

# **'Finished Labour of a Thousand Hands'**

## **The archaeology of the Combe Down Stone Mines, Bath, Somerset**

by Lynn Willies, Neville Redvers-Higgins, and Ianto Wain

with contributions by

*Lisa Brown, John Cotter, Damian Goodburn, Jill Hind, Marek Lewcun,  
Chris Salter, Ian Scott, Ruth Shaffrey and Lena Strid*

Illustrations by

*Markus Dylewski, Magdalena Wachnik, Georgina Slater  
and Anne Kilgour Cooper*

Reconstruction drawings by

*Mark Gridley*

Oxford Archaeology Monograph No. 13

2011

The publication of this volume has been generously funded by the Combe Down Stone Mines Project which was managed by Bath & North East Somerset Council with funding from the Homes and Communities Agency's Land Stabilisation Programme

Published for Oxford Archaeology as part of the Oxford Archaeology Monograph series

Designed by Oxford Archaeology Graphics Office

Edited by Lisa Brown and Alan Hardy

Except where indicated otherwise, all images are © Oxford Archaeology

©Oxford Archaeology Ltd  
www.oxfordarch.co.uk

Figures 1.1, 1.2, 1.5, 1.9, 2.8, 3.2, 3.10, 3.13, 3.14, 4.1, 4.2, 4.6, 4.7, 4.8, 4.9, 4.10, 4.11, 6.1, 7.2, 9.2, 9.35 are reproduced from the Ordnance Survey on behalf of the controller of Her Majesty's Stationary Office, © Crown Copyright, AL 1000005569

Figure 2.1 is reproduced by kind permission under British Geological Survey BGS copyright permit IPR/135-57CY. © NERC 2011. All rights reserved.

Front cover *Prior Park: The Seat of Ralph Allen* engraving by Anthony Walker c 1750 (courtesy of The Building of Bath Museum)

Oxford Archaeology Monograph No 13

ISBN: 978-0-904220-60-5

Typeset by Production Line, Oxford  
Printed in Great Britain by Information Press, Eynsham, Oxon

# Contents

List of Figures .....	vii
List of Tables .....	xv
Summary.....	xvi
Acknowledgements .....	xix
<b>Chapter 1: The stabilisation of Combe Down and its archaeological recording .....</b>	<b>1</b>
Introduction .....	1
History of the Combe Down Stone Mines Project.....	4
Aims of the archaeological project.....	9
The Stabilisation Scheme methods and archaeological recording .....	11
Subdivision of the underground workings for the archaeological survey .....	12
Monitoring methodology: standard and adaptive methods.....	14
Enhanced recording .....	18
Post-excavation methodology .....	19
Combe Down and underground archaeology.....	20
<b>Chapter 2: The landscape of Combe Down.....</b>	<b>23</b>
Topography .....	23
Geology .....	23
<b>Chapter 3: Development of the 18th-century landscape .....</b>	<b>35</b>
Bath and its rebuilding: a brief history.....	35
Combe Down prior to 1700 .....	36
Historical overview of the area after 1700 .....	38
<b>Chapter 4: 19th- and 20th-century developments: the spread of surface quarrying     and the growth of the quarrying village .....</b>	<b>53</b>
Introduction .....	53
Break-up of the Allen Estate .....	53
Landscape and working of 19th-century quarries .....	67
<b>Chapter 5: Combe Down and quarrying in the time of Ralph Allen .....</b>	<b>71</b>
The early 18th century – setting the scene .....	71
Ralph Allen - early life and rise to prominence .....	74
Allen’s stone business 1727-64 .....	77
Allen’s last years and the aftermath.....	96
Conclusions.....	98
<b>Chapter 6: Underground quarrying after Ralph Allen .....</b>	<b>99</b>
Quarrying under the Allen Estate 1764 to c 1805 .....	99

Underground quarrying and Combe Down 1801 to c 1838.....	103
Combe Down underground quarrying after 1838.....	113
Underground quarries away from the core area of Combe Down .....	114
Underground working today.....	116
<b>Chapter 7: An outline of the technology used and the underground landscape at Combe Down .....</b>	<b>117</b>
Why go underground? .....	117
Types of quarry.....	117
The underground quarrying landscape .....	122
<b>Chapter 8: Techniques of underground quarrying: 1. The method of working .....</b>	<b>133</b>
The organization and layout of the working faces – room and pillar methods.....	134
Features on working faces .....	145
Reworking or scavenging/pillar robbing .....	159
Lighting.....	161
<b>Chapter 9: Techniques of underground quarrying: 2. Transport and materials handling.....</b>	<b>163</b>
Cartways and associated shafts .....	163
Barrow-ways .....	178
Haulage and winding.....	188
Lifting and cranes .....	192
Vertical shafts .....	197
<b>Chapter 10: Techniques of underground quarrying: 3. Support of the roof and spoil management.....</b>	<b>201</b>
Support of the roof .....	201
Disposal of the waste .....	227
<b>Chapter 11: Other structural and artefactual evidence in the underground quarries.....</b>	<b>233</b>
Introduction .....	233
Non-quarrying features and quarry after-use .....	233
Graffiti and inscriptions.....	238
The artefactual evidence .....	246
<b>Chapter 12: The Combe Down complex – chronology, development and case studies .....</b>	<b>269</b>
Geography of the workings.....	269
Phasing of the workings .....	271
Phase I: Pre-Allen quarrying.....	272
Phase II: Workings mainly associated with Ralph Allen 1728-30 to 1764 .....	282
Phase III: The Allen Estate leased quarry workings 1765-c 1803.....	291
Phase IV: Workings between c 1803 and c 1838.....	294
Phase V: Small-scale working in the mid-19th century 1838-68.....	312
Phase VI - working from the late 19th century to the early 20th century .....	316

*Contents*

<b>Chapter 13: Quarrying at Combe Down - consideration of the evidence.....</b>	<b>323</b>
<b>The significance of the archaeology .....</b>	<b>330</b>
<b>Conclusions.....</b>	<b>332</b>
<b>Bibliography .....</b>	<b>333</b>
<b>Index.....</b>	<b>337</b>



## List of Figures

1.1	Combe Down with the Combe Down Stone Mines site and other infilled underground quarries within the surrounding area. The centre of the main site lies at NGR ST 7662. . . . .	2
1.2	Central Combe Down with named roads and paths and the Firs-Byfield underground quarries outline (this plan is also reproduced inside the front cover) . . . . .	3
1.3	Phase plan of the Quarry Areas within the Combe Down Stone Mines site (this plan is also reproduced inside the back cover). . . . .	6
1.4	Firs Field during the stabilisation project, view east. Firs Shaft is covered by the green circular roof in the centre foreground, and the Materials Shaft (the former Arched Shaft) is at the right of the long green-roofed building in the background (Image courtesy of Bath and North East Somerset Council). . . . .	7
1.5	Modern underground road network. Sheeps House, Jones and Burgess quarries were surface quarrying areas . . . . .	8
1.6	Timbered support on modern roadway 2 near Firs Shaft. The blue pipes delivered the concrete used for infilling . . . . .	10
1.7	Steel supported section of Roadway 2 in east Firs, after concrete had been emplaced . . . . .	10
1.8	Modern roadway heading with tracked mini-excavator - East Firs . . . . .	12
1.9	Pillars and Sectors (after Hawkins 1994), with divisions used to communicate general locations within Firs and Byfield Quarries. The shading shows the High Grade Areas where laser scanning was carried out . . . . .	13
2.1	The geology of Combe Down and the surrounding area, showing the parish boundary and selected place-names . . . . .	24
2.2	The strata under Combe Down (after Hawkins 1994) . . . . .	25
2.3	The beds under Combe Down (after Hawkins 1994) . . . . .	27
2.4	The 'Bastard Bed' seen in the background behind H Pillar, East Byfield. . . . .	28
2.5	One of the two Priory Close gateposts, nominally 3.7 m (above ground) x 0.9 m sq. The pair are the largest extant blocks of Combe Down freestone. . . . .	30
2.6	The Grand Canyon inclined barrow-way and pillars with sedimentary beds, derived from a laser scan image . . . . .	31
2.7	Sailed pillars - the result of a fault running through north Firs . . . . .	32
2.8	Plan of roof showing joint system and pillar spacing in the Allen and Allen Estate workings in Central Firs . . . . .	33
3.1	Inscription found on a Roman stone coffin-lid at Combe Down. Illustration by C S Beckett, in Scarth 1864 . . . . .	36
3.2	Map of the modern ward of Combe Down, showing surface and underground quarries, updated from the 2000-2001 field archaeological survey . . . . .	37
3.3	A segment of Thomas Thorpe's Survey <i>Five Miles Around Bath</i> (1742). It shows Summer Lane in its earlier position extending to buildings where now Stonehouse Lane meets the Claverton Road. The Long Drung is only sketchily shown. Note the Cross Keys Inn, and the road there and another to the west going by the 'Old Stone Quarries' at Barrocks (Barrick's farm), associated with the old Roman route down to Bath. (Image courtesy of Bath Record Office) . . . . .	41
3.4	Schematic representation of typical surface and underground arrangements at the entries of Allen's underground quarries . . . . .	42
3.5	Route of Allen's wooden railway from the Combe Down Quarries to Dolemead Wharf at the Avon Navigation, Bath (after Chapman 1996). . . . .	43

3.6	Allen's wooden railway, at the lower end of Prior Park about 1750. The nearer carriage contains block stone, the other seems to contain walling stone. From an engraving by Anthony Walker <i>Prior Park: The Seat of Ralph Allen</i> (courtesy of The Building of Bath Museum) . . . . .	44
3.7	Ralph Allen's stone yard and wharf at Dolemead, alongside the Avon Navigation in about 1734. The nearby large buildings are a brewery. Detail from <i>The South East Prospect of Bath</i> , an engraving by Samuel and Nathaniel Buck (image courtesy of The Building of Bath Museum). . . . .	45
3.8	The Old Rank of the eleven cottages at Combe Down, designed by Wood for Allen's workmen 1729-30 . . . . .	45
3.9	The cottages built for the stoneyard workers at Dolemead, at the lower end of the railway. . . . .	46
3.10	The railway and probable quarry entries at Combe Down, derived from the Allen Estate and Thorpe maps, and archaeological evidence . . . . .	47
3.11	<i>Ralph Allen's Freestone Quarry at Combe Down</i> showing the Masons Crane House Quarry and crane, with the Old Rank, including Dial House (where Richard Jones lived) in the background. Sketch by Thomas Robins the Elder, probably around 1750 (by permission of the Victoria and Albert Museum, London) . . . . .	48
3.12	<i>Freestone Quarries near Bath</i> by J. Hassall, about 1800. The site may be near Entry Hill. Note the use of bow-sawing and the wagon awaiting loading. (copyright Victoria Art Gallery, Bath & North East Somerset Council). . . . .	48
3.13	A proposed railway from Mount Pleasant Quarry (Shaft Road) down to the intended Somersetshire Coal Canal. There is no evidence it was ever built. Detail from plan supplied by David Pollard . . . . .	49
3.14	Quarries at Entry Hill in 1799. Those on the east side were within Combe Down. Detail from the 1799 Charlton Map of Lyncombe and Widcombe . . . . .	50
4.1	Land at the centre of Combe Down sold by Benjmain Wiggrove to Edward Layton in 1805. The three sets of buildings, from right to left, are the Old Rank which became de Montalt Place, the Carriage Inn and Isabella Place. Three surface quarries are shown. The rectangular area is Masons Crane House, Burgess' is behind the de Montalt Place and Sheeps House behind Isabella Place. Note the stable at the south-west corner of Masons Crane House Quarry. (Source LL. A/91/18/5/17). . . . .	54
4.2	Plan of Hadley and Salmon quarry leases (derived from LL./A91/18, and Irving 2005 and pers. comm.) . . . . .	57
4.3	Quarrying north of North Road (The Turnpike), based upon the Cotterell map of 1852 with data from the 1851 Tithe award. . . . .	59
4.4	The Farris Lane Cottages built on the quarry dump. The second from the right was the first to be built. . . . .	59
4.5	Farris House, built on the bottom of the quarry. . . . .	60
4.6	Quarrying north of North Road c 1880 (1882-84 OS 25 inch map). Note use of cranes. Underground workings were accessed from the small area left open next to the Turnpike. . . . .	61
4.7	Quarrying north of North Road c 1900 (1902 OS 25 inch map). Most of the area to the west has been quarried, with Junction Quarry still extending over what is Prior Park today . . . . .	62
4.8	Quarrying at the top of Prior Park (1882-84 OS 25 inch map). . . . .	63
4.9	Combe Down Quarries, near Shaft Road, about 1930. Lodge Stile Quarry is on the left of Shaft Road (OS 25 inch map) . . . . .	64
4.10	Entry Hill and Crossway Quarries (1930 OS 25 inch map). Springfield Quarry had become the largest in the area about 1900. . . . .	65
4.11	Kingham Quarry Railway. Possible route of William Smith's railway to his stone-works at Tuckingham next to the Somersetshire Coal Canal (after Pollard 1982). . . . .	66
4.12	Shafts left from quarrying under the Hadley leases by 1900, detail from auction plan (Hadley Arms Papers) . . . . .	68
4.13	A quarry crane preserved at the former Union Quarry, Odd Down. The mast has been slightly shortened . . . . .	69



*List of Figures*

5.1	Detail of the c1764 Allen Estate Map showing the triangular, tree-planted quarrying area at Combe Down (BRO) . . . . .	72
5.2	Detail from <i>Four Bath Worthies</i> (artist unknown), showing Ralph Allen (seated) and Richard Jones c 1735. (Bath Preservation Trust, Building of Bath Collection) . . . . .	75
5.3	Allen's town house in Bath, one of John Wood's first commissions, seen from Lilliput Alley. . . . .	78
5.4	Detail showing Allen's quarrying area on Thorpe's 1742 survey <i>Five Miles Around Bath</i> (BRO) . . . . .	82
5.5	The same area on the Allen Estate map, c 1764 (BRO) . . . . .	83
5.6	Richard Jones' sketch, in his <i>Life</i> , of the position of the Masons Crane House Crane (image by permission of Bath Central Library) . . . . .	84
5.7	The stone carriages used on the wooden railway (Desagulier 1734) . . . . .	85
5.8	Crane house, probably the Masons Crane House (William Halfpenny 1731) . . . . .	86
5.9	Capstan crane (Desagulier 1734) . . . . .	86
5.10	The rat tail crane at the Dolemead Wharf (Desagulier 1734) . . . . .	87
5.11	The cratchet winch (Supplement to the New and Universal Dictionary 1751) . . . . .	88
5.12	South Parade, one of the Grand Parade developments c 1742, designed by Wood, with stone and some building works by Allen . . . . .	89
6.1	Cotterill's plan of the area of Combe Down east of the Long Drung, with Tynning Road and Gladstone Road and the Brow in 1845. The plots for lease included the use of the stone beneath them (BRO) . . . . .	109
7.1	The Masons Crane House Quarry shown on a lady's fan. Compare with sketch of same view in Fig 3.11 (Bath Central Library, print supplied by David Pollard) . . . . .	118
7.2	Undermining quarries in the south of the core area, located by borehole and surveyed by laser scanning. . . . .	119
7.3	Horsecombe Quarry, showing a large open joint or 'gull' which is parallel to the side of the escarpment resulting from cambering or land-slipping of the strata. . . . .	120
7.4	Cartway within an adit or level entry (Allen's east cartway, central Firs) before stabilisation (Photo, Paul Deakin) . . . . .	121
7.5	Reconstruction drawing of Irving's incline in use, early 19th century, West Byfield. . . . .	123
7.6	Vertical cable grooves in the side of a shaft, East Firs. . . . .	123
7.7	Inclined barrow-way over dumped rubble, eastern end of the Grand Canyon, Central Firs . . . . .	124
7.8	Stepped working face, south-west Firs. This was the only full example found, as usually faces were left vertical or the area backfilled with spoil. . . . .	124
7.9	Small ventilation shaft in the roof of the workings, with cap formed of stone slabs over timber supports, Central Firs . . . . .	126
7.10	Window used to throw out high-level spoil from Long Room working beyond, just north of Firs Shaft . . . . .	126
7.11	Corbelled stone arch over the Hadley Arms steps. The stone pack was part of that supporting the North Road and the patina suggests it was built later than the steps (Photo by Paul Deakin) . . . . .	127
7.12	Partially sawn pillar with timber sprag (or scorter) to tighten blocks in the roof (Photo by Paul Deakin) . . . . .	127
7.13	Section through a barrow-way with rubble thrown up onto dumped rubble and fines, West Byfield (Quarry 514) (Photo by Paul Deakin) . . . . .	128
7.14	Mould of chain formed by links pressing into the stone. The chain, wrapped around a pillar, was part of a crane anchor, late 19th century, Central Firs (Quarry 2201) . . . . .	129
7.15	Revolver found within early 20th-century domestic waste dump in the Chestnut Tree Shaft, near the Memorial in Firs Field. . . . .	130
8.1	Remains of a picking bed entry at top centre, about 0.9 m high in East Firs (Quarry 2205). . . . .	133
8.2	Jad slot near the top of a pillar to allow the bed above or below to be wedged out . . . . .	134
8.3	Schematic illustration showing the development of the working face in benches to facilitate stone extraction. . . . .	134

8.4	Working on the steps of benches just below the picking bed of an abandoned face, Central Firs . . . . .	135
8.5	Apophygate pillar showing the area picked and broken-out at the top, with a small lip below where the freestone beds were removed (Quarry 505) . . . . .	136
8.6	Block of stone dressed in situ, showing the parallel jad slot used to free it . . . . .	136
8.7	Dressed block in situ showing use of a chamfered jad to assist removal. The use of the chamfered jad may be just the choice of the workman, but was probably mainly used for shallower depths . . . . .	137
8.8	Corbelled pillar in Firs Quarry (2201) Quarry Area 2211 . . . . .	138
8.9	Long Room developed just west of Firs Shaft (Quarry 2200). Note the window in the left wall, and the almost continuous side walls and the end wall which would greatly assist stability. . . . .	139
8.10	Window used to dump spoil from the long room just beyond, north of Firs Shaft (Quarry 2201) . . . . .	140
8.11	Reconstruction of Long Room working method . . . . .	141
8.12	Sketch plan of Long Wall, gullet and pillar working in Quarry 2224 in north central Firs. The area on the right (A) had been worked similarly, then was completely backfilled . . . . .	142
8.13	Open Room working area in Byfield Quarry (518). Cranes and winches were used to drag stone away from the working face across the floor. (Photo by Paul Deakin). . . . .	143
8.14	Late period Open Room working method, showing use of a post crane to pull stone blocks off the face and load them on to a flat wagon (after Wooster 1978). . . . .	144
8.15	Stone used to pack up the top of a pillar where it had been intruded upon by the picking bed, east Firs . . . . .	145
8.16	Sketch to show terms and methods of working at the face . . . . .	146
8.17	Continuous jad slot across a face . . . . .	146
8.18	Underside of a jad slot showing pick marks at the rear and jadding iron marks . . . . .	147
8.19	Wedge pits left in situ, East Firs . . . . .	148
8.20	Wedge pit impressions left from cutting down a pillar . . . . .	148
8.21	The jad cut, used to cut down the side of a pillar, West Byfield . . . . .	149
8.22	A saw-cut pillar, mid-late 19th century, north Central Firs . . . . .	149
8.23	The gap left by removal of the wrist stone, freeing adjacent blocks for removal. In this case the removal was probably part of the re-working of old pillars, Central Firs . . . . .	150
8.24	Stacked wrought stone, produced by a banker mason, East Firs . . . . .	150
8.25	Possible stacking area for blockstone in Central Firs (Quarry 2211). . . . .	151
8.26	Marks left by a scappling axe on a face, with wedge slots, south-east Byfield. . . . .	152
8.27	Repeated rows of wedge pits on a pillar used to break successive beds . . . . .	153
8.28	Distribution of wedge pits in the roof of the late 18th-century Entry Hill quarry, allowing inferences to be drawn about the direction of working. . . . .	154
8.29	Curved face (at top) made using a bow saw, to allow access to vertical saw cut below. Probably part of a secondary working, pillar robbing activity, Central Firs Quarry (2203) . . . . .	156
8.30	Sawn pillars in James Riddle's Quarry (518) . . . . .	156
8.31	A frig bob saw (late 19th century) leaning against a typical sawn face with graffiti . . . . .	157
8.32	Sawn face showing the slot left by a saw end penetrating into the rock at the far end (Shaft Road). . . . .	157
8.33	Face in Foxhill Quarry showing picking-back behind the wrist stone to allow insertion of saw behind the sawn face on the right . . . . .	158
8.34	A saw-sharpening stone in which the saw was held – teeth upright – for sharpening, Central Byfield (Quarry 505). . . . .	158
8.35	Reworked example of removal of lower block of the best stone. Many examples of this appear to have been deliberately concealed in both East and Central Firs (2201) . . . . .	160
8.36	The most extreme example seen of the reworking of a pillar, in East Firs (2203). . . . .	160
9.1	The only example of a cartway where likely traces of horse-hoof impressions were noted, north-east Byfield Quarry (505) . . . . .	163
9.2	Plan of known cartways in Firs and Byfield, also showing shafts . . . . .	165

*List of Figures*

9.3	Allen's western cartway in Central Byfield, near the entry. It appears not to have been used after abandonment in the mid 18th century because of bad roof conditions at its inner end, discovered after work restarted c 1803. The white reflection may be due to stone particles within the re-crystallising mud cleared to the side of the cartway . . . . .	166
9.4	Upper section of Allen's western cartway in central Byfield showing a roof-fall which is below a wide joint or gull in the roof. Seated is mine manager, John Lister . . . . .	167
9.5	Allen's east cartway in Central Firs. Note the remains of an apophygate pillar, on the left, the original roof destroyed by a fall. The heap is a cone of debris from the narrow shaft above. The passage with light from the left links to the west cartway . . . . .	168
9.6	Allen's west side cartway in Central Firs showing apophygate pillars and support packs alongside . . . . .	168
9.7	Stepped section showing cartway and other development at the Allen western cartway in Central Firs . . . . .	169
9.8	Plan of cart ruts in the western Allen or post-Allen cartway at its north end near the boundary pillar . . . . .	170
9.9	Shaft cap above cartway (2194) viewed from the underside, associated with Allen Phase II workings in East Firs (Quarry 2206). . . . .	172
9.10	Southern end of the cartway east of the Long Drung . . . . .	173
9.11	The sequence of deposits in the easternmost cartway, east of the Long Drung (Section 155) . . .	174
9.12	Curving cart ruts cutting deep into the surface of the westernmost cartway east of the Long Drung . . . . .	174
9.13	Nineteenth-century cartway in East Byfield, showing rub marks caused by a cable on the right side pillar, and wheel ruts on the floor . . . . .	176
9.14	Cartway near Firs Shaft leading towards the Hadley Arms. Note rub-marks from a cable on the left side-pillar and a corbel with a post-working fracture on the right-side pillar. . . . .	176
9.15	The arch supporting the shaft on the Firs-Hadley Arms cartway. . . . .	177
9.16	Wheelbarrow 'shadow' in East Firs, close to the Long Drung . . . . .	178
9.17	Types of wheelbarrow and their use . . . . .	179
9.18	Barrow-way routes in Quarry Area 2332 in East Firs, shown over the drawn and annotated plan of the area . . . . .	180-1
9.19	Barrow-way in Far East Firs (Quarry 2356) . . . . .	182
9.20	Barrow-way in Far East Firs (Quarry 2365). . . . .	183
9.21	Barrow-way filled in on retreat in Central Firs. The rubble pack rests on the former barrow-way (Quarry Area 2347) . . . . .	184
9.22	Section showing the sequence of three filled-in barrow-ways in Quarry 517, East Byfield . . . . .	184
9.23	Section of barrow-way in Central Firs (Quarry 2347) with lateral rubble-stone packs and stacking. . . . .	185
9.24	Barrow rut preserved by calcitic flowstone Eastern Firs (Quarry 2337). . . . .	186
9.25	Barrow-way system linked to a cartway in Central Byfield (Quarry 505). . . . .	187
9.26	Vertical section in Central Byfield (Quarry 505), showing successive barrow-ways . . . . .	188
9.27	Example of atwo-wheeled cart at Beer Stone Quarries, Devon (photograph by David Pollard) .	189
9.28	Shaft from a two-wheeled cart, found near Burgess' Arched Shaft in Central Firs . . . . .	189
9.29	Flat-bed four-wheel bogie stone wagon (photograph by P. Wooster). . . . .	190
9.30	Grooves in the side of a pillar at Allen's east side entry at Jones Quarry (Ralph Allen Yard), the nearly horizontal grooves suggesting the crane cable was diverted up the cartway to draw out carts or wagons. . . . .	190
9.31	Types of crane used underground . . . . .	191
9.32	Crane-cable grooves in the branch cartway out of the east Allen Cartway in Central Firs . . . . .	191
9.33	A Lewis <i>in situ</i> in north Central Firs, used to hold a crane stay . . . . .	191
9.34	A post crane base-stone, with a pillar behind and a chog hole in the roof with a Lewis slot. . .	192
9.35	Chog holes and their relationship to roof joints at the Mount Pleasant underground quarry . . .	193
9.36	Preserved underground crane at Combe Manor Hotel. . . . .	194
9.37	Probable mast crane position inside the Firs Shaft indicated by wooden slats projecting from an arrangement of Lewis slots . . . . .	195
9.38	Crane positions in Central Firs (Quarry 2202) indicated by positions of Lewis anchorages . . . .	196
9.39	Shaft (12062) capped with stone blocks. . . . .	197
9.40	Underside of barrel-arched shaft-cap in East Firs . . . . .	197

10.1	Various pillar types . . . . .	203
10.2	Apophygate pillars within Central Byfield (Quarry 505). The pillar on the left is severely degraded. . . . .	204-5
10.3	Apophygate pillar in East Firs close to The Brow cartway in Quarry 2339. This is an example outside Allen's quarrying area . . . . .	204
10.4	Section of the top of an apophygate pillar including a small chamfered jad . . . . .	205
10.5	Major areas of roof collapse in Byfield and Firs. Note the high concentration in the southern area of East Firs, part of the Allen Phase II workings (after Hawkins 1994) . . . . .	206
10.6	Corbelled pillar in Byfield. . . . .	207
10.7	Transitional form of apophygate and corbelled pillar in Central Byfield (Quarry 505) . . . . .	207
10.8	Corbelled pillar just west of Firs Shaft, with inadequate support in the core width below . . . . .	207
10.9	Direct pillars in Central Firs (Quarry 2340) . . . . .	208
10.10	Section of worked face 3007, an irregular form of direct pillar with narrow core, showing picked and wedge-and-chip broken surfaces. . . . .	209
10.11	Tapered sawn pillars in north Central Firs (Quarry 2215) . . . . .	210
10.12	Substantial rubble and blocks used to construct the wall near the Hadley Arms under the south side of North Road . . . . .	211
10.13	Rubble stone mortared packs under a municipal drain running across the surface overhead in West Byfield. . . . .	212
10.14	Fallen blocks in Byfield (Quarry 509) . . . . .	213
10.15	Delaminating roof bed in Central Firs (Quarry 2211) . . . . .	213
10.16	Collapse of Twinhoe Beds in East Firs. . . . .	214
10.17	Support pack in Central Firs. . . . .	214
10.18	Pack built on top of fallen blocks in Central Firs (Quarry 2200). . . . .	215
10.19	Use of timber sprags for roof support in West Firs (Quarry 2342) . . . . .	216
10.20	Section of pillar 299, showing timber sprags from pillar supporting the roof . . . . .	216
10.21	Wooden wedges or cleats inserted to tighten roof blocks . . . . .	217
10.22	Horizontal timber used for roof support under Shaft Road. . . . .	217
10.23	Vertical prop placed on a pack . . . . .	218
10.24	Stone arch at a West Byfield entry (Quarry 505) with sawn voussoirs. . . . .	219
10.25	Rounded arch 4142 in Central Firs (Quarry 2391) under North Road, probably dating to the early-mid 19th century . . . . .	220
10.26	Section showing roof support packs alongside cartway (Section 155) in the easternmost cartway east of the Long Drung. . . . .	222
10.27	Flanking roof support packs in the first section of Allen's west cartway from Sheeps House Quarry . . . . .	223
10.28	Plan of the North Road roof support pack . . . . .	224
10.29	Bathite blocks used to support roof under the rear of the Hadley Arms. . . . .	225
10.30	Conical pack in East Firs (Quarry 2364) . . . . .	226
10.31	Sawn stone used as a sprag in West Firs (Quarry 2342). . . . .	226
10.32	Miner seated in original position demonstrating waste-stowing to roof level . . . . .	228
10.33	Inclined barrow-way . . . . .	229
10.34	Lobate tipping in Central Firs south of the Grand Canyon (Quarry Area 2209) . . . . .	230
11.1	Job Salter's well, later the Hines Brewery well, in West Byfield, under the present William IV Public House yard . . . . .	234
11.2	The Carriage Inn well, in the pre-Allen E4 stub workings, (Central Firs, Quarry 2347). The two pump rods and pipes are visible, but the pumps themselves appear to be buried . . . . .	234
11.3	The well in Byfield (Quarry 911) just east of Ralph Allen Yard, was sunk through pre-existing workings but, unusually, had been lined from within the well shaft, resulting in the 'inside-out' pack seen here . . . . .	235
11.4	The Byfield well inside the pack shown in Fig. 11.3 was not seen other than via this photograph. It was taken with the camera pushed through a small hole made in the pack . . . . .	236
11.5	The probable drain in Quarry 2392 in Far East Firs, projecting through the roof. Made of thin-sawn stone slabs, there was no sign of it ever having been used. . . . .	236

*List of Figures*

11.6	The Irvings Incline, a slope entry into the West Byfield, Hulonce Quarry (504) made early in the 19th century and variously used for storage and an air-raid shelter after quarrying finished . . . . .	237
11.7	Francis Oliver graffito of 1730 in Quarry 2339 (Far Eastern Firs), strongly suggesting a pre-Allen date for the workings there . . . . .	239
11.8	Tapered pillar in north-east Byfield Quarry (308) with a wide range of inscriptions including the date 1816 (faint and high to the right), giving a fairly reliable earliest date for the sawn face and other activity in the area. . . . .	239
11.9	Layers of later graffiti on a sawn face in West Byfield Quarry near the entrance . . . . .	240
11.10	Successful stripping of the Knowles and Prescott graffito using silicon rubber. Far East Firs (Quarry 2363). . . . .	240
11.11	Graffito of man with hat and pipe (Foxhill Quarry 2380) . . . . .	241
11.12	'Ship' graffito, depicting a lugger, a type active in south-western waters, including perhaps, the Avon Navigation. Other graffiti in the area is dated from the 1830s (Eastern Firs, Quarry 2203). . . . .	241
11.13	The Hadley Arms graffito, dating to after the building of the pub in 1845-46 (Central Firs, Quarry 2202). . . . .	242
11.14	'Holly' graffito, Eastern Firs (Quarry 2206). . . . .	242
11.15	Graffito possibly based on 'Jane' the mid 20th-century Daily Mirror cartoon character (Foxhill Quarry 2380). . . . .	243
11.16	The 'Naked Lady', dated 1836 or earlier by a scrawled date over it (Central Firs, Quarry 2201) . . . . .	243
11.17	Graffito of top-hatted but otherwise naked man, probably early 20th century (Central Byfield, Quarry 518). . . . .	244
11.18	Tally graffito, early 20th century, near to the West Byfield entrance in Quarry 501. . . . .	244
11.19	Graffito of tabulated form of types of stone produced or to be produced, c 1820s (West Byfield Quarry 501) . . . . .	245
11.20	Metalwork: Splitting the stone from the bed . . . . .	250
11.21	Metalwork: Stone cutting and shaping . . . . .	251
11.22	Metalwork: Haulage and lighting . . . . .	252
11.23	Worked stone and architectural stone . . . . .	257
11.24	Architectural stone . . . . .	258
11.25	Clay pipes . . . . .	261
11.26	Glass vessels . . . . .	263
11.27	Pottery . . . . .	266
12.1	Map of the Quarry Areas involved in the case studies. . . . .	270
12.2	Case Study 1: Phase I and II Quarries 2339 and 2350 - east of the Long Drung. . . . .	275
12.3	Apophygate arches and supporting packs with masons' working area in the foreground . . . . .	276
12.4	Case Study 2: Phase I Quarry 2347, under the south end of The Avenue . . . . .	277
12.5	Graffiti from the E4 stub, indicating early 18th-century workings. . . . .	279
12.6	The partially infilled cartway suggesting an entry from the north-west side (in Sheeps House quarry). . . . .	280
12.7	Banker mason's workplace indicated by spoil heaps . . . . .	280
12.8	Long corbels on a pillar in the E4 Stub . . . . .	281
12.9	Long but narrow room in the E4 Stub. . . . .	281
12.10	Development of jads in the E4 Stub. . . . .	282
12.11	Capitals for columns. It seems likely these were produced to a pattern, not turned on a lathe (Quarry Area 2348). . . . .	282
12.12	Case Study 3: Phase II: Allen underground quarry 2200, entered from Sheeps House Quarry . . . . .	286
12.13	View along the eastern Allen cartway at the junction with the branch cartway . . . . .	287
12.14	View down the eastern cartway near the Firs Shaft . . . . .	287
12.15	Case Study 4: Phase II workings in Central Byfield (Quarry 505). . . . .	288
12.16	View of the 'Great Quarry' in Central Byfield (505). This was by far the largest area open to view in the Allen workings. . . . .	290

12.17	Case Study 5: Phase III. Workings east of the Allen cartway in Central and East Firs . . . . .	292
12.18	John Davidge's working, to the south of Hills Shaft in East Byfield (Quarry 520) . . . . .	295
12.19	Late 18th- to 19th-century cartway with cart ruts in West Firs (Quarry 2342) which belonged to Samuel and John Pearce. . . . .	296
12.20	Case Study 7: Phase IV Quarry west of Combe Road – Hulonce's Quarry. . . . .	298
12.21	High Pillars in William Hulonce's Quarry (West Byfield) . . . . .	299
12.22	Case Study 8: Phase IV, John Scrace's two-level quarry and the masons' quarry . . . . .	300
12.23	The unstable lower working in Scrace's quarry (Quarry Area 512, Byfield). . . . .	301
12.24	Section of the masons' quarry, showing step-down from John Scrace's Upper Quarry (508) on the right. . . . .	301
12.25	The masons' quarry: note the clear floor, spoil neatly stacked and the clear-cut faces on the pillar. . . . .	302
12.26	Supporting stone packs at the Arched Shaft. . . . .	304
12.27	Plan of the Grand Canyon area (2209) of the Three Acre Quarry . . . . .	306
12.28	View towards the north-west from just under the roof of the Grand Canyon, directly over the central gullet, showing the full 8.5 m maximum height of the direct pillars and the barrow-way below, with over 5 m-high rubble stone packs at the side . . . . .	307
12.29	Direct pillars seen from the southern end of the Grand Canyon . . . . .	307
12.30	Laser scan image of the east face of pillar 5391 (within the Grand Canyon), showing working features. . . . .	308
12.31	Long elevation of the Grand Canyon produced by laser scanning, viewed to the north-east of the central row of pillars, intervening spoil-supporting packs and the north-east wall between. Note the over-deepening of the floor shown by the higher level of the base of the rubble packs . . . . .	309
12.32	Reconstruction drawing to show how stone may have been worked at the south-east end of the Grand Canyon . . . . .	310
12.33	Arcuate tipping front in Quarry 2353 from the Grand Canyon. . . . .	311
12.34	Inclined barrow-way at the south-east end of the Grand Canyon . . . . .	312
12.35	Cleared floor at Stonehouse Lane Quarry, with scappled slabs . . . . .	314
12.36	Open room working floors in Quarry 2202 . . . . .	315
12.37	Pillar with scorter recesses . . . . .	315
12.38	Case Study 13: Phase VI. Foxhill Underground Quarries: Wilks Quarry, Cox's Vertical Shaft Mine and Tankfield Quarry (2380, 2381, 2382 and 2383) . . . . .	318
12.39	Pillars in James Riddle's Quarry . . . . .	321

# List of Tables

1.1	Glossary of frequently used terms.....	5
5.1	The profitability of Allen’s stone business .....	95
6.1	Underground stone quarries leased by the Lord Warburton, 1795-98 .....	102
6.2	Early 19th-century quarries and leases on Greendown, Combe Down (LL.A91/18/5/25 to 35).....	105
11.1	Breakdown of pottery types from the underground quarries at Combe Down .....	264
13.1	Estimated output by phase for the core area underground workings of Combe Down .....	323

# Summary

Between November 2000 and August 2008 Oxford Archaeology carried out a programme of underground monitoring and detailed recording of a section of the underground stone quarries at Combe Down, Bath. The works were carried out prior to and during the stabilisation of the quarries, a process that was carried out by concrete infilling. The quarries (legally mines during the Stabilisation Scheme), were situated below the central Conservation Area of Combe Down, which lies between 1.5 and 2 km south of the historic centre of Bath. A large proportion of the parish was subject to either quarrying underground or at surface over a long period, but mainly between 1730 and 1860, when the area provided the main building material for the 'golden age' of Bath. Quarrying in the outer areas of the parish continued, but the main supply of Bath Stone thereafter came from the much larger, rail-served Wiltshire quarries.

The recording works were carried out as a long-running Watching Brief, during the construction of a network of supported engineering roadways designed to initially provide safe access to all areas of the mine and latterly to facilitate the filling of the mines with foam concrete. The recording was primarily by drawn and photographic methods, although a range of other techniques such as laser scanning and video photography were employed to augment the traditional techniques.

The survey, augmented by programmes of documentary and archival research, has enabled a

detailed chronology and technological analysis of the development of the underground workings to be established. These have demonstrated that although stone quarrying was certainly being carried out in the early 18th century and may have been undertaken as far back as the Roman period, the first large-scale exploitation of the quarries occurred during the middle years of the 18th century (c 1730-1764) under the ownership of the entrepreneur Ralph Allen, who introduced innovative techniques and industrial organisation to the process. Extensive quarrying continued after Allen's death in 1764 although the central organising influence was ended and the work was conducted by a number of independent quarrymasters or freemasons. Underground quarrying continued in the central Combe Down area until the 1860s and both underground and surface quarrying continued on the fringes of the area until the 1930s.

The Combe Down Stone Mines Project is the first time in the UK that the full resources of a professional archaeological body, Oxford Archaeology, have been used to carry out a large-scale archaeological examination of underground quarries. The project successfully demonstrated that such works are compatible with ongoing mining operations where old workings are to be disturbed by development. The strategy integrated thorough archaeological investigation with an extensive examination of documentary and published resources, and the results are presented in this volume.



# Zusammenfassung

Zwischen November 2000 und August 2008 unternahm Oxford Archaeology Beobachtungs- und detaillierte archäologische Aufzeichnungsarbeiten in einem untertägigen Teilbereich der Combe Down Steinbrüche in Bath. Die Arbeiten wurden im Vorfeld, sowie während des Stabilisierungsprozesses der Stollen durchgeführt, bei welchem diese mit Gasbeton verfüllt wurden. Die Steinbrüche, welche während des Stabilisierungsprozesses den rechtlichen Status von Minen innehatten, lagen zentral unterhalb des Flächendenkmalbereichs von Combe Down, welcher 1,5 bis 2 km südlich des historischen Stadtkerns von Bath liegt.

In einem großen Bereich des Stadtteils Combe Down wurde über einen langen Zeitraum hinweg unter- oder obertage Stein abgebaut, wobei die Blütezeit des Abbaus zwischen den Jahren 1730 und 1860 lag, in welchen Combe Down die Materialien für das "goldene Zeitalter" Baths zur Verfügung stellte. Steinbrüche in den Außenbezirken der Gemeinde wurden auch im Anschluss noch weiter betrieben. Der Hauptlieferant des "Bathstone" wurden jedoch die sehr viel größeren, an das Schienennetz angebundenen, Steinbrüche in Wiltshire.

Die archäologischen Aufzeichnungsarbeiten wurde während der anhaltenden Baubegleitung für die Konstruktion des unterirdischen Straßennetzes angefertigt, welches anfangs sicheren Zugang zu allen Teilbereichen der Mine garantieren sollte und später dabei half, die Stollen mit Gasbeton zu füllen. Aufgezeichnet wurde in erster Linie durch Zeichnungen und Photographien, wenngleich andere Techniken, wie z.B. Laserscanner und Videotechnik eingesetzt wurden um die traditionellen Methoden zu unterstützen und zu erweitern.

Die Expertise, angereichert durch Ergebnisse der Quellen- und Archivarbeit, ermöglichte eine detaillierte Chronologie und eine technische Analyse der Entwicklung der untertägigen Grubenfelder anzufertigen. Es wurde aufgezeigt, dass –obwohl Arbeit im Steinbruch sicherlich im frühen 18. Jahrhundert und vielleicht sogar schon in der Römerzeit stattgefunden haben – die ersten groß angelegten Abbauprojekte im Steinbruch in der Mitte des 18. Jahrhunderts (ca. 1730-1764), in welchem der Unternehmer Ralph Allen Eigentümer des Steinbruchs war und innovative Techniken und eine industrielle Organisation einführte, ihren Anfang nahmen. Eine umfangreiche Förderung wurde auch nach Allens Tod im Jahr 1764 fortgeführt, jedoch endete die zentrale Organisation des Abbaus und die Arbeiten wurden von unabhängigen Steinbruchmeistern und Freimauernern durchgeführt. Der untertägige Abbau im zentralen Gebiet von Combe Down dauerte noch bis in die 1860er Jahre an, in den Außenbezirken von Combe Down wurde sogar noch bis in die 1930er Jahre unter- und obertägig abgebaut.

Das "Combe Down Stone Mines Project", ist das erste Projekt seiner Art in Großbritannien, welches mit Hilfe einer professionellen archäologischen Institution, Oxford Archaeology, eine groß angelegte archäologische Untersuchung eines untertägigen Steinbruchs durchgeführt hat. Es hat sich dabei herausgestellt, dass archäologische Arbeiten auch bei gleichzeitigem Betrieb der Mine durchführbar sind, wenn alte Grubenfelder durch Bauvorhaben gefährdet werden. Die Ergebnisse der ganzheitlichen, archäologische Forschungsstrategie, in Zusammenschluss mit einer umfangreichen Auswertung von Dokumenten und publizierten Quellen, ist in diesem Band wiedergegeben.

## Résumé

Entre novembre 2000 et août 2008, Oxford Archaeology a exécuté un programme de suivi souterrain et de relevé détaillé d'une section des carrières de pierre souterraines à Combe Down, Bath. Les travaux ont été effectués préalablement et pendant la stabilisation des carrières, un procédé opéré grâce au comblement en ciment. Les carrières (légalement des mines durant le Projet de Stabilisation) étaient situées sous la Zone de Conservation centrale de Combe Down, localisée 1.5 km à 2 km au sud du centre historique de Bath. Une large proportion de la Paroisse de Combe Down a fait l'objet soit d'une extraction souterraine ou en surface sur une longue période mais surtout entre 1730 et 1860, lorsque la région produisait le matériau de construction principal de "l'âge d'or" de Bath. L'exploitation dans les environs de la paroisse a continué, toutefois la pierre de Bath provient ensuite principalement des carrières bien plus importantes de la région du Wiltshire desservies par voie ferroviaire.

Les travaux de relevé ont été réalisés sous forme de surveillance de travaux à long terme, durant la construction d'un réseau d'ingénierie de voies souterraines conçu initialement pour fournir un accès sécurisé à toutes les parties de la mine et dernièrement pour faciliter le remplissage de la mine de béton allégé. Le relevé a d'abord été effectué par des méthodes graphiques et photographiques, bien qu'une gamme d'autres techniques telles que le balayage au laser et la photographie vidéo aient été employées pour ajouter aux techniques traditionnelles.

L'étude, complétée par des programmes de recherche documentaire et archivistique a permis une chronologie détaillée et une analyse technologique permettant d'établir l'évolution des carrières souterraines. Elles ont démontré que, bien que les extractions de pierre aient certainement eu lieu au début du XVIII<sup>e</sup> siècle et aient peut-être continué jusqu'à l'époque romaine, la première exploitation des carrières s'est produite au milieu du XVIII<sup>e</sup> siècle (c. 1730-1764), alors propriété de l'entrepreneur Ralph Allen, qui a introduit des techniques innovantes et une organisation industrielle au processus. Une exploitation extensive a continué après la mort d'Allen en 1764 mais l'influence de l'organisation centralisée s'est achevée et le travail a ensuite été conduit par plusieurs maîtres de carrières ou francs-maçons indépendants. L'extraction souterraine s'est poursuivie dans la zone centrale de Combe Down jusqu'aux années 1860 et l'extraction souterraine et en surface a perduré aux abords du site jusqu'aux années 1930.

Le Projet des Mines de Pierre de Combe Down représente le premier projet au Royaume-Uni ayant occupé l'ensemble des ressources d'une organisation archéologique professionnelle, Oxford Archaeology, pour effectuer l'examen archéologique à grande échelle de carrières souterraines. Ce projet a démontré avec succès que de tels travaux sont compatibles avec la poursuite des opérations d'exploitation minières lorsque des chantiers existants sont perturbés par le développement en cours. La stratégie a intégré une enquête archéologique minutieuse à l'examen approfondi des ressources documentaires et publiées. Les résultats sont présentés dans ce volume.

# Acknowledgements

In nearly nine years of archaeological investigation under and over Combe Down, and more than a further year of post-excavation work, the debt incurred to others by both Oxford Archaeology and the authors has been immense. Our primary debt of gratitude must go to Bath and North-East Somerset Council and to the Homes and Communities Agency (formerly English Partnerships) for their support and generous funding of this project over the course of the fieldwork and post-excavation phases.

It is from the recognition of the quarries' (Stone Mines) national importance by the Bath and North East Somerset Council in conjunction with English Heritage (regional inspectors Amanda Chadburn and Phil McMahon), that the impetus for the 'preservation by recording' programme originated.

Throughout the project the authors and Oxford Archaeology benefited from very fruitful co-operation with Bath and North East Somerset Council staff, notably the Combe Down Stone Mines Team and its leader Mary Sabina Stacey and the Council's Archaeological Officers Bob Sydes and Richard Sermon. We have been ably assisted by a number of project co-ordinators over the years including Hannah Atkinson, Jen Albano, Rachael Thomas and Jessica Turner (née Bowden). We are grateful to Susan Fox of the Roman Baths Museum for her continuing assistance with the finds.

We have worked closely with the engineering and contracting companies, including Parsons Brinckerhoff with Ross Singleton as their Technical Director, who carried out the initial engineering assessment, and Scott Wilson (Mining) and its Site Engineer Dr Colin Harris who took over for the main project. We benefited from the guidance of Annette Roe, the Scott Wilson Archaeological Monitor. The main contractors throughout were Hydrock Contracting with its Managing Director, Dr Brian McConnell and on-site Director Dr Rob Narbett. These, with the mine manager, John Harvey and the substitute mine manager John Lister, and with the determined influence of Her Majesty's Inspector of Mines, Mr A Forster, were collectively responsible for our safety and for ensuring we could meet our recording objectives. Our day-to-day fieldwork was considerably assisted by the diligence of Katie Alexander, Adrian Brooks and Phil Brown of Davis Langdon and the course of the project smoothed by Paul Wells and Neill Dowsett of Provelio.

On a more personal level, the authors would like to thank those who worked directly with us underground for varying periods: Pete Burge, Nathan

Chichen, Tom Davis, Sarah Lane, Mike Simms, Phil Stastney and Kim Watkins. We cannot individually thank all the OA staff who contributed to this project during its eleven-year lifespan but special mention should go to the team of dedicated GIS staff who spent so many hours diligently digitising, analysing and shaping the plans that form the backbone of many of the illustrations in this volume. Particular thanks therefore to Anne Kilgour Cooper, Evangelia Kappa, Robin Latour, and Mercedes Planas. The project was initially managed by Robert Kinchin-Smith, a role then taken over by Ianto Wain. Bob Williams provided overall management and guidance throughout the project. The post-excavation programme benefited from the management of Lisa Brown. The initial draft of the report was read by, and benefited from, Dr John Barnatt's diligence.

We enjoyed a very good relationship with the Combe Down Heritage Society and Combe Down residents, and particularly wish to thank Professor Richard Irving, who was stimulated to write a book on the Byfield Mine (2005) and who also provided us with important documentary evidence, as also did Rosemary Simmons and Malcolm Aylett. Thanks also go to Roger and Julia Phillips whose house had its own underground workings accessed through their garage floor, and who donated a frigg bob (stone saw) which we later used to saw out graffiti slabs. The landlord of the Hadley Arms, who also had his own access to below, via a well in his rear bar-room, allowed us access to his property deeds (Hadley Arms Papers) which filled several gaps in our knowledge.

Information came from a wide range of sources, both individual and institutional. Prior knowledge of the underground workings, freely shared with us, principally came from David Pollard, but also from Dr Brian Hawkins, Derek Hawkins, Philip Wooster and Paul De'Ath; on the local historical maps and plans, Mike Chapman, and on stone quarrying generally, Paul Sowan. Peter Davenport, formerly of the Bath Archaeological Trust, advised on the amount of stone used in buildings, and Mike Chapman and Brenda Buchanan did the same on Bath history. For help with documentary searches we thank the staff of the Bath Record Office (BRO), The Bath Central Library (BCL) and the Taunton, Somerset (SRO), and Gloucester Record Offices (GRO), and for access to the Hadley Estate papers (discovered there by David Pollard), the Lewisham Library (LL), and for detail on Bath generally, the Bath at Work and the Building of Bath Museums. We were helped in the supply of illustrations by

Dan Brown of [www.bathintime.co.uk](http://www.bathintime.co.uk) and the Victoria Art Gallery, Bath, the Victoria and Albert Museum, London and the Bath Preservation Trust. Philip Wooster, Paul Deakin, David Pollard and Mike Chapman all supplied images used, but also many more for the research collection.

External expertise was brought in for laser scanning (APR Ltd) and for video recording, initially Peter Egglestone of IA Recording and, later, Rob Franklin. Assistance with the preservation and removal of graffiti and general conservation works for the finds were supplied by Dana Goodburn-Brown. Thanks must also go to Gerald Melksham for his assistance in the physical removal of some of the more significant graffiti pieces.

On a workaday basis, our thanks go to our mining colleagues. Initially this was a dozen or so people whom we were able to get to know very well indeed: most were former coal miners and some owners (in a small way) from South Wales – the exception came from the Forest of Dean. As the project developed,

first to around 50 people, then to around 250 it sometimes became faces rather than names (apologies), but all the miners and other underground and surface workers appear to have appreciated what was being seen and found, and ensured it was brought to our attention. We are, certainly unfairly to the others, naming only two mining colleagues here, Elwyn Davis who became the underground deputy and Steve Dix the mine surveyor, both of whom saved hundreds of hours by their prompt actions in the allocation of work and in ensuring our maps were up to date. The rest of the miners who helped us on a day-to-day and week-to-week basis cannot all be listed here by name, but their help and co-operation was invaluable.

Thank you all.

*Lynn Willies  
Neville Redvers-Higgins  
Ianto Wain*

Extracts from *A Description of Bath* by Mary Chandler (1687–1745)

...View the brown Shadows of yon *pathless Wood*;  
And craggy Hills, irregular and rude!

Where Nature sports romantic: Hence is seen  
The *new made Road*, and wonderful Machine,  
*Self-moving* downward from the Mountain's Height,  
A *Rock* its Burden of a *Mountain's* Weight.  
HAIL, mighty *Genius!* Born for *Great Designs*,  
T' *adorn* your *Country*, and to *mend* the *Times*;

...PROPHETIC here, the Muse shall build thy Seat,  
Great like thy *Soul*, in ev'ry Part complete:

...On this fair Eminence the fabric stands,  
The finish'd Labour of a thousand Hands;

...Thy Taste refin'd appears in yonder Wood,  
Not *Nature* tortur'd, but by *Art* improv'd:  
Where *cover'd Walks* with *open Vista's* meet,  
An *Area* here, and there a *shady Seat*....

...How from the Mountain's rocky Sides he drew  
A thousand shining Palaces to view:  
*Temples*, and *Hospitals* in ev'ry Land,  
From Age to age, his Monuments shall stand.  
*Envy* itself shall die, and fickle *Fame*,  
When he is dead, do Justice to his Name.

Mary Chandler (1687-1745) was a poet and an early champion of women's independence, and became famous for this poem, which glorifies the city and environs of Bath, and extols the achievements of Ralph Allen.

