for dingy accommodation which would make our best London houses stare. However the daily number of visitors is greater now than ever it was at Portland…*' (*ibid.* 96-97). Thus outside the main established accommodation Holyhead remained significantly underdeveloped. This began to change from the 1860s onwards, with considerable expansion within the town itself and the port area. This expansion is to some extent a result of the construction of the Great Breakwater at Holyhead.

8 STATEMENT OF SIGNIFICANCE

The breakwater as a whole forms a very significant element within the port's historic landscape for which there is no parallel in Wales, with the closest parallel being the breakwater and port at Portland in Dorset, where similarities can be noted in terms of personnel involved, methodology and surviving historic remains. The scale of the undertaking at Holyhead needs to be viewed in terms of this and other harbours worldwide. These monuments form one of the best preserved maritime engineering landscapes of the mid-19th century. The concentration of later development around the inner harbour has meant that much has been preserved from the 19th century breakwater era within the wider port.

The construction of the Holyhead Breakwater reflects governmental interest in the question of harbours of refuge, reflected in the work of a Royal Commission which in 1847 discussed the need for a harbour of refuge at Holyhead to protect shipping on its way to or from Liverpool as well as the safeguarding of the Holyhead packet boats. The breakwater was a massive engineering undertaking which reflected the importance with which the protection of shipping was viewed. The town of Holyhead was also changed significantly by the construction of the breakwater, with a significant increase in population.

The work at Holyhead had close links with international harbour breakwater projects, including direct ones at Ponta Delgada on the island of São Miguel in the Azores, reflecting the importance of British trade and engineering at the height of the British Empire.

In addition to the evidential, historical and aesthetic value of the breakwater as analysed throughout the Level 4 report, the breakwater can also be considered to have significant communal value. Communal value can be interpreted in many ways, including its role in collective experience, identity or memory and as an asset with social value and a source of social interaction distinctiveness. The breakwater reflects many of these values as it is a significant and monumental representation of the town's *raison d'être* as a major port and port town and Holyhead draws elements of its identity and collective memory from the breakwater. It is still used by the local

community as a promenade, providing a focal point of social interaction and distinctiveness, including an appreciation of the views over the surrounding port, town and countryside.

It is clear that the breakwater and its associated hinterland should be viewed as being of **local, national and International** significance.

9 ACKNOWLEDGEMENTS

The author would like to thank Jamie Gardiner of Royal HaskoningDHV for commissioning the work and to the staff at the National Archives, Kew for their help in sourcing material. The assistance of the staff at Anglesey Archives and the University Archives at Bangor is also gratefully acknowledged. The guidance of David Jump, the Isle of Anglesey County Council Senior Planning and Conservation Officer, and Ashley Batten and Jenney Emmett of GAPS is also acknowledged.

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RAIL 837/81 Plan of James Rendel's Breakwater Proposals of 1846

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Figure 01: Location Map, based on 1:10000 Ordnance Survey County Series Map Sheet SH28sw and SH28se. Scale: 1:10000@A4.

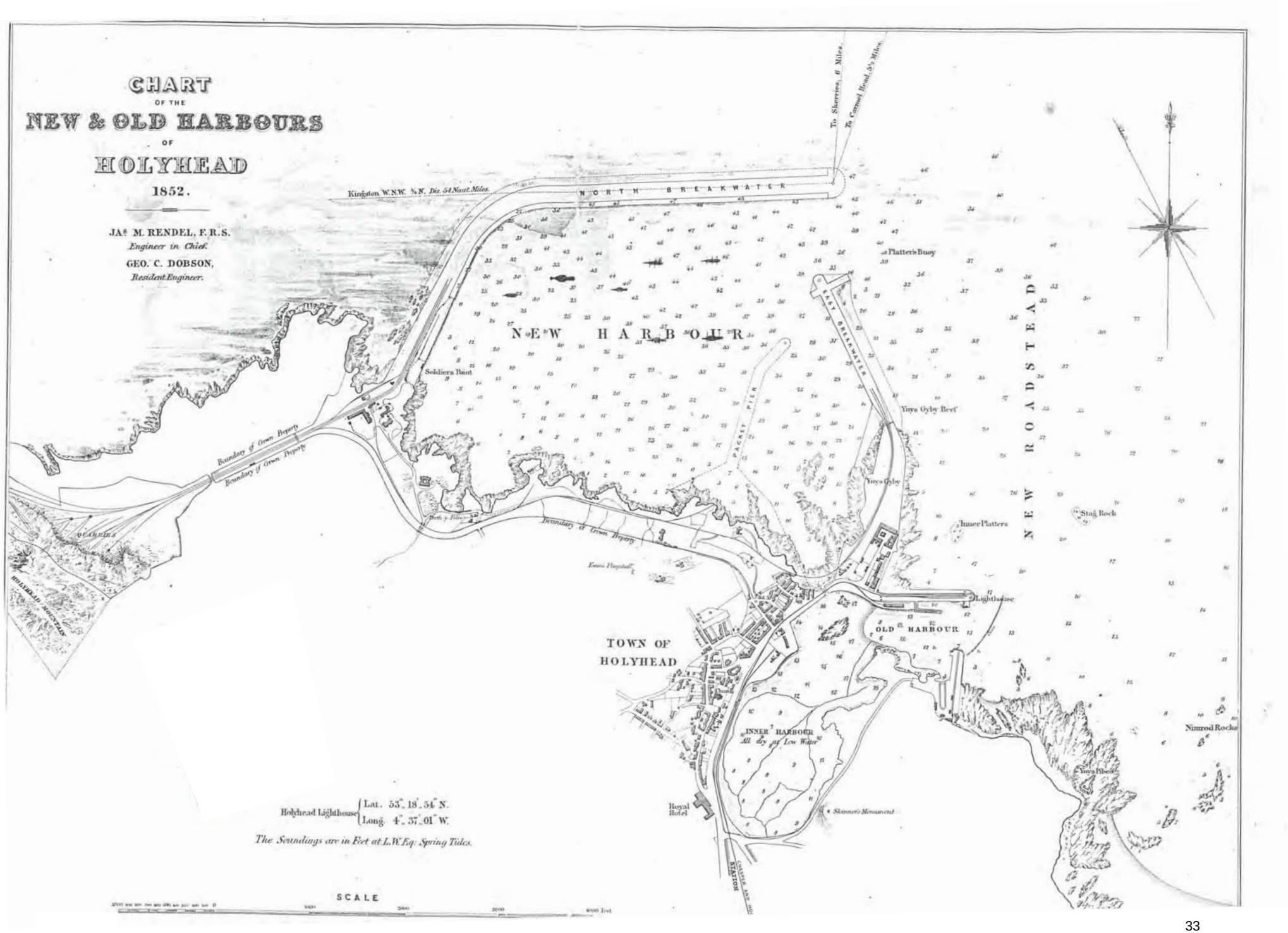


Figure 02. Plan of the proposed North Breakwater dated to 1852, two years before it was amended with the 2,500 yard north-eastern extension

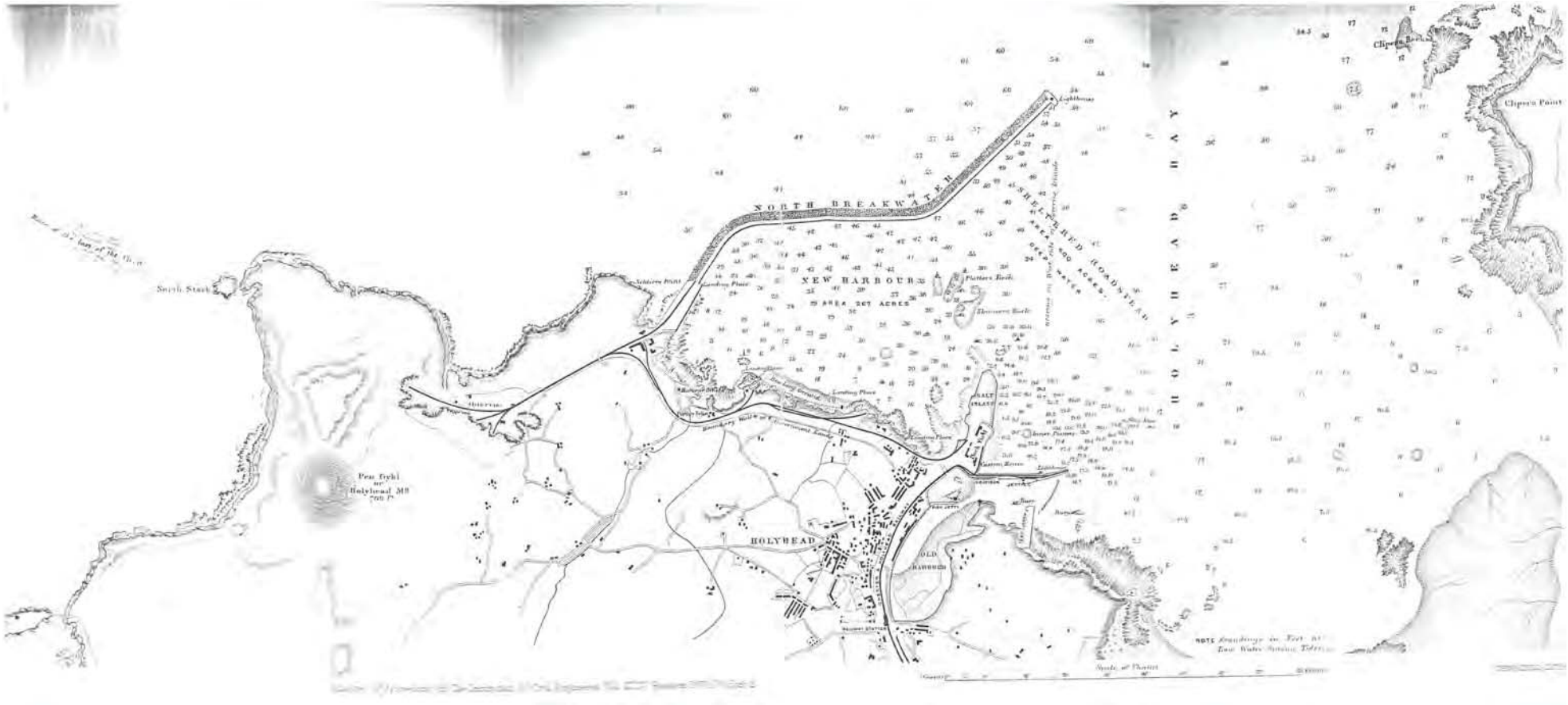


Figure 03: The Great Breakwater as completed in 1873. Drawing taken from the *Minutes of Proceedings of the Institution of Civil Engineers Vol. XLIV Session 1875-76. Part 2*. Not to Scale

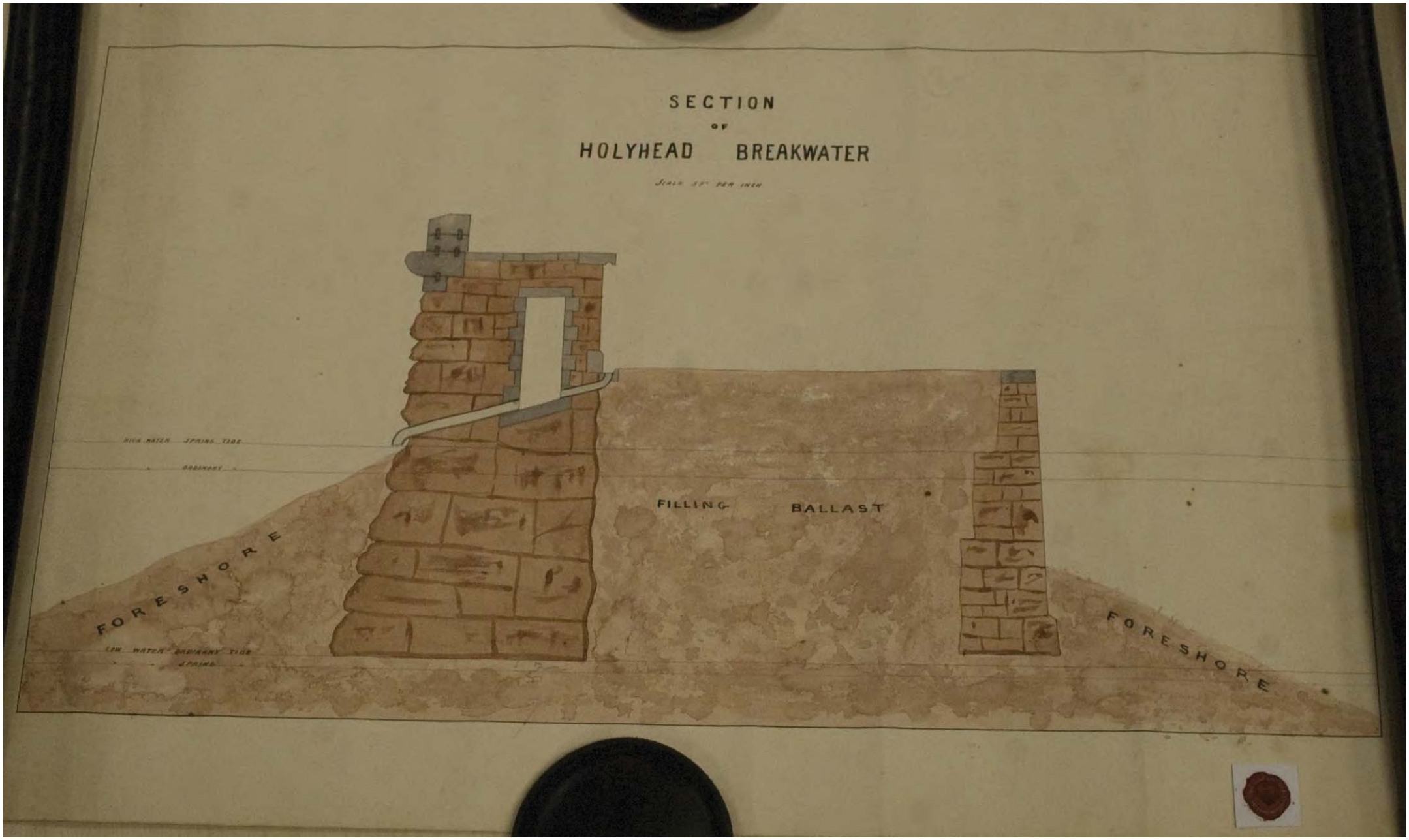
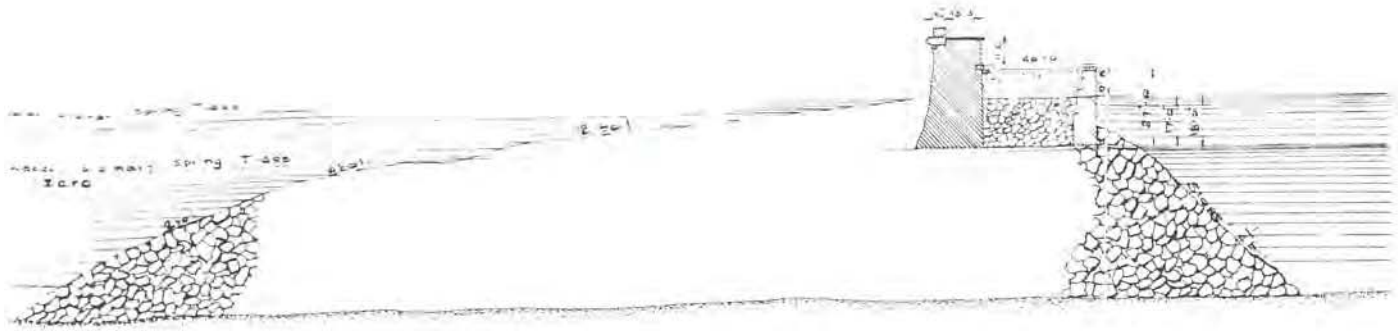
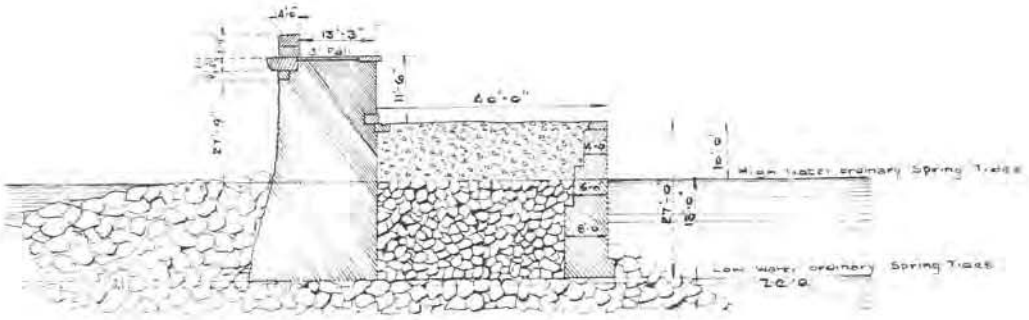


Figure 04: Cross-section through the Holyhead Breakwater, drawn in 1852 (Anglesey Archives WDD/86). Image not to scale, black items are weights used to hold the drawing down flat for photography.



TRANSVERSE SECTION OF BREAKWATER
Scale 50 feet = 1 Inch



ENLARGED SECTION OF SUPERSTRUCTURE
Scale 25 Feet = 1 Inch

Letter	Date	Description of revisions
	S. T	
	31ST JULY 1986	Divisional Civil Engineer

British Railways Board
Divisional Civil Engineer
British Rail London Midland
Rail House
Gresty Road
Crewe CW2 6EA
Telephone Crewe 55

HOLYHEAD BREAKWATER
1876

Scale	
File Numbers	
Drawing Number	

BR 906

Figure 05: British Railways Board copy of section drawings of the Holyhead Breakwater in 1876 upon completion of the breakwater. Not to Scale

Figure 06: View of the Great Breakwater at Holyhead in 1874 shortly after its completion. Image by G.H. Andrews (NLW)

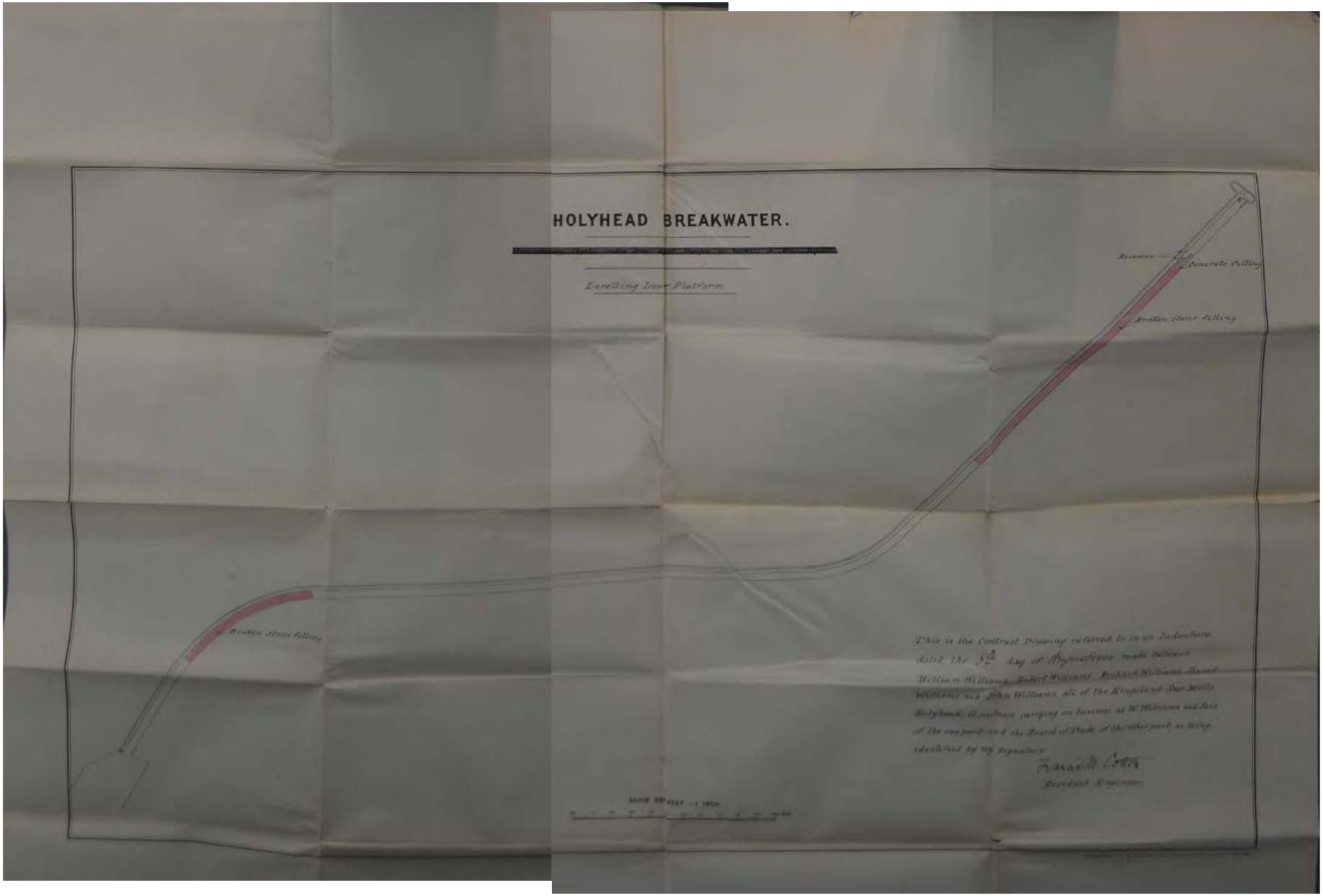


Figure 07:Plan showing area to be repaired of the Holyhead Breakwater in 1904 (National Archives, RAIL 837/8).

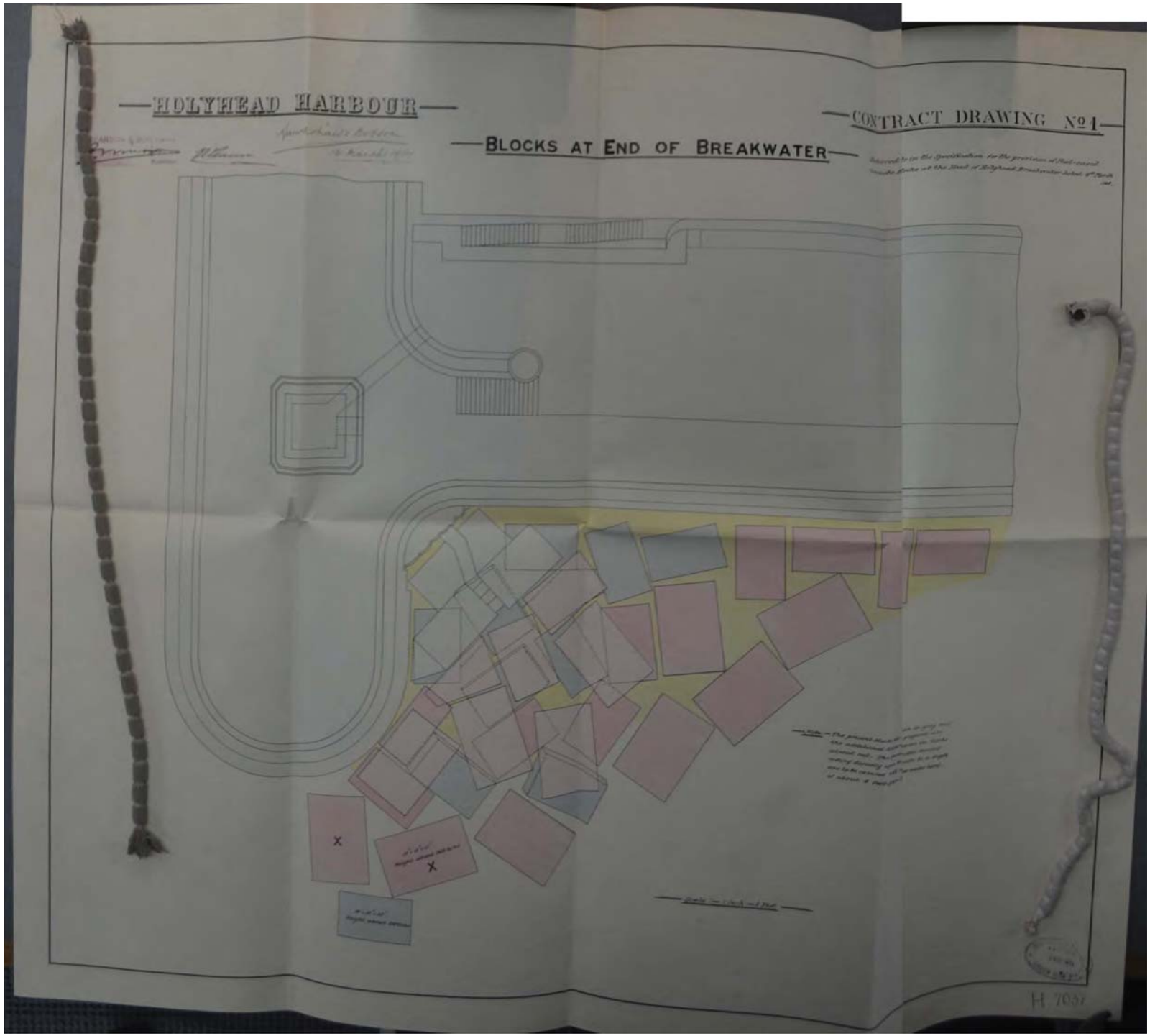


Figure 08: Plan showing steel encased stones deposited at the north-east end of the breakwater in 1914 as a protective measure (National Archives, RAIL 837/32). Not to Scale

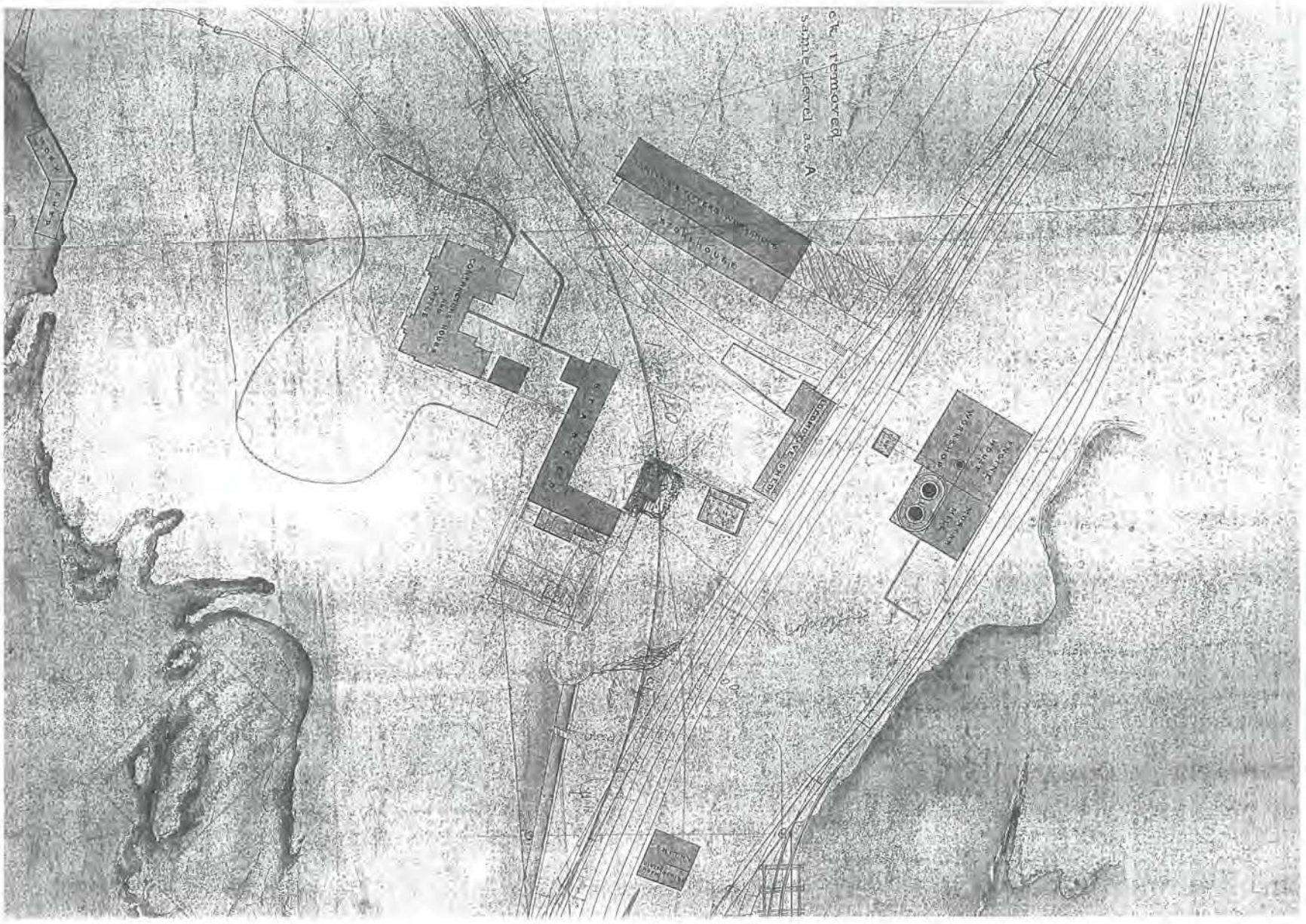


Figure 09: Late 19th century plan of Soldier's Point at the landward end of the breakwater showing the structures and tramway located on it (Gwynedd Archives; X/LNWR/356).

Plate 01: Holyhead Breakwater's Landsend with view of the remnants storage and working area on the portside and decorated bollard on the seaward (sourced from Civil Engineering Solutions: 20150928 Holyhead Breakwater 988.jpg).

Plate 02: View from portside of the lands end of former storage and working area and beginning of parapet marked by the decorated bollard (sourced from Civil Engineering Solutions: 20150928 Holyhead Breakwater 1088.jpg).

Plate 03: Seward view of the parapet at landsend, showing large rubble foundation blocks supporting the parapet (sourced from Civil Engineering Solutions: 20150928 Holyhead Breakwater 1086.jpg).

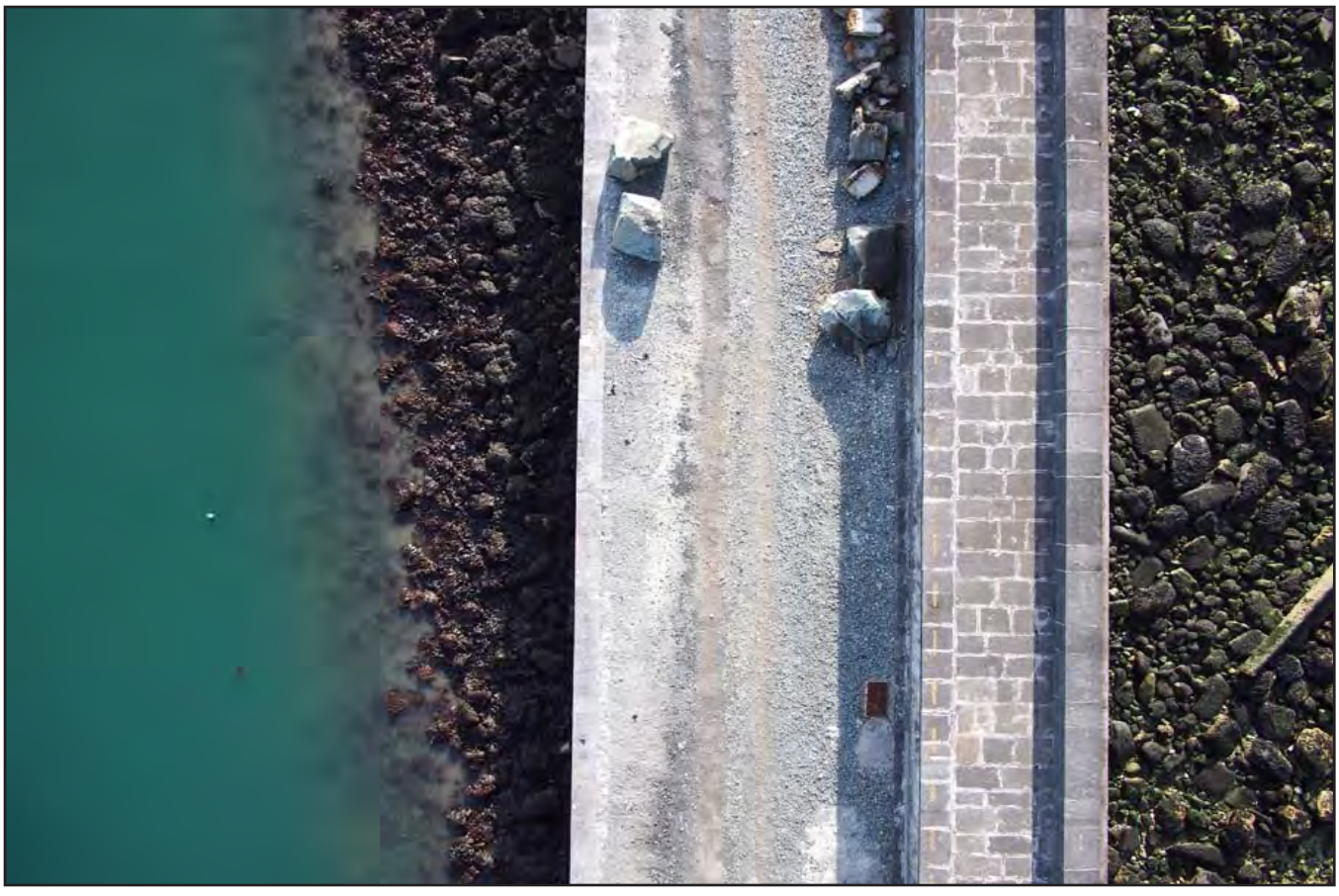


Plate 04: Birdseye view of breakwater showing the parapet's Ashlar masonry of quarried stone from Moelfre and the slip road with former manhole access in view (sourced from Civil Engineering Solutions: 20150928 Holyhead Breakwater 256.jpg).

Plate 05: Seaward side view of rubble sourced from Holyhead Mountain used as supporting foundations of the parapet (sourced from Civil Engineering Solutions: 20150928 Holyhead Breakwater 186.jpg).

Plate 06: Seaward view of parapet with the remnants of a later addition of a ladder, possibly used in emergencies (sourced from Civil Engineering Solutions: 20150928 Holyhead Breakwater 206.jpg).

Plate 07: View of mid - 20th century concrete repairs to the seaward side of the breakwater, with the upper slabs molded to resemble original ashalr masonry of the parapet (sourced from Civil Engineering Solutions: 20150928 Holyhead Breakwater 193.jpg).

Plate 08: View of further concrete repair work along seawards side of the breakwater (sourced from Civil Engineering Solutions: 20150928 Holyhead Breakwater 203.jpg).

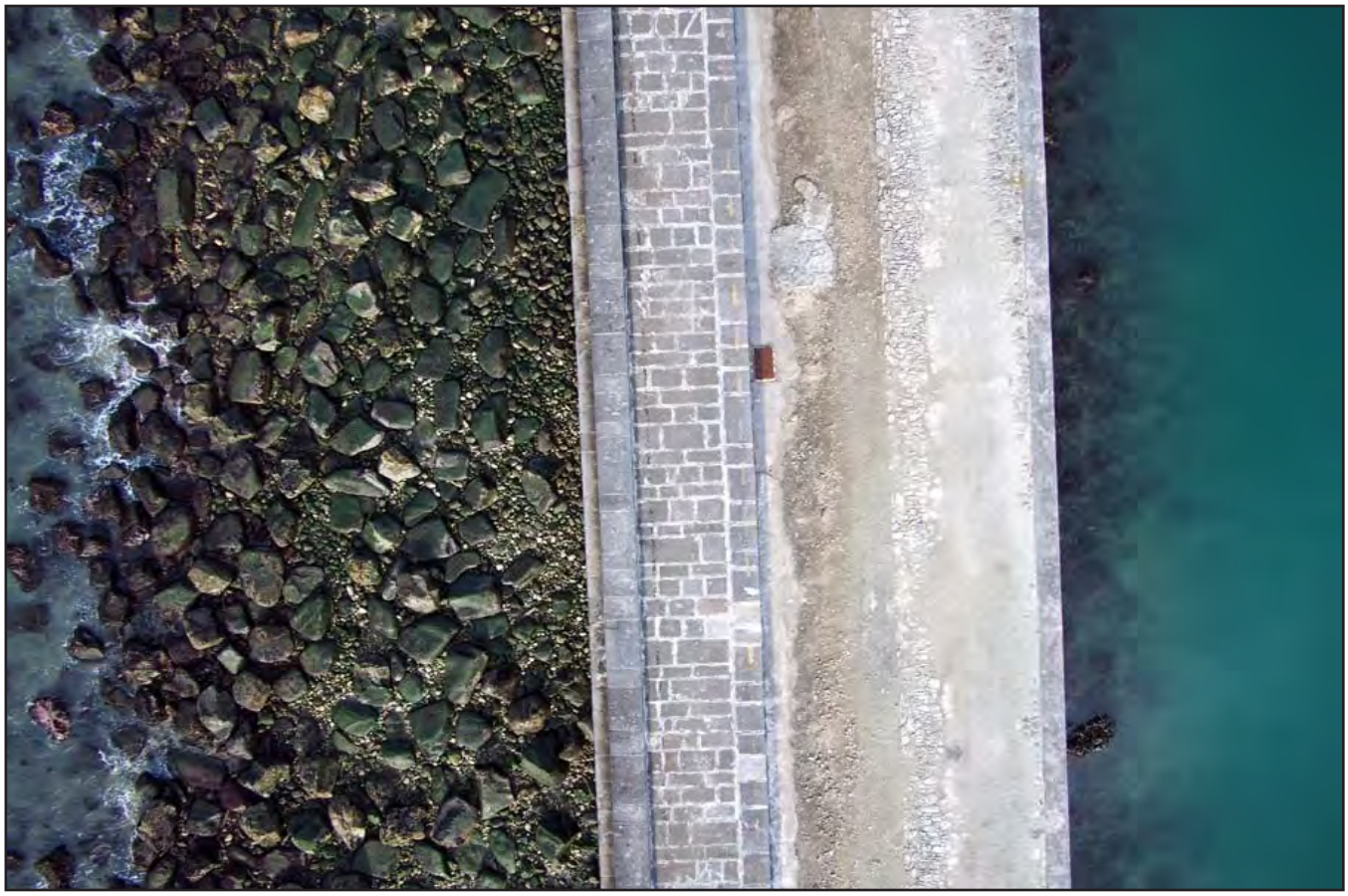


Plate 09: Birds-eye view of breakwater showing remnants original surface on portside, former manhole, and the ashlar masonry of quarried stone from Moelfre and rubble sourced from Holyhead mountain on the seaward side (sourced from Civil Engineering Solutions: 20150928 Holyhead Breakwater 062.jpg).

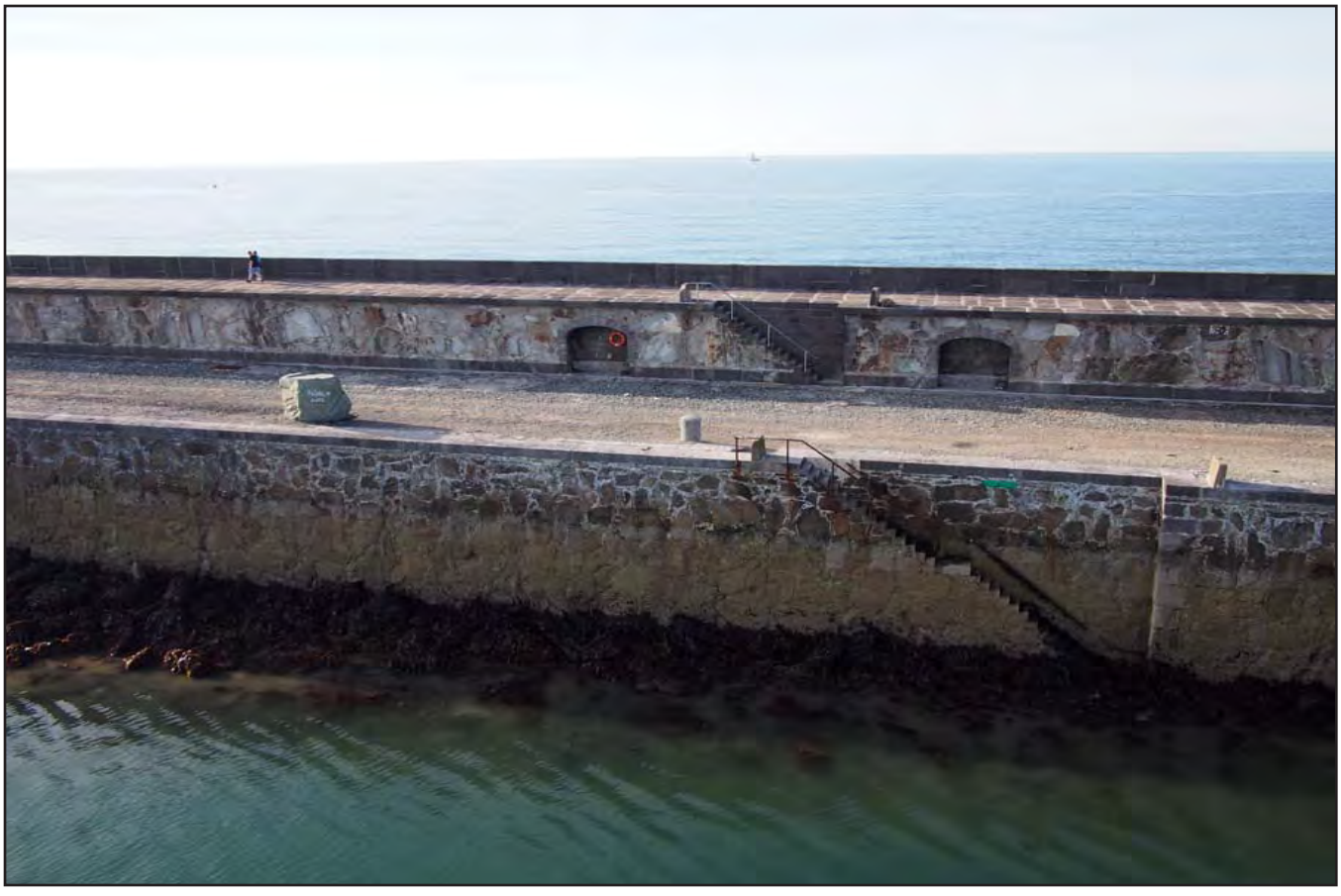


Plate 10: Portside view of mooring post, and staircases leading into the sea, and onto the parapet. Note two original alcoves with masoned seated areas possibly used for shelter during shipments (sourced from Civil Engineering Solutions: 20150928 Holyhead Breakwater 377.jpg).

Plate 11: Portside view of the tail end of breakwater showing relationship with the ashlar masonry with view former storage and convenience area (sourced from Civil Engineering Solutions: 20150928 Holyhead Breakwater 151.jpg).

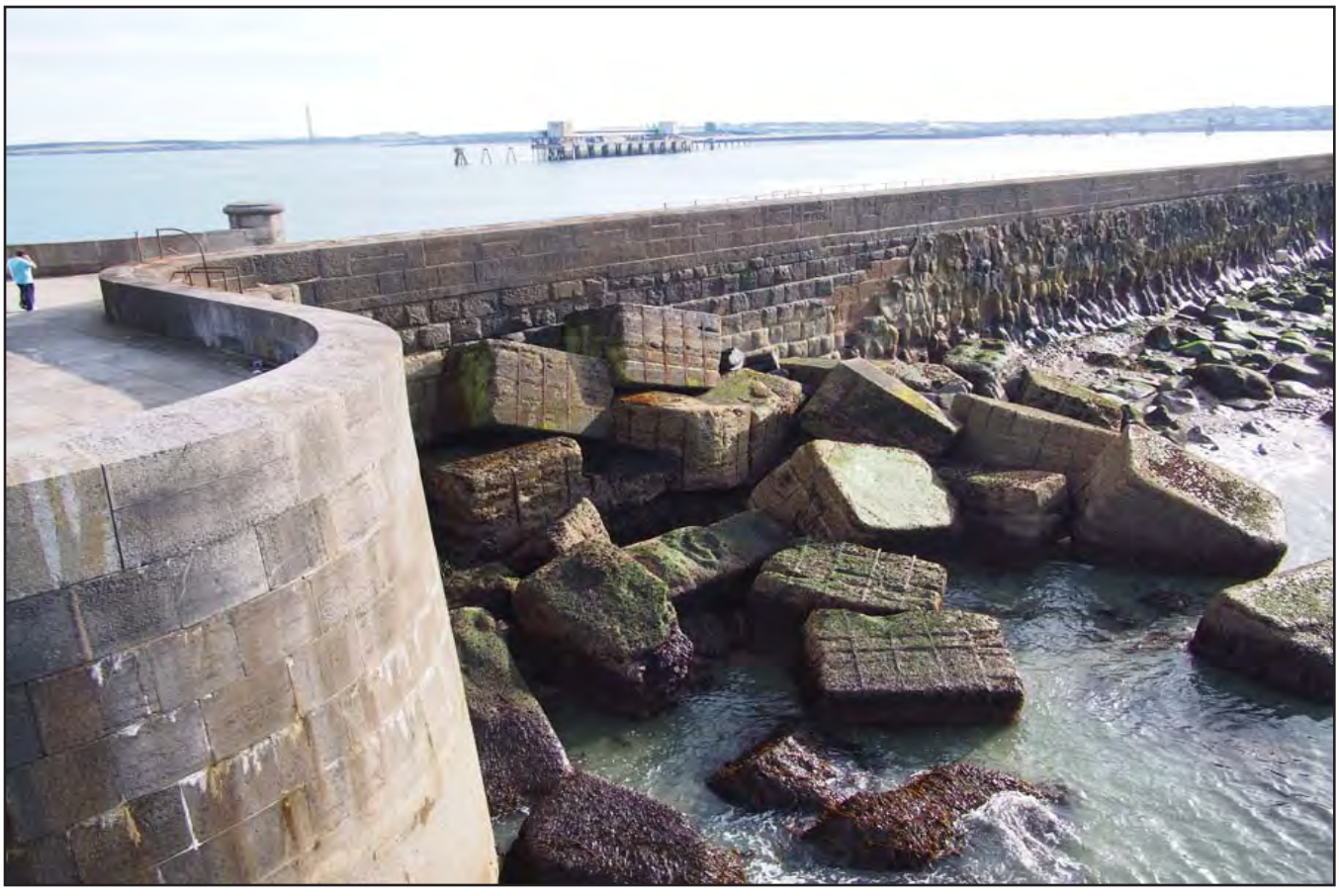


Plate 12: Seaward view of the breakwater's tail end showing large stone ballas, as seen in Figure 08 (sourced from Civil Engineering Solutions: 20150928 Holyhead Breakwater 168. jpg).

Plate 13: Aerial view of the tail end of the breakwater with the light house (sourced from Civil Engineering Solutions: 20150928 Holyhead Breakwater 225.jpg).

Plate 14: View of full length of breakwater showing its curve leading towards landsend at Holyhead Mountain (sourced from Civil Engineering Solutions: 20150928 Holyhead Breakwater 160.jpg).

Plate 15: Holyhead Breakwater - view from east looking towards Holyhead mountaing from upper parapet (archive image: G2498_042).

Plate 16: Holyhead Breakwater - general view from the southwest looking from the upper parapet (archive image: G2498_047).

Plate 17: Holyhead Breakwater - view from northeast detailing surviving remnant of rail at landward end of hardstanding/building area (archive image: G2498_001).

Plate 18: Holyhead Breakwater - view from southeast of large stone drum with roped design at endof the parapet (archive image: G2498_003).

Plate 19: Holyhead Breakwater - interior view of barrel vaulted refuge chamber (archive image: G2498_009).

Plate 20: Holyhead Breakwater - view from southwest of three barrel vaulted refuge chambers (archive image: G2498_010).

Plate 21: Holyhead Breakwater - view from east of bollard for tying up vessels; located along lower breakwater walkway (archive image: G2498_013).

Plate 22: Holyhead Breakwater - view from south of refuge within the breakwater parapet and stairway between upper and lower levels (archive image: G2498_015).

Plate 23: Holyhead Breakwater - view from west of wooden sleepers located along lower breakwater walkway near the lighthousse (archive image: G2498_022).

Plate 24: Holyhead Breakwater - view from southeast of upper parapet storage area and central latrines (archive image: G2498_015).

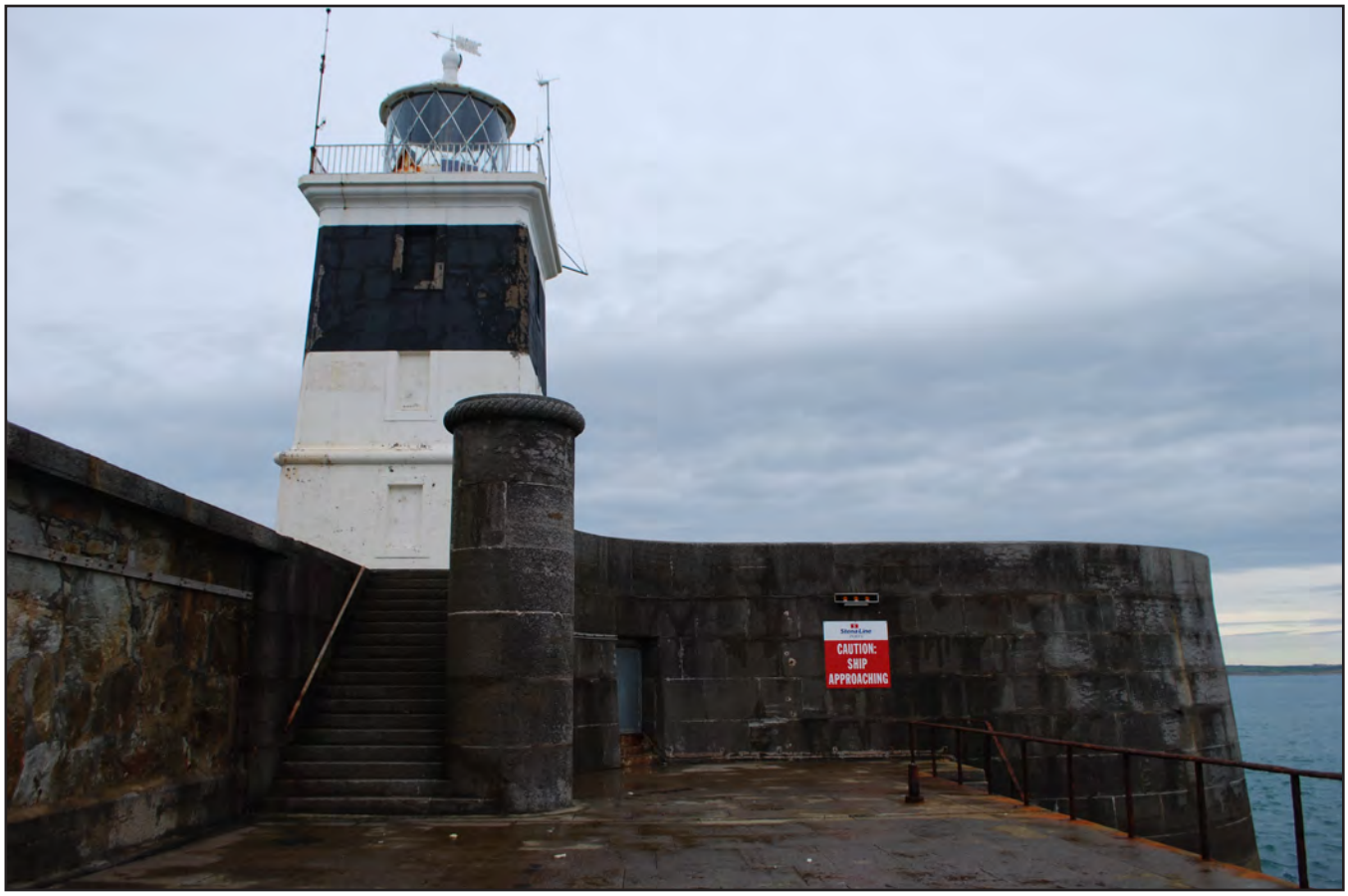


Plate 25: Holyhead Breakwater - view from west of the lighthouse (archive image: G2498_025)

Plate 26: Holyhead Breakwater - view from southeast of parapet ashlar showing cyclopean blocks (archive image: G2498_037)

Plate 27: Holyhead Breakwater - view from east-southeast of breakwater dog leg showing seaward side (archive image: G2498_040).

Plate 28: Holyhead Breakwater - view from east of storm damage repair to the parapet and carriageway (archive image: G2498_046).

Plate 29: Holyhead Breakwater - view from north of former wharf at southwestern end of the breakwater (archive image: G2498_050).

Plate 30: Holyhead Breakwater - view from northwest of the breakwater quarry (archive image: G2498_058).

11 APPENDIX I: PROJECT DESIGN

HOLYHEAD BREAKWATER (G2489)

PROJECT SPECIFICATION FOR:
LEVEL 4 BUILDING RECORD

Prepared for

ROYAL HASKONINGDHV

December 2016

Ymddiriedolaeth Archaeolegol Gwynedd
Gwynedd Archaeological Trust

HOLYHEAD BREAKWATER

PROJECT SPECIFICATION FOR LEVEL 4 BUILDING RECORD

Prepared for *Royal HaskoningDHV*, December 2016

CONTENTS

1 INTRODUCTION

Gwynedd Archaeological Trust (GAT) has been asked by *Royal HaskoningDHV* to prepare a project specification for a historic building appraisal and record of Holyhead Breakwater, Ynys Môn (Primary Reference Number (PRN) 11821; NGR SH24008420; Figure 01). Holyhead Breakwater comprises a 2.4km long stone-built structure designed to provide maritime shelter at the Port of Holyhead/Holyhead as well as protection from coastal erosion. The breakwater was built between 1848 and 1873 and is a Grade II* listed structure (ref. 5743). In addition to the pier, which forms the main structure, the breakwater also includes a pier end three-storey lighthouse (PRN 11822; NGR SH2567484751), built in 1873, a large stone quay from which the breakwater extends, built in 1847 (PRN 34000; SH23818388), and a late 19th century small stone building located at the end of the quay (PRN 34025; NGR SH23868389).

The historic building appraisal and record will be completed as part of a project appraisal report (PAR) as part of a flood risk management appraisal in line with Flood and Coastal Erosion Risk Management – Appraisal Guidance (FCERM-AG), which will appraise a range of options. The historic building appraisal and record will be completed in accordance with a Level 4 building record as described in *Understanding Historic Buildings: A guide to good recording practice* (Historic England 2016).

The historic building appraisal and record will be completed in accordance with the following guidance:

- Conservation Principles (Cadw, 2011)
- Guide to the conservation of historic buildings, BS7913:2013;
- Guidelines for digital archives Royal Commission on Ancient and Historic Monuments of Wales 2015;
- Management of Archaeological Projects (English Heritage, 1991);
- Management of Research Projects in the Historic Environment: The MoRPHE Project Managers' Guide (Historic England, 2015);
- Standard and Guidance for the archaeological investigation and recording of standing buildings and structures (Chartered Institute for Archaeologists, 2014); and
- Understanding Historic Buildings: A guide to good recording practice (Historic England 2016).

The following information will also be consulted as part of the record (as identified in the *Scope Holyhead Breakwater Project Appraisal Report*):

- Holyhead Breakwater Environmental Scooping Report, Black & Veatch Ltd., 2009;
- Outline design drawings and indicative landscape plan;
- Engineering report;
- High resolution aerial photographic survey undertaken on 28th September 2015 (1109 images), capable of being-post processed to provide a dense point cloud of the breakwater along with 3d mesh in AutoCAD format.

Additional available information is also identified in the *Scope Holyhead Breakwater Project Appraisal Report* section 3, which may also be consulted as part of the record.

Gwynedd Archaeological Trust is certified to ISO 9001:2008 and ISO 14001:2004 (Cert. No. 74180/A/0001/UK/En) and is a Registered Organisation with the Chartered Institute for Archaeologists and a member of the Federation of Archaeological Managers and Employers (FAME).

2 METHODOLOGY

The historic building appraisal and record will be completed in accordance with a Level 4 building record as described in *Understanding Historic Buildings: A guide to good recording practice* (Historic England 2016).

Level 4 provides a comprehensive analytical record and will draw on the full range of primary and secondary sources of information about the breakwater and discuss its significance in terms of architectural, social, national and economic history. In particular, this will include its relationship with similar 19th century breakwaters and the impact on Holyhead socially and economically during construction and use.

The Level 4 record will be completed using a combination of a photographic record, a drawn record and an analytical record.

2.1.1 Photographic Record

A photographic record of the breakwater has been completed by *Civil Engineering Solutions* undertaken on 28th September 2015. A total of 1109 high resolution aerial photographic images were taken during the survey; the location of each image is detailed on *Civil Engineering Solutions* drawings CES391-1 to CES391-7. These images will be used by GAT as the core photographic record for the Level 4, as they include images in plan and elevation of the entire structure, including views that would not be possible from a landward record. Selected images will be used to illustrate the structural appearance, function and phasing of the breakwater, including any industrial remains. GAT will also prepare general views of the breakwater in its wider setting and landscape.

2.1.2 Drawn Records

The drawn record will not include additional plans and elevations prepared on site by GAT. Any plans and elevations will be generated using the aerial photographic images completed by *Civil Engineering Solutions*.

Drawn records will include:

- A site plan based on the 1:10000 Ordnance Survey County Series locating the feature within the regional landscape;
- Reproduction of contemporary drawings that illustrate the construction and use of the breakwater;
- Reproduction of historic maps that illustrate the construction and use of the breakwater.

2.1.3 Analytical Record

The analytical record will include a detailed examination of available primary and secondary sources. Information will be sourced from the following:

1. The regional Historic Environment Register (HER, Gwynedd Archaeological Trust, Craig Beuno, Garth Road, Bangor, Gwynedd LL57 2RT) will be examined for information concerning the study area. This will include an examination of the core HER, the 1:2500 County Series Ordnance Survey maps and any secondary information held;
2. Archive data and historic maps, will be consulted in the regional archives at the Llangeni (Anglesey Archives, Industrial Estate Rd, Llangefni LL77 7JH) and at the Bangor University Department of Manuscripts (Bangor University, Bangor, Gwynedd LL57 2DG);
3. The National Monuments Record (NMR RCAHMW, National Monuments Record of Wales, Plas Crug, Aberystwyth SY23 1NJ) will be checked for sites additional to the HER, and if required additional supporting information will be examined at the NMR.
4. On-line catalogue search of the National Library of Wales;
5. The National Archives (Kew, Richmond, Surrey TW9 4DU) will be examined for primary sources. The National Archives currently list 42 record items related to the breakwater.
6. The Welsh Newspapers Online portal curated by The National Library of Wales (http://www.llgc.org.uk/index.php?id=4723) will be examined for contemporary newspaper articles. The Welsh Newspapers Online portal currently lists 112,307 articles related to the breakwater.

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2.2 Monitoring Arrangements

A copy of this design and all subsequent reporting must be approved by Gwynedd Archaeological Planning Services (GAPS) and the Isle of Anglesey County Council (IOACC) Senior Planning and Conservation Officer prior to final issue in each instance. The GAPS Archaeologist will need to be informed of the project timetable and the role of GAPS must be acknowledged in all reporting. The relevant contact details are:

GAPS

- Ashley Batten ashley.batten@heneb.co.uk | 01248 370926; and
- Jenny Emmett jenny.emmett@heneb.co.uk | 01248 370926.

IOACC Senior Planning and Conservation Officer:

- David Jump djxpl@ynysmon.gov.uk | 01248 752461

3 PROCESSING DATA, ILLUSTRATION, REPORT AND ARCHIVING

Following completion of the stages outlined above, a report will be produced within one month incorporating the following:

1. Non-technical summary
2. Introduction
3. Aims and purpose
4. Specification
5. Methods and techniques, including details and location of project archive
6. Level 4 Results
7. Summary and conclusions
8. List of sources consulted.
9. Appendix I – approved GAT project specification

The Level 4 results will provide a comprehensive analytical record and will draw on the full range of primary and secondary sources of information about the breakwater and discuss its significance in terms of architectural, social, regional and economic history. In particular, this will include its relationship with similar 19th century breakwater's and the impact on Holyhead socially and economically during construction and use.

4 DISSEMINATION AND ARCHIVING

A full archive including plans, photographs, written material and any other material resulting from the project will be prepared. The Historic Building Recording requirements and approaches outlined in this project specification will be undertaken during December 2016 and January 2017. A final report will be submitted to the Historic Environment Record within six months of submitting the draft report (subject to approval).

The following dissemination will apply:

- A paper report(s) plus digital report(s) will be provided to the client (draft report then final report).
- A digital report will be provided to GAPS (draft report then final report).
- A paper report plus a digital report will be provided to the regional Historic Environment Record, Gwynedd Archaeological Trust; this will be submitted within six months of report completion (final report only).
- A digital report and archive (including photographic and drawn) data will be provided to Royal Commission on Ancient and Historic Monuments, Wales (final report only) in accordance with the *RCAHMW Guidelines for Digital Archives Version 1*. Digital information will include the photographic archive and associated metadata.

4.1 Historic Environment Record

In line with the regional Historic Environment Record (HER) requirements, the HER must be contacted at the onset of the project to ensure that any data arising is formatted in a manner suitable for accession to the HER. This will include the completion of a HER Enquiry Form at the start of the project.

5 PERSONNEL

The project will be managed by John Roberts, Principal Archaeologist GAT Contracts Section and attended by a team of project archaeologists experienced in historic building recording. The team will be responsible for completing the Level 4 record in accordance with the methodology listed in section 2.0.

6 INSURANCE

Public Liability

Limit of Indemnity- £5,000,000 any one event in respect of Public Liability

INSURER Aviva Insurance Limited

POLICY TYPE Public Liability

POLICY NUMBER 24765101CHC/000405

EXPIRY DATE 22/06/2017

Employers Liability

Limit of Indemnity- £10,000,000 any one occurrence.

The cover has been issued on the insurers standard policy form and is subject to their usual terms and conditions. A copy of the policy wording is available on request.

INSURER Aviva Insurance Limited

POLICY TYPE Employers Liability

POLICY NUMBER 24765101CHC/000405

EXPIRY DATE 22/06/2017

Professional Indemnity

Limit of Indemnity- £5,000,000 in respect of each and every claim

INSURER Hiscox Insurance Company Limited

POLICY TYPE Professional Indemnity

POLICY NUMBER

HU PI 9129989/1208

EXPIRY DATE 23/07/2017

7 SOURCES CONSULTED

1. British Standards Institute, 2013. *BS 7913:2013 Guide to the conservation of historic buildings*
2. Cadw, 2011. *Conservation Principles*.
3. *Civil Engineering Solutions* drawings CES391-1 to CES391-7
4. Chartered Institute for Archaeologists, 2014.Standard and Guidance for the archaeological investigation and recording of standing buildings and structures.
5. Historic England, 2016. Understanding Historic Buildings: A guide to good recording practice.
6. Royal Commission on Ancient and Historic Monuments of Wales 2015 Guidelines for digital archives

8 FIGURE 01

8.1 Location Map, based on 1:10000 Ordnance Survey County Series Map Sheet SH28sw and SH28se. Scale: 1:10000@A4. Crown Copyright. All Rights Reserved. License number AL100020895.

Figure 01: Location Map, based on 1:10000 Ordnance Survey County Series Map Sheet SH28sw and SH28se. Scale: 1:10000@A4.

Gwynedd Archaeological Trust
Ymddiriedolaeth Archaeolegol Gwynedd

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