



# *Sheetlines*

The journal of  
THE CHARLES CLOSE SOCIETY  
for the Study of Ordnance Survey Maps

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THE CHARLES CLOSE SOCIETY  
for the Study of Ordnance Survey Maps  
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The Charles Close Society was founded in 1980 to bring together all those with an interest in the maps and history of the Ordnance Survey of Great Britain and its counterparts in the island of Ireland. The Society takes its name from Colonel Sir Charles Arden-Close, OS Director General from 1911 to 1922, and initiator of many of the maps now sought after by collectors.

The Society publishes a wide range of books and booklets on historic OS map series and its journal, *Sheetlines*, is recognised internationally for its specialist articles on Ordnance Survey-related topics.

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**THE CHARLES CLOSE SOCIETY**  
for the Study of Ordnance Survey Maps

Number 90

April 2011



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# Sheetlines

Number 90

April 2011

Welcome to *Sheetlines* number 90. In its thirty-one years, the look-and-feel of *Sheetlines* has continuously evolved as developments in technology have made possible enhancements in design and production. The most recent change was the introduction of full colour last year and no doubt the process of evolutionary development will continue for the next ninety issues.

Meanwhile, this 64-page issue carries our usual mix of research, history, opinion, controversy and news, from a mix of familiar and new authors. News of our forthcoming publication *Old Series to Explorer* is on page 3.

We apologise for a mistake which occurred in the article in *Sheetlines* 89 about Irish postcodes, where we stated that a Loc8 code defines an area of 120 metres by 120 metres. In fact the code is accurate to plus or minus six metres throughout the island of Ireland. In this issue, Gary Delaney, originator of Loc8 codes explains their purpose, structure and benefits.

Ordnance Survey announced in January that they have moved to their new home at Adanac Drive, Southampton SO16 0AS. Now that OS have discontinued their own print facility, maps are being printed by Butler Tanner & Dennis in Frome, Somerset. Details of the first sightings are on page 44.

Several events that may be of interest to members are taking place over the coming months. An exhibition, *Putting Bath on the map* runs until 28 November at The Paragon, Bath ([www.bptlearning.org.uk](http://www.bptlearning.org.uk)). Southampton Maritime museum has an exhibition until 5 June on the history of Ordnance Survey in Southampton, whilst the London mapping festival starts on 6 June ([www.londonmappingfestival.org](http://www.londonmappingfestival.org)). *Home and Abroad*, an exhibition of maps from the historic collections of the University of Nottingham runs from 22 April to 14 August ([www.lakesidearts.org.uk](http://www.lakesidearts.org.uk)).

The Defence Surveyors' Association has a seminar at The Hermitage, Newbury on 11 June. More information from Mike Nolan at [maptnolan@gmail.com](mailto:maptnolan@gmail.com) or 01635 253167.

There may still be places available on this summer's CCS visits, to Gotha (15 to 18 June) and Dublin (6 to 9 July). Contact, respectively, Gerry Zierler on 020 7284 2848 or Rodney Leary on 01584 874246.

And don't forget the AGM in Kingston-on-Thames on 7 May.



## ***Campbell Ballantyne 1932-2010***

*remembered by*

*Yo Hodson and David Milbank Challis*

Campbell, who died suddenly at the age of 78 in his bed from ischemic heart disease in August 2010, was a good friend to the Charles Close Society. He was also a good friend to me, from the time that I began my association with Ordnance Survey in the late 1960s until the 1990s. From then on we were in touch regularly at Christmas, but did not manage to meet.

Campbell was one of the few remaining 'family' OS men; it was not uncommon, from the 1840s until about the 1960s, for grandfathers, fathers, and sons from the same family, to have taken up work with the Survey. Campbell's father had spent his whole working life at Ordnance Survey and so, too, did Campbell, until he took early retirement sometime in the 1980s. By that time the whole ethos of OS was changing – cartography was becoming very different with the advent of digitisation – and he felt, very keenly, that quality was being sacrificed at the altar of economy.

Campbell lived and breathed OS; his delight in finding that I shared so many of his views about the preservation of records meant that he was assiduous in saving from the bin a multitude of maps – experimental proofs, for example – and documents. On my regular trips to OS I would return home with a car full of bounty. All of this was stored in my stable until it went to Cambridge University Library and, in some instances, to the National Library of Scotland or the British Library. It was for this devotion to all matters concerning OS that Campbell was made the first Honorary Member of CCS (other than OS Director General) in 1991.

There was another side to Campbell: he was a talented DIY expert. I occasionally stayed at his Southampton home while using the OS library for a couple of days, and it was half constructed by him alone. As well as being something of a master builder, his garden was designed to attract birds and wildlife and his knowledge on these matters was amazingly extensive.

And, finally, I have to say that he was an excellent driver. I shall never forget the occasion when I had overrun my time at the OS library and was clearly going to miss my train back to London. Campbell decided he knew all the short cuts and would make it his business to deliver me to the station with minutes to spare. Nobody else could have accomplished this, and I still cover my eyes with my hands whenever I think of that journey which was accomplished at seemingly warp speed, yet all, I am sure, within the speed limits.

*Yo Hodson*



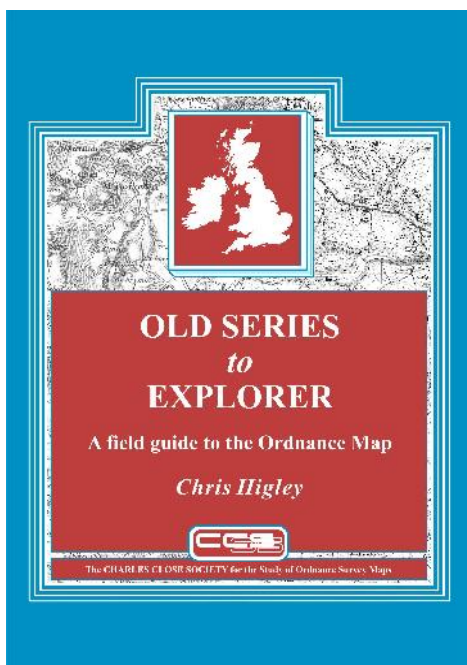
Throughout the design and production phases of the two editions of the *Londinium* map (a joint collaboration between the Ordnance Survey and the Museum of London) I was a regular visitor to the OS at Southampton and Campbell's office was my base; in fact he and I acted as the liaison team that produced the maps.

A *Londinium* map was originally an idea put forward by Alan Marles at OS and as I was head of design and publishing at the Museum of London, plus my considerable experience of dealing with OS during in the lengthy process of producing *Ordnance Survey maps: a descriptive manual*, I was tasked with bringing the radical concept to reality.

Campbell made the job a pleasure, he was the ideal person, he was an OS man through and through but with his feet firmly on the ground, and he was well aware of the organisation's 'limitations' and its tendency to act as a 'closed shop'. He 'opened doors', 'obtained inside information', 'cut through the bureaucracy', 'got things done', 'allowed me free run of the map library', and provided me with 'goodies!'. Nothing was too much trouble.

The two editions of the *Londinium* map fulfilled their brief and although not to the purists' taste, were very successful and that was in no small measure thanks to CB.

*David Milbank Challis*



*Old Series to Explorer*, by Chris Higley, subtitled a field guide to the Ordnance map, will be the next CCS publication. The book will appeal to all who would like an overview of the various series of maps published by the Ordnance Survey of Great Britain at different scales. It also has a readable history of OS with explanations of how maps were made, together with a chapter on Ireland, the Isle of Man and the Channel Islands, and another on war-time mapping. The book will have 160 pages, amply illustrated by examples and diagrams.

Watch out for news of publication date on our website [www.charlesclosesociety.org](http://www.charlesclosesociety.org) and on the discussion group at

<http://uk.groups.yahoo.com/group/ordnancemaps>

# ***Ordnance Survey data collection and the mapping of tidal features - a review of policy, methods and potential analysis***

***Brian Baily<sup>1</sup>***

## ***Abstract***

Tidal lines have often been recorded on maps and have the potential to aid the understanding of coastal processes to help inform predictions of coastal change and associated sea level rise. One of the principal forms of cartographic tidal data available is Ordnance Survey mapping which has periodically reviewed and displayed tidal line data. Initially, the Ordnance Survey collected the data using land survey techniques and later developed remote sensing based approaches. This review examines the approach of the Ordnance Survey to the mapping of tidal lines on the maps of England and Wales from 1868 until the 1960s.

## ***Introduction***

Coastal erosion, coastal flooding and rising sea defence costs are an increasingly difficult issue for many cities and regions around the British Isles. Data which can inform, improve and help justify coastal management policy and practice is imperative for those concerned with coastal management and policy. More recent data is now collected and available from various bodies including local councils, the Environment Agency and groups such as the Channel Coast Observatory ([www.channelcoast.org](http://www.channelcoast.org)). Longer-term data sets relating to coastal change are less widely available and are often difficult to collect or expensive to obtain. One form of data which has been used as evidence of longer-term coastal change is that of tidal line data from cartographic sources.<sup>2</sup> More generally, maps of various kinds have been widely used for many forms of coastal research from vegetation studies through to geomorphological investigation. For those concerned with historical coastal change, the selection of source evidence used in the research is often dependent upon the scale of the features under examination and the degree of change which may have occurred. Earlier maps of the coast are often unreliable and of limited use for coastal research, especially those studies which analyse geomorphological change. Later maps, in contrast, may have the potential for providing valuable information for those concerned with longer-term coastal behaviour.

The research discussed here is principally concerned with the historical evolution of tidal line mapping on Ordnance Survey maps. In particular, it examines the evolving policy in relation to Ordnance Survey tidal line lines and reviews the data collection techniques used. In contrast to other studies which have examined spatial inaccuracies in the cartographic medium, this research examines the rationale, policy and practice behind the mapping of tidal lines

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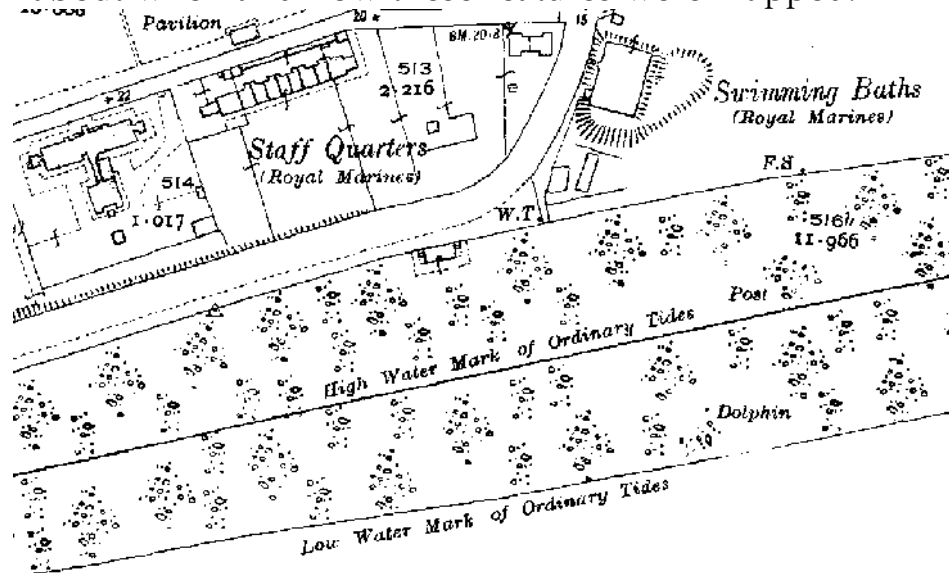
<sup>1</sup> The author is lecturer in the Department of Geography, University of Portsmouth.

<sup>2</sup> See, for example, B Baily and P Collier, 'The development of photogrammetric mapping techniques of tidal lines by the Ordnance Survey', *Cartographic Journal* 47 (3) (2010), 262-269 and J M Hooke and R C Riley, 'Historical changes on the Hampshire coast 1870-1965', *Proceedings of the Hampshire Field Club Archaeological Society* 47 (1991) 203-24.

and asks whether this makes these features suitable for any reasonable analysis of coastal change.

***Tidal line mapping by the Ordnance Survey – an evolving approach***

Tidal lines are one form of physical feature which appear on Ordnance Survey maps (*figure 1*). In practice, on some maps it is possible to identify tidal lines going back to the eighteenth century, although it is more common for earlier maps to have simply recorded the sea/land interface. Potentially, these lines may be useful indicators of sea level rise, beach erosion and accretion or beach narrowing. The comparison of the movement of these lines for geomorphological research is compounded by errors in the cartographic medium and the uncertain nature and definition of the features defined by these early coastal surveys. Consequently, any research which wishes to use these features as evidence of coastal change also needs to ascertain accurately the exact details of what tidal features were recorded in the field along with information about when and how these features were mapped.



*Figure 1. An example of early tidal line mapping from the Eastney beach area of Portsmouth*

The mapping of tidal lines became widespread from the nineteenth century onwards. Tidal lines were surveyed by Ordnance Survey teams in the field using ground survey techniques. This practice continued until after the Second World War when experiments with aerial survey were carried out to try and improve the collection of tidal line data and reduce the associated costs.<sup>3</sup> Ground survey data collection often involved manual surveying but also at times included field sketching of features. The important aspect for coastal change researchers is that the primary reason for the Ordnance Survey collection of tidal line data was as a boundary delineation feature and not to record a geomorphological feature in the field (in contrast to a cliff edge for example).

<sup>3</sup> Baily and Collier, *op cit*.



The Ordnance Survey archival files at The National Archives<sup>4</sup> reveal that tidal lines were surveyed and displayed on maps primarily:

- a. *To delineate the boundary between the foreshore which, prima facie, belongs to the Crown and other property*
- b. *To delineate the limits of jurisdiction of the harbour authorities and the line below which the Minister of Transport and Civil Aviation exercises control over works in the interests of navigation*
- c. *To delineate the high and low water lines on Admiralty charts and Ordnance Survey maps*
- d. *To indicate, on engineers' plans certain maximum and minimum heights for such projects as coast protection against flooding and sewerage, etc.*

The Ordnance Survey policy on tidal line mapping was an evolving process subject to internal review and legal changes in the definitions of boundaries which the Ordnance Survey was legally obliged to collect. Early Ordnance Survey maps often plot the high and low water marks of Ordinary Spring Tides (this still applies to all maps of Scotland), whilst later maps show the ordinary/mean tidal level. The origins of the mapping of tidal line data can be traced back to the Ordnance Survey Act 1841, paragraph 1, which required Justices of the Peace to appoint meresmen to assist the Master General and Board of Ordnance in 'examining, ascertaining and marking out the reputed boundaries of each County, City, Borough, Town, Parish'.<sup>5</sup> Important changes occurred during the middle of the eighteenth century which influenced the Ordnance Survey approach to the particular features collected in the field during a tidal survey. Before 1868, the boundaries of a parish had been defined as the high water line of a tide, therefore many extra parochial places including the foreshore were outside of their parish boundary and exempt from the Poor Laws. In 1868, however, the Poor Law Amendment Act was passed which resulted in the parish boundary's extension to the low water line. Thus, it became legally necessary for the Ordnance Survey to map the low water line in the same way as any other boundary and they were legally obliged to show this feature on the map in question. In the subsequent surveys of 1870s onwards, the Ordnance Survey carried the parish boundaries to the low water mark of ordinary tides, as this now defined the seaward extent of the city, parish and town etc. It is also important to note at this stage that the surveys from this period onwards clearly and consistently plotted the position of the ordinary tide (later changed to medium tides in August 1935), whereas in some earlier cases the tide measured had been a spring tidal line. The definition of the boundary of the low tide line was clarified further when the Lord Chancellor (Lord Cranworth) legally recognised the high and low water mark of an ordinary or average tide as the boundary of the foreshore in 1854. In contrast to this, the

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<sup>4</sup> *Survey of tides 1946-53*, TNA PRO OS 1/561.

<sup>5</sup> House of Commons, 'Ordnance Survey: A Bill. To Authorize and Facilitate the Completion of a Survey of Great Britain and the Isle of Man', 24 May 1841. House of Commons Parliamentary papers, Online Proquest Information, 2005.

Scottish maps followed the historic practice of measuring the mean spring tide position except where Udal Law operates.<sup>6</sup>

### ***Defining and mapping a tidal line***

Tidal lines are represented on several different types of maps including Admiralty charts and Ordnance Survey maps. However, as the agencies concerned were mapping different variants of tidal lines, the lines depicted on these maps are essentially different physical features. As referred to above, the Ordnance Survey maps (after the 1868 judgment) depict the high and low water marks of ordinary tides in relation to the Ordnance Survey datum relevant at the time of survey. Admiralty charts, in contrast, show the tidal lines of the highest or lowest astronomical tides related to the Admiralty chart datum (2.7 m below Ordnance Survey Datum Newlyn). The different datums and features collected prevented the two bodies sharing map data. However, there are numerous references in the archives of The National Archives relating to the Ordnance Survey's using the raw soundings data from the Admiralty which was adjusted accordingly and used to plot the low water mark in inaccessible areas. The representation of tidal lines on maps varies depending on the tidal characteristic surveyed and the datum used. As a result, a variety of different terms and acronyms are found on different maps from the various agencies concerned. Oliver<sup>7</sup> notes that tidal lines of spring tides marked on maps before 1868, may be marked as mean tide lines and that since circa 1950 the date of survey of the tidal lines and their revision date have been consistently shown on the 1:2500 and 1:1250 maps. The list below exemplifies the typical nomenclature used in various maps and charts:

- MH/LWS Mean high/low water springs
- MH/LWN Mean high/low water neaps
- MH/LW Mean high/low water
- H/LWMOT High/Low water mark of ordinary tides
- H/LWMMT High/Low water mark of medium tides
- H/LAT Highest/Lowest astronomical tide
- H/LWOST High/Low water mark of ordinary spring tides

The Ordnance Survey maps appear to have three broad periods where the names for tidal lines changed on the printed medium. The earliest maps refer to ordinary tides (1868 onwards), which was later changed to medium (1935 onwards) and eventually from 1965 onwards mean tides (*table 1*).

Ordnance Survey policy and obligations regarding the collection of tidal lines are extremely important in relation to the final features displayed on the

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<sup>6</sup> For a more detailed discussion of the legal definitions of the foreshore see D J McGlashan, R W Duck, and C T Reid, 'The foreshore: geographical implications of the three legal systems in Great Britain', *Area* 36 (4) (2004), 338-347 and D J McGlashan, R W Duck, and C T Reid, 'Defining the foreshore: coastal geomorphology and British Laws', *Estuarine, Coastal and Shelf Science* 62 (2005), 183-192.

<sup>7</sup> R Oliver, *Ordnance Survey maps a concise guide for historians*, Charles Close Society, 1993.

<i>Abbreviation</i>	<i>Dates covered</i>	<i>Full definition (England and Wales)</i>
H/LWMOT	December 1868 to August 1935	High / Low water mark of ordinary tides
H/LWMMT	August 1935 to March 1965	High / Low water mark of medium tides
MHW/MLW	March 1965 to present	Mean High / Mean Low water

*Table 1. The various nomenclature of tidal lines as shown by Ordnance Survey from 1868*

maps. However, for those wanting to use tidal line data for geomorphological research, it is also necessary to consider the practical realities of collecting this form of data in the field. In reality, it is likely that some of the largest discrepancies in the data may exist where different survey methods were used, or in some cases where secondary data was utilised. Numerous questions arise which need to be considered in relation to the reliability, the repeatability and comparability of the different surveys. Influential variables between coastal areas may exist and influence the quality of the results obtained; these include meteorological conditions, local geomorphology at the time of survey, tide prediction accuracy, accessibility (especially of the low water line) and coastal type. One particularly important factor in tidal line surveying was the accuracy of the predictions of the tidal times themselves. Admiralty tide tables were used to predict when an ordinary or medium tide would occur, predicted from an estimate calculated from the 18.6 year metonic cycle. Whilst these tide tables are accurate for the specified purpose, relatively small differences between the predicted and actual tides could have serious impacts on tidal lines and the subsequent surveyed line. Getting the correct timing of the optimum tidal condition was essential for field survey teams to be able to put aside all other work and survey the tidal line for the short period when it was at the correct position. As this research reveals, later attempts to match the actual and predicted tide times in the field were met with mixed results.

The instructions given to surveyors and superintendents are clear about the conditions which control whether a tide is suitable for survey. In 1932, the OS instructions to be used for revision in the field state that if ‘the tide was not ordinary another tide must be taken’.<sup>8</sup> In this case the term ‘ordinary’ relates to either unacceptable meteorological conditions or problems with the predicted and actual tide time. The local conditions would clearly have influenced the state and exact timing of a tide. The temporal uncertainty and meteorological conditions may have affected the low water line more than the high water mark, as this was more susceptible to slight changes in conditions. An appendix to the *Ordnance Survey field bulletin 31*,<sup>9</sup> states that the high water mark

<sup>8</sup> Ordnance Survey, *Instructions to field revisers 1/2500 scale*. London: HMSO, 1932.

<sup>9</sup> *Survey of tides 1946-53*, TNA PRO OS 1/561.

generally presents fewer problems for ground survey as a clear mark is usually left by the tides (*e.g.* wet water line or a seaweed line). However, the document also suggests that the survey of the low water mark in the field is much more difficult given the limited temporal period available before the tide turns. Surveyors are told that as much as possible should be surveyed in a short period as is feasible ‘the normal field method of surveying the Low Water Mark was to select a time from the Admiralty Tide Tables when the actual Low Water Mark was predicted to be close to the computed Low Water Mark of Medium Tides. All other work could then be put aside and a greatest effort made to survey as much of the water line as possible in the short time the actual water level could be regarded as being identical with LWMMT.’<sup>10</sup>

Trying to establish the accuracy of surveyed tidal lines is an extremely difficult as Close notes ‘Local conditions vary, and it is impossible to lay down the best method of checking and ensuring accuracy in different cases and Division’.<sup>11</sup> No formal standard of accuracy was set by the Survey Act of 1841, Section 1 of the Act refers only to the collection of reputed boundaries. In 1947, it was decided that for Ordnance Survey purposes, it is plan position which matters as this determines areas. No absolute standard of accuracy was specified because of the variations in local conditions and individual surveys. Ordnance Survey policy was therefore to ‘make a good honest attempt’ to map the low water line without an ‘undue expenditure of money’.<sup>12</sup> In contrast, in surveying the high water mark the Ordnance Survey aimed to be more precise as this can be more ‘exactly determined’.<sup>13</sup> Nevertheless, in 1955 an attempt to estimate potential horizontal accuracies related to foreshore gradient and tidal variation was calculated for tidal line data (*table 2*).

<i>Foreshore gradient</i>	<i>Time period equivalent to</i>	<i>Accuracy horizontal distance +/-</i>
1:500	3 inch rise and fall of the tide	38.1 m
1:200	6 inch rise and fall of the tide	30.6 m
1:100	9 inch rise and fall of the tide	22.8 m
1:20	12 inch rise and fall of the tide	15.24 m

*Table 2. A suggested 1955 accuracy statement of air survey of tides (TNA PRO OS 1/945)*

### ***Collecting the data – ground and photogrammetric surveying of tidal lines***

The definition of the tidal line as a boundary required the Ordnance Survey to survey, map and publish the feature. Admiralty tide lines were already being recorded but could not be accepted by the Ordnance Survey because of the

<sup>10</sup> *Tide lines high and low water mark 1951-74*, TNA PRO OS 11/46.

<sup>11</sup> C F Close, *Instructions to examiners and field revisers*, Southampton: Ordnance Survey, 1912.

<sup>12</sup> *Tide lines high and low water mark 1951-74*, TNA PRO OS 11/46.

<sup>13</sup> *ibid.*

‘Admiralty policy of adopting independent chart datum’ and because ‘The Low Water mark now being adopted on Admiralty charts is that of lowest astronomical tide (LAT). This low water line is clearly contrary to that defined by the Lord Chancellor in 1854’.<sup>14</sup> Before the advent and adoption of suitable photogrammetric techniques, the main method for capturing tidal line data was by using field survey (figure 2). The instructions given to Ordnance Survey



Figure 2. A volunteer holds a chalkboard displaying the tide and time during a tidal survey in 1952 (TNA PRO OS/561)

surveyors state that particular care has to be exercised in the surveys of high and low water lines that they are made at specified tides and ‘superintendents must arrange to make the most of the time available’.<sup>15</sup> The practicalities involved in surveying these features are recognised and the guidelines to surveyors crucially state that ‘The high-tide line will in all

cases be surveyed, but the low-tide line may often be left with advantage to the examiner to insert at the discretion of the division officer’.<sup>16</sup> This may suggest that examiners were to be given the flexibility to sketch the low water line, or, as the records imply, leave this to be inserted at a later date. Other historical records also show that in estuaries and other inaccessible areas, the Ordnance Survey could use the Admiralty survey data to plot the low water line providing the relevant adjustments were made. The high tide lines appear to have presented less difficulty in relation to accessibility and survey, or marking for subsequent surveying. At the designated time the surveying team would mark out the area where the water was or had been or use other physical features to determine this. With regard to the high water line, this is defined as ‘generally marked by seaweed which can be pegged out and surveyed at leisure’.<sup>17</sup> As discussed above, the tides, although predictable, could be variable in their exact timing and behaviour. In England and Wales, the 1882 instructions state that the tidal lines to be surveyed in the field should be the tide lines half-way between neaps and springs (mean or ordinary tides). To do this the instructions suggest that the Divisional Officer should calculate, where Admiralty tide tables allow, for an ordinary tide level for both high and low water marks. The instructions

<sup>14</sup> *Instructions to surveyors*, TNA PRO OS 45/8, OS 307.

<sup>15</sup> *ibid*, page 4.

<sup>16</sup> *ibid*, page 5.

<sup>17</sup> *ibid*, page 5.

also state that, where it is not possible to survey on the mean tidal period, the survey should be done at the fourth tide before new and full moon. However, as the Ordnance Survey notes these tide levels may vary a good deal at times from the true mean.<sup>18</sup>

One crucial factor which would have affected these surveys would have been the meteorological effects, especially wind conditions and the barometric pressure. Once again this will differ depending upon the type of coastline being surveyed and will vary over relatively short temporal periods. In rockier coastlines, the weather conditions would have been less important whilst on wider, flatter beaches the meteorological conditions would have been crucial to the position of the line. In rocky coasts, it is argued, tidal levels varying a foot or more in the actual and predicted tidal levels 'may make no practical alteration in the position of the line surveyed, but on sand flats, two or three inches difference may alter the position of the tide line greatly'.<sup>19</sup> The instructions for surveyors go on to state 'that the level of any particular tide may be very considerably affected by wind and weather, and selected tides should only be utilised under normal conditions'.<sup>20</sup>

The guidance given seems to accept that the unpredictability of the potential tidal effect on the surveyed line and that the small changes in tidal level may well be crucial and the effects of the meteorological conditions would have been extremely important. One thing which was extremely problematic for the Ordnance Survey was the effect of barometric pressure which would also have impacted upon the corresponding tidal height. In relation to a query concerning the effect of barometric pressure, the Ordnance Survey Deputy Director of Field Surveys records in 1953 that the surveyors 'do not allow for this and neither is there any way of doing so'.<sup>21</sup> This potentially could be an important determinant of whether the tidal line data are suitable for geomorphological analysis. Different barometric pressures could alter the tidal level reached which is recognised by the Ordnance Survey who state that 'a one inch difference in barometric pressure could make a difference of up to 12 inches in the tidal level, which, as already noted, would make a large difference on a flatter foreshore'.<sup>22</sup>

The field survey itself was carried out over a short time period and as a result was to be carried out whereby 'every available surveyor should be told off to such a portion of the tide line as he can complete without fail within the time at his disposal'.<sup>23</sup> In 1959, the Ordnance Survey state that the HWM is easier to mark either by using the jetsam line or by staking out the highest tide

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<sup>18</sup> Ordnance Survey, *Instructions for 1:1250 field and office examination and revision* (The Green Book), Southampton: Ordnance Survey, 1948.

<sup>19</sup> *Instructions to surveyors*, TNA PRO OS 45/8, OS 307, page 5.

<sup>20</sup> *ibid*, page 4.

<sup>21</sup> *Survey of tides 1946-53*, TNA PRO OS 1/561.

<sup>22</sup> *ibid*.

<sup>23</sup> *Instructions to surveyors*, TNA PRO OS 45/8, OS 307, page 4.



line reached. However, the Ordnance Survey<sup>24</sup> also notes that experience has shown that the mapping of the HWM has three potentially serious problems. Firstly, the tide level may be wrong and different from that predicted. Secondly, local configurations along the coast may alter the tide locally. Finally, the line being surveyed is on a surface which is liable to alteration and varies according to recent conditions. In contrast to the high water line, the low water mark often presented a very difficult feature to survey on the ground. One example of this is the difficulty of surveying across mudflats or other unstable areas or in areas where the tide retreated over long distances (*e.g.* Morecambe Bay). The instructions suggested that the surveying teams should be in position ready to survey this line an hour before the predicted low tide level, in order to take the fullest advantage of the period of slack water for the survey for the half hour or so before and after the low tide.<sup>25</sup> In many cases the low water line was manually surveyed, with evidence suggesting that a mud and water allowance was sometimes given to surveyors who became wet or dirty whilst surveying the low water line.

Ground survey could be hazardous and impractical along many areas of the coastline and the actual collection of the data itself presented insurmountable difficulties. In particular, in some tidal areas the tide retreated so far that ground survey of the low water line was both dangerous and difficult. Even when the coast was accessible, the short window when the low tide level was in the correct position meant that only a limited stretch of coast could be surveyed at any one time. Of increasingly important concern to the Ordnance Survey were the costs involved with detailed ground survey of coastal lines. Photogrammetric techniques were increasingly applied to other areas of mapping and the field survey section of the Ordnance Survey decided to test their suitability for tidal surveys. Photogrammetric data collection potentially offered a series of challenges, in particular capturing the imagery when the tide was in the correct position and when weather conditions were acceptable. There was also the issue of photogrammetric ground control which meant that coastal photography would need to cover areas of land where control points could be fixed.

Initially, experiments took place in 1947 at two field sites (Bournemouth / Boscombe and Weston-super-Mare) during the summer of 1947 with the field sites being selected for the different coastal features they contained. The initial photogrammetric experiments took place during May and June 1947 with photography being captured at a scale of 1:11,000 and 1:22,000. The camera used was a K17 which had a 152mm lens. The main aim of the research led by the field section was to concentrate on the suitability of photogrammetric techniques to map the low water line. The high water line it was suggested presented less of a problem and could be surveyed with 'generally little

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<sup>24</sup> *Survey of tides 1946-53*, TNA PRO OS 1/561.

<sup>25</sup> *Instructions to surveyors*, TNA PRO OS 45/8, OS 307, page 5.

difficulty on the ground'.<sup>26</sup> The original experimental design highlighted the following questions which the experiments needed to solve:<sup>27</sup>

- a. *Identification of the best photographic material in varying conditions. In particular, whether false colour infra-red film was better at showing the water marks left by the tide.*
- b. *The best specifications for height, scale etc. This involved working out how much of the beach could be photographed within a particular tidal window at a scale which allowed identification of the tidal features.*
- c. *How much latitude the RAF could be given in the flying period without producing any appreciable error in the position of the tidal line.*
- d. *How to plot the LWMMT when the line is very far from the land.*
- e. *Compare ground survey data with the data collected from the aerial photographs for data collected at the time of photographic exposure but also to compare with data ground surveyed thirteen months earlier.*
- f. *To check that the RAF could record the given area within the time latitude.*

The scale of the original aerial photography was selected so that at least half (preferably 60%) of the aerial photograph was on the landward side of the coast, which would make the identification of ground control easier. The photography capture times had been calculated from the Admiralty tide tables on the basis of allowing a difference in tide level between the actual and predicted tide level of one foot. However, at the Weston-super-Mare site, it is noted that, as the tide varies by thirty-one feet, this allowance may be too little and at Bournemouth and Boscombe it is suggested that one foot may be too great a degree of latitude to give.

The experiments by the Ordnance Survey demonstrated the important effects of local topography and sea defence structures on tidal positions. During the experiment, poles were inserted along the foreshore marking the tide at different points along the beach. These poles were then surveyed and it was noted that the time of the tide on any one day was not the same at all poles with a variation from 5 minutes late to 25 minutes early from the predicted tide time. The conclusion from the observed tidal behaviour on the beach is that 'if it does exist it is a further indication that tides are so irregular that highly accurate surveys of the tide lines are unjustified and meaningless'.<sup>28</sup> The field report goes on to note that 'Poles inserted in the middle of the 1st period were reached by the returning tide considerably before the middle of the 2nd period. The average for the 17th May was 16 minutes early. The average for 18th May was 36 minutes early'.<sup>29</sup> Later checks on tide times and tables led to the conclusion that the tide tables should be treated with extreme caution when deciding exact tidal positions. This inconsistency in the predicted and actual tidal position was reflected across the Boscombe experimental site and indeed

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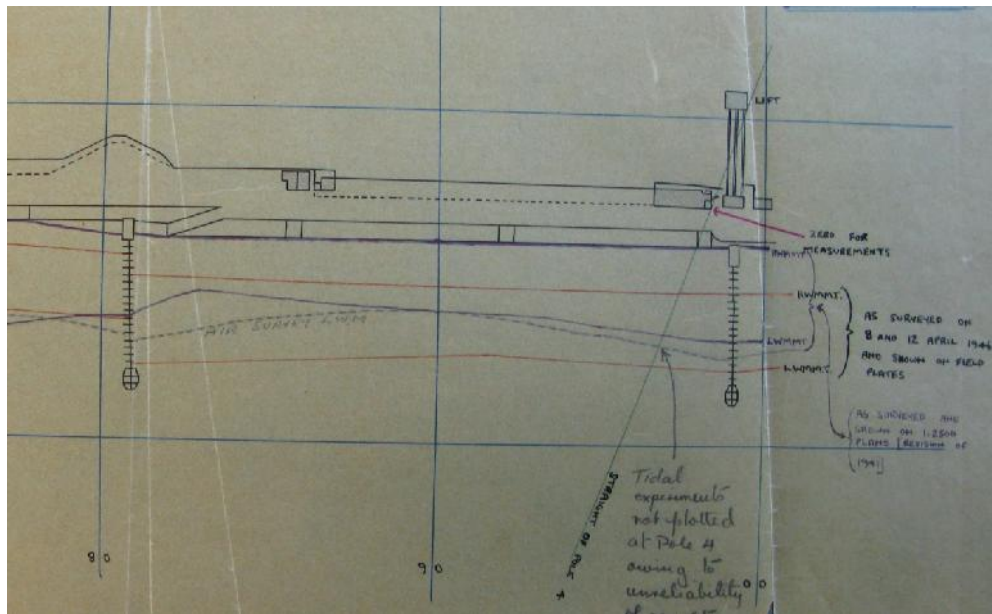
<sup>26</sup> *Survey of tides 1946-53*, TNA PRO OS 1/561.

<sup>27</sup> *ibid.*

<sup>28</sup> *ibid.*

<sup>29</sup> *ibid.*

the average across the whole experiment showed that the tide was 25 minutes earlier than predicted (*figure 3*). The tidal fluctuation resulted in spatial differences, which at one period, led to a discrepancy of nineteen links (nearly 4 metres) across the beach when the tide should have been in the same position. The surveyor writing the report noted that ‘although working to a definitive system, (the tides tables) are exceedingly irregular and are not worthy of any accurate survey’.<sup>30</sup> The imprecise nature of the optimum tidal conditions in turn led to difficulties in capturing the photography at the correct moment. It also suggested that many previous ground surveys were recording tides in the different positions from the ‘true’ average.



*Figure 3. A section of one of the plans produced by the original beach experiment. This shows the plotted survey lines for the Boscombe beach area (TNA PRO OS 1/561)*

The photogrammetric experiments also highlighted the importance of the influence of short-term changes in geomorphological conditions. ‘It may be noted that movement of sand on the beach appears to take place to such an extent as appreciably alter the position of the tide lines on a beach in a short space of time’.<sup>31</sup> Levels recorded of subsequent tides also show the effect of the wind on wave set up and run up, with levels of the tide recorded on a calm day in different positions from those on a windy day.

The early photogrammetric experiments concluded that air survey offered a more reliable method of obtaining a smooth line than ground survey. In particular, the advantages of photogrammetric plotting were immense in areas of mudflats and sandbanks, although the comparison experiments at Weston-super-Mare had to be cancelled as the surveyors were unable to get to the low water line because of the soft mud, perhaps in itself showing the need for aerial survey of tidal lines. One of the interesting outcomes of the field experiment at

<sup>30</sup> *Survey of tides 1946-53*, TNA PRO OS 1/561.

<sup>31</sup> *ibid.*

the Boscombe site was the comparison of the ground survey tidal lines with those derived using photogrammetric techniques. The results were positive with a reasonable match between the ground and air surveys, suggesting that continuity would not be severely affected by switching techniques. It was noted that in areas with a more complicated local topography, differences were found particularly where groynes had been installed. The initial air survey experiments also concluded that air survey offered a more reliable method of obtaining a smooth line than ground survey. The photogrammetric experiments also exposed the dynamic nature of tidal lines as recorded by the surveys. In particular, the results revealed that, although there was a broad agreement between the aerial and ground survey for the same time in 1947, there existed a large disparity between these lines and a ground survey in the same area recorded thirteen months earlier in April 1946. The research report also states that the lines recorded showed considerable differences between the ground survey of 1946 and a similar survey of 1941. The report continues that surprisingly the largest changes had occurred in the high water line showing the potential differences which could naturally occur. The report of the aerial photogrammetric tests demonstrated that the variation within the high and low water line recorded in the field was not consistent or uniform. Indeed, the surveyors report suggests that 'as expected, the position of LWMMT has changed more than the position of HWMMT but their changes of both are so great that I think they provide the strongest possible argument for the exclusion of both high and low water marks from the 1/1250 plans'.<sup>32</sup> The Director of Field Surveys in response notes that tidal line mapping is always going to be problematic and that trying to find a consistent feature is 'a tendency to hunt for the unattainable'.<sup>33</sup>

The early experiments by the Ordnance Survey demonstrated that photogrammetric mapping of the tide lines was economic, practical and as reliable as ground survey and in using infra-red film better at mapping the low water line. Aerial survey evolved to replace ground survey as the main technique used to capture tidal line information. By 1964, the archival evidence suggests that aerial survey was the normal method for revision of the low water mark. In particular, it is noted that the ability of photogrammetric plotting to provide a continuous line rather than a series of points has a significant advantage over ground survey. In responding to a query concerning mapping methods in 1955 the Ordnance Survey Deputy Director of Field Surveys notes that the main error associated with aerial tidal mapping is in the actual and predicted tide levels. In particular, the timing of flights is seen as crucial, and any flexibility is governed by the gradient of the cross shore profile. Limits were set for different foreshore gradients which indicated the degree of flexibility which could be exercised when taking the photography. In reality, it was necessary to give the RAF temporal latitude of one foot above and below the

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<sup>32</sup> *Survey of tides 1946-53*, TNA PRO OS 1/561.

<sup>33</sup> *ibid.*

low water mark alongside which other suitable meteorological conditions were required.

As well as the aerial photogrammetric tests using conventional aeroplanes, further experiments were performed during 1967/8 using helicopter photography to map tidal lines between Loch Sunart and the Isle of Mull.<sup>34</sup> The principal aim of the experiment was to discover if suitable photographs could be obtained using helicopters (*Figure 4*). The results concluded that the quality of the photography varied depending upon the stability of the helicopter and the results of the experiment were mixed, partly due to the poor weather



*Figure 4. Surveyors preparing the helicopter for a tidal line survey experiment in 1968 (TNA PRO OS 13/19)*

during the test period. In particular, it was found that on a straight line the helicopter took reasonable photography. However, when the pilot needed to make small adjustments to speed or direction a loss of photographic quality was recorded. Costs of image capture were slightly lower than the fixed-wing equivalent (£10.10s.4d [£10.52] for helicopter compared to £12.18s.10d [£12.94] for fixed wing) largely due to the higher camera amortisation rate from fixed wing aircraft. However, it was acknowledged that costs

from plotting from helicopter photography would be higher. The conclusions drawn from the experiments were that helicopter photography would only be suitable when 'circumstances preclude conventional air survey or ground methods'.<sup>35</sup>

In some ways aerial survey and photogrammetry improved the mapping of tidal lines, making a smoother more consistent feature. However, the same controlling factors such as tidal unpredictability, local geomorphological conditions still applied alongside the additional factor of obtaining the appropriate flying conditions for the survey. As the Ordnance Survey commented the greatest advantage of air survey was 'To make a good honest attempt to find out where LWM is at a predicted time of the Mean Low Tide (springs in Scotland) without undue expenditure of money. Air survey methods are used to reduce costs where necessary'.<sup>36</sup> For coastal researchers, one major advantage of aerial survey and photogrammetric mapping is that the existence of the photography allows

<sup>34</sup> Field experiment 269, TNA PRO OS 13/19.

<sup>35</sup> *ibid.*

<sup>36</sup> *Tide lines high and low water mark 1951-74*, TNA OS 11/46.

researchers to revisit the mapped site at later dates to review or check the data collected and, if necessary, to re-measure it themselves.<sup>37</sup>

### ***Discussion***

Long term data indicative of coastal change is sparse and until the advent of regular coastal aerial survey, has to some extent had to place a degree of faith in those collecting the data. This review and other associated research into the ground survey of tidal lines and the photogrammetric collection<sup>38</sup> suggest that it is not legitimate to accept the tidal features presented on maps at face value alone. Principally, it is clear that the tidal lines were collected as a boundary feature rather than as a geomorphological feature. Whilst this may be well known and established within the specialist cartographic community, there is perhaps a tendency in other areas to treat tidal lines in the same manner as building outlines or coastal cliff lines. Tidal lines presented on maps offer one of the few potential sources of evidence of longer-term coastal change. This research has shown that tidal lines represent an honest, clearly defined attempt to map a regularly changing feature which is fit for the purpose relating to the reason it was being collected. From the archival evidence, it is clear that the extent of the lines was clearly defined after the Lord Chancellor's 1868 judgment. Likewise, researchers can be confident that the instructions for surveyors ensure that there were rigorous controls on the quality of the field survey. However, the reality is that by their very nature tidal lines are mobile temporary features, which in many cases are difficult, dangerous and impractical to survey. Practical considerations of accessibility, safety considerations, and time restrictions are important to recognise and make allowances for. Likewise, it is necessary to accept the variable behaviour of tides and the effect of local meteorological and geomorphological conditions. Within The National Archives there exist numerous enquiries concerning the accuracy of tidal lines. These queries emanate from the Ordnance Survey and from the general public at large. The answer which probably best sums up the advice for those wishing to use this data is given by the Director General of the Ordnance Survey in response to a query regarding tidal line accuracy's 'Tidal lines marked on Ordnance Survey plans thus represent an honest attempt to portray the position of the High and Low Water Marks of mean tides on a certain date. The Department is legally bound to show these tide lines; but at the same time the impracticability of great precision and liability to frequent changes, in tide lines is recognised'.<sup>39</sup>

I would like to thank Dr Peter Collier for his advice and The National Archives for access to the information within this paper. Also thanks to the journals *Survey Review* and *The Cartographic Journal*.

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<sup>37</sup> B Baily and P Collier, 'The development of photogrammetric mapping techniques of tidal lines by the Ordnance Survey', *Cartographic Journal* 47 (3) (2010), 262-269.

<sup>38</sup> *ibid.*

<sup>39</sup> *Survey of tides 1946-53*, TNA PRO OS 1/561.



***Colby's camps***  
***Iain Thornber and Richard Oliver***



*The camp on Creach Bheinn, Ardgour (NM 879576). Visible are the two massive stone wall windbreaks, between which are four semi-circular stone platforms, possibly bases for tented accommodation and a more substantial building near the lower wall, possibly the cook house or officer accommodation.*

It is well known that the Ordnance Survey had its origins in a late eighteenth century project to construct a triangulation of Great Britain, starting with a base line at Hounslow Heath. By 1809 most of England had been triangulated, and work was under way in southern Scotland. By 1822 a large part of Scotland had





*Creach Bheinn, detail of lower windbreak wall*

been observed, and a connection had been established to the north of Ireland. The ensuing six-inch scale Townland survey of Ireland and a greatly increased use in triangulation for control of detail meant that from 1824 to 1837 all Ordnance trigonometrical work was concentrated in that country. When the triangulation of Britain was resumed in 1838 much of the earlier work was felt to be unsound and was re-observed, together with observations of some stations not previously occupied. The fieldwork was completed in 1852, and the results were published in 1858. Because of the extensive work after 1838, much of the later observing can only have had a very tenuous connection with Thomas Colby. Up the late 1820s he had participated personally in the observations in the field, and expected to be away from Survey headquarters in the Tower or at Dublin for long periods in the observing season, but

thereafter he was much more desk-bound. No complete list survives of which station was occupied when, but it is evident that the concept of primary, secondary and tertiary orders of triangulation only emerged gradually. Whilst none of the stations observed in Britain before 1824 was of tertiary status, many were later of only secondary status.

Of the stations shown in these photographs, most were not treated as primary stations when the work came to be computed and written up by Alexander Ross Clarke in the 1850s.<sup>1</sup> In fact, the only one that was is that on Jura, presumably first occupied in 1822 at least partly with a view to the connection with Ireland. The most striking group of the photos is of Creach Beinn (NM 870576), which was evidently treated as a secondary station by Clarke's time. In fact, it is unclear whether Colby himself actually occupied it. The foundations for tents are interesting relics: one wonders if they might have been reused or even repaired by visitors later.

<sup>1</sup> A R Clarke, *Account of the observations and calculations of the principal triangulation...*, Southampton: Ordnance Survey, 1858; a summary of the work and a diagram of the primary triangulation is in W A Seymour (ed), *A history of the Ordnance Survey*, Folkestone: Dawson, 1980, 33-43, 139-46, and Plate 11.





*Beinn an Oir, Jura (NR 495749) above: camp and path leading to summit cairn; below left: the camp; below right: unrecorded stone building about 100 metres below and east of summit, possibly WC or observation hut*



*Opposite:*

*Top and middle: trig point and remains of camp on Ben Alder (NN 496718)  
Lower: original trig point on island of Staffa, above and to the left of McKinnon's Cave (by the boat)*





Colby and others chose stations for their good inter-visibility with other stations, and this meant that it was inevitable that they would be on the summits of hills and mountains, and thus often in rather inhospitable places. The usual way of marking the observing stations was by buried stones, about two feet or so square, with a hole bored to indicate the precise point for setting up the theodolite: on mountains it was usual to protect these stones by erecting cairns over them.

Although a considerable achievement in its day, the 1784-1858 triangulation did not compare well with later European ones, even by 1900, and much of the secondary triangulation had been undertaken to suit county-based rather than nationally-based larger-scale survey. Thus a complete re-triangulation began in 1935: most of the primary observations were completed by 1938, but the results were only published in 1967. Many of the original stations were reoccupied, but now they were marked by concrete pillars, and the building of these tended to result in the partial demolition of the original cairns. Some summits, such as Creach Beinn, which had not been used as primary stations in the original triangulation were now promoted to that status: it would be interesting to know whether any of the camps of the earlier nineteenth century were reused a hundred or more years later.<sup>2</sup>



*Photographs and captions are by Iain Thornber (left), narrative is by Richard Oliver.*

*Iain Thornber, JP, DL, FSA has written extensively on aspects of Scottish history and archaeology. His recreations are deer stalking, photography and local history research.*

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<sup>2</sup> *The history of the retriangulation of Great Britain*, 2 vols, London: HMSO, 1967: summarised in Seymour (ed), *A history*, 268-72, 307-17, and Plate 18.

***Bringing the past into the digital age –  
the historical Ordnance Survey map scanning project at the  
Bodleian Library, Oxford***

***Richard Harper<sup>1</sup>***

***Introduction***

With the last issue of *Sheetlines*, members received a stunning reproduction Ordnance Survey map of the Crystal Palace. The copy of this map was produced thanks to an exciting project being undertaken at the Bodleian Library, Oxford. This article describes the origins and aims of this venture and how in the future it could benefit all map aficionados.

Through donations, and its status as a national deposit library, the Bodleian has acquired over time a wide range of rarities; historically important and beautiful documents. Among the vast number of collections is an almost complete collection of Ordnance Survey County Series maps. Included in the collection are maps dating from the mid-nineteenth century to the end of the Second World War, at scales of 1:500, 1:528, 1:1056, 1:1250, 1:2500, 1:10,560 and 1:63,360. These maps provide extensive and detailed information on how the country was shaped during the past in magnificent detail. The sheer size of the collection means that most of these maps have been seen only by a privileged few. A project currently being undertaken at the Library aims to change this.

***Project beginnings***

After successfully digitally capturing the Library's fourteenth century Gough Map, staff from Protinus Holdings remarked to Nick Millea, head map librarian, how useful it would be to scan the historical Ordnance Survey map collection kept in the Library's book stacks. No one present on that day realised how a passing comment would lead to the biggest single project the company and the library's map department had ever undertaken.

In January 2005 Protinus embarked on this ambitious enterprise to digitally capture the entire Bodleian Library collection of historical Ordnance Survey maps. The company felt that, commercially, there was a real need for high quality digital images of historic OS maps that could be used in various Geographical Information Systems (GIS). With a wealth of experience in digitising historical maps Protinus had the knowledge and expertise to undertake such an ambitious project. The aim of the venture was to scan every out-of-copyright large-scale historical Ordnance Survey map the Library held. This would provide the Library with a digital copy of each map that could be viewed by readers at the Library without the need to retrieve the original map. The company would in turn be able to use the maps for various commercial ventures.

At the beginning the project was housed in the depths of the basement at the New Bodleian Library. Equipped with only a single sheet-feed A1 sized

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<sup>1</sup> The author is Protinus' project manager for the project.

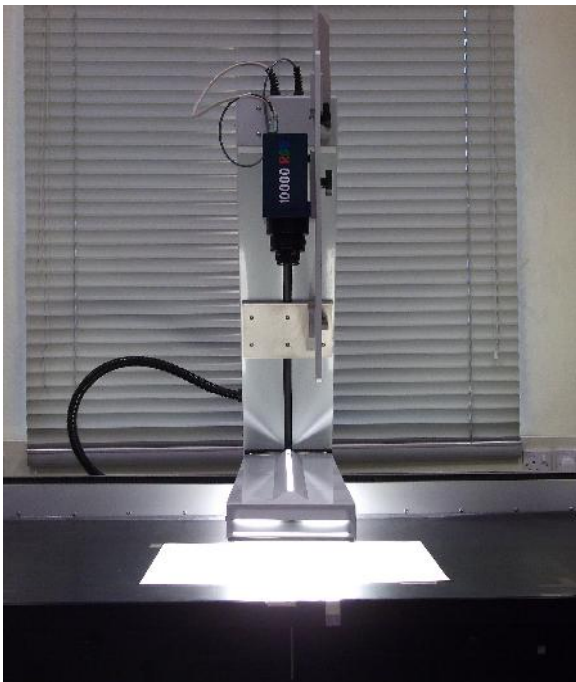


scanner and a computer, no one had any idea how long the project would take. As the Library had received maps from the OS they had never been individually catalogued. The map librarians only had a rough idea of how many OS maps were in the collection. The enormity of the project still invokes a sense of awe within the office and at the time of writing Protinus is still based at the Library. The location may have changed, (the project is, ironically, now located in the old map reading room), personnel and equipment may have changed but we are still scanning!

### ***Map cataloguing***

With such a vast collection it soon became apparent that Protinus would need a dedicated map librarian to assist with cataloguing and retrieval of the maps from their storage location. To this end Alex Zambellas was employed and over time he has painstakingly listed the OS County Series maps. This has proved hugely useful not only to the company but to the Library as well. The Bodleian's collection has been checked against other collections at the British Library and the National Library of Scotland, (NLS), as well as consulting OS catalogues, indexes and Richard Oliver's Concise guide.<sup>2</sup> Maps missing from the collection have been identified and where possible replaced by donations from the recent dispersal of the OS's collection at Southampton and by purchases of scans from the NLS. A better estimate on map numbers has been established. Without yet being in a position to count individual maps it is still not possible to know how many the Library holds, but Alex's records have helped ascertain an estimate figure for the County series, including reprints, of approximately 300,000.

### ***Map capture***



Each map is individually scanned in full 24-bit colour using a French built I2S A0 scanner, (*figure 1, left*). The camera scans in a sweeping motion digitally capturing one pixel wide by a specified number high, depending on map size. Sophisticated software stitches all the individual one-pixel images together to produce a final image of the entire map. Depending on the map scale the images are captured at 300 or 400 pixels per inch (ppi) as a TIFF image. This gives an accurate reproduction of the original material that can be viewed, used and reproduced in a number of ways, simply not possible with the initial paper map. The sweeping motion of the camera

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<sup>2</sup> R Oliver, *Ordnance Survey maps, a concise guide for historians*, Charles Close Society, 2005

means that nothing comes into direct contact with the map itself. Cold lights positioned on the moving camera arm ensure that the maps are only exposed to the increased light for the shortest possible time.

As each map is examined before scanning, any damaged sheets are quickly identified and listed for attention of the Library's Conservation and collection care department. This makes further damage less likely and they are repaired to exacting standards. These delicate maps are then preserved for the future.

The scanning process takes about forty seconds to capture one map and the TIFF file is saved to an external hard drive. The data is uploaded to the company's substantial server facilities in Hampshire. With each map taking up to 550,000 megabytes of storage space, terabytes are quickly consumed.

Maps are then checked for errors and catalogued. Backing up of the data is essential to ensure that any corruption of files doesn't result in map images being lost. Lists of maps held on Protinus's servers are double checked against the catalogue of the Library's holdings. This guarantees that all maps have been captured.

### ***Obtaining more from the maps***

Having a digital archive of the Bodleian's OS maps is one thing, but advances in computer mapping software have allowed Protinus to use these maps in a wider range of contexts than just viewing. The company saw a real need to provide users with online maps of Great Britain for every available date range and scale. The maps need to be displayed at a high resolution, fully searchable and with a zoom function to see detail.

Working copies of the original TIFF image are made, enabling digital cartographers to work on the processing of maps without fear of damaging the original master image file. To facilitate in the joining of the individual map sheets, mapping software is used to remove the marginalia from around the edge of each map leaving just the surveyed map area remaining. The important information contained in the border of each map, including, but not limited to, map title, survey date and publication date, is transferred to a database.

The database is a vital component of the project. Having the maps available to view is all very well but without this accompanying metadata they can mean very little. The database is fully searchable and linked to each corresponding map. By selecting an area of interest the date range of maps in that area is displayed. Selecting a specific map scale or date range will then present all other information associated with that particular map.

Every map printed by the OS for each scale was produced to an exact size. However, paper size would vary. By digitally 'cutting away' the marginalia the remaining map image is squared and straightened allowing it to be joined to the adjacent map seamlessly.

*Figure 2* shows an example of four individual 1:2500 maps that have been joined. The original paper map colour has been retained to highlight the four individual sheets. However, a procedure can be applied to the maps that enables each map to be colour matched. This removes discolouration incurred

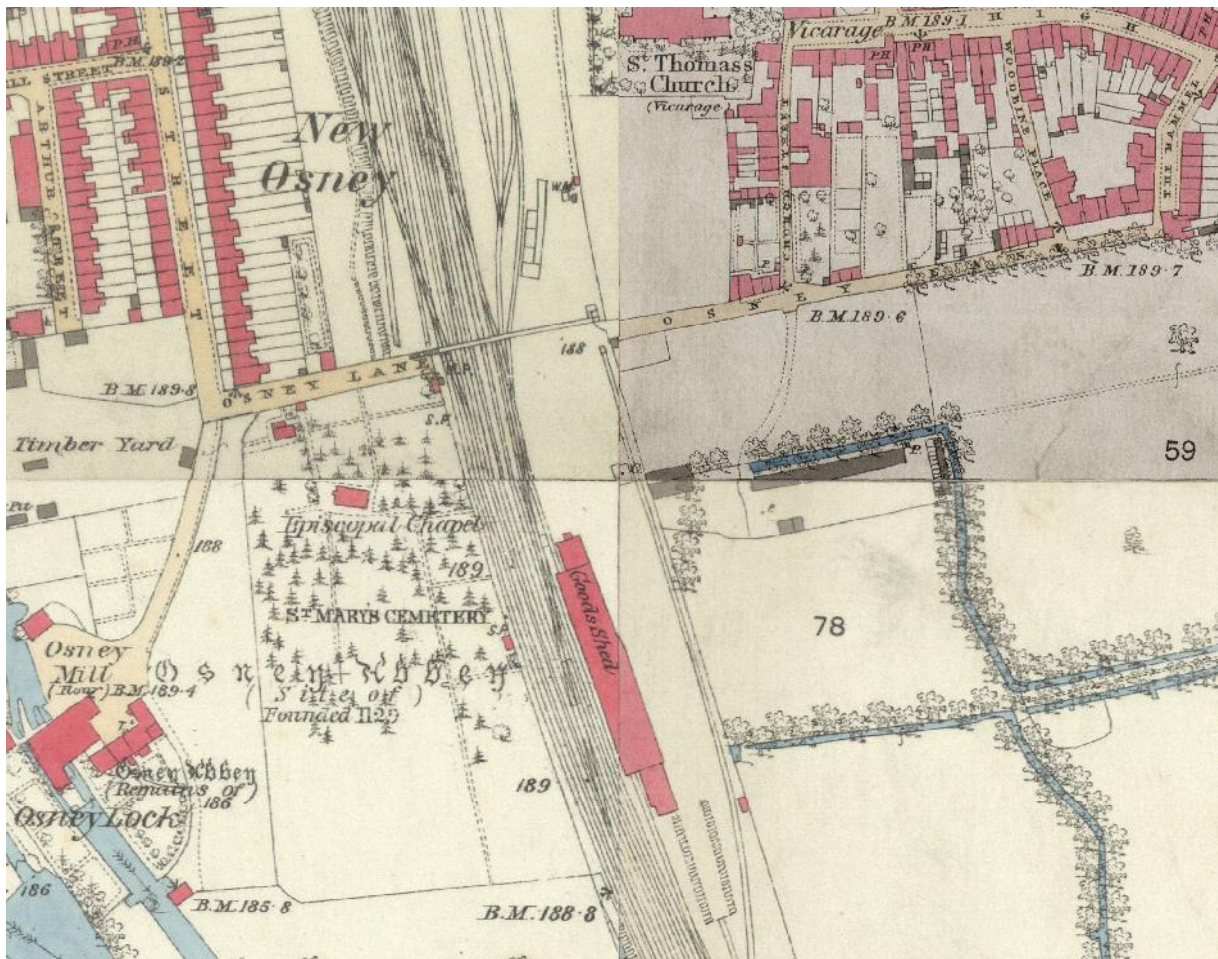


Figure 2. Four 1:2500 maps joined to create one new map

through exposure to light and dirt and gives the background a uniform appearance.

Once a series of maps has had the marginalia digitally removed, straightened and squared, a mosaic of the individual maps is constructed. This creates an area until eventually the whole county is compiled. Protinus assembles these mosaics a county at a time just as the OS originally surveyed.

The mosaic of an area is compared to modern day mapping using specialist software. A process of geo-rectification is then performed so the historical map is assigned a known coordinate position. Ground control points (GCPs) are placed on the projected map and the identical point placed on the historical map. As more GCPs are placed, the software uses algorithms and trigonometry to predict where other GCPs should be located. The cartographic technician will then correct the software assumptions. The more GCPs that are placed the more accurate the geo-rectification of an area becomes.

When geo-rectifying, the technician is looking for map objects that are unlikely to have changed over time. Among the most useful features are churches as they are prominent historical features that often remain on the modern day mapping. Bisecting field boundaries can be used in rural areas but care must be taken when selecting dynamic objects as they could have been altered with the passing of time. The technician will also be looking to spread

the GCPs evenly over an area so that bias will not distort the map. It can be very easy to position many GCPs on an urban area but in rural locations definitive points are harder to find. It is the skill of the cartographic technician that ensures that no distortion of the map image occurs.

This process is performed for each map sheet in a grid. Once all the maps for a county have had GCPs placed they are then grouped to form a large, single GCP file. This is then positioned on the whole county map mosaic. The geo-rectification process is run which effectively transfers the known positions from the projected map to the unprojected historical map. When the whole procedure is complete the county borders are painstakingly cut and joined to the neighbouring county to eventually develop one map of England, Wales and Scotland in its entirety. With over 300,000 maps to process this is an extremely time consuming exercise.

To aid file manageability, the newly formed map is cut into individual 1 km tiles. The coordinate information is stored in a file format called a GeoTiff. This allows mapping software to open each GeoTiff map tile in its correct geo-position. A map of Great Britain for each date range at each map scale is produced. These can then be layered to allow comparisons to be made.

Map viewing software is under development which will in future allow users to view maps online. Two or more maps can be compared altering the transparency of the display so that landscape change is highlighted. For commercial purposes, geo-referenced site diagrams can be uploaded to the website to assist in historical site evaluation. This software, due to be available in 2012, is also linked with the map data database so all the important OS information contained in the map marginalia can be retrieved and added.

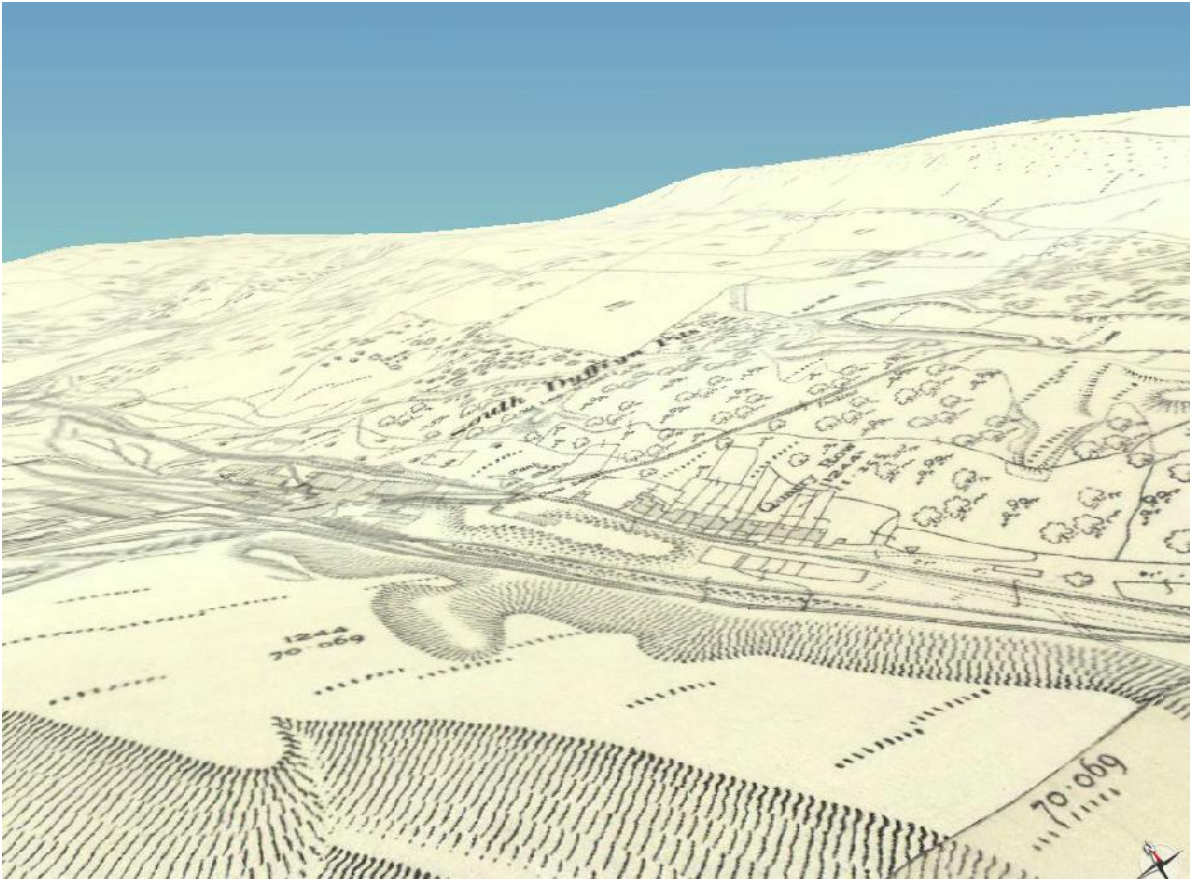
The market for high quality digital images of historical maps is ever increasing. Uses for these maps is broad with requirements ranging from new site development, commercial insurance, historical land use surveys, archaeological interest to personal curiosity. Having access to these maps online allows users to view them from anywhere with internet reception rather than having to visit the Library themselves.

### ***Further future development***

Uses for the historical maps other than online viewing are being developed. With the OS making a number of its products freely available through the OpenData initiative has opened up a whole new range of possible applications that would not have been possible without further funding.

One such area that is being explored is applying OS height data to the historical maps. The OS OpenData package Land-Form PANORAMA® contains height data originally generated from stereo aerial photography produced in the 1970s. The date of the data is perfect for the historical maps as the latest date for the scanned maps is the 1960s. This height data is input into mapping software to create a digital terrain model, (DTM). The historical map tile image can be layered over the top of the DTM to produce a 3D image. The generated 3D image brings the maps to life as the surface elevation is clearly represented.





*Figure 3: A 3D view of an area near Merthyr Tydfil, Wales*

*Figure 3* shows how combining the surveyed map image with the 1970s height data enlivens the 2D historical map

Protinus is also developing a method of extracting contour line data displayed on some of the 1:10,560 maps. Due to the difference in the colour of the contour displayed on the map, software can identify the contour line, separate it from other details on the map and produce a separate vector map of the contours. The various height values can be assigned to the relevant contour. The newly produced contour maps can also be used to develop historic DTMs and a historic height database.

### **Conclusion**

This project benefits the Library by providing a digital image of every map that lets them be more widely viewed while helping to preserve the originals. A better understanding of the collection has been achieved and missing or damaged maps have been identified. Users will be able to search the maps themselves, freeing up the map librarians.

Outside of the Library the maps will be used in a variety of applications. It is hoped that companies and individuals will be able to purchase full colour, site-centred areas of the historical maps where once it would have involved cutting and pasting black and white photocopies. With the recent introduction of OpenData from the OS more ideas are being put forward on how to combine historical map imagery with other geographical information to produce more innovative products.

## ***A picture of the land – an aesthetic appreciation of the depiction of relief on OS small scale maps***

***Aidan de la Mare***

I approach this subject from the view point of both the original meaning of the word *aesthetic* as ‘perception by the senses’, and particularly the refined meaning as ‘relating to, or possessing a sense of beauty’. So, unlike many of the contributions to *Sheetlines* that deal with verifiable facts, this is entirely a matter of opinion and therefore open to question or disagreement. I do not attempt to make more than a passing reference to the development of, or history of, the particular maps as this has been dealt with elsewhere.<sup>1</sup>



The basic OS small scale map from its inception at the beginning of the nineteenth century to the present day can be described as a technical drawing of the land, such as might be seen directly below a balloon or aeroplane in a diffused light that shows no shadows and so gives no indication of relief. The use of hachures on the Old Series one-inch map was an attempt to indicate that the land had a third dimension, but being on the same black plate as the rest of the detail, they tended to confuse the image which remained a rather imprecise technical drawing. The later addition of contours and spot heights, although helping the reader to understand the relief, did nothing to improve the aesthetics of the map.

Then, towards the end of the nineteenth century by changing the hachures to brown they took a step towards showing the third dimension at a glance, but it was not enough. It needed the introduction of the New Series in colour<sup>2</sup> for the OS to produce a picture of the land. But, for this to be effective the shades of colours used for the hachures, contours and roads have to be right. The red hachures give a happier effect than the darker brown of later editions and the paler roads are less intrusive than the stronger burnt sienna ones that followed. But, as often seems to happen, the pioneering effort turns out to be more attractive than the successor. The Third Edition, with its hachures so dark a brown that they seem black, and with added colours, loses the clarity of the New Series in colour, and with it much of the image of relief. Probably unique was the two-inch to one mile *War Department Land on Salisbury Plain* that ran to several editions from 1898 to 1911 in which the relief was shown by horizontal hachures. This is quite an effective system that amounts to very closely spaced contours, but it is less than obvious at a glance which are the

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<sup>1</sup> Yolande Hodson, *Popular maps*, Charles Close Society, 1999, for the experimental maps before 1914 and up to the Fifth Relief Edition. Also Dr Oliver in the series of Charles Close Society booklets on the Fifth up to the Seventh Series, as well as various articles in *Sheetlines*.

<sup>2</sup> Tim Nicholson, *The birth of the modern Ordnance Survey small-scale map*, Charles Close Society, 2002.



ridges and which the valleys.

Just into the twentieth century the OS decided to challenge Bartholomew's already popular half-inch series, and entered that market with their own hill-shaded map. It is quite a nice map that gives a good clear impression of the highlands but is much less satisfactory in the lowlands where the hill-shades merely give a smudgy look to the map and the widely spaced contours do little to help. Their next venture was to add layers as well, which is quite successful in the lowlands, although even there the green base colour is too strong. But where the hills rise to more than 500 feet the map becomes one of the worst ever produced by the OS, so dense are the browns and greys of the higher layers that the hill-shades can scarcely be distinguished and even the map detail is almost unreadable. Fortunately this excursion did not last long as it was separated into two editions, the hill-shaded and the layered versions, and although neither achieved much aesthetic value; the layered version went on to be a competent if less popular rival to the ubiquitous Bartholomew's map.



*Killarney 1913, 'one of the most beautiful and successful pictures of the land'*

The real departure from the map as a technical drawing came in 1913 with the publication of the celebrated *Killarney* map and its immediate successors, and the genesis of this has been fully discussed by Hodson.<sup>3</sup> It is interesting to speculate on the 'might have been' had this development not been interrupted by the First World War and its aftermath. Of these maps I have in my collection

<sup>3</sup> *Popular maps*, pp 21-29.

*Killarney*, as well as *Dorking*, *Ilkley* and *Glasgow* of 1913 and *Belfast* of 1918. There seems little to choose between them in quality; all except *Dorking* have significant mountain areas that most readily justify layers and hill-shading, and the effect is enhanced by these areas being lightly populated, requiring less map detail thus giving a clearer view of the shape of the land. *Dorking* however is both heavily wooded and heavily populated, so is cluttered with all the detail that goes with it, resulting in a rather heavier look to the map exacerbated by the generally stronger colours used throughout. Although there are many areas of hills shown, they are of much smaller scale than on the others, so the effect of the relief techniques is much less noticeable and the immediate appeal of the map lessened.

Several other specimens of relief maps were produced and two are illustrated in Hodson.<sup>4</sup> *Aldershot North* and *South* were also published in both relief and plain styles, but the relief seems to have been of very uncertain quality, showing considerable variation in different surviving examples. On my copy of the *North* sheet the effect is so slight that it is almost completely ineffective, and no improvement on the contemporary plain version with red contours. A batch of relief maps that were derived from *Killarney*, were published after the First World War, five in England and seven in Scotland.<sup>5</sup> These are quite effective with their green base layer and with layers of light brown for the hills augmented by hachures that give a limited hill shading effect as though lit from the north-west. But they lack the refinement and subtlety of the first batch, being a sort of economy version of those maps that set such very high standard. *New Forest* has hachures so lightly drawn as to be ineffective on much of the area, and *London* has uncomfortably dark brown layers above 500 feet, but, fortunately for the map, not much land of that height. *Snowdon* and *The Lake District* have the same browns but they start at a much higher altitude, and so work better. Of the Scottish maps *Deeside* is uncomfortably heavy-handed with the hachures, *Rothsay & Firth of Clyde* has a pleasant light shade of yellow to indicate the heights, but, out of the bunch, *Scott's Country* gets the best balance of hachures and layers.

A whole batch of Tourist Maps followed from 1922 in a plain layered style not dissimilar to the Bartholomew's half-inch maps, quite effective, but layers alone are not enough to indicate the subtleties of the shape of the land. Curiously *The Lake District* of 1925 (my copy 1935) has very prominent grey contours on subtle layers and gives an unusual view of the land, much better than the same map of 1945 where the layers are in much stronger colours, and the red/brown contours are largely lost against them.

Then comes another watershed with the arrival of the Fifth (Relief) Edition

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<sup>4</sup> *Popular maps*, plates 2 and 3.

<sup>5</sup> In England: Third Edition - *Snowdon District*; *Lake District*, Popular Edition - *Isle of Wight*; *London*; *New Forest*. In Scotland: *Burns' Country*; *Deeside*; *Lower Strath Spey*; *Oban*; *Rothsay & Firth of Clyde*; *Scott's Country*; *The Trossachs & Loch Lomond*.

and this has been comprehensively discussed by Hodson<sup>6</sup> and Oliver<sup>7</sup>. There was much contemporary disagreement at the time of publication from 1931, but the outcome was unequivocal; the attempt to sell an artistically advanced map to the public for general use was a failure. I find this regrettable but understandable, for there is no doubt that the plain style that superseded the relief edition is easier to read, but that stands to reason as it is, once again, a technical drawing of the land. A look at the Physical Features Only version of the map shows what an excellent job they made of the relief drawing, it is a very clear and detailed view of the land; but by adding normal map details on top of it, both suffer, the details do not stand out and the land-form gets lost under the details. The two *Aldershot District* maps and the Tourist Maps *Dartmoor* and *Exmoor* are no more than rearranged sheet lines of the numbered maps. But a spin off of the style appeared on Popular Edition Tourist Maps: *Ilkley District* in 1935 in which the rather pale understated Fifth Relief style has been strengthened in the hill shading and contours, somewhat to the detriment of the overall view; and *Snowdon* of 1938 where the hill shading has become heavier still, but even with less prominent contours, it is still too dense.

Of the Scottish maps in the same style *Invergordon to Loch Ness* of 1933 is a very good map to look at, the mountains show their shape very clearly and the relief drawing is appropriately light in the lowland areas so that the map detail still shows well. It is, I think, the best of the bunch, and incidentally has what is perhaps Ellis Martin's most attractive cover. *Oban* of 1936, having a very high proportion of mountains on the map, reverts more closely to the Fifth Relief subtle shading and this works well. *The Cairngorms* also of 1936 however departs considerably from the established yellowy/brown colours of the hill shading, introduces much more grey and much heavier contours, it also has plain green woods and a lot of isolated tree symbols. The overall effect is unique among relief maps and shows the mountain forms particularly clearly, though its very unfamiliarity of style banishes thoughts of comparing it favourably with the yardstick of *Killarney*. The *New Forest* Tourist Map of 1938 has quite a lot of the 'feel' and detail of *The Cairngorms*, with its plain green woods and isolated tree symbols. But the much denser lowland map detail and redder cast make it a less successful map.

The half-inch map also tried its hand at Fifth Relief style with *The Cotswolds* in 1931 and *Birmingham District* in 1933. Quite nice maps, but the rather dense map detail tends to overpower the relief, the place names are written so small that they are difficult to read and many small patches of woodland on *Birmingham* add further confusion. The *Peak District* of 1936 reverts to layers, but not much of the map actually uses these layers, as only a relatively small part of the large area covered is high ground. So although easier to read than the relief maps it still suffers from too great a density of detail in the lowlands. The *Island of Skye* of 1932, the only departure at this scale in Scotland, is a

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<sup>6</sup> *Popular maps*, pp 211-213.

<sup>7</sup> *A guide to the one-inch Fifth Edition*, Charles Close Society, 2000.



triumph. The all-brown Fifth Relief style is especially suited to the mountainous islands that stand up dramatically from the pale blue sea. The picture of the land is enhanced by the small amount of place names and other map detail due to the light population of the islands, and the ridges of the mountains show up particularly clearly although the shading is quite lightly applied. All this suggests that this is among the very best relief maps published by the OS.



*Island of Skye 1932, 'among the very best relief maps published by the OS'*

The quarter-inch Second Series maps have such crude hill-shading that it would have been better left off. But mention should be made of the interesting Royal Air Force Third Edition of 1936 with its purple layers and very prominent railways that gives an unusual and surprisingly clear view of the land, which was, I suppose, just what it was meant to do. At the two-inch scale came *Jersey* of 1914 (my copies 1924, 1934 and 1958). The 1924 edition has a green base and layers of light brown and pink above; these, with rather ill-defined hill-shades, combine to make a gloomy map. The 1934 revised edition omits the layers and strengthens the hill-shades to produce a better effect, but is still rather dull. The 1959 version is further curtailed and has contours only. At the same scale *Isles of Scilly* of 1933 (my copies 1937 and 1959) is a spin off from the Fifth Relief. The 1937 printing works well, having quite a lot in common with *Island of Skye*, but lacks the impact as the islands are so small. In the 1959 printing, however, the relief has become so washed out that it is completely ineffective.

With the advent of the one-inch Seventh Series, a new batch of Tourist Maps followed. These display several varieties of the basic layer and hill-shaded formula of the pre-war relief maps. As I have accumulated several printings of each map, I can, to some extent, compare the development and variations that have occurred in the forty or so years that was their lifetime. The first two, *The Peak District*, 1957 and *North York Moors*, 1958 have layers beginning with a pale green base rising through pale brown to a medium brown in the highest areas. The hill-shading is lightly applied, and makes an attractive and efficient map, but the colouring of layers and contours darkens in later printings, but lightens again with the late 1:50,000 derived version that introduces a pinkish colour for the highest layers. *The Lake District*, 1958, *Lorn and Lochaber*, 1959 (later changed to *Ben Nevis and Glen Coe*), and *Loch Lomond and the Trossachs*, 1961 are all similar with a green base layer and above that very subtle shading of pale browns that do not form separate layers, but have rather prominent hill-shades. *The Lake District* suffers darkening of colours and contours in mid term with the C edition of 1966 only to lighten again in C5/\* of 1977, and then dark again in the 1:50,000 derived B edition of 1994. The other two remained little changed through their lifetime. All these are good maps with effective depiction of relief in mountainous areas, but they lack star quality.

As with its pre-war edition, *Cairngorms*, 1964 is also a departure from the established style. The A edition was unique in having cased white main roads, and all editions have green tree symbols instead of green background colour for woods. The base layer is green, which becomes a fierce green on A//, 1973. But, as almost all land on the map is over 1000 feet it is overwhelmingly brown with patches of mauve over 3000 feet. For a Tourist Map it covers an extraordinarily high proportion of uninhabited and almost inaccessible land. But it is a fascinating map to study for a southern Englishman who will never go there; it could be described as more interesting than beautiful. *Wye Valley and Lower Severn* of 1961 (the only printing) is unremarkable, being a plain layered map. But it does raise the question whether the Seventh Series would have benefited by being offered in this form for general use. In this, and GSGS 4620A, wherein layers were added to New Popular Edition mapping, the layers add a lot to the normal one-inch map, without unduly confusing its readability.

*Dartmoor* and *Exmoor*, both 1967, reverse the trend of the other maps of this series in that the layer colouring and hill-shading gets lighter as they were reprinted, which is just as well because the blue and purple above 1000 feet and reddish brown down to 700 feet is not a good choice aesthetically, whatever else it achieves. The 1:50,000 derived version of *Dartmoor* in 1985 reverts to a much happier range of browns above 300 metres and a range of yellows below that to a pale green base layer, which, coupled with lightly applied hill-shades gives a much more pleasing map while still clearly showing the shape of the land. *Exmoor* started similarly to *Dartmoor* but is less strident in its colouring, and gradually softened even that, so that B4 of 1990 the last of the Seventh Series is also the best printing of that map.

*New Forest* of 1966 was a curious exception in that the ground colouring indicates, not altitude, but 'predominant vegetation' wood, downland, meadow and heath. Relief is shown by hill-shades and spot heights, but not contours until the 1:50,000 derived edition of 1985 which includes contours. The A edition has a curious almost malachite green for the woods with prominent black trees, but by B/\*\* of 1976 the woods have faded to a pale green and the trees much reduced in prominence, a definite improvement. The C edition reverts to normal woods green but the tree symbols have faded even further and are absent from many of the woods, but the yellows of meadow and downland have grown in strength, and that is not an improvement. It is no surprise that the OS did not repeat the 'predominant vegetation' experiment, for, although the map is quite nice to look at, the wrong message is sent to the reader who is expecting the colouring to represent altitude.

The half-inch *Snowdonia* began life as the layered numbered sheet 28 in 1961, but was transformed in 1966 into *Snowdonia National Park* with the addition of hill shades and on revised sheet lines. It follows the sequence of getting lighter in later printings, but fails aesthetically by having map details that are too prominent, which allows the roads and the park boundary to distract from the land form. It does, however, draw our attention to the regrettable absence of a good general purpose map of the country at this scale. The 1:250,000 (quarter-inch) Fifth Series of 1960 departs from the layered style of the previous Fourth Edition at this scale by adding hill-shades. This produces a colourful map giving a good overview of mountainous country, but offering little more than occasional grey smudges to lowland country. *Wales and the Marches* Special Sheet of 1959 goes through the sequence of the hill-shading getting lighter in successive printings, so that the last in 1976 is the best.

There only remain two oddities; the isolated experiment with Landranger 124 *Dolgellau* of 1995 in which smudged hill-shading was, apparently rather casually, applied to the mountains. But it can only be described as a failure. The other is the surprising appearance in 1992 of the one-inch *Yorkshire Dales* Tourist Map, derived from 1:50,000 material. It made a rather better job of the hill-shades than *Dolgellau*, but there seems some doubt as to where the light is coming from; the convention being from the north-west, but on this one it seems to be more like due north. A nice map but by no means outstanding.

This survey has been confined to the maps in my collection that I have been able to examine alongside each other, but I don't think I have missed any others that are worthy of consideration. The only others that might be contenders are the experiments discussed by Hodson,<sup>8</sup> but these were not published and I have not seen them except as illustrations. My conclusion is, rather unimaginatively, that it is the famous *Killarney* and its immediate successor *Ilkley* that can claim to be the most beautiful and successful pictures of the land, followed closely by *Invergordon to Loch Ness* and *Island of Skye*. But, of course, this is open to question, being only my opinion.

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<sup>8</sup> *Popular maps*, pp23-29.



## ***How Bartholomew gained and lost a customer***

***Rob Wheeler***



David Archer's paean for Bartholomew's maps<sup>1</sup> made interesting reading, but I am not sure to what extent the people David deals with are representative of the normal customer for new maps. Perhaps I was unrepresentative too, but here is my story of how as a teenager I was briefly lured away from the Ordnance Survey product.

Hitherto I had taken on my cycle rides my father's Leicester sheet of the one-inch Second War Revision. I had always been impressed with the amount of detail it showed and how accurate it was, but I recognised that its depiction of the landscape was outdated. Besides, our house was inconveniently close to the southern edge. So I went to the Midland Educational, Leicester's general-purpose bookshop, to get something better.

Naturally, I started by looking at the Seventh Series OS one-inch, but found that to cover the area I wanted would require four sheets. In contrast, Bart's half-inch would only require two sheets and between them these would cover a much larger area than the four OS sheets. They were cheaper too and looked perfectly satisfactory. I remember looking to see if an OS half-inch existed that would meet my needs but, of course, there wasn't one. So I bought the two Bart's sheets.

I was soon aware – in fact, I may already have noted in the shop – that the maps' depiction of Leicester's new housing estates was scarcely better than the Second War Revision, but that was a deficiency I could live with. And it did at least show the new motorway. I had learned to distinguish railway over-bridges from under-bridges on the OS and was pleased that Bartholomew also seemed to make this distinction, although I found it was not altogether reliable.

What I found unacceptable was its road classification. In 1960s rural Leicestershire there were tarred, motorable roads and there were tracks across fields that might just be passable on foot if the nettles were not too high. Off-road cycle paths would, I thought, be a nice idea, but they simply did not exist. As a cyclist, I needed a map that distinguished roads from field paths, and this did not seem an unreasonable demand. Bart's showed 'Recommended through routes' (few problems there), 'Other good roads', a few of which were only field paths, 'Serviceable roads' (meaning unimportant because there were so few of these) and 'Other roads and tracks' (mostly tracks but some tarred roads). I now realise that Bart's 'good roads' in this area are generally those shown as Second Class on the OS Revised New Series, whilst the 'other roads' are Third Class. However, that does not explain the instances of 'good roads' that were field paths, which had been regarded as Third Class by the OS. Even had I known that the road classification on my map was closely derived from the OS New Series, that would not have removed my annoyance at finding I had to retrace my steps because a 'yellow road' had turned out to be impassable.

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<sup>1</sup> *Sheetlines* 89, 54.



Figure 1



Figure 2a



Figure 2b



Figure 3

The final deficiency of the Bart's map is something I took a while to spot. I knew my way across Leicester and would never have regarded the half-inch scale as particularly suited for the depiction of urban centres. However, the way it showed the main roads in the historic centre of Leicester with four roads converging on a sort of gyratory system around the cathedral was pure fiction, and rather tasteless fiction at that. *Figure 1* shows Bart's depiction. *Figures 2a, 2b* show the Revised New Series, which Bartholomew had presumably used as the basis of their reduction. *Figure 2a* adds the 'A' roads through the ancient city as they were for at least the period 1956-65; *figure 2b* shows the ones Bartholomew has chosen to show as 'recommended through routes' in red. *Figure 2a* is colour-coded to show the antiquity of the routes. The red ones are essentially Roman, and remained through routes to the 1960s. The yellow roads are a late-eighteenth century inner by-pass; the green route was only opened in 1902. It follows that apologists for Bartholomew cannot claim that the map is merely a little out of date in its depiction. The streets to the east of the cathedral that Bartholomew marked in red were always narrow, wholly unsuited for through traffic, and never used for that purpose.

*Figure 3* has been added to show that the OS half-inch also left a little to be desired in its depiction of through roads. The route it proposes from the south is certainly feasible but until 1902 it would have involved turning through the fourteenth century Magazine Gateway (marked with a purple 'M' on *figure 2b*); it was never to my knowledge regarded as a normal through route.

I suggested a few years back<sup>2</sup> that the choice of coloured roads on the OS Third Edition one-inch map was made in Southampton by not-very-inspired guesswork. As for the method that Bartholomew used, the existence of the splendid archive at NLS makes speculation inappropriate; I should like to think that a definitive answer will be produced by a future researcher there.

So this particular purchaser was looking for reliable content at a competitive price. Covers were an irrelevance; hypsometric tinting a mere bonus. Finding the content far from reliable, he never bought a (new) Bart's map again.

<sup>2</sup> *Sheetlines* 71, 22.

## ***Loc8 codes – directions made easy***

***Gary Delaney<sup>1</sup>***

A Loc8 code is a digital address code designed as a smarter form of postcode for use with modern location-based technologies. Every Loc8 code defines a position to an accuracy of +/-6 metres with respect to ITM (Irish Transverse Mercator) Grid, allowing a vehicle or pedestrian to navigate to within visual distance of the desired destination.

Garmin assisted in field testing the technology and has now released it as standard on all its popular consumer satnavs. Loc8 codes are now available to all manufacturers and developers and an iPhone app is shortly to be released also.

Ireland is famous for the long-winded directions used to assist visitors and natives alike find places. If you were coming to our office we would guide you as follows: *Get to roundabout in Crosshaven by Cronin's pub (7km from Carrigaline); take second exit, start up hill, continue 200 yds, slow sign on left, white building (Cobbles) on left, go another 10 metres and turn left into Cobbles.*

In the UK this might be done with postcodes and road and junction numbers. In Ireland we have traditionally used landmarks instead. However, with the advent of popular GPS and web mapping such as that provided by Google, ordinary people have discovered 'GPS coordinates', previously known to professionals as latitude and longitude. In addition, those who are surveyors or hillwalkers will have some experience with alternative grid coordinates. So whilst the professional art of navigation has moved to the consumer world, the means by which location is defined has not. As a result, in an effort to get around the vagaries of Irish addresses and related landmark directions, in recent years many forms of coordinates have been thrown at the ill-prepared with disastrous consequences. So our address in Crosshaven, Cork could be precisely defined in any of six coordinate forms, as follows:

51.800883 N, 8.293833 W or 51 48 03.2 N, 8 17 37.8 W or 51 48.053 N, 8 17.630 W or 579734 E, 560997 N or 179780 E, 60934 N or W 79780, 60934

This does not take into account other possible variables in terms of axis or quadrant definition. In our own trials we saw that those who have no experience of using these easily mistake one for the other and lat/long decimal degrees mistakenly entered as minutes and decimals of minutes could see errors in destination selection in the order of tens of kilometres – catastrophic in the case of an ambulance!

To solve this problem we investigated postcode-related solutions but discovered many limitations related to postcodes. As an example, even the UK postcode only works if every road has a name and every property has a

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number. This is not the case in the island of Ireland. In Northern Ireland, efforts to impose them in order to introduce the UK postcode were less than satisfactory, rendering the postcode there, and in other rural areas of the UK, less than precise. Postcodes also are a solution invented in the 1960s to help sort mail not find places. Places were still to be found by postmen; all pre-dating the powers of GPS, GIS and routing software. So whilst traditional postcodes contain inherent visual elements to define sorting offices, they very much rely on the local knowledge of a postman to deliver them. Nowadays we can define the exact destination and let GIS identify the sorting process; especially given that all bulk sorting is done by machines rather than human beings.

So the eventual Loc8 code solution is not aimed at sorting mail but rather at defining the exact destination. Once the exact destination is known, the required sorting process can be identified by GIS and routing software and varied to suit different operations – mail, courier, white goods delivery and service delivery to name a few. In the case of people finding places for business, pleasure or tourism then no sorting at all is required and they can go directly to the desired destination using a Loc8 code.

A Loc8 code therefore is seven alphanumeric characters, concatenated to allow it define areas, zones and localities visually in its structure. It is separated by dashes rather than spaces as spaces in traditional postcodes are an invitation to add something in error. So we have replaced long-winded directions and a variety of error prone coordinate variations with a simple W8L-82-4YK; a seven character Loc8 code with an additional eighth character for extra robustness, as it introduces error checking. W is an area on the south coast, W8L is a zone around the town of Crosshaven and W8L-4YK is the street-related locality. 82 is the target destination; a bit like the property number but actually the +/-6m accuracy grid coordinate.

So some say Loc8 should contain a place name. There are 60,000 townland place names in Ireland, so not practical at all and once you add names you lose accuracy, require a database and you get into all the local issues relating to Irish and English language versions of places names and local variations in spelling. Many more modern postcodes do not use names either. Canada and The Netherlands are two notables; the place names are already in an address so this would just be unnecessary duplication for no more than cosmetic reasons. In fact, in many UK postcode areas the place name abbreviation actually has no local relevance at all. Take BT for example, representing Belfast but used everywhere in Northern Ireland including Derry.

Some also say that Loc8 is too long and difficult to remember. Loc8 code is finite at eight characters; it never has to get longer. To find a property in the UK, you need the postcode plus a property number. This is on average nine characters long (variable) and if there is no property number then the postcode only gets you to an area and you need the postman to guide you in. A Loc8 code fixed at eight characters needs no property number, will get you to the

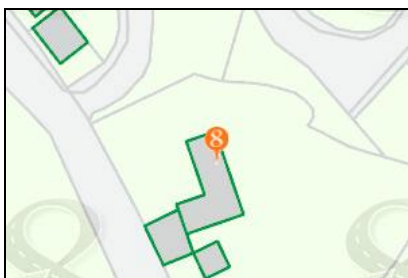
door and also will work on non-property destinations (specific gates, construction sites etc.), something that a postcode can never do. In the same way that Irish people became familiar with the fact that Dublin 11 is around the Ballymun area in Dublin, so too will they quickly establish that our zone, W8L, defines an area around Crosshaven in Cork and the zone NN6 is around where the Parliamentary Buildings are in Dublin. So once all this is understood, remembering the locality W8L-4YK is no problem with 82 (W8L-82-4YK) as the required door.

Furthermore, unlike traditional postcodes, Loc8 codes do not need an expensive address database loaded to make them work on mobile devices. Nor does a code have to change as property densification occurs; Loc8 codes are mathematically related to ITM grid and so they never have to change.

Key features which differentiate Loc8 codes from anything else in use globally are as follows:

- a checker code which checks a user entered code and prompts error correction
- key features which ensure that a Loc8 code can be easily validated
- key features which allow software or scanning devices to robustly pick out a Loc8 code in the middle of many other items of text, addresses, reference numbers and codes
- language independent
- does not require an existing address to be changed and can be used on devices without a loaded address database
- can be used to identify non-property based destinations
- in a web connected scenario the Loc8 code can identify other key information to help guide the user to the destination
- there is no requirement to change property codes as densification occurs as is normal with traditional postcodes
- a Loc8 code is formatted in such a way as to allow it to be added to a standard URL to pinpoint the location on a web map; for example, enter *www.loc8code.com/W8L-82-4YK* to see its location on Loc8's web mapping service

So Loc8 codes are a modern location solution which avoid the complications of coordinates for the untrained and solve the inadequacies of postcodes with added robustness and flexibility. They are now in use in Ireland and Northern Ireland with plans to implement in other territories.



*The location of W8L-82-4YK identified on Loc8 website*



## ***Photo-zincography and helio-zincography***

***Richard Oliver***

A couple of years ago, when the Charles Close Society's reissue of the 1920 York town map was being prepared, someone asked the question: 'What is the difference between photo-zincography and helio-zincography?' Both terms are met with on Ordnance Survey large-scale maps from the 1880s to the 1930s, though latterly it is helio-zincography that prevails.<sup>1</sup>

The first of the two processes to be developed was that of photo-zincography. The principle was developed more or less simultaneously in 1859 by John Walter Osborne in Australia and by Captain Alexander de Courcy Scott and Lance-Corporal Rider working under Colonel Henry James at the OS in Southampton.<sup>2</sup> As James had the more effective publicity machine and the bigger ego, he claimed the invention of photo-zincography for himself. From the point of view of contemporary domestic map production it was actually of very limited use, as the largest negative available was considerably smaller than the double-elephant size of a standard six-inch (1:10,560) or larger scale map of the period. Its main use in the 1860s was for producing facsimiles of historical documents, starting with Domesday Book; by the 1870s it was also being used for rapid reproduction of overseas mapping for the War Office.

The basic process in photo-zincography was that the original was photographed, producing a negative on glass. A carbon positive print on treated paper was taken from the negative, floated in water to remove gelatine on the paper, and transferred by being laid down on a grained zinc plate covered with lithographic ink. The image was transferred from the paper to the zinc by the application of considerable pressure, and after the ink had been removed from those parts not covered by the image, it was ready for zincographic printing. A disadvantage of the process was that the print had to be wetted and so lost shape: this introduced distortion of about 1/150 of length or breadth, according to paper expansion, and to counter this paper expanded by moisture was printed on and subsequently dried so as to be at the correct scale.<sup>3</sup>

Photo-zincography was first used on a significant scale for domestic map production from 1881-82 onwards, in order to speed up the production of the six-inch map. Hitherto this had been engraved, but there were increasing delays, and in the new process the linework of the parent 1:2500 was photographed down to six-inch scale. This so speeded things up that it was possible to issue the six-inch sheets before the corresponding 1:2500 sheets were complete, as the latter had to have field acreages calculated and added

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<sup>1</sup> The Ordnance Survey preferred to write both terms as a single word, rather than in hyphenated form.

<sup>2</sup> This has been explored in detail in Ian Mumford, 'Milestones in lithographed cartography from 1800', University of Reading PhD thesis, 1999, 158 ff. Osborne's process was actually for photo-lithography, i.e. laying down the transferred image on stone rather than on zinc.

<sup>3</sup> This description is derived from Duncan A Johnston (ed), *Account of the methods and processes... of the Ordnance Survey*, London: HMSO, 1901, 157, 175-9.



before being published. The drawback was that the size of available negative made a six-inch full sheet (36 by 24 inches) impracticable, and so the mapping was issued instead in quarter-sheets (18 by 12 inches). The glass negatives were stored, and once contours were surveyed they were added to the negatives by 'photo-writing'. As a result most six-inch quarter-sheets of the period 1883-91 were issued in a 'First Edition without contours' (and sometimes also a 'Second Edition without contours', probably just a reprint) before being issued in a 'definitive' contoured edition.

By 1889 it was possible to produce a double-elephant sized negative, and photo-zincography was adopted as standard for the production of the 1:2500 and larger scales. This was the period of 'the replotted counties', when first Lancashire and Yorkshire and then seven Scottish counties which had been mapped at the six-inch scale between 1841 and 1854 were remapped at 1:2500, and large-scale revision was beginning in London, Glasgow and elsewhere. As this entailed also mapping urban areas, mostly at 1:500 (1:1056 in London), huge numbers of glass negatives were generated. After a few quarter-sheets had been produced by the direct-reduction method in the extreme south of Lancashire, a new method was adopted for the six-inch, of photographing the 1:2500 down to twelve-inch, taking prints in non-photographic ferro-prussiate blue to act as drawing-keys, penning-in the necessary detail for the six-inch in black, and photographing again to produce a six-inch scale negative, for photo-zincographic reproduction by the now standard method.<sup>4</sup>

Growing output of large-scale mapping as 1:2500 survey was succeeded by revision coupled with a lack of storage space meant that from about 1894-5 the use of photo-zincography was restricted to the 'heavier' sheets covering built-up areas. 'Lighter' sheets of more open areas were produced by a manual tracing of the 1:2500 revision documents, which was laid down on zinc for zincographic printing: lack of storage space meant that the zinc plates were usually cleaned off, and reprinting could involve new tracing.

By this time an alternative to photo-zincography had been developed: helio-zincography. The essential difference between the two was that what was sometimes known as 'the helio process' worked by placing the photographic negative directly in contact with the sensitised zinc plate, thereby avoiding the photo-printing and transferring processes entailed in photo-zincography. Officially the process was developed in 1893 by Colonel Duncan Johnston, 'assisted by Mr A. Algar'.<sup>5</sup>

Helio-zincography was adopted fairly quickly for six-inch and 1:2500 production, though constraints on storing negatives meant that, like photo-zincography, it was used sparingly for the larger scale. The process for the six-inch up to negative stage remained fundamentally the same up to the end of the County Series after 1939: the statement in the footnote that the mapping was 'Heliozincographed from 1/2500 plans' may well have misled some people in

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<sup>4</sup> Johnston (ed), *Methods and processes*, 160-1.

<sup>5</sup> Johnston (ed), *Methods and processes*, 157-8, 179-80.

the past into supposing, wrongly, that such six-inch mapping was prepared by direct reduction from the 1:2500.<sup>6</sup> It wasn't. Although in principle it was possible to revise by correcting the negatives, in practice six-inch revision seems to have been either by correcting existing drawings and re-photographing, or preparing wholly new twelve-inch drawings when there was enough change on the ground to warrant this.

Growing experience with 'the helio process' led to the extension of its use to small-scale mapping. In 1914 the one-inch and smaller scales were still produced mainly on the basis of engraving but by 1918 the helio process was trustworthy enough to be used for the new quarter-inch of Great Britain, and the half-inch of Ireland published in 1911-18 was the last new series to be completed that was based on engraving.<sup>7</sup> The Popular Edition of Scotland, the one-inch Fifth Edition, and the contemporary and later small-scale series were all based on helio-zincography, although (earlier Scotland Populares apart) this fact was not usually advertised in the footnotes of the maps.<sup>8</sup>

To round off the story: in 1900 a technique devised by Conductor Vandyke of the Survey of India was introduced to the Ordnance Survey. In 'Vandyking' a zinc printing plate was produced by placing a drawing in contact with a sensitised zinc plate in a vacuum frame, and exposing the combination to light: the image was copied by the action of the light passing through the drawing onto the plate. This method had several advantages: it was a photographic process which did not involve a camera or the production of a negative, and the thin zinc plates coming into use at this time were much easier to store than either the bulkier zinc plates used hitherto or glass negatives. It soon became the practice that where a drawing was to be reproduced and published at the same scale – as with the 1:2500 – Vandyke was used, and when at a different scale the helio process was used. Generally scale-transformation meant reducing a larger-scale drawing to a smaller scale for publication – as in drawing at twelve-inch for publication at six-inch – but a significant exception was the production from 1911 of 1:1250 mapping by photo-enlargement from 1:2500. This was initially undertaken under great pressure of time for land-valuation purposes: that it was practicable at all was greatly due to 'the helio process'.

References to 'helio' have probably reached a much wider audience in the past thirty years thanks to the reprints issued by Alan Godfrey Maps, and the following notes are offered as a rough guide. The various processes used can

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<sup>6</sup> The writer in his teens was one such.

<sup>7</sup> Engraving seems to have been confined to the outline and water plates. The Popular Edition of England and Wales, though completed later, was based on material engraved rather earlier. By 1914 helio-zincography was an established technique for overseas mapping produced by or on behalf of the War Office, such as the 1:100,000 series of Belgium, GSGS 2364.

<sup>8</sup> By the late 1960s, with the increasing use of synthetic colours, a more sophisticated technique was being used, of using original photographic negatives or positives to produce combined positives or negatives, with the combinations being brought into contact with the printing plates.

usually be inferred from the footnotes of the published maps. In the publication note, usually placed bottom centre, ‘Zincographed’ can be interpreted as the product of a tracing from revision documents, with the plate probably cleaned off once the edition had been printed; ‘Photozincographed’ and ‘Heliozincographed’ indicate that there was a new manuscript drawing which was photographed, and so there was a negative; ‘Printed’, which was usually employed from the mid 1900s onwards, seems to indicate that the Vandyke process of direct transfer from a manuscript drawing was being used. In reprint notes, ‘Reprint’, unqualified, seems ambiguous, but ‘Reprinted by Heliozincography’ suggests that a pull was photographed and a plate produced from the resulting negative, and ‘Reprinted by Direct Helio’ suggests that the Vandyke process was used, with a printed impression substituting for the manuscript drawing. Reprints of earlier mapping produced by photozincography may sometimes have a ‘helio’ mention: this would seem to indicate that a plate was produced directly from the negative by helio-zincography, rather than by transfer to zinc of a photo-zincographed print.

### ***Latest map printings***

The first OS maps printed by Butler Tanner & Dennis (BTD) have started to reach the shelves. Map covers printed by BTD are distinguished by having slightly different typography. Additionally, the imprint at the foot of the rear cover is now simply ‘Published by Ordnance Survey, Southampton’ instead of ‘Made, printed and published...’ The first new edition to feature such a cover appears to have been *Explorer 198 Cardigan & New Quay* edition A1//, published 30 September 2010, and several other examples have followed.

On the map sheets themselves, the imprint ‘Made, printed and published by Ordnance Survey, Southampton’ is entirely omitted from the legend panel on sheets printed by BTD, of which so far there have been relatively few.

A further cover variant printed by BTD arrived in February 2011, including shaded sheet overlaps on the rear cover index diagram and also featuring Ordnance Survey’s new Adanac Drive address on the inside.

A more considered analysis of the changes will follow in the next edition of *Sheetlines*.

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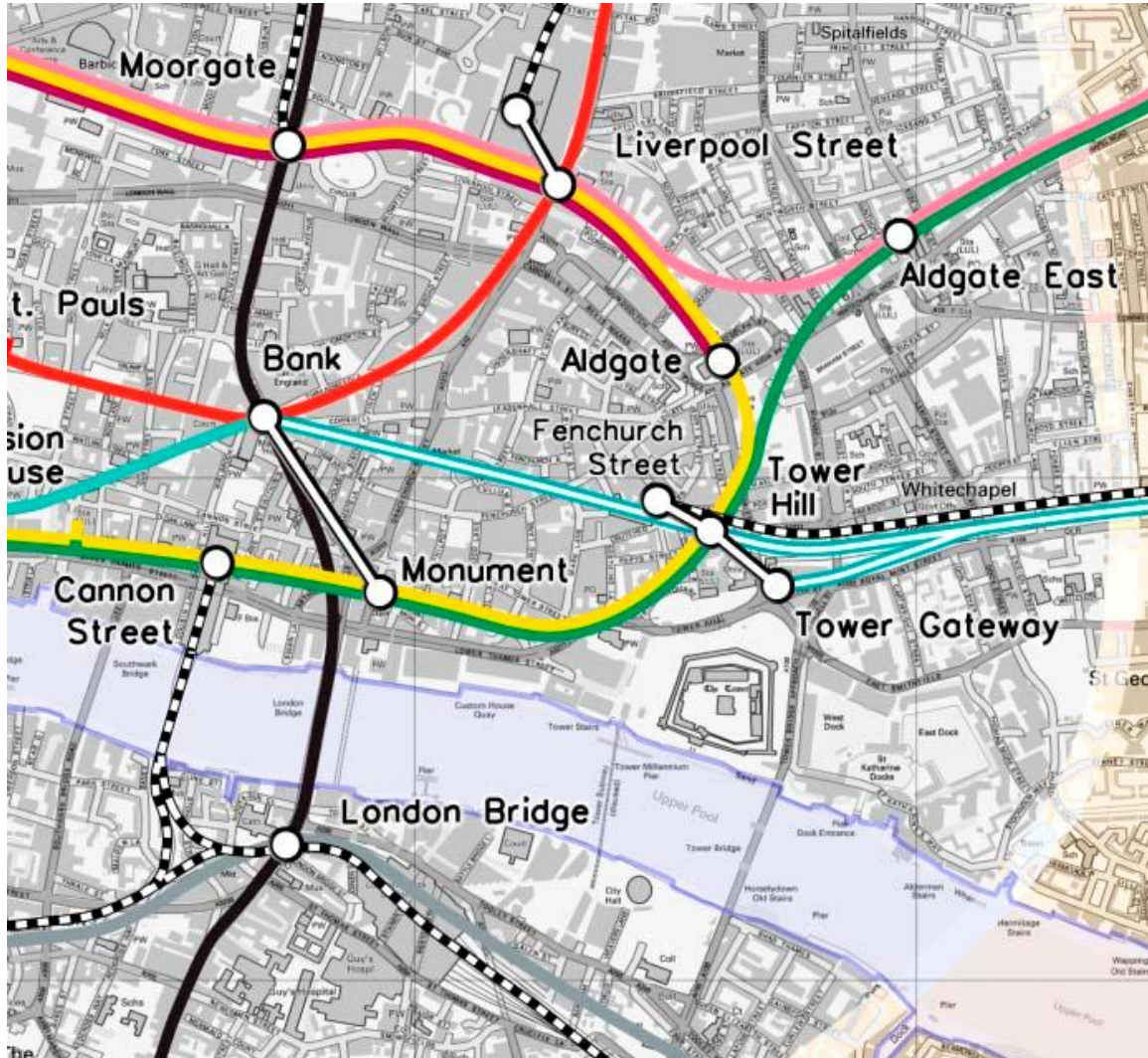
Published by Ordnance Survey, Southampton, United Kingdom.

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*Ed Fielden*

## *Stanfords print-on-demand maps of London railways*

*Gerry Zierler*



A series of railway maps using Ordnance Survey's StreetView data (available under the 'Open Space' initiative), has been released by Stanfords, created by their resident cartographer Piotr Czapik.

Customers can choose between a variety of underlying data and features, such as fare zones, congestion charge zone and bike-hire stations, with combinations of rail networks. Railways are shown black-dashed for National Rail and in the standard colours for tube, DLR and Overground, and are (approximately) in their true positions. Railway buffs will enjoy spotting the differences between convention and reality! Freight-only lines are not included.

Background StreetView data starts as 1:10,000, but in most cases will end up as approximately 1:14,000. Definition is 254 dpi. The maps are printed on demand to customer specification and can be up to a maximum of 2m by 1m on waterproof paper. One version covers an area stretching from Ealing in the west to Stratford in the east, another Shepherd's Bush to Whitechapel. Czapik has personally established the locations of many London stations using GPS.



Piotr Czapik is a photogrammetrist as well as cartographer, and recognised the opportunity for creating user-specified on-demand maps. He published some London Borough maps last year, as well as one showing all London boroughs and relief.

The standard set of five maps mentioned on Stanfords' website<sup>1</sup> is available from stock. Variations to suit your own requirements are printed while you wait, taking about twenty minutes each. The cost is £14.99 per sheet, but CCS members contacting Mr Czapik are offered 10% discount.

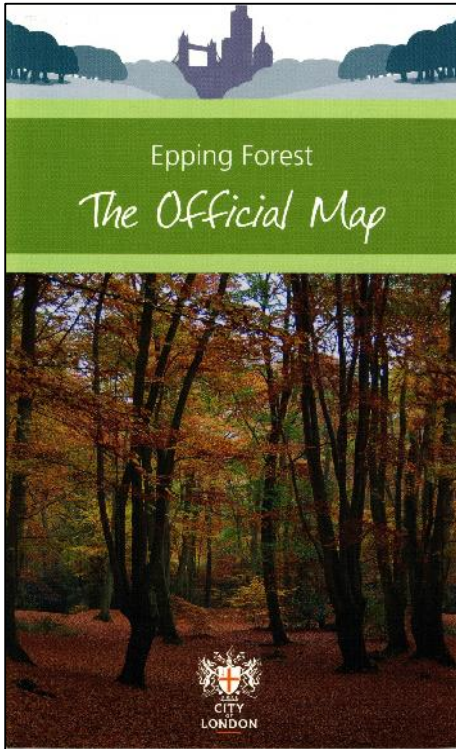


*Extract from Epping Forest The official map, reduced by about 10% (see opposite)*

<sup>1</sup> [www.stanfords.co.uk/series/stanfords-tube-maps-print-on-demand-flat-maps](http://www.stanfords.co.uk/series/stanfords-tube-maps-print-on-demand-flat-maps)



***Epping Forest The official map, City of London, 2010,  
ISBN 978-0-85203-089-0, £4.95***



Epping Forest, London's largest public open space, covering almost 8000 acres, stretches some 13 miles, north from the east end of London to beyond Epping, with several detached outliers. It is nowhere more than two or three miles in width and the shape of this map reflects this, opening out to two and half flaps, over a metre in height and about 650mm wide. The map, at a scale of 1:20,000, has been produced by Collins to City of London requirements and is based on the popular Collins London street atlas.

Colour coding differentiates wood pasture / woodland from grasslands / heath-lands. So-called buffer lands are indicated in yellow. The status of buffer land is not defined on the map, but it is in fact land that has been acquired by the City of London to protect the forest from encroaching development and to maintain links between the forest and the wider countryside.

Within the forest proper there is an open right of access (not the case with buffer land) with many paths and tracks. These are indicated on the map, differentiated as byway, bridleway, footpath, shared-use trail, easy access trail, informal walks and cycle paths. Car parks are differentiated as to whether or not they are suitable for horseboxes. Leisure facilities indicated include football, building of historic interest, public house, horse riding, boating, fishing, playground and easy access path.

Overall, the appearance of the map is very attractive and a model of clarity. This is largely due to the soft colouration of the surrounding built-up areas and the use of colour-coding within the forest. The reverse side has an index of about 250 names of features within the forest and a comprehensive street index for the surrounding urban area.

This is an entirely new production and a huge improvement on previous editions. Previously, the Epping Forest map at the same scale has been based on OS 1:25,000 mapping with harsher colouring, no street names and no index.

The map may be obtained by writing or telephoning the Epping Forest visitor centre, High Beach, Loughton, Essex, IG10 4AE (020 8508 0028) for £5.95 inclusive of post and packing.

*John Davies*

## ***Black work at Counter Drain***

***Rob Wheeler***

The Second World War saw unprecedented traffic demands on some railway lines and extra sidings and loops were put in place on some of the most heavily stretched lines. I had not thought of the Midland & Great Northern Joint as one of those lines, so I was interested to see a section of double track near Counter Drain station (TF 178208, about three miles west of Spalding, Lincs) on Second War Revision of the one-inch map of England & Wales (GSGS 3907) sheet 64 (*figure 2*) where it had previously been single (*figure 1*).



*Figure 1. 50,000/9/41LR*

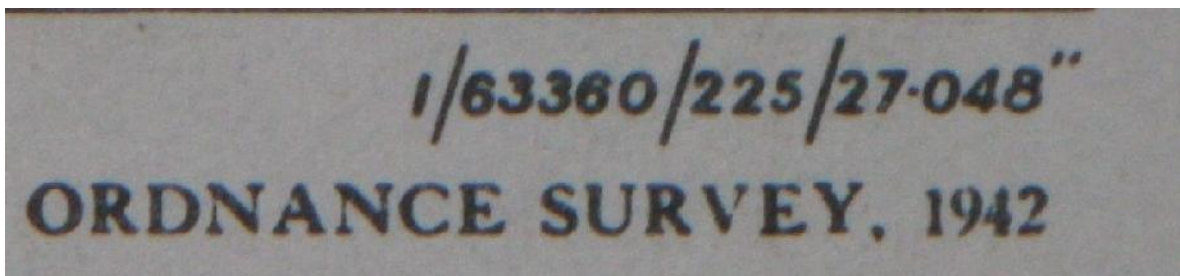


*Figure 2. 30,000/4/42F*

The change appears to take place between two states of this map, which is a series not normally updated with that sort of change. Yet more surprising, the post-war one-inch shows the railway as single track.

The answer, I suspect, is that the railway had not been doubled at all. All that had happened was that my copy of the 30,000/4/42F printing had benefited from an over-generous supply of black ink. Note how the minor road at the lower left of *figure 2* has become a solid black line. In just the same way, the white chequers of the railway have filled with ink, to such an extent that the line is indistinguishable from solid black.

Assiduous readers of *Military maps*<sup>1</sup> will be aware that this state carries an additional print code (or order code) bottom right (*figure 3*).



*Figure 3. Additional code on 30,000/4/42F*

<sup>1</sup> Roger Hellyer and Richard Oliver, *Military maps*, Charles Close Society, 2004.

## ***Engraved maps – another opinion***

***David Milbank Challis***

This weighty tome<sup>1</sup> seems to be causing something of a stir within the membership, and having just had the task of reviewing the publication for *Imago Mundi* (The International journal for the history of cartography), I thought I would contribute a few ‘professional’ comments.

*Sheetlines* originally asked Chris Perkins to review the new work, and I have to say I largely agree with what he penned.<sup>2</sup> It was a well considered and succinct summary of the content, that also made some valid criticisms of its form and content. In the following issue<sup>3</sup> we are treated to a lengthy defence of the book by David Archer – a CCS ‘insider’. Quite frankly this is a piece of unnecessary ‘salesmanship’ and missed the underlying points that Perkins was trying to point out – the need for more rigour at the concept/editorial stages of a projected publication. Archer’s comment that Perkins ‘essentially fails to say anything good about the book’ is really unfair and as for ‘Synergy at its finest’, I beg to differ! It’s simply not enough to say ‘follow that’ – the Society must surely be looking outwards and ensuring that it is trying to inform and educate the ‘wider audience’.

### ***Basic points***

- 1 The publication is simply the sum of the two authors’ work (Roger Hellyer and Richard Oliver) plus Chris Higley’s typographic layout and index illustrations.
- 2 What it lacks is balanced independent editorial consideration to make the work accessible to the ‘wider audience’ – the Society’s publications committee seems to have overlooked this aspect.
- 3 The ‘wider audience’ in this case is anyone who is interested (or needs to know) about the particular OS mapping in question but lacks Hellyer and Oliver’s expert knowledge (few of us have had their opportunity to study the material at such length).
- 4 The resulting book is approached from an insider’s perspective, someone who is ‘in the know’, this has tended to make it a ‘hard read’.

### ***Further considerations***

- 1 The key problem is the sheer bulk of information that is mainly contained in the three country’s cartobibliographies; this has resulted in many of the shortcomings in the final preparation of the work and the ‘material’ has had to be ‘squeezed’ in – not very clever.
- 2 The format is satisfactory; but it should be remembered that A4 was never intended to be a book format. This happened largely through architects’ pressure for standardisation in the 1960s and subsequently I had to design

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<sup>1</sup> Roger Hellyer and Richard Oliver, *One-inch engraved maps of the Ordnance Survey from 1847*, Charles Close Society, 2009.

<sup>2</sup> *Sheetlines*, 86, 50

<sup>3</sup> *Sheetlines*, 87, 7



numerous governmental technical publications in A4 and the format does have its shortcomings in layout and typographic terms. The two column layout is a very stilted solution.

- 3 Typography and the choice of Garamond as the house typeface is less than ideal, it is a narrative book face that does not work with technical material, the italic is highly idiosyncratic, and the bold italic headings are an abomination. Garamond has a small 'x' height and given the amount of wordage and the need for economy, the type-size chosen is too small to digest easily, plus it's a pretty dense page at over 1500 words and miniscule references. The pages are heavy-going and relentless and the 'show-through' on the thin paper doesn't help. Books, and particularly technical ones, need 'air' occasionally to break up the mass of information – regular illustrations would have helped.
- 4 Illustrations must have been an afterthought; it's forty pages of introductory essay before we get any relief from the words and then it's of little consequence. Maps are visual/graphic interpretations of the topography and the book does not have a single complete map example to provide context (hence my point about it being for those in the know). A few complete examples would surely have helped and aided the understanding of the detailed illustrations that are included.
- 5 Sheet line indexes, again lost sandwiched between Oliver's essay and Hellyer's cartobibliography (By the way there are only the eight pages that Perkins notes, not 15 as Archer would have us believe – there are 15 indexes in the group). They are not properly captioned to work independently, neither is there any cross referencing to get at the relevant text matter. These indexes should have appeared at the appropriate point in the text where they would have made telling points. The 'Preston to Hull line' is not illustrated topographically (not everyone's knowledge of the exact whereabouts of UK towns is sound). Again the bulk of pages probably dictated the need for prudence with the illustrations (or figures if you prefer), but having got to over 700 pages then why not a few more.
- 6 More importantly, these indexes should also have appeared at the beginning of each country's cartobibliography as an aide-memoire. In the case of England and Wales it should have been simply the 360 sheet numbered layout as per the way the listing are ordered; the large sized index to the New series (page 111) only shows this numbering small, the index being dominated by the full sheet numbers. One final point, given the large A4 format, the whole page indexes could have included selected town names in the background and county names – for 'users' this would have made the indexes a working tool.
- 7 The book is paper-cased, not cloth bound and with its bulk/weight as a work of reference and the need to keep 'flipping' to get at core elements, the spine will fail. Neither is the printed paper case used to illustrate a complete map or any of the 'colour' versions.

8 All these points should have been properly considered at the outset and the real decision faced – present the work in sensible parts; ideally four (even in a slip case). The end product would have been much more user friendly. As a ‘user’ of such works I think it highly unlikely that you need all this data in one book; and they could easily have been made to work as a set. The only area where one might want two countries material at the same time is the England/Scotland border. A diagram of the interaction of the two country’s sheet lines is a ‘missing’ diagram.

As you will have gathered I am not of the ‘stamp collecting’ wing of the Society, but a humble ‘user’ who relies on the sterling work of Hellyer and Oliver in the frustrating task of trying to understand what the map cartographer has recorded and I am endeavouring to interpret. Keep up the good work but involve people who know and will be using the information.

*Editor’s note: David Challis was the designer of J B Harley’s Ordnance Survey maps: a descriptive manual, published by HMSO in 1975. He discussed the process of producing that book in Sheetlines 65 (2002).*

*The Society will wish to give serious consideration to these comments from a professional book designer, but notes that the economics of a short print run book like Engraved maps are very different from those of a government publication. Engraved maps is a work of considerable scholarship; its publication by a small voluntary society at a price that members can afford is quite an achievement.*

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### ***Lost in translation?***

The Mapstor website at *mapstor.com* sells Russian maps of countries of the world and has a brief description of the major attractions of each country. Below is an excerpt from the Great Britain page.

“Scotland with its castles and mountainous scenery is a totally different country, severe and majestic, whose landscapes have brought it the fame of the raciest region of Great Britain. It is here that Ben Nevis, the highest peak of the state, and the legendary Loch Ness with its hypothetical prehistoric monster Nessy are located.

The largest city in Scotland is Glasgow. It is quite expensive indeed and is buried in verdure, but nevertheless has a distinctive architecture that combines Gothic, Italian Renaissance, Gregorian and Victorian styles.

Edinburgh is an example of interweaving of times divided by the very history into several parts: the Old City (early Middle Ages), the ‘new’ city (XVIII century) and the modern one. Attention is attracted by Arran Island with the museum ‘Scotland in miniature’.

## ***A map too far? Arnhem 1944***

***Mike Nolan***

Over the years, usually in September, there have been occasional items in the press regarding the battle at Arnhem including the absence of the bridge from the operational maps. One such, taken from the *Sunday Telegraph* of 24 September 1978 (right), is typical.

Sadly as the years have passed the veterans with an interest have diminished in numbers, as has the correspondence, and the matter has perhaps, until now, fallen out of sight. Having been interested in the subject since 1980, I therefore read Rob Wheeler's article<sup>1</sup> with interest.

In responding, the first thing to stress is that the absence of the bridge on the tactical 1:25,000 scale map of the town in September 1944 was probably not critical. The motorway alignment on the south bank pointed directly to the site of the bridge and up-to-date reconnaissance photographs of the bridge were available. Those taking part in the battle knew where the bridge was and, I suspect, the bridge was visible to many involved from some distance from the town, but in this last opinion I may be wrong.

The 1st Airborne Division Intelligence summary for 5 September 1944<sup>2</sup> gave the following information on potential river crossings at Arnhem, the bridge numbered 2541/5 at grid reference 747768 being the critical one:

- 2541/5 747768 – road bridge, 3 span steel bowstring, central span 410 feet, two spans each 150 feet, width of water 480, overall length 760, width of road 35. Air cover dated 11 December 1943 shows the smaller span damaged and repair work being carried out.
- 2541/5 738774 – road bridge military, pontoon bridge, 490, 600, air cover dated 11 December 1943
- 2541/5 707764 – Oosterbeek railway bridge
- 2541/5 688768 – vehicle ferry
- 2541/5 665757 – Doorwerth passenger ferry

The 1 Para Brigade operation order No. 1<sup>3</sup> quotes the maps in use as:

- 1:25,000 GSGS 4427, Gimbel 388, Ede 387, Renen 5NE, Arnhem 6NW
- 1:100,000 GSGS 2541 sheets 2 and 5
- GSGS 4416 sheet P.1

**M**OST MILITARY tacticians would agree that in order to take a position, a map showing where it is does come in handy. But historian and former Reconnaissance Corps sergeant John Fairley has come out with the surprising revelation that the famous Arnhem Bridge—the “bridge too far” in Lt-Gen F. A. M. “Boy” Browning’s memorable phrase — never appeared on the Airborne forces’ maps at all.

<sup>1</sup> Rob Wheeler, ‘Arnhem 1944 – were the maps good enough?’, *Sheetlines* 87, 11.

<sup>2</sup> TNA PRO WO 171/392 or 393.

<sup>3</sup> TNA PRO WO 171/393.

Questions on military survey in World War II are often resolved by consulting *Maps and Survey* by Brigadier Clough, the HMSO monograph on military survey in WWII and *Notes on the GSGS maps* of various theatres, all of which are now available as scanned documents on the Defence Surveyors' Association website at [www.defencesurveyors.org.uk](http://www.defencesurveyors.org.uk).

The context of the pre-1944 mapping of the Arnhem area is perhaps worth considering. From 1942 to 1944 the UK was heavily committed to the production of maps of Europe, in particular the *ab-initio* compilation of 1:25,000 scale maps of Normandy for Operation Overlord from aerial photographs, the so called *Benson* project.

It was only in May 1942 that the Loper-Hotine agreement was reached, whereby the United States undertook the mapping of North and South America, Australia, New Zealand, the Pacific, Dutch East Indies, Japan, West Indies, Iceland, Greenland and Bermuda. The United Kingdom undertook to provide reproduction material as required from its library resources.

In March 1943, a revised division of responsibility between UK and US was agreed. For the European theatre of operations the US accepted a commitment to produce 1:100,000 maps of Germany, maps of the Iberian peninsula, and all series of Spanish and French Morocco and Algeria. It also accepted responsibility for a newly drawn and revised 1:25,000 series of the Netherlands and a block of 1:100,000 sheets in southern France. This was, of course, in addition to its responsibility for mapping of the Pacific islands, the Netherlands East Indies, the Philippines, Formosa, Korea and Japan.

Doubtless priorities for map production of various areas were decided upon. Rob Wheeler suggests that the advance to the Rhine and Ruhr pursued by Montgomery initially may not have been the highest priority for the American field commanders. I know of no evidence that Gelderland remained an area of low priority for map production by the Army Map Service (AMS) in the US. It appears that AMS had completed the production of the 1:25,000 scale series between March 1943 and September 1944 amongst its other commitments.

The fact remains that the few tactical scale sheets at 1:250,000, 1:100,000, 1:50,000 or 1:25,000 scale of the Arnhem area were but a very few of the literally thousands of sheets compiled in haste by UK and US between 1942 and 1944, often with wartime recruited and hastily trained cartographers. Furthermore, before the war, the US probably had little interest in the possibility of widespread production of maps of Europe and was initially heavily dependent upon the provision of suitable source material from the GSGS library holdings and survey standard vertical aerial photography as it was acquired throughout the war by reconnaissance by 1 Air Survey Liaison Section R.E.

A factor that must be taken into account is the pace of events. *Maps and Survey*, quoted by Rob Wheeler, also devotes a section to the mapping-up of the First Allied Airborne Army (FAAA) from 15 August 1944 to 20 May 1945, a section probably based on the document in The National Archives, at WO



402/365. Briefly this makes the point that the FAAA, which had formed up on 15 August 1944 immediately planned for an assault crossing of the River Seine. On 19 August 1944 those plans were cancelled and a new plan was made to cut off the Pas de Calais and capture the V weapon launch sites, the Tedder plan. On 24 August full scale preparations were being made for Operation Boxer only to be cancelled the next day in favour of Operation Linnet to capture the Lille-Arras-Douai area. On 3 September Operation Linnet was cancelled and Operation Comet appeared, to capture bridges in south-east Holland on 7 September. On 10 September Operation Infatuate for the capture of Walcheren Island was initiated and on the same day Operation Comet was replaced by Operation Market with a target date of 14 September. On 12 September D-Day for Operation Market was fixed for 17 September and all troops were mapped-up by the 15 September.

For all these operations FAAA was mapped-up from a map depot in Newbury and one can imagine the hectic work that took place. Meanwhile 30 Corps, the key formation, and other units on the mainland of Europe, were being supplied with maps by Field Survey Depots that had crossed the Channel in June 1944. In but 104 days the British and Canadians had advanced from Normandy to the Meuse-Escaut Canal just south of Eindhoven where they were poised for the final advance to the Rhine at Arnhem as part of Operation Market Garden. The DAD Survey of FAAA and the map depot staff in support of the operation were probably fully engaged in just providing the stocks of current editions to the units involved. I suspect that it is doubtful that he would have even considered asking the GSGS, through whatever channels were in place, for a last-minute update of the mapping, any more than he would have sought updates of the mapping for all the previous cancelled operations.

In view of the timetable of events above, it is just not conceivable that FAAA could have been provided with a last-minute revision overprint of maps of Arnhem, and even more unlikely that 30 Corps could have been similarly mapped-up with the same maps even had they been revised in UK. In other words, as is so often the case, the army just had to make do with the current operational edition, whatever its faults.

Rob Wheeler poses the question, 'how did the view that a good road map is essential fall out of sight?' In the context of 1944 operations, the 1892 quote by Farquharson, for a need 'to enable a General to move his troops to desired points' would have been met by 1:250,000 or 1:100,000 scale topographic maps, although special road maps were also produced. How errors in the depiction of roads on tactical topographic map occurred is pertinent. However, in view of the overall production programme hinted at above and the short time-frame involved, errors of omission on a few sheets, with no immediate tactical significance when they were compiled, might be forgiven. In the mobile operations that characterised the preceding campaigns in the Western Desert and North Africa, and even in the breakout from Normandy across France in which tracked vehicles and some four-wheel drive vehicles were used, the

omission of a particular stretch of road might be of little account. Unfortunately, in the autumn approach to Arnhem across the flat and often impassable terrain of the Netherlands, the difficulty of off-road movement made the availability of good roads and information on them paramount.

Looking at the available map series by increasing scale:

**1:500,000 - GSGS 4072 and GSGS 4369**

The aeronautical chart series at 1:500,000 scale meeting most needs for operational cover over continental Europe was series GSGS 4072. Series GSGS 4369 is not included in the list of operational maps or air maps. It is, however, shown on the combined index for series GSGS 4072 and GSGS 4369. Neither of these series is relevant to the operation.

**1:250,000 - GSGS 4042 - NW Europe Army/Air**

This, and other 1:250,000 scale series of north-west Europe are described in *Notes on GSGS maps of France Belgium & Holland*, December 1943 as being roughly equivalent to the quarter-inch maps of Great Britain. They were produced in Army/Air style with the aim of showing the maximum military information possible for the scale but with a clarity suitable for flying conditions.

Rob Wheeler does not mention this scale at all, but this is probably the series which met the need for a general road map, or rather, a general topographic map showing road communications, and Sheets 2 and 5 of this series are quoted in 1 Para Brigade operation order No. 1.

**1:100,000 - GSGS 2541 Holland**

This sheet was published in September 1944 and it is assumed that it was available for Operation Market Garden. Rob Wheeler quotes 'Partially revised from Dutch maps of 1936-39. Communications revised from GSGS 4183 and 2185 and Autokaart Van Nederland, Intelligence Reports to 1942'. There are evidently three different printings of this edition, each with different compilation notes.

Rob Wheeler also states 'That their intelligence reports did not include the dropping of the Rhine and Waal bridges is a little more surprising'. As he states that the railway bridge had its central span destroyed by the Germans in September 1944, it is not surprising that the sheet published in September 1944 compiled from earlier material does not take note of that fact. It would appear that a total of 65,000 copies of the three different printings of edition 3 were produced in UK in September, with a further unspecified print run by an unspecified map reproduction section, possibly on the continent.

**1:100,000 – Series GSGS 4416, Series AMS M651 & M671**

GSGS 4416 was a 1:100,000 series that was published in three versions, a topographic (M671), a trafficability (unknown) and an air version (M651). The existence of a trafficability version indicates that there was an awareness of terrain problems and the need for road information.

Sheet P.1 is quoted in 1 Para Brigade operation order No. 1. Unfortunately, I

have not yet found any examples of the trafficability version but it seems to have been adapted later by 21 Army Group as series 21 AG 39. On this series, based on official Dutch sources, a detailed roads legend is included as prepared by Branch of Research and Analysis, OSS 14 November 1944. It is possible that either GSGS 4416 or 21 AG 39 will show the state of the approach road and routes over the Rhine at Arnhem if copies can be found.

**1:50,000 – Series GSGS 4083**

This series is not relevant. Rob Wheeler is correct in saying that this was considered too cluttered for issue to troops.

**1:25,000 – Series GSGS 4427**

The town of Arnhem falls in the north-east corner of Sheet 6NW, a sheet at the eastern extremity of the cover. East of this sheet cover is in series GSGS 4414 Germany 1:25,000. The edition presumed to have been used on the operation is the completely redrawn January 1944 First Edition compiled in Washington ‘.. partly revised from 1940, 1941, 1942 and 1943 aerial photography’. This edition shows the southern approach road from Elden to about 600 metres from the south bank, but not the bridge.

Sheets Gimbel 388, Ede 387, Renen 5NE, Arnhem 6NW are quoted in 1 Para Brigade operation order No. 1.

**1:7000 – Series GSGS 4458**

Finally, of course, a town plan series had been produced in series GSGS 4458. The Arnhem sheet at 1:7000 scale is not included in the list of sheets available in *Notes on GSGS maps of France Belgium & Holland*, December 1943, and there is no general series description, presumably due to the variety of sources used for the series and the presumed variety of styles. However readers were advised that other sheets were imminent, and the Arnhem sheet was one of these, 5000 copies being printed in May 1944. It is not known if this map was used during the operation. It should have been invaluable for the fighting that took place in the built-up area. The key to important buildings, numbered 1 to 103, includes 68 Rijn Bridge and 90 Pontoon Bridge. The railway bridge is not shown, being to the west of the cover of this town plan.

**1:12,500 – Series CA 20**

Rob Wheeler asks, what about maps of Arnhem in November 1944 after it had been the front line for two months? In response to this question *Maps and Survey* throws further light upon remedial action taken after Operation Market: ‘When enemy resistance stiffened in Holland, Canadian survey units were again occupied with 1:25,000 printing. The new series covering western Holland (GSGS 4427) which had been produced in eight colours was not suitable for economical printing in the field and, though it was a well drawn and extremely clear map, it contained many errors due to faulty interpretation. The Canadians, who were operationally concerned with this part of Holland, therefore revised a number of sheets, and in the process they reduced the number of printings

from eight to four'.<sup>4</sup> This probably refers to the Canadian 1:12,500 series CA 20.

In addition to the base production of standard series maps in US and UK already described above, the British and Canadian Field Survey companies and Map Reproduction sections supported the advance of the British and Canadian units in their drive from Normandy to the Rhine. The British units were limited to producing new mapping from aerial photography by graphical radial line techniques, with heighting and contouring by stereoscope and parallax bar methods, in essence, Hotine's Arundel Method. However, the Canadian Field Survey companies were already in 1944 equipped with, and proficient in the use, of the Multiplex aerial photo stereo-plotter which prior to D-Day had been used to some effect to produce special beach maps of the Normandy coast and very large scale detailed contoured plans of potential airfield sites in the anticipated Normandy bridgehead area. When the advance on the Rhine stalled, it was the Canadian units who produced up-to-date large scale mapping of the Rhine obstacle.

'The 1:12,500 River Rhine series was another new large scale compilation from air-photos. First of all there were 12 sheets in the Arnhem-Zutphen area, and these were followed by several others covering the R. Rhine from Arnhem to Duisburg. Part of this was done to assist Second Army in their preparations for the Rhine crossing.'<sup>5</sup> There are about 22 sheets in the collection. Some sheets follow the sinuous river line at various orientations and are simply numbered, e.g. 1 to 11. Other, standard, north-oriented sheets, have standard alpha-numeric sheet numbering e.g. 5NE/2, 6NW/1, 6NW/2, 6NW/3. Some have Defence Overprints, some do not.

### ***Aerial photography***

Rob Wheeler asks if the aerial photography used for the map compilation was taken when the area was flooded and if those using them were confused in their interpretation of detail. Perhaps the answer lies in photography hopefully archived at TARA (The aerial reconnaissance archive). What is certain is that the air photo coverage diagram for Holland in *Notes on GSGS maps of France Belgium & Holland*, December 1943 shows complete cover of the Arnhem area had been obtained by that date and it must be assumed that the accepted cover was to survey standards showing the topography in a normal state without floods.

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<sup>4</sup> *Maps and Survey*, 406-407.

<sup>5</sup> *Maps and Survey*, 407.





However, perhaps as a postscript to the foregoing notes, a vertical reconnaissance photograph taken on 18 September 1944 with a 24-inch focal length camera from 19,000 feet with a resulting nominal scale of 1:9500, clearly shows the bridge and its southern approaches and, I suspect, the 'brewed-up' column of German vehicles at the north end of the bridge. It also shows the pontoon bridge further to the west with the centre section moored against the northern section on the north bank of the river (arrowed above) possibly within reach of the troops trying to reach the bridge to the east. The title strip on this photo indicates that it was taken by a Lightning aircraft of the 27th Squadron of the United States 7th photo recce group.

*[photograph from Focus on Arnhem, Photographic reconnaissance and Operation Market Garden by J Taylor. Jimmy Taylor is a Spitfire pilot who flew over Arnhem]*

**Rob Wheeler adds:**

The 1:100,000 sheet I referred to was brought as a photocopy by Francis Herbert to CCS meeting at Edinburgh in September 2009. It had print code 50,000/1/44.Wa and appeared to both of us to have been used in the operation. If so, then the September 1944 printings of GSGS 2541, which have different compilation notes, were not the version (or at least not the only version) used in the operation.

I had made three criticisms of the maps:

1. There was disagreement between the maps available to 30 Corps during the operation on the state of the Arnhem-Nijmegen motorway.
2. Depiction of bridges on the November 1944 printing of GSGS 4427 was erroneous.
3. The redrawing of GSGS 4427 had made the map more difficult to interpret.

I had not criticised the depiction of the Arnhem bridges at the time of the operation, because I was uncertain which edition of GSGS 4427 was in use, nor did I know how recent photographic coverage might be.

With regard to the first criticism, I was aware of the numerous cancelled operations that preceded Operation Market Garden. I had not supposed that special revision might be possible and I was aware that this was not an area where imminent operations were expected; that is what I meant when I suggested that the Gelderland ought not to have been accorded a high priority. I agree that there were extenuating circumstances. I still think it is possible that this deficiency may have contributed to the unfortunate decision of 30 Corps not to push forward from Nijmegen on the afternoon of 20 September. I have not seen the 30 Corps operation order but I note that the 1 Para Brigade operation order that Mike quotes refers to GSGS 2541 and 4427, which is why the exact printing of GSGS 2541 in use may be important.

With regard to the second criticism, the Rhine at Arnhem had now been the front line for two months. I still find it curious that well-known facts about the state of the bridges at the end of September were not incorporated in a field reprint made in November.

With regard to the third, I must confess to being highly irritated by the self-congratulatory tone of *Maps and Survey* regarding this 'well-drawn and extremely clear map'. I would value Mike's views on how the depiction of the old main road running SW from the old pontoon bridge at Praets should be interpreted (figure 2 of my original article).

Mike's information is immensely helpful in drawing attention to a range of highly relevant sources. One which struck me particularly was the 5 September 1944 intelligence summary, based on photographic coverage of 11 December 1943. Those photographs showed repair work under way on one span of the road bridge. We now know that this work continued for eight months; only in August 1944 was the bridge opened to traffic. Did those responsible for planning this operation know that the bridge was passable or were they just assuming that whatever repair work was in progress could not be too serious? Of course, the USAF air photo of 18 September 1944 would have provided confirmation that the bridge was open, but by then the operation was already under way.

## ***Kerry musings***

***David Archer***

Most people will agree that our members are very generous in sharing information, not at all secretive. Yet anyone who has tried it will report that a note in *Sheetlines* seeking help in listing a map series produces indifferent results. But put a *list* of maps in the same publication, suggesting there might yet be others to add, and the responses flow in. Why will our members check a list yet are reluctant to write and say what they have?

With a list, most of the work has been done already. If members respond, they only have to note additions, but with a general request for information, they would have to list all they have. This, they are not willing to do, as it is a big task and they assume they only have common items which the requester knows of. So why bother? Ah, give me a good list to check any day, they say. And they do. Why? What does someone get from checking a list? Well, it's a good excuse to have a serious play with their maps, to renew acquaintances and indulge in a bit of nostalgia, remembering exactly where and when each item was found and the thrill of finding them. If a list is structured, identifying sub-categories or variations from the norm, it might answer various questions that have accumulated over the years. Indeed, it might help to explain what is held. Most people get pleasure from chipping in to help achieve a greater end, just as we all donate to charity. People check lists because they want to be able to add a little to the end result; maybe offer a little 'thank you' for previous work, from which they have benefited.

Checking a list is not purely altruistic. They hope to get something from it. At the front of everybody's mind is the desire to know what proportion of the list they hold. Pleasing if high, a bit depressing if low, especially if the map series is one they are interested in and they thought they were well on the way to completing a set. But this is soon outweighed by the excitement of finding an unlisted item. People just love to find something not listed, and this possibility is the driving force in this situation. Finding not only something the experts have missed, but more importantly, something they have found, even if prompted, in *their* collection. Surely I have a rare map? Oh, the joy. And now I can write to the expert and tell him or her of my wonderful map. Not that it looks wonderful, nor that I knew it to be so until three minutes ago. But a rare map is a rare map, and I own it. Thus enthused, they use the list to get up their own list of items wanted. They now know what to ask for and what to look for. The collecting end is in sight, or at least they see the finishing line.

What does a cartobibliographer receive from having a list checked? Reassurance, joy, disappointment. As the replies arrive, one part of the compiler relaxes: they are reassured, the list is understood and the subject appeals enough to be checked. Regardless of how many new items are reported, a feeling of well-being will now exist. If few, then contentment at having found those listed unaided. If a lot, then the delight of being able to fill gaps and not having issued an incomplete 'final' list. No matter how many or few items are

reported, a compiler welcomes all contributions to the final production. Possible disappointment and unease are felt should no replies be forthcoming. A total lack of replies will cause bewilderment and great distress. Surely someone must have spotted something, even trivial little mistakes if nothing else. What about those items thought to exist but not found? Someone must know of at least one of them. Is there a major mistake in the structure of the list, or the codes or the introduction, making it incomprehensible? Are friends not telling me they cannot understand it? What is going on? No replies. The one certainty of submitting a list to the scrutiny of our members, is that it will be checked thoroughly. New categories are unlikely to be found, but new maps might be, with new states more likely. It helps if the compiler knows how many people have checked the list: the more who check it without notifying anything, the more complete it must be, and from feedback, the compiler can better assess whether there are any problems with the terminology.

Of course, when a list appears, it will not be the first time that anyone has seen it. As with any research, a controlled experiment is needed and a few selected individuals will usually have seen a previous version. But even with this group, the question arises as to when should a draft be circulated? Goldilocks would probably say 'Not too soon and not too late, somewhere in between should be just right'. Some consultants really earn their money. If offered too late, meaning too near publication of the final list, it will dent the freshness of the final piece. A lot of hard and tedious slog always goes into the last twenty per cent of such research, with little return. The same information might have been obtained more easily if the list had been offered earlier. If thorough research has been undertaken, little will be notified after publishing a draft list in the final stages. If little is found, members might be discouraged and be reluctant to check future provisional lists. However, if notifications abound in what is considered the final stages, warning bells will ring and doubt might be cast on the whole work.

I think it fair to say that anyone checking a list will expect it to be pretty complete, hence it cannot be offered in the very early stages of research. The work must be far more than skeletal; anorexic will not do, a good chubby offering is needed for a final fattening. If a brief list were to bring in a vast amount of information it would certainly save work, but anyone who undertakes such a project is far from work-shy, and anyway, they want it to be overwhelmingly their offering. If map details and locations are received early on, it might well flush out hard to find items, thus saving a lot of work. It might even attract a like-minded person to help, good news if the two can get on together. But if offered very early, resulting in too much to notify, replies might not be forthcoming due to the work involved. Replying to a list must be easy, not hard work, and therefore a near complete list is required, as in 'I think this is everything, does anyone disagree?' But problems arise when the list is nearing six hundred pages and size does matter. Here, even the most pessimistic cartobibliographer should feel safe that the list will not be bettered if



released for general scrutiny.

If one has done the job thoroughly and checked every conceivable location, why not go straight to the final publication and avoid the disadvantages of submitting a provisional list? What disadvantages? Well, if destined to be issued as a monograph, sales might suffer. If a much collected series, unlisted items might be considered rare and not be notified, whilst the owner corners the market in these maps, or prices might rise for unlisted items. Neither being true in my experience. Indeed, prices might fall, as supposedly rare maps are seen to be more common than previously thought. No, the main drawback to issuing a preliminary list are the pressures that might be put on the compiler. If no response results, is the list not of interest? Does it mean the cartobibliographer has indeed found everything, in which case, can the research be stopped, or is anyone withholding information which might yet be found elsewhere? If several people report the same missing item why did the compiler not find it? Doubts will appear everywhere. The researcher might get discouraged by the amount of work still to be undertaken, or by adverse criticism of work done so far. If encouragement abounds, people will expect a finished list to appear soon, whilst the worst case scenario would be to find someone else has a more complete list.

If there are disadvantages to issuing a draft list, there will also be advantages. The main one being that the list might be improved, made more complete. Something missed will be found and incorporated in the final product for the benefit of all. The language in an accompanying essay will be more confident. Things might be firmed up. 'Might exist' could be replaced by 'Almost certainly does not exist'. If there is any prospect of the whole project not being completed, it gets something into the public domain, adds to the body of knowledge, offering information that might be needed in other areas. It tests the mechanics of the list, its structure, terminology and so on. A good body of work might 'open doors' if access is needed to restricted areas in order to complete the research, as the compiler will be seen to be a bona-fide researcher on that subject. If the list is to result in a monograph, initial publicity will be given, aiding decisions on the print run and price. Issuing a draft might encourage others to share their 'work in progress' on other subjects, not that I have ever been brave enough to submit a list of any sort, and live in awe of all who do.

Once the final list has been published, the odd, very minor addition might be noted, tinkering really, and usually found by the compiler. Such people just cannot stop looking, until they become immersed in something else.

## ***Letters***

We would like to thank everybody concerned for contribution to the latest addition to the *CCS Maps from the Past* series. *Crystal Palace* is a fascinating map and is beautifully produced. We were not even aware of its existence, but what an excellent choice, it is good to look at and packed with intriguing detail.

We and John Cole have been speculating on the task confronting the surveyors when they had to obtain all that intricate detail of the private gardens so meticulously recorded. The arrival of this map, unannounced, at Christmas time brought back a bit of the joy of surprise that used to be a feature of Christmas presents. Congratulations to all responsible, and thanks for the pleasure of a valued addition to the collection.

*Aidan and Ruth de la Mare*

If senior members would kindly identify themselves.....

I feel confident that those among us who were approached by Guy Messenger with a request to inspect our Old Series maps will recall the experience. We were identified as 'PC/number' in his sheet histories of the Ordnance Survey one-inch Old Series maps of Essex and Kent, and Devon and Cornwall, published by the Charles Close Society in 1991. Some of us will no doubt remember which 'PC' number we actually were. However a search through Guy's research papers in Cambridge University Library has failed to reveal his master list of collectors' names to whom those numbers referred.

Some twenty years on, and after much further research, some of the 'PC' copies that Guy listed in those sheet histories remain unique examples of those states. The opportunity to re-examine these copies is thus emerging as a priority to those of us involved with revising and updating the published Old Series cartobibliographies. So, if any of you were prepared to reveal yourselves (and we are hoping that those identified as PC/1, 2, 4, 6, 7, 8, 10, 11, 12 or 15 in particular would do so), please get in touch with me, via my postal address, which is in the Almanack, or by *info@CharlesCloseSociety.org*.

*Roger Hellyer*

*Contributions to Sheetlines 91 should be notified to the editors as soon as possible and submitted no later than 30 June.*

We are particularly interested to hear of 'one-off' local maps, such as Epping Forest (p.47). Depending on the response, we hope to include a feature about these in the next issue.

### ***Puzzle corner 90 – This island race***

There are generally thought to be about 136 inhabited islands in the British Isles. Can you identify these seven, as shown on 1:50,000 maps, but with meaningful names deleted. Various clues abound, such as the land colouring, island shape, the direction of the ferry track and the local features. Scales are different, but can be judged from the kilometre grid squares. Answers opposite.

