

LIMEKILNS OF THE PEREGRINI COAST

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INTRODUCTION

The Northumberland coast is underlain with rocks of the Carboniferous age, forming repetitive and deep successions of the lower, middle and upper limestone groups. Although these successions are by no means all composed of limestone, it is easily accessible along much of the coast, exposed by the sea in stratified beds or strewn along the shoreline as boulders, and has been exploited for lime-burning since at least medieval times.

DEVELOPMENT OF THE LIME INDUSTRY

Although most of the lime kilns surviving on the North Northumberland Coast are of late 18th or 19th century origin, there is considerable evidence for lime production in earlier times. The burning of limestone to produce lime was probably first undertaken on the Northumberland coast in the medieval period - notably in the construction of military edifices such as Bamburgh - although the technology was known to and practiced by the Romans. A late 15th or early 16th century lime kiln, revealed by winter storms and excavated in 1995 by Williams & Williams lies on Beadnell Point, to the east of the later kilns at the harbour, and may have been used to provide lime for the refurbishment of the probably thirteenth-century Ebba's Chapel. In 1367 an iron rake for a limekiln is mentioned in a Lindisfarne inventory and Lindisfarne Priory account rolls and inventories from the 14th to 16th centuries indicate the monks worked limekilns on the island.

In the post-medieval period lime was increasingly used as in agriculture to reduce acidity levels and act as a catalyst for fertilisers, increasing the ability of plants to take up nutrients and limiting the negative effects of nitrates. The associated increase in soil crumb formation also helps to aerate the soil and makes conditions favourable for a range of micro-organisms, which in turn speed up the breakdown of organic matter and recycling of nutrients. While full comprehension of the benefits of liming agricultural land may have evaded farmers of the 18th or 19th century, the increased yields from arable lands and fatter livestock from the richer pastures led to its increasing use from as early as the early 17th century and, by the middle of the 18th century, lime was in widespread use for reclaiming waste and improving existing land, as well as for mortar and lime wash.

In 1794 John Bailey, a well-known land steward in the area, remarked that lime 'has long been used in the Bamburgh ward.' Each estate would have had its own kiln supplying its tenant farmers, while even some individual farms would also have had their own kilns, especially where limestone was accessible within the tenancy and the farm profitable enough for the outlay of the initial construction and quarrying costs. As the 19th century progressed, however, demand for lime outgrew the capacity of field kilns, and industrial-scale kilns were built, associated with large quarries or supply mechanisms.

Inland transport of lime, prior to the introduction of railways, will have been limited, perhaps to one or two days travel with a farm cart. Coastal resources were open to the transport of lime by sea, however, thereby opening extensive areas of the adjacent Scottish lowlands, which lacked local limestone resources and from an early date were being supplied by kilns on Wearside. The Kennedy limekilns on Holy

Island and the later battery at Castle Point were built to serve this Scottish market, as were earlier kilns down the coast at Beadnell and Seahouses. But the movement of lime by sea was hazardous, as shown by the fate of the *Curlew*, a trading sloop owned by Ralph Wilson of Holy Island, which was bound for Dundee with a cargo of burnt lime on 31 July 1868 when water came into contact with the volatile cargo and set fire to the boat, causing it to be lost (Williams & Williams Jermy 1992, 43). With the advent of the railways, transport of lime to less well-resourced and quite remote inland areas also became feasible, making the coastal kilns less profitable

BURNING AND USING LIME

Descriptions of limekilns and the methods of their operation in Northumberland are contained in several contemporary accounts, notably the great agricultural modernisers, Bailey and Culley:

'The mode of burning lime in this county, is mostly in draw-kilns, of the form of an inverted cone, with two or three eyes or mouths for drawing out the lime, and admitting air: These kilns are kept burning and drawing perpetually. Some of the large sale kilns will afford 40 or 50 cart loads a day: A cart load of coal is reckoned to burn two cart loads of lime' (Williams & Williams Jermy 1992 Bailey and Culley 1797).

This description outlines the basic technology used in all the lime kilns surviving along the Northumberland Coast, the operation of which was determined by the same basic chemistry and by similar economic principles involving the costs of raw materials, transport and labour. Thus, all kilns required a good supply of limestone, so many are often found close to small quarries or with access to sea and rail transport. Many kilns are built into a hillside, sometimes into a 'bench' of the quarry supplying the kiln, so that stone could be loaded directly into the top of the kiln without the need to build a ramp.

Just as essential to the working of a kiln was a fuel supply, which could have been charcoal from nearby woodlands, but the later, commercial kilns used coal, mined on site or brought in by road, rail or sea. For larger kilns, the greater quantities of fuel needed would make this a major consideration in the choice of site. The transport mechanisms and routes by which the coal arrived were also used to transport the unprocessed quicklime (or, much more rarely, processed hydrated lime) away from the site.

The labour force used in the limeburning and processing industry tended also to be local but larger operations needed additional labour. The coastal kilns, where the population was small and largely concerned with fishing, could not rely upon seasonal (agricultural) labour and depended much more heavily on imported, migrant or itinerant labour. The Kennedy limeworks, for example, operated largely with a Scottish workforce, but workers for the limekilns would also have been found amongst the seasonal influx into mainland Britain of Irish workers, as well as itinerants from industrial Tyneside and the coalfields.

All the remaining upstanding kilns are draw kilns, some of which are amalgamated into rectangular blocks or batteries, as at Lindisfarne, wherein each kiln pot was associated with three or four draw arches, but the principles of both construction and operation remained the same. Such kilns are stone-built structures, often square or oblong in plan, but sometimes rather amorphous where they have been extended or adapted, often widening towards the bottom but usually partially submerged in a sea of accumulated kiln waste, or built into a hillside. The smaller farm or estate kilns have a single pot, circular or oval in plan and tapering, funnel-like in cross-section, towards the bottom. Pots are lined with stone or brick – often refractory firebricks

made from clay found in coal measures – in order to protect their surfaces from the erosive impact of both heat and thermal shock. Two, three or four draw arches – always round on the Northumberland coast, but more often pointed in the interior uplands – usually stone-built but sometimes brick-lined, define recesses or porches around the openings, or ‘eyes’. The eyes supplied and, with the draw arches, regulated the necessary draught, as well as yielding the burnt lime, which descended to the bottom of the kiln continuously once the kiln was in full operation. Above the eye there may be a poking hole, through which an iron poker was pushed to riddle or stir the burning lime. The other essential component of all kilns is the ramp up which the raw materials, invariably coal and limestone, ascended to the opening of the pot. Such ramps sometimes used the natural topography - as at the Lindisfarne Castle kilns, where the kilns are built at beach level and the kiln pots reached from the cliff top – particularly where kilns were built into quarries, but in other cases were deliberately constructed, reinforced and widened over time with the aggregation of quarry- and kiln waste materials.

The large industrial kilns such as the Lindisfarne Kennedy Limeworks, are associated with storage features for both raw materials and products, slaking pits, smithies and transport facilities, including horse drawn railways to transport raw materials to the kilns and burnt lime from them.

In draw kilns, coal and limestone were packed into the kiln pot in successive bands, often at a ratio of 1:2, and a fire kindled with wood stacked at the base. This ignited the bottom layer of coal which burnt through, heating the layer of limestone above with the draught drawing the fire through and eventually igniting the superseding layer of coal. This process could continue *ad infinitum* until seasonal conditions became too damp, or the kiln became unserviceable or uneconomic.

The process of limeburning in all kilns is determined by the chemical process wherein the chemical constituents of calcium carbonate (CaCO_3) dissociate to form carbon dioxide gas (CO_2) and calcium oxide (CaO), a process known as calcining. The product is volatile quicklime. Although seemingly a simple process, much experience was needed in order to achieve a successful burn, with the speed of the burn and its ferocity regulated by the opening or closing of the draw holes or eyes at the base of the kiln.

Once removed from the kiln the quicklime could be changed by the addition of sufficient water, a process often accompanied by hissing and bubbling, to form ‘slaked’ lime. If sufficient water were added, this formed a paste, the normal preparatory state for its use in mortar. If the addition of water were controlled carefully enough, the quicklime would fall to a powder (a dry hydrate), a form ideal for direct application on agricultural land.

KILNS IN THE SURVEY AREA

A search for limekiln sites was undertaken using the county council historic environment record, historic Ordnance Survey mapping, aerial views and previous surveys carried out by Glasgow University Archaeology Department (GUARD), Stafford Linsley and AP Ltd.

Scremerston (Cargie’s Kiln) Limekiln, NU 02095 49655

Cargie’s Kiln is situated above the shoreline at the edge of the steep and eroding coastal slope and is accessed by an incised trackway running across this slope. It is considerably decayed and has been affected both by slumping of the soft geology of the slope it is built into and by erosion from the sea which has undercut it. It is a

multangular structure with three access arches in red sandstone rubble with squared sandstone voussoirs around, and a single but now obscured circular pot, with wing walls to north and south. Historic Mapping shows that it was in use at the time of the 1st edition (1866) Ordnance Survey plan, when the present trackway was in use along with another shown running from the front of the kiln to the sea. The kiln was disused by time of 2nd edition Ordnance Survey Plan (1893).

Saltpan How Limekiln; NU 025 489

This kiln appears on the 1st edition (1866) Ordnance Survey plan, where the working kiln is set a little way to the west of an extensive quarry with a substantial loading ramp running to it from the north and a tramway running beyond the kiln, but was disused by time of 2nd edition Ordnance Survey Plan (1893). The remains of one round pot and draw arch were visible in a fragmentary state in 1976 when recorded by Stafford Linsley, but had been lost by 1993. Local information suggests that the kiln and its surrounds were razed and infilled in 1981, but it is possible that remains of it survive underground.

Saltpan How 'Old Limekiln'

An 'old limekiln' is shown on the 1st edition (1866) Ordnance Survey plan to the east of the Saltpan How quarry, above, but no physical evidence survives for the structure.

Sandbanks Limeworks Kiln, NU 032 481

This kiln was 'in good condition plus two other kilns' when recorded by Stafford Linsley in 1976 but is now lost, probably buried after partial razing in 1981, although a very substantial loading ramp survives topped with WWII gun emplacement on the south side of the kiln position. The kiln is shown on the 1st edition (1866) Ordnance Survey plan with three pots and its loading ramp running to the south-east which supported a tramway powered by an engine on the loading platform. A tramway is also shown running on a trestle from the north-west side of the platform accessing quarries. The complex was still in use at the end of the 19th century, under the ownership of Scremerston Colliery, with the tramway from the kiln on an altered course to access the main rail line, but went out of use in or around 1910.

Cocklaw Dunes Limekiln, Sandbanks, NU 03420 48105

The limekiln, already disused by the time of the 1st edition (1866) Ordnance Survey plan is set into the eroding boulder-clay coastal slope and is a relatively well-preserved multangular structure with facework of uncoursed rubble. A large circular pot, now largely infilled with hazardous materials from WW2 coastal defences (including razor wire), was accessed by a loading ramp. Four access arches are visible, one opening on to the shore, three to the west, each with red or grey sandstone voussoirs

Kennedy Limeworks, Holy Island; NU 1220 4310

While a clause within the 1793 Enclosure Act for Holy Island allowed for the construction of a lime kiln, there is no physical or documentary evidence to show that any kilns were constructed until 1846 (Jermy 1992, 21). The works exploited limestone on the northern edge of the island at Buck Skerrs, Snipe Point and Nessend. Eventually, three blocks of limekilns sat in an area known as The Links a

little way to the south of the quarries, joined to them by a waggonway which also ran on to a timber jetty at The Basin on the west side of Holy Island village. In addition to surveys by Stafford Linsley in the 1970s and Guard in 1993, O'Sullivan and Young surveyed the site for their 1995 publication on the archaeology of the island (Williams & Williams Jermy 1992 Bailey and Culley 1797). O'Sullivan and Young 1995).

Two blocks of kilns remain in evidence:

The *Northern kilns*, built by David Gibson of Belford and John Lumsden of Mousen and were in use by 1846 as the St Cuthbert's Limeworks. The Berwick Advertiser for 25 July 1846 describes the enterprise:

Messrs. Gibson and Lumsden of Belford... have during the past year, built two capacious limekilns, made a tram or railway, upwards of a mile in length, from their works to the shore, and erected a jetty for the purposes of shipping; and have already sent several cargoes of lime...to Dundee, Perth and other points in the north of Scotland. They have also landed several cargoes at different places on the coast of Northumberland and Berwickshire for the use of those farmers whose distance from the limekilns prevents them getting that useful article by any other means' (quoted in Jermy 1992, 21)

Two fragmentary, circular pots survive in the dunes, lined with vitrified sandstone and some firebrick, their arches to the front (south) hidden in the sand. The upper part of a stone arch can be seen between the two pots. This will have accessed a central lobby or cross passage between the kilns. The loading platform and loading ramp, obscured by windblown sand, extend to the north of the kilns.

The *Southern Kilns* lie along the east side of the tramway south of the Northern kilns and were in use for a fairly short time in the late 1850s. They were built by William Nicholl, lime merchant and ship owner of Dundee, who obtained a 21 year lease for the works from John Selby, Lord of the Manor. Unfortunately, he erected them beyond the area of the lease and they were quickly abandoned in favour of the well-known kilns at Castle Point, also constructed by Nicholl. They appear to have consisted of three pots set within a rectangular structure, but the front wall is missing.

In addition to the kilns and waggonways, remains of other features on the site include a linear structure of nine projecting bays, now partially submerged by sand, set on the west side of the tramway between the kinn blocks described above. These have been interpreted as limekilns but are more likely lime storage bays to hold burnt lime prior to onward transportation. Their location suggests they were a part of the 1846 St Cuthbert's Limeworks but they had disappeared by 1898. Just to the north, also on the west side of the track are the earthwork remains of a smithy, while on the east side is a large, earthwork enclosure, perhaps for slaking, and somewhat to the east of that are the foundations of limeworkers cottages within a walled enclosure, partially excavated in 2016:

Excavations at the Kennedy limeworkers cottages were restricted to an exploratory investigation of one cottage interior, across a dividing wall with fireplaces built on both sides and large, limestone hearth stones extending into the room spaces. The floors were of compressed lime mortar, but in the eastern room slots had been cut to take timber sleepers for an overlying floor of wooden boards. The solid, heavily-mortared stone walls had been roofed with red pantile, many pieces of which were recovered, along with numerous hand-made bricks, probably locally made, which had presumably been used as fillers and features in the stone walls and for the construction of fireplaces. Some evidence was derived, from the different construction of sections of the front wall, to suggest that the block was not all built at the same time, but perhaps in stages.

Two doorways were revealed on the south side, each with socketed stones to take timber door frames and with limestone slabs set at threshold level externally. Finds included abundant pottery, including china and kitchen wares, as well as iron work and glass, including window glass and parts of several wine bottles, but it is likely that this represented only a small fraction of the rubbish deposited around the cottages, much of it probably discarded in permanent or temporary middens (the latter perhaps subsequently redeposited on the adjacent fields). Little evidence for the food consumed by the residents was found, other than some animal bone and whelk shells which were, somewhat surprisingly, almost the only shellfish remains found on the site. Although relatively recent in origin, established at the beginning of a period of industrialisation which, alongside its fishing and farming heritage, opened the island to the modern world, this site would certainly merit further investigation. This point was emphasised in a talk given in the new village hall on July 1st 2016 by Roger Jermy, author of *Lindisfarne's Limestone Past*, who detailed the part played by the lime industry, its kilns, railways and shipping facilities in developing the island's economy and adding to its cultural and genetic heritage in the 19th century.

Castle Point Limekilns, NU 137 417

This is a large, monumental limekiln comprising six pots set into a large, rectangular structure built against sloping ground on the north-western edge of Castle Point. It was constructed following the failure of his Kennedy enterprise, by William Nicholl of dressed but randomly coursed sandstone masonry. Round-headed draw holes at the base of each pot were accessed variously from six external round-headed access arches and a pointed Gothic arch (on the south face), some directly accessing the pots, some leading to vaulted passages and further access arches within. Tramlines ran along the passages and facilitated removal of the burnt lime into small trucks. The short loading ramp to the north provides access to the top of the kiln. The six pots are all circular in plan, lined with firebricks, and taper to the base. Limestone qaa quarried from Nessend Quarry on the northern edge of the island and transported by tramway, while burnt lime was taken from the kiln to a jetty on the point below the castle. This kiln was in use from 1860 but had fallen out of use by the end of the century.

The Snook Limekiln, Holy Island

A limekiln is shown on the 1st edition Ordnance Survey plan on the Snook at about the position of the current cottage, and fragments of it may survive under a mound on its north side.

Easington Grange Mill Limekiln, NU 11928 36452

A lime kiln is shown on the 1st edition Ordnance Survey plan (1860) on the eastern edge of the road running north from Easington Grange Mill, but no evidence for it survives today on the ground.

Easington Demesne Limekiln 'A', NU 11966 35463

This kiln, set within the north-east corner of an extensive quarry shown as fully extended on the 1st edition Ordnance Survey plan, is now very fragmentary and obscured by rubble and soil build-up around it. One pot is visible, circular in plan and with a firebrick lining, with three, possibly four access arches partially infilled. This

kiln, along with another to the south (see below), was in use in 1860 but marked as 'Old' by 1898.

Easington Demesne Limekiln 'B', Easington; NU 12014 35331

The sits at the south-western edge of the quarry noted above and is a substantially intact kiln with multangular frontage wall of uncoursed sandstone, pierced by three access arches which are round headed with stone voussoirs. There is a ponded area against the north-east frontage of the kiln, which has one pot with a vitrified lining. An earth loading-ramp curves up from the south of the kiln.

Budle (Kiln Point) Limekiln; NU 1537 3534; HER 5093

Positioned to the east of a lane running down to the shoreline at Kiln Point on Budle Bay, this kiln is in a fairly poor condition with one of the three access arches having collapsed. It has a multangular frontage wall of random whin rubble facing south with (originally) three round-headed access arches with brick voussoirs and a wing wall to the east. There is one central pot, circular in plan but infilled. A tightly curving earth loading ramp runs from adjacent to the trackway and up to the loading platform. The kiln was in use in 1860, when a track is shown on the 1st edition Ordnance Survey plan running from the lane south of the kiln to the shoreline, but was disused by 1898. Structures shown appended to the east face of the kiln and to the south are not obvious today.

Spindlestone Limekiln, NU 1521 3362

This comprises a large rectilinear structure of coursed sandstone rubble with neatly cut angle quoins at the north end and with massive clasping buttresses added below the kiln which is built into a gentle slope climbing to the south. The three round-headed arches, all at the north end of the kiln in the north, west and east faces, have neatly cut sandstone voussoirs and access one central pot, lined with firebricks but largely infilled. The draw holes are narrow and round-headed with small, square poking holes above. As the kiln is set into a slope, the earth ramp at the south end is fairly short but extends the width of the structure. The 1st edition Ordnance Survey plan shows the kiln in use but it was out of use by the 2nd edition of 1898.