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“How OS depicted limekilns in
Scotland’s Central Belt”

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How OS depicted limekilns in Scotland's Central Belt

Paul Bishop and Gavin Thomson¹

Introduction

Richard Oliver's recent short review² of Bill Bignell's new book on OS mapping of windmills³ highlighted the fact that there has been relatively little discussion of the ways in which OS mapping symbols depict the object that is being mapped, and the 'veracity'/accuracy of that mapping. Bignell developed that theme at some length, and Oliver also noted that a recent *Sheetlines* piece in that same vein concerned the mapping of ha-has,⁴ which discussed the conventions, or lack thereof, associated with representing ha-has; that discussion continued in follow-up exchanges.⁵ Oliver likewise explored the mapping and representation of churches in an earlier *Sheetlines*.⁶

This note discusses the mapping of limekilns on OS first and second edition maps of the Central Belt of Scotland, with an emphasis on the first edition six-inch maps. We explore the ways in which the mapped symbols represent the 'true' situation 'on the ground', both in terms of the type of kiln being represented, and in terms of how many limekilns are actually mapped. We undertook this survey as background to a new project on the early lime industry in Scotland. The focus is on Scotland because the lime industry here is distinctive in several ways and the literature on lime-burning is generally dominated by reports of lime-burning in England.⁷ Moreover, the literature that is Scotland-

¹ Paul Bishop is a Professor in the School of Geographical and Earth Sciences at the University of Glasgow, and Gavin Thomson graduated from the University of Glasgow in summer 2013 with a Honours BSc degree in Geography. We sincerely thank Mr John Moore of the University's Library, and the staff of the Library's Maps, Official Publications and Statistics Unit, for kindly providing access to the maps. All OS map extracts are reproduced by permission of the National Library of Scotland. John Harrison, Richard Oliver and David Andrews provided helpful comments on an earlier draft.

² Richard Oliver, 'Mapping the windmill – The Charles Close Society's latest book', *Sheetlines* 96 (2013), 4-5.

³ Bill Bignell, *Mapping the windmill: the Ordnance Survey in England*, London: Charles Close Society, 2013.

⁴ Paul Bishop and Richard Oliver, 'Representation of ha-has on OS six-inch mapping', *Sheetlines* 94 (2012), 6-15.

⁵ David Andrews, Paul Bishop and Richard Oliver, 'More about ha-has on Ordnance Survey maps', *Sheetlines* 96 (2013), 31-35; David Andrews and Paul Bishop, 'Ha-has – the last laugh? David Andrews and Paul Bishop reach a happy conclusion.' *Sheetlines* 97 (2013), 48-49.

⁶ Richard Oliver, 'Steeple and spires. The use of church symbols on Ordnance Survey one-inch maps', *Sheetlines* 28 (1990), 24-30 (in the print version of *Sheetlines* 28; pages 27-35 in the online version at www.charlesclosesociety.org/SheetlinesArchive).

⁷ Lest there be concerns that the treatment here is overly influenced by considerations of Scotland's separateness (against a background of a referendum that is looming in 2014), let us reassure readers that the lime industry in Scotland *does* appear to be locally distinctive. It is often characterised by a particular geological setting, which, unlike in many other parts of Britain, provides both limestone and coal together in the same rock sequence. In addition, the acidic soils of Scotland are particularly needy of 'sweetening' by lime, reflecting Scotland's

focused is itself dominated by discussion of masonry-built draw kilns for producing lime, largely ignoring, save for a few notable and important exceptions, the widespread use of clamp kilns (see below for an explanation of these two types of kilns).

Background on lime

Multiple uses for lime – for bleaching, tanning, mortar, sugar production, plaster, medicines, corpse disposal, ‘sweetening’ acid soils, and so on – have been known since antiquity,⁸ and lime industrial archaeology/history is extensively documented. Agriculture in northern Britain depends critically on liming because of higher rainfalls and acidic, often poorly structured, heavy soils that are significantly improved for agriculture by the addition of lime or by ‘liming’.

Lime is produced by burning (calcining) limestone (CaCO_3) to a temperature of at least 900°C in a kiln, using coal, wood or even peat as fuel. This burning drives off CO_2 leaving CaO , or quick lime, to which water may be added to form slaked lime (i.e. $\text{Ca}(\text{OH})_2$). The kilns used to calcine the limestone in Scotland may be relatively simple clamp kilns: three-sided U-shaped or rectangular pits or embayments (*figure 1*) that were packed (‘charged’) with inter-layered limestone and fuel, and fired by igniting the fuel and covering or ‘clamping’ the kiln charge. More elaborate draw kilns were also used, consisting of substantial, masonry-built structures enclosing an internal kiln ‘pot’ or pots where the limestone and fuel were loaded from the top and burned as the charge moved down through the pot, until the lime was drawn off from a draw hole at the base of the pot (*figure 2*). Agricultural liming in Scotland dates from at least the early seventeenth century,⁹ but, unlike for Yorkshire,¹⁰ the relative numbers and spatial distribution of kiln types in Scotland’s lime production are essentially unknown, except for a few areas covered in a range of crucial but rather obscurely published works.¹¹ Nonetheless, recent literature, drawing heavily on Skinner’s work on draw kilns in the Lothians,¹² continues to emphasise large masonry-built draw kilns as the

humid climate. Scotland's agriculture, therefore, generated particular demands for large quantities of lime, which may not have existed in England, at least in the south.

⁸ e.g., R Williams, *Lime kilns and lime burning*. Shire Books: Shire Album 236, 1989.

⁹ e.g., A Fenton, *Scottish Country Life*, Edinburgh: John Donald, 1976.

¹⁰ D Johnson, *Limestone industries of the Yorkshire Dales*. 2nd ed., Stroud: Amberley, 2010.

¹¹ e.g., Nisbet, 2003, *op.cit.*; S Nisbet, ‘The archaeology of the lime industry in Renfrewshire’, *Renfrewshire Local History Forum Journal* 13 (2005), 41–58; KJH Mackay, ‘Limestone working. A forgotten Stirlingshire industry’, *Forth Naturalist & Historian* 2 (1977), 80-105; JG Harrison, ‘Lime supply in the Stirling area from the 14th to the 18th centuries’, *Forth Naturalist & Historian* 16 (1993), 83-89; J Mitchell, ‘Cornstone burning for fertilizer’, *Scottish Local History* 85 (2013), 43-45; I Donnachie, ‘The lime industry in south-west Scotland’, *Transactions of the Dumfriesshire and Galloway Natural History and Antiquarian Society* 3rd series 48 (1971), 146-151.

¹² BC Skinner, *The lime industry in the Lothians*, University of Edinburgh: Department of Adult Education and Extra-Mural Studies, 1969; BC Skinner, ‘The archaeology of the lime industry in Scotland’, *Post-Medieval Archaeology*, 9 (1975), 225-230.

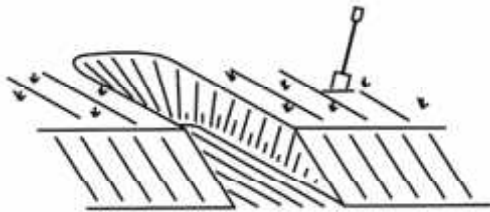


Fig 1: sketch of clamp kiln

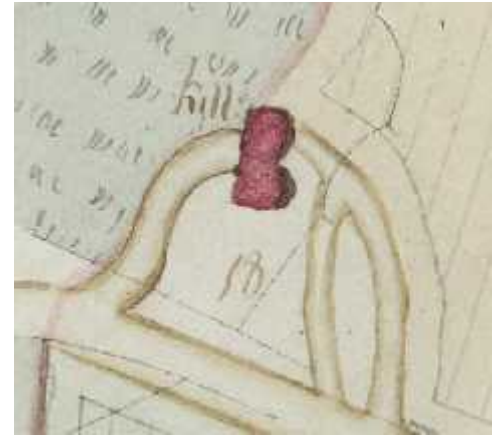


Figure 1 (above):

Left: Nisbet's sketch of a clamp kiln (U-shaped embayment) [Redrawn by PB from figure 1 in S Nisbet, 'The 18th century lime industry in Scotland', Scottish Local History 58 (2003), 8-13]

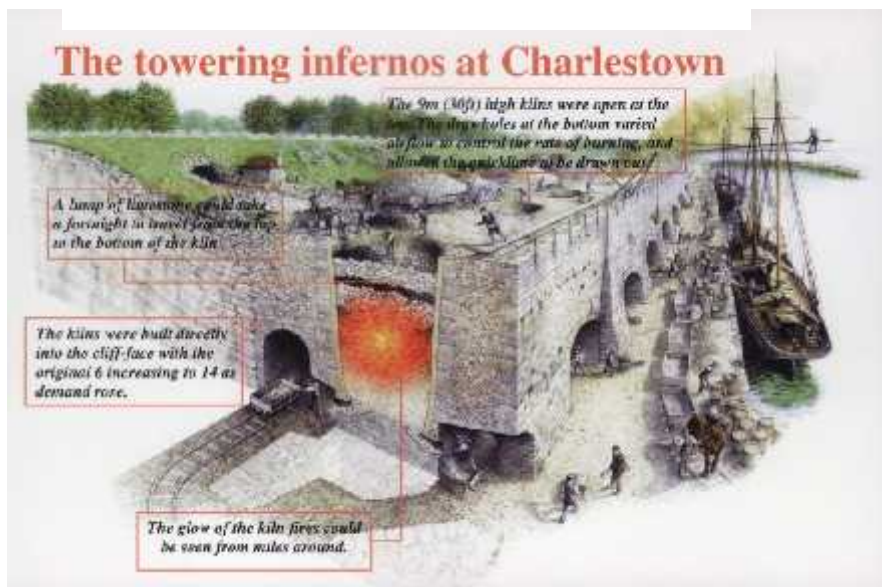
Centre: Clamp kilns at Kilnpothall, Lanarkshire [figure 6 in T Ward, 'Braehead Village, South Lanarkshire: a survey and historical review', Biggar Archaeology, nd, online at www.biggararchaeology.org.uk/pdf_reports/Braehead.pdf; accessed 22 July, 2013 reproduced by permission]

Right: U-shaped symbols labelled 'Kill' (common Scots word for kiln) at Langfauld, west of Scotland, on an ?1805 farm plan for 'Long Fauld', part of the Dougalston Estate [National Records of Scotland, RHP 05302-00020]

Figure 2

Lower left: Postcard of the draw kilns at Charlestown in Fife, highlighting the charging of the kilns with limestone and coal from above and the drawing of lime from below [courtesy of the Scottish Lime Centre Trust, with thanks]

Lower right: The single-pot draw kiln at Johnshaven, Kincardineshire, with the two arched tunnels providing access to draw holes at the base of the pot for drawing off lime [picture: Paul Bishop]



pre-eminent and dominant technology,¹³ to the unhelpful and inappropriate extent that the Lothians is thought of as “somehow the ‘cradle of the industry’ in Scotland”.¹⁴ This view was at odds with PB’s reconnaissance observations that lime manufacture in clamp kilns was widespread in Scotland’s Central Belt and in many dispersed localities elsewhere.

First edition six-inch mapping of lime works

We documented every mapped occurrence of limekilns or limeworks on the mid-nineteenth century OS 1st edition six-inch maps of the Central Belt of Scotland, covering, broadly from west to east (and using the mid-nineteenth century county names), the Counties of Ayrshire, Renfrewshire, Dunbartonshire, Lanarkshire, Stirlingshire, Linlithgowshire (West Lothian), Edinburghshire (Midlothian), Haddingtonshire (East Lothian), Berwickshire, Perthshire & Clackmannanshire, and Fifeshire & Kinross-shire. One of us (GT) examined the 487 sheets that make up this coverage, systematically moving an A4-sized ‘window’ west to east across each sheet, on successive lines down the sheet. Each lime kiln or limeworks was noted within that ‘window’, assisted by a magnifying glass as necessary. GT recorded the mapped kiln symbol(s) as well as the location of each limekiln or limeworks to 5 inch accuracy using the latitude and longitude on the map sheets margins; all data were compiled in an Excel spreadsheet. Other information related to the industrial activity, but of less relevance to the present note, was also recorded, including the presence of quarries, mines, tramways, train lines, and so on. We then worked our way through all 487 sheets a second time, with one of us reading out the locational and other information from the spreadsheet and the other checking the map for the accuracy of that information as well as ‘mopping up’ any limekilns or limeworks that had been missed in the first pass. We are confident that we have located virtually all of the lime-related features mapped on these 487 sheets.

The mapping symbols

We located a total of 1608 kilns, which had been mapped using more than 30 symbols (*figure 3*). For several reasons we are satisfied that all of these symbols are meant to represent limekilns. These reasons include, firstly, the close relationship between the mapped symbol and the technology ‘on the ground’. Thus, U-shaped clamp kilns are mapped by a U symbol and less frequently a three-sided open rectangle, and draw kilns by a circle that we interpret to represent the pot of a draw kiln, with the black dot on the circumference representing the draw hole (e.g., the various symbols in group 5, *figure 3*). When that symbol is surrounded by a square, which we take to represent the stonework of the draw kiln, the match between mapped symbol and object is even closer (see below).

¹³ JR Coull, ‘Communications and trade in Scottish farming from the Medieval Period to 1900’, in A Fenton & K Veitch (eds), *Scottish Life and Society. Volume 2. Farming and the land*, Edinburgh: John Donald, p.855.

¹⁴ Nisbet, 2005, *op.cit.*, p. 51.

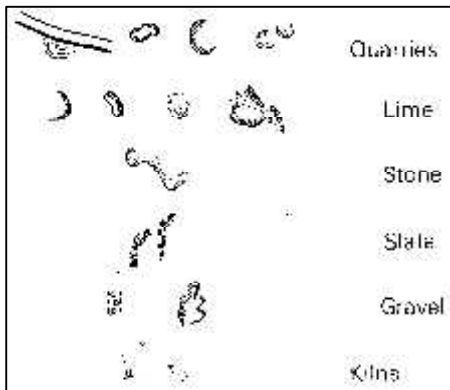


Figure 3. Symbols used on OS first edition (mid-nineteenth Century) six-inch maps of the Central Belt of Scotland to map limekilns (as indicated by the label 'Limekiln' or 'Old Limekiln' being beside the symbol recorded here). The symbols are hand-drawn by us here for clarity and some examples from maps are given below. Our original classification of these symbols included more symbols than are given here, some of which were subsequently deleted and others moved into other symbol groups. We retain the original numbering here, however, for consistency with our Excel spreadsheet data and to avoid potential errors arising in re-numbering those spreadsheet data.

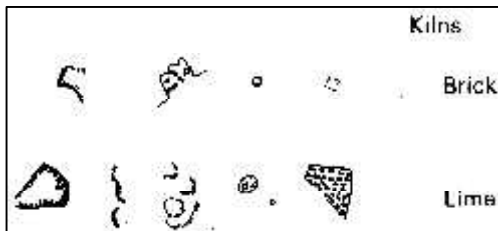
Secondly, some of the symbols, particularly those for masonry-built draw kilns, correspond to those used for limekilns on the one-inch Old Series maps, as re-drawn by Rodney Fry for the Margary volumes, *The Old Series Ordnance Survey maps of England and Wales* (figure 4). Interestingly, the symbols for clamp kilns on the first edition six-inch maps (i.e., figure 3 symbols 1, 2 and 3) are not as clearly represented among the Old Series symbols, although it is possible to interpret some of the Old Series symbols as perhaps representing U-shaped clamp kilns (e.g., some symbols in figures 4A, 4B, 4C, and 4D).



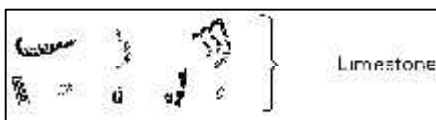
4A



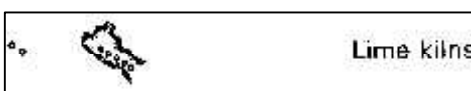
4B



4C



4D



4E



4F

Selected mine, quarry and kiln symbols redrawn by Fry from the Old Series one-inch maps (from the Margary volumes as indicated).

Figure 4A. Limekiln symbols from Margary Vol II. Note the possible similarity between these two symbols and that in figure 3.1f. However, we are unclear as to what the filled black squares represent here, as we are similarly unclear as to what is represented by the dot in figures 3.1f and g.

Figure 4B. Various minerals-related symbols from the legends given in Margary Vol IV. The U-shaped symbol at the far left of those labelled "Lime" may represent a clamp kiln, with the others representing draw kilns, the circles evoking the pots of draw kilns. The symbols labelled "Kilns" at the bottom of this group are enigmatic (and perhaps include a U-shaped clamp kiln?)

Figure 4C. Various kiln symbols from the legends given in Margary Vol V. Once again, the meaning of all the limekiln symbols is not immediately obvious. We interpret those incorporating small circles as indicating draw kilns, and perhaps the more-U-shaped symbols represent clamp kilns (e.g., third from the left) but the right-hand symbol is enigmatic.

Figure 4D. Symbols for 'Limestone pits and quarries' from Margary Vol VII. Although explicitly labelled as related to pits and quarries, it might be argued that symbols at bottom left, incorporating circles, might indicate draw kilns (see next set of symbols - E).

E. Lime kiln symbols from Margary Vol VII, which almost certainly represent draw kilns.

F. Lime kiln symbols from Margary Vol VIII. All but the extreme right-hand symbol probably represent draw kilns, and it is noteworthy that the bottom left symbol is the same as the symbol we take to represent a draw kiln on the six-inch first edition maps being studied here (i.e., symbol 5, and particularly 5a, in figure 3).

In other words, the facts that the symbols in *figure 3* lie adjacent to ‘Limekiln’ or ‘Old Limekiln’ labels, and that precursor limekiln symbols are used on the Old Series maps (*figure 4*), give us confidence that the symbols in *figure 3* do indeed represent limekilns. We are essentially certain that symbol groups 1 to 6, 12, 21 to 25 in *figure 3* do represent limekilns, with one set of symbols corresponding to clamp kilns (groups 1-3, 21) and one set to draw kilns (groups 4-6, 12, 25).

Returning to the issues that motivated this examination of limekiln symbols, namely, the extent to which the first edition six-inch mapping captures essential aspects of the lime-burning industry, we can ask several questions.

Does map symbol mirror form and therefore function?

Evidently, yes: in PB’s local area of Baldernock Parish (East Dunbartonshire; formerly Stirlingshire), for example, all lime kilns ‘on the ground’ are U-shaped clamp kilns or, in some cases, more circular, horseshoe-shaped clamp kilns. In almost all cases, the orientations of the mapped U-shapes match the orientations of the embayments on the ground. In other areas, U-shaped embayments and rectangular embayments are mapped side-by-side, clearly differentiating these two clamp kiln sub-types (*figure 5A*), but in other examples, a clamp kiln mapped as an open (three-sided) rectangle on the first edition may have become a closed rectangle by the second edition (e.g., *figure 5B and 5C*). Notwithstanding that uncertainty (which, incidentally, we think cannot be interpreted to represent a change in kiln type between the first and second editions, because the kiln is already defunct [‘Old’] when mapped for the first edition), we judge that a map symbol for a clamp kiln generally means that a clamp kiln was there. The 25-inch may give more detail than the corresponding six-inch map (*figure 5D*).

Likewise for draw kilns: the number of pots generally seems to have been faithfully recorded (*figure 6*). Symbol 5a (*figure 3*) is very commonly used for mapping a draw kiln and it is clear that the circle represents the kiln pot (e.g., *figure 6B and 6C*); we speculate that the dot on the circumference locates the draw hole. Evidence for this conclusion includes the following: the dot is not always in the same position each time the symbol is used for a bank of draw kilns, and superimposing semi-transparent OS first-edition six inch on Google Earth imagery, via the excellent National Library of Scotland mapping website, indicates that the location of the circumferential dot is consistent with its marking a draw hole or at least the tunnel that provides access to the draw hole. We commented above that the mapped orientation of a clamp kiln generally matches the kiln’s orientation on the ground, and it is noteworthy that many clamp kilns, certainly in Baldernock Parish where we have seen all mapped kilns on the ground, have their open ends towards the prevailing wind that blows in an arc ranging from the west through the south to the south-east. Likewise, the dot on map symbol 5 is very commonly located on the western to south-eastern part of its circle’s circumference, which we speculate indicates draw holes facing the dominant wind direction. Such speculation needs careful testing, however, not least because clamp kilns functioned by being ‘clamped’ (i.e., the charge was covered over) so as to control the burn. So, limeburners would certainly have needed to control the draft provided by prevailing winds, but clamp kilns *did*

need draft, not least because the product of the burning – CO₂ – extinguishes a fire. Clamp kilns excavated by David Johnson in Yorkshire incorporate quite sophisticated plumbing for draft.¹⁵

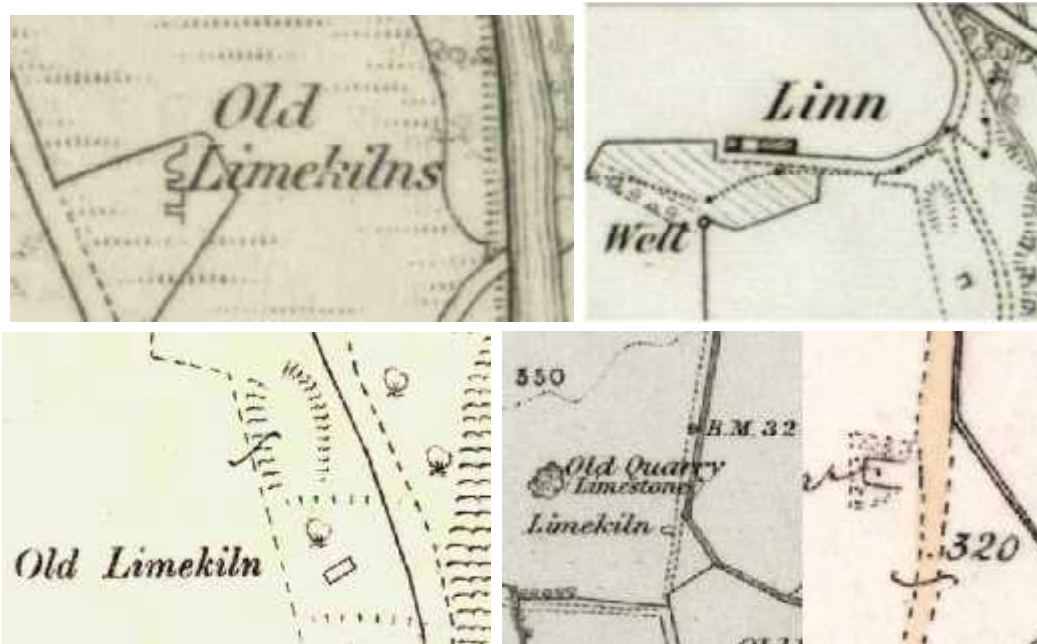


Figure 5A (top left): Types 1A and 2A clamp kilns at Gartincaber [first edition six-inch Stirlingshire, Sheet XIV]

Figure 5B (top right): Unlabelled (and presumably defunct) clamp limekiln at Baldernock Linn on first edition six-inch mapping (Stirlingshire, Sheet XXVII), represented by symbol 2a (figure 3). We know that this is an ‘Old Limekiln’ as it is labelled as such on the corresponding first edition 25-inch sheet. An abandoned quarry, a larger U-shaped symbol outline by slope hachures, lies immediately to the north of the kiln

Figure 5C (lower left): The same defunct (‘Old’) Baldernock Linn clamp kiln as in B, but here labelled and represented on the second edition six-inch by symbol 3a (figure 3) [Stirlingshire Sheet XXVII.SE]

Figure 5D (lower right): Clamp kiln near Meiklemire (Ayrshire) on first edition six-inch map (left; Ayrshire sheet VII) and on first edition 25-inch map (right; Ayr Sheet VII.15 (Dalry)). We wonder if the dotted stipple pattern around the kiln on the 25-inch mapping indicates ground sloping away from the top of the U-shaped embayment.

In some localities both clamp and draw kilns are mapped (figure 6B), with the map representation faithfully recording the draw kiln’s situation and the meaning of its mapping symbol (figure 6C). Draw kilns and clamp kilns also may be distinguished in the same map (figure 6B), and there may be further information on different kilns’ relative ages (figure 6D).

¹⁵ D Johnson, ‘The archaeology and technology of early-modern lime burning in the Yorkshire Dales: developing a clamp kiln model’, *Industrial Archaeology Review*, 30 (2008), 127-143.

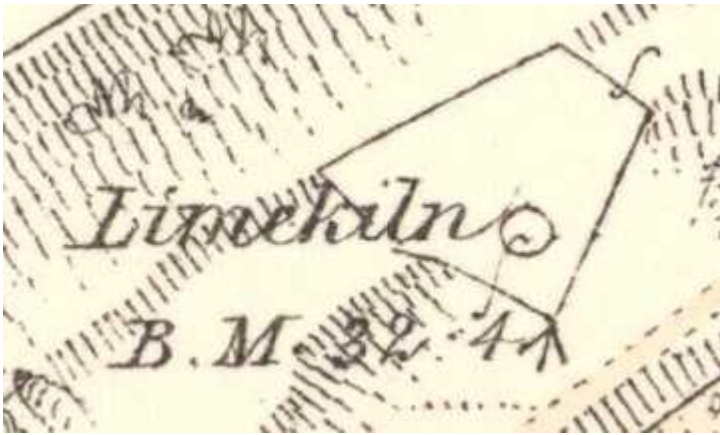


Figure 6A (top left). OS first edition 25-inch mapped symbol for the Johnshaven (East Mathers) draw kiln, showing the single pot that is still clear 'on the ground' and from which quick lime would have been drawn in the two arched draw holes shown in figure 2 right. The eroded pots of two earlier draw limekilns still visible to the immediate west of this kiln are not mapped (Kincardineshire, Sheet XXVII.4 (St Cyrus)).



Figure 6B (top right): The single-pot draw kiln at the Cults Lime Works, Pitlessie (Fife, Sheet 17), which is still clearly visible on modern Google earth imagery in C. Adjacent to the draw kiln are banks of operating clamp kilns, here mapped with symbols 2a (figure 3).



Figure 6C (centre left): Google Earth image of the draw kiln (upper centre) mapped at Cults Lime Works in B.

[©Google. ©Getmapping plc]

Figure 6D (lower left): Draw kiln and abandoned clamp kiln at Nobleston (Dumbartonshire, Sheet XVIII). Note how the 'Old Limekiln' label is attached to a degraded clamp kiln (approximately represented by symbol 1d (figure 3), and that a quarry is evidently represented to the northeast of the abandoned clamp kiln.

An intriguing question is prompted by the detail implied by the symbols 4 to 6 in *figure 3*: in those symbols in which the circular pot symbol is surrounded by a geometrical figure, does the geometrical figure indicate the form of the kiln's masonry surrounds? Symbol 5e presumably indicates a kiln pot supported at its sides by embankments, with a wall at its front where the draw hole is located. It is less clear what we are to interpret of the kiln form that is mapped by more elaborate representations, such as at Auchencloigh (Ayrshire) (*figure 7*).

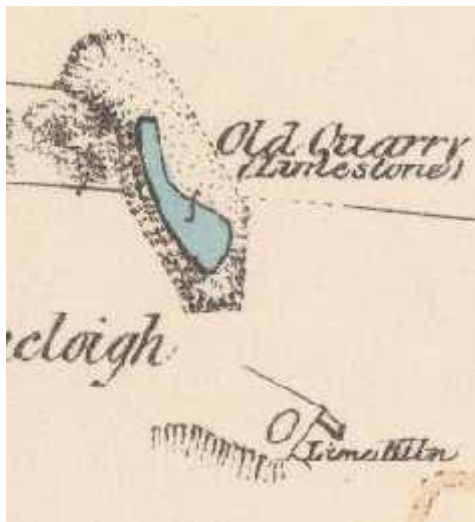


Figure 7. Draw kiln at Auchencloigh Farm, Ayrshire, showing an oval kiln pot apparently in a masonry structure, with a sloping southern side. We presume that the 'wings' at the kiln front, either side of the 'LimeKiln' label, represent projections on either side of the draw hole. [Ayr Sheet VII.08 (Kilbirnie)]. This kiln is not mapped on the corresponding first edition six-inch map.

Are all kilns mapped?

No. In Baldernock Parish, there are 35 clamp kilns mapped and at least double that number extant on the ground. In upper Bannock Burn (Stirlingshire), not one of an extensive field of 45 horseshoe-shaped clamp kilns¹⁶ is mapped on OS first edition six-inch maps.¹⁷ Nor is there is any mention on this site of limeworks, which is sometimes OS practice when many kilns are present. The latter situation is found around Braehead in Lanarkshire where Ward has identified and georeferenced more than 140 clamp kilns.¹⁸ In some but by no means all of these Braehead settings, the first edition six-inch maps simply record Limeworks, with no indication as to numbers or types of kilns, whereas for other Braehead localities kilns are indicated, generally as clamp kilns. This lack of information on kiln typology and numbers in OS first edition six-inch maps of some localities diminishes the utility of these maps in mapping the industry.

The reasons for only partial mapping of limekilns remain unclear, but may simply come down to the surveyors' unwillingness or lack of time to record every individual structure. The failure to map kilns when adjacent and equally obvious kilns are mapped, as is the case in the ~50% under-mapping of clamp kilns in

¹⁶ Mackay, *op. cit.*

¹⁷ The lack of mapping of the upper Bannock Burn clamp kilns almost certainly reflects the fact that they were long-abandoned by 1860 (J. Harrison, *pers. comm.*, 11 July 2013; see also Harrison, *op. cit.*).

¹⁸ Ward, *op. cit.*

Baldernock Parish noted above, is noteworthy in this regard. In the Baldernock case, one kiln in a pair or triplet of side-by-side kilns will be mapped and the other(s) not. It is possible that the surveyors had neither the time nor the motivation to record every last kiln. In some cases in Baldernock, groups of up to 12 or 15 kilns went unmapped, whereas other groups were meticulously recorded. Perhaps it came down simply to the numbers that had to be mapped to record every kiln in a locality versus the pressure to complete 'the job' and move on, perhaps along with an outcome of different surveyors working in adjacent areas. Another possibility is that some kilns were more degraded (and hence less obvious) than others and were not recognised as kilns, but we think that this is not an explanation for the partial mapping, as the degree of degradation of mapped kilns and adjacent unmapped ones is quite uniform.

The situation in this regard is different from the case of windmills examined by Bignell,¹⁹ where failure to map a windmill, or failure to map the type of windmill correctly, probably cannot be attributed to the sheer number of windmills. In the case of clamp kilns, many tens of which occur in some localities, there may have been 'information overload' for the surveyors (or perhaps, indeed, for the engravers?).

Are the mapped representations of kilns accurate, both temporally and in terms of kiln type?

It is clear from the preceding point that there are slight differences between the six-inch and 25-inch scales, the origin(s) of which we cannot explain at this stage and which are worthy of further investigation. As well, old limekilns will sometimes appear on the second edition six-inch maps (late nineteenth century) when they were not mapped on the first edition. There is no reason to think that these kilns were built, operated, and then abandoned to become 'old' between the mid-nineteenth century first edition mapping and that of the late nineteenth century second edition. No, they were simply missed or ignored in the first edition mapping. Notwithstanding these uncertainties and anomalies, we think it likely that kilns mapped as 'Old Limekilns' on the six- and 25-inch first editions were abandoned at the time of mapping. We see no reason to record something as 'Old' and, we interpret, abandoned when it is still operating, and the current degree of degradation of these kilns remains is consistent with their considerable antiquity. As well, we speculate, but cannot so far demonstrate, that the non-inclusion of 'Old' in the labelling means that the kiln was still functioning at the time of mapping. It is clear that at least some of the clamp kilns that do not include 'Old' in their label are today considerably less degraded ('sharper' in appearance) than those mapped as 'Old' on the first edition mapping. It is entirely possible, however, that practice varied throughout OS and that abandoned limekilns might have been mapped without the 'Old' label. A definitive answer on this matter awaits the fuller development of the project to which this map work is the precursor.

¹⁹ Bignell, *op.cit.*

So, the temporal dimension of the mapping has to be treated with caution, especially in terms of the comings and goings of the industry. Nonetheless, there are many examples of kilns appearing on the second edition of the six-inch mapping in situations in which we can be reasonably confident that the change is 'real'. One example from Campsie Parish in the western Central Belt illustrates such a change (*figure 8*).



Figure 8. The Derry Coal and Lime works, near Milton of Campsie, Stirlingshire (left), which had become the Glorat Lime Works by the end of the nineteenth century (right).

Left: The Derry Coal and Lime Works on the first edition six-inch map (Stirlingshire, Sheet XXVIII). Note the two small operating

clamp kilns ('Limekilns'; symbol 1a) at upper left of centre and the eight defunct limekilns ('Old Limekilns'; symbol 1a) at upper right.

Right: The Glorat Lime Works as shown on second edition six-inch mapping (Stirlingshire Sheet XXVIII.SW). Note: (i) the number of kilns at the lime works has now increased to five (the actual number still identifiable at this locality); (ii) the size of the kilns has increased (these are some of the largest clamp kilns that we have so far identified); (iii) the installation of a tramway connecting the lime works to the railway line at Milton of Campsie; and (iv) the continued mapping of the eight defunct kilns at upper right. The number and size of the kilns at the Glorat Lime Works and the Works' connectedness to the railway network point to major investment at this locality, presumably between the mid-nineteenth century (first edition) and the late nineteenth century (second edition). Unless the first edition maps are incorrect and have not mapped the lime works and kilns correctly, and are somehow mapping a previous form of the Works, then we take the changes from first edition to second to be 'real'. Bignell [op cit] highlighted the ways in which mapping of windmills may have suffered from failures to update earlier mapping, but it must be remembered for this Milton of Campsie case that it is logically impossible to judge the first edition mapping as incorrect because of a failure to update earlier mapping.

Concluding points

This note is concerned with OS mapping of limekilns, and the degree to which form and function can be interpreted from the mapping symbol. These issues are similar to some of those addressed by Bignell in his recent *Mapping the windmill*. Bignell notes that there is evidence that OS surveyors tried “to do more than simply signify the presence of ‘a windmill’, whether through the use of nuanced symbols or of ground plans”. (p. 59) It is easy to see how this issue applies also to the mapping of limekilns, particularly to distinguishing clamp kilns and draw kilns, and perhaps to the elaboration of the varied morphologies of draw kilns. Regarding the apparent mismatch between the mapped symbol for a windmill and the actual type of windmill, Bignell noted: “The much more likely explanation is that the surveyors were simply not sufficiently determined in their resolve to get this distinction between post mills and tower mills correct ... and that this issue continued to be unaddressed, even under the strictures of Colby’s new regime of better fieldwork.” (p. 88) Similar conclusions might be drawn about the mapping of limekilns in Scotland, especially where there were many tens to be mapped in a relatively small area. In other words, mapping is difficult and time-consuming, and especially so when there are more-or-less subtle differences between distinctive types of the object to be mapped (e.g., post mill vs. tower mill, or different types of clamp kilns).

Despite these cautionary notes, it does seem that OS first edition six-inch mapping forms a useful basis for understanding the mid-nineteenth century distribution of limekilns, with the following caveats. Clamp kilns are almost certainly under-represented in the mapping, especially where there are many kilns in a small area. The forms of clamp kilns and draw kilns are distinctive (unlike, perhaps, the more similar forms of the post windmills and tower windmills that Bignell examined, and which he shows are often substituted for each other in the mapping). So, we feel confident in using the mapping to provide an overview, at least, of the lime industry in the Central Belt of Scotland in the nineteenth century.

It seems likely that the variations in map symbols for draw kilns (symbols 4-6 and 12) represent variations in the built masonry that surrounds and supports the kiln pot. We remain uncertain, however, about the subtleties of form implied by the various symbols for clamp kilns (symbols 1-3), especially when different symbols are used within a bank of side-by-side clamp kilns (*figure 5A*). These variations might be recording real variations in kiln morphology apparent at the time of mapping (e.g., square-ended kiln embayments vs. more rounded embayment ends, in the case of *figure 5A*) but other obvious variations in clamp kiln morphology have not been mapped (e.g., keyhole-shaped clamp kilns [plan-view] we have observed at the Cults Lime Works). Elaboration of the meaning(s) of all of these symbols awaits further fieldwork.