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THE IDENTIFICATION OF SLAGS AND RESIDUES FROM DGLA SITES NATIONAL GALLERY AND PEABODY, LONDON.

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Summary

The slags and residues from these excavations were examined. The ironworking slags on the Peabody site were concentrated in the Saxon and dark earth contexts, in sufficient quantity to suggest that blacksmithing had been carried out close to the site. There were small deposits of slag in Saxon and 10-12th century contexts on the National Gallery site.

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The Identification of Slags and Residues from DGLA Sites National Gallery and Peabody.

Dr Gerry McDonnell

1 Introduction

DGLA excavations at the site of the National Gallery extension and at Peabody examined Saxon deposits. Both sites produced ironworking slags. This report presents the slag data from both sites, but wider discussion of the evidence of Saxon ironworking in London will be presented in a further report when more sites will have been examined. The full listing of the slags from each site is given in the appendices.

2 Slag Classification

The slags were visually examined and the classification is solely based on morphology. In general they are divided into two broad groups. Firstly, the diagnostic slags which can be attributed to a particular industrial process, which comprise the ironworking slags, i.e. smelting or smithing slags. The second group, the non-diagnostic slags cannot be attributed to a particular process either because they may be generated by non-industrial processes, e.g. fuel ash slag, or because they could have been generated by a number of different processes but show no diagnostic characteristic that can identify the process, e.g. hearth or furnace lining. In may cases the non-diagnostic residues may be ascribed to a particular process through archaeological association.

The residue classifications are defined below.

2.1 Ferrous Diagnostic Slags and Residues

Smelting Slag (SMLT) - silicate slag generated by the smelting process, ie the extraction of the metal from the ore. It does occur in characteristic forms, in particular tap slag.

Smithing Slag (SSL) - randomly shaped pieces of silicate slag generated by the smithing process.

Hearth Bottom (HB) - Plano-Convex accumulation of silicate slag formed in the smithing hearth.

Cinder (CIN) - high silica smithing debris, often formed at the reaction zone between the smithing slag and the hearth lining.

2.2 Non-Diagnostic Slags and Residues

Hearth Lining (HL) - the clay lining of an industrial hearth, furnace or kiln that has a vitrified or slag-attacked face.

Cinder (CIN) - high silica slag that can either be formed as described above or by high temperature reaction between silica and ferruginous material. It may be ascribed to either the non-diagnostic slags or the diagnostic slags depending on the iron content and its morphology.

Other Material which normally comprises fragments of fuel, ferruginous stones (not "ores") etc.

3 The National Gallery Site

Excavations on the site of the National Gallery extension revealed large quarry pits. The dating is uncertain, the earliest fills are mostly sterile, but some contain Roman or Middle Saxon finds. The later fills are dated to the 10-11th Centuries. Medieval and later features were also present on the site.

The full listing of the slag weights in context order is given in Appendix 1. A total of 14.84 kg of smithing slag lumps (SSL) and 1.49 kg of hearth bottoms (HB) was recovered from 39 contexts. Only three contexts contained more than 1 kg of slag (27, 77, and 108) of which Context 27 contained 4.3 kg. This distribution of generally small amounts of slag in many contexts is typical of a background distribution, i.e. the slag being accidentally deposited with other general debris. Context 27 may represent the deliberate dumping of blacksmithing waste. The very small amount of hearth lining recovered (0.14 kg from 4 contexts, of which 0.12 kg occurred in Context 132) is not associated with the smithing waste and therefore may derive from a process other than ironworking. Usually if deliberate dumping of ironworking debris has occurred significant amounts (usually greater than 0.5 kg) of hearth lining are recovered, and therefore the lack of associated hearth lining is indicative of background levels rather than deliberate dumping. There were no other "residues" except a small amount of naturally occurring ferruginous concretion (Context 190), classed as "Other Material".

The phase distribution of the slag is summarised in Table 1. This shows that the majority of smithing slag (SSL) derived from early medieval contexts (10-12th Centuries), and a small quantity from Middle Saxon deposits. It cannot be ascertained whether the 10-12th Century material is residual Saxon slag or represents a contemporary deposit of slag.

Table 1 Phase Distribution of National Gallery Slag

Middle Saxon

	SSL	HB	HL	OTHER
Quarry Pit 38	1815	510	-	60
Quarry Pit 46	1640	-	125	-
Sub_Total	3455	510	125	60
10-12th Centuries				
Quarry Pit 38	430	-	-	-
Quarry Pit 46	1263	-	-	15
Pit 36	7320	280	-	1300
Sub_Total	9013	280	-	1315
13th Century and later (including unstratified)				
Sub_Total	2375	700	17	10
TOTALS	**14843**	**1490**	**142**	**1385**

3.1 Conclusion

The evidence is not strong enough to indicate Saxon smithing on the site. If the 10-12th Century material is redeposited Saxon slag, then the deposits would represent a small but significant dump of smithing waste. If the medieval material derived from contemporary activity then both deposits would generally be considered background levels. However, to establish guidelines as to what represents background levels of slags a number of similar London sites will have to be examined.

4 Peabody Site

The full listing of slag type weights ordered by context are given in Appendix 2. There was a very small quantity (0.04 kg) of possible smelting slag from Context 68, but it is perhaps more probable that it was smithing slag that had achieved liquidity through excess heating. If it was smelting slag it was intrusive, and is not evidence for iron smelting on the site or in the vicinity. There was a large quantity of smithing debris comprising 60.6 kg of smithing slag lumps (SSL) and 4.2 kg of hearth bottoms (HB). In general the smithing slag had a solid texture, i.e. there was little excess silica available to give a cindery appearance.

There were 11 contexts containing more than 1 kg of slag, of which only one exceeded 5 kg and contained 17.99 kg of smithing slag and 1.24 kg of hearth bottoms (Context 254). Despite this large concentration of slag there was very little hearth lining present (0.06 kg in total), of which the largest amount 0.03 kg, was in Context 254. The lack of this residue again argues for the smithing activity to have been carried out elsewhere, but given the quantity of slag in Context 254 the smithing site was probably reasonably close, possibly within a hundred meters or so.

A small amount of cinder was recovered (0.03 kg) but is too small to be significant; it probably derived from the smithing activity.

There was 2.65 kg of ferruginous concretion classed as other material, of which 2.6 kg derived from a single context (Context 281). The concretion forms naturally due to the precipitation of iron compounds.

The phase distribution (Table 2) indicates that there was significant smithing activity during the Saxon period. The slags are also present in the Dark Earth as disturbed material. The quantity of slags in later deposits suggests that they derive from the disturbance of earlier material.

Table 2
Peabody Site Slag Listing By Phase (Weight in Grammes)

	SSL	HB	Smelt	Cin	HL	Other
Saxon Period	36024	2787		20	45	2650
Dark Earth	18182	420	45		17	
Medieval	4814	692				
Post-Medieval	555	302				
Unascribed	1043			10		
total	**60618**	**4201**	**45**	**30**	**62**	**2650**

Table 3 gives the slag distribution by area and phase. This shows that the main concentrations occur in the central part (Saxon phase, 15.5 kg [SSL+HB]), and the southwest corner of the site (Saxon Phase, 20.8 kg [SSL+HB]). Spheroidal hammer scale, which is expelled during welding, was recovered from an environmental sample from context 46.

Conclusion

There is sufficient smithing waste concentrated in the Saxon and Dark Earth contexts of the central and southwest part of the site to indicate smithing activity close to the area excavated. The recovery of only a small amount of hammer scale from one context in this area indicated that the smithing did not take place on the site. Assessment of the finds associated with the large deposits should be made to investigate whether they represent dumping of general waste or whether it was a specific deposit of industrial material. The associated iron finds are of particular interest, any possible iron stock, eg bars or rods of iron, should be investigated.

Table 3 Peabody Site Slag Listing by Area and Phase (Weight in Grammes)

Area:North Part of the Site (TS 4d-9a)

	SSL	HB	SMLT	Cin	HL	Other
Saxon Phase	-	-	-	-	-	-
Dark Earth	600	-	-	-	-	-
Medieval Phases	-	-	-	-	-	-
Post -Medieval Phase	-	-	-	-	-	-
Unascribed	55				10	
Area Total	655				10	

AREA: Central Part of the Site

	SSL	HB	SMLT	Cin	HL	Other
Saxon Phase	13979	1545			10	2650
Dark Earth	3669	420				
Medieval Phase	-	-	-	-	-	-
Post-Medieval Phase	-	-	-	-	-	-
Unascribed	176					
Area Total	17824	1965			10	2650

AREA: Central Part of the Site (South Side)

	SSL	HB	SMLT	Cin	HL	Other
Saxon Phase	2485					
Dark Earth	5245					
Medieval	-	-	-	-	-	-
Post-Medieval	-	-	-	-	-	-
Unascribed	357					
Area Total	8087					

Table 3 (Continued)

	AREA: South West Corner of the Site					
	SSL	HB	SMLT	Cin	HL	Other
Saxon Phase						
	19560	1242		20	35	
Dark Earth						
	8668		45		17	
Medieval Phase						
	-	-	-	-	-	-
Post-Medieval Phase						
	555					
Unascribed						
	95					
Area Total	28878	1242	45	20	52	

	AREA: Southwest corner of the Site (Ditch 258)					
	SSL	HB	SMLT	Cin	HL	Other
Saxon Phase						
	-	-	-	-	-	-
Dark Earth						
	-	-	-	-	-	-
Medieval Phase						
	4814	692				
Post-Medieval Phase						
		302				
Unascribed						
	-	-	-	-	-	-
Area Total	4814	994				

	AREA: Unlocated					
	SSL	HB	SMLT	Cin	HL	Other
Unascribed						
	360					
Unlocated	360					
Site Total	**60618**	**4201**	**45**	**30**	**62**	**2650**

APPENDIX 1

National Gallery Site Slag Listing in Context order (Weight in Grammes)

Context	SSL	HB	HL	Other	Other Type
2	360				
8	50				
16	35				
18	5				
24	375				
27	4315				
31	140				
33					
34	155				
42	405				
43	250				
48	80				
53	168				
54	130				
60	975				
75	10				
77	1995				
79	465	280			
81	490				
85	200				
88	665				
96	40				
108	1325				
113	65				
115			5		
118			5		
132			120		
134			12		
138	30				
154	240				
161		700			
163	300				
178	440				
179		510			
188	915				
189	120				
190				60	Ferruginous Conc
192	100				
**********	**********	**********	**********	**********	**********
Site Total	14843	1490	142	60	

APPENDIX 1 (Continued)
National Gallery Site Slag Listing by Phase
(Weight in grammes)

cont	sfn	ssl	hb	hl	other	otype
Middle Saxon Contexts in Quarry Pits 38 and 46						
60		975				
88		665				
118				5		
132	31			120		
154		240				
178		440				
179	45		510			
188		915				
189		120				
190					60	ferrug concretion
192		100				
		2555	510	125	60	
slags from Upper fills of Quarry 46						
34		155			15	
43		250				
53		168				
81		490				
85		200				
Slags from layers over Quarry 46						
8		50				
113		65				
115				5		
Slags from 11-12th Century Contexts						
27		4315				
31		140				
33					1300	pudding stone? or pebbly
42		405				
48		80				
75	60	10				
77		1995				
79		465	280			
96	25	40				
163	41	300				
Slags from Pit 148 (13th Century?)						
138	68	30				
Slags from 'layer' cut by pit 17 (14-15th Century)						
54	64	130				

APPENDIX 1 (continued)

Slags associated with Pits 17 and 93

16		35		
18		5		10
24		375		

Slags from Post-Medieval Layers

2		360		

Slags from Unphased Contexts

108		1325		
134			12	
161	37	700		
Total from Site	**14843**	**1490**	**142**	**1385**

APPENDIX 2
Peabody Site Slag Listing by Context order
(Weight in Grammes)

Context	SSL	HB	SMLT	Hl	Cin	Other	Type
21	176						
23	25						
24	1010						
25	60						
27	850						
30	155						
31	352						
34	358						
46	135						
49	219						
50	340						
51	270						
52	155						
55	235						
61	400						
62	3600						
63	65						
66	530						
67	480						
68			45(?)				
69	170						
70	170						
85	560						
92	227						
93	220						
94	596						
95	95						
96	80						
97	410						
100		420					
102	2305						
107	40						
111	90						
112	1030						
116	615						
117	142						
120	1900						
160	40						
164	290						
169	30						
174	215						
178	275						
184	2152						
185	455						
186	310						
188	765						
191	150						
195	50						
197	440						
199	962						
200	1500			17			
201	165						
203	506						

APPERNDIX 2 (continued)
Peabody Site Slag Listing (Weight in Grammes)

Context	SSL	HB	SMLT	Hl	Cin	Other	Type
206	2771	370					
209	1030	545					
210	513						
211	3290	630		10		50	Ferrug
216	95						Conc
218	620						
231	150						
245	690						
254	17995	1242		35	20		
255	2104	302					
257	115						
271	300						
279	1050	692					
280	40						
281						2600	Ferrug
284	390						Conc
303	110						
312	370						
317	55						
347	130						
350	545						
380	360						
391	310						
394	240						
398	15						
426	50						
433	60						
435	25						
437	70						
441	45						
454	200						
460	55						
527					10		
532	5						
672	90						
912	290						
990	70						
**********	**********	**********	**********	**********	**********	**********	**********
Total	**60618**	**4201**	**45**	**62**	**30**	**2650**	