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Ancient Monuments Laboratory
Report 214/88

DORCHESTER, DORSET: GREYHOUND YARD SLAG REPORT.

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Summary

Excavations at Greyhound Yard, Dorchester recovered 40kg of ironworking slag, ore and other residues. Examination of the slag showed that it derived from the iron smithing process, and that there was no evidence for iron smelting. The largest deposits derived from the construction of the Insula in the 1st Century AD. No chemical analyses were undertaken.

Author's address :-

Ancient Monuments Laboratory
English Heritage
23 Savile Row
London
W1X 2HE

01 734 6010 x533

Dorchester, Greyhound Yard Slag Report.

Dr Gerry McDonnell

1 Introduction

All the material classed as slag was examined. A full listing is given (Table 2) of the weight (in grammes) of each slag type recovered from each context. Some contexts have no weights ascribed to them, because they were found to contain iron artefacts and no slag. The contexts are grouped according to three levels of phasing (P1, P2 and P3) provided by the archaeologists. The material is discussed in terms of the broad phases of the site (P1).

2 Morphology of the Slags

The material was divided into eight 'slag types', of which three can be considered diagnostic of the ironworking process.

2.1 Smithing Slag Lumps (SSL)

SSL are randomly shaped pieces of smithing slag which were generated in the smiths hearth during blacksmithing, but were not left long enough in the hearth to fully develop into Hearth Bottoms (see below). The SSL from Greyhound Yard were typical of examples from other Roman Sites in having a higher silica content than the true fayalitic composition. This gives the SSL a "cindery" morphology/texture. The SSL formed the greatest proportion (by weight) of the slag material recovered from the site (73%).

2.2 Hearth Bottoms (HB)

Hearth Bottoms are plano-convex accumulations of fayalitic slag that formed in the base of the smithing hearth. They have the same chemical and mineral composition as the SSL. No significance has been ascribed to the variation in size of hearth bottoms, except that there is a trend towards larger hearth bottoms on "industrial sites" and smaller ones on small smithy sites especially rural sites. The results from Greyhound Yard (Table 3) show the presence of both large and small examples, but that in general the number of hearth bottoms (10) is low compared to the amount of SSL recovered. Hearth Bottoms formed 7.5% of the material recovered (by weight).

2.3 Smelting Slag

Smelting slag is fayalitic slag generated during the smelting of iron. A single small fragment of probable smelting slag was identified. It is not significant, and is interpreted as intrusive.

2.4 Cinder

A high silica slag that is non-diagnostic, ie it may have been generated by processes other than ironworking (smelting and smithing). It is commonly associated with the iron smithing process, and given the overall higher silica content of the Greyhound Yard SSL, it is probable that in this case it was generated by the smithing process.

2.5 Hearth Lining (HL)

Hearth Lining is the clay lining of a hearth that was raised to sufficient temperatures to cause vitrification. These temperatures were normally achieved only in the tuyere zones of hearths. It may have formed in any hearth, or furnace and is therefore considered non-diagnostic, but again association suggests that it was generated by blacksmithing.

2.6 Fuel Ash Slag (FAS)

A very high silica slag (usually >90% silica) formed under high temperature oxidising conditions by the reaction of siliceous material and fuel ash. It is a non-diagnostic slag which can be formed in any hearth or fire.

2.7 Ore

An iron bearing stone that has a sufficiently high iron content for the rock to be considered an economic ore. Although it may be viable as an ore it may have been collected for other purposes (eg hematite as a pigment) or be a naturally occurring rock on the site. A significant amount of "ore" was recovered (7.2 kg, 17% of the total material from the site), but the absence of any evidence for iron smelting on the site precludes it having been used as an iron ore. It was tentatively identified as goethite, and was also present on the Old Methodists Chapel Site. This suggests that it may occur naturally on the site (see discussion below).

2.8 Other Material

There was a small quantity of material that could not be ascribed to the above categories. It was identified as "ferruginous concretion", which results from the natural redeposition of iron salts, usually around some organic matter, eg charcoal or wood. This material is not listed in Table 2.

3 Distribution of the Slags

Table 1 shows that there were three main phases of slag deposition, Phases 42, 43 and 44, Phase 61 and Phase 71.

Phase 42 The development of the Eastern side of the insula in the early Romano-British period. Only two contexts contained significant amounts of SSL; Contexts 4671 and 4699, which were the latest features of this phase. The slag was dumped into these pits and ditches, and it does not represent iron smithing having been carried out on the area excavated. Clearly the construction of the insula would have required some "on-site" smithing.

Phase 43 The development at the back of the western frontage of the insula in the early Romano-British period. No contexts contained significant deposits of slag, but it was present at high background levels, possibly deriving from smithing in the insula during its development.

Phase 44 The Romano-British developments of the central area of the site, behind the frontage properties. No significant large deposits of slag, but a large number (32) of small deposits. This also represents high background levels of slag.

The evidence in Phases 42-44 suggest that iron smithing was carried out on the insula, but not in the area excavated, presumably during the construction of the buildings and the slag was re-used to backfill pits, ditches etc.

Phase 61 The early medieval development of the site. There was only one context with a significant quantity of slag (Context 2202), the remainder occurred as small deposits. It could have derived either from contemporary smithing or from residual Roman material. There was no significant morphological differences between the Phase 42-44 and the Phase 61 slag. It is therefore probable that it is residual Roman material. This uncertainty could be resolved if there were other Roman finds in the same deposits.

Phase 71 Post-Medieval development of the site. There were two large deposits of slag (Contexts 953 and 759) and eleven small deposits. Slags of this type would not have been produced in the post-medieval period, and therefore these slags derive from disturbance of earlier deposits.

The presence of slag in Phase 71 suggests that later activity invariably caused slag to be redeposited. It is therefore likely that the Phase 61 material is also the result of disturbance of earlier(Romano-British) levels.

The pattern of ore distribution does not follow that of the slag. There is no ore before Phase 44, which, given the extensive prehistoric activity would suggest that it was not naturally occurring on the site, but that it was brought onto the site during Phase 44. The large quantity recovered in that phase is due mainly to one one single large deposit (Context 1144). The other deposits on the site range from 20-500gms, with one exception of 800gms in Phase 71. There is no correlation between the occurrence of ore and slag, and on most occasions they are mutually exclusive. It is of interest to know whether it is associated with any other type of find.

Table 1 Summary of Slag Distribution by Phase (P1)

Phase	SSL	HB	Smelting Slag	Cinder	HL	FAS	Ore
Neolithic Phase (Phasing Uncertain)							
21	80						
Romano-British Phases (1st-5th Centuries AD)							
42	6500	570			20	10	
43	1410	320		10	35		
44	4945	2335		85	120		2055
45	685						460
46	15						
51	115						240
Medieval Phases (13th-15th Centuries AD)							
61	6240			15	490		415
62	660						715
63	755		30	40		40	365
Post-Medieval Phases							
71	7920						2095
72	750						
Un-phased							
	785				5		860
TOTAL							
	30860	3225	30	150	670	50	7205

4 Conclusions

The ironworking evidence from Greyhound Yard indicates that there was some on-site smithing during the construction of the insula. This material was disturbed and redeposited in the medieval and post-medieval occupation of the site. Despite the presence of iron ore on the site there was no evidence for iron smelting.

TABLE 2 Dorchester Greyhound Yard Slag Listing
(Weight in Grammes)

Key:		
	P1	Phase(1)
	P2	Phase(2)
	P3	Phase(3)
	Cont	Context Number
	SSL	Weight of Smithing Slag Lumps
	HB	" " Hearth Bottoms
	SMLT	" " Smelting Slag
	Cinder	" " Cinder
	HL	" " Hearth Lining
	FAS	" " Fuel Ash Slag
	Ore	" " Ore

P1	P2	P3	Cont	SSL	HB	SMLT	Cinder	HL	FAS	Ore
21	2	2	1636	80						
Total in Phase				80						
42			3597					20		
42	1	2	5333	30						
42	1	2	5353							
42	7	5	5178							
42	9	6	1921		250					
42	10	2	4770	50						
42	10	7	4744	220						
42	11	8	4671	3850						
42	11	8	4699	2350						
42	11	8	4953						10	
42	12	1	2313							
42	12	3	4161		320					
Total in Phase				6500	570			20	10	
43	6	1	3672	50						
43	6	2	3251	1075	160					
43	6	2	3279		160					
43	6	2	3294	105						
43	6	2	3488	50				35		
43	6	4	3453				10			
43	6	5	2073	130						
Total in Phase				1410	320		10	35		

Dorchester Greyhound Yard Slag Listing

P1	P2	P3	Cont	SSL	HB	SMLT	Cinder	HL	FAS	Ore
44	2	5	3926	800						
44	3	9	1159							20
44	4	3	4087	50						
44	4	10	3634		150					
44	4	10	3653	120						
44	4	10	3824		825					
44	4	10	3956		90					
44	4	10	4000	320						
44	4	10	4027	280						
44	4	10	4028		250					
44	4	10	4031		800					
44	5	2	3404				25			
44	5	2	3611	50						
44	5	3	3406	75						
44	5	3	3434	25						
44	6	1	3446	120						
44	6	2	2532	90						
44	6	2	4627	20						
44	6	2	4636				30			
44	6	6	1107							100
44	6	6	1144	100						1300
44	7	4	2720	320						
44	7	7	2163	725						
44	7	7	4962	50						
44	7	7	4963							
44	8	2	3099	10						
44	9	2	5088	110						
44	9	7	1132							225
44	9	14	1182	100						320
44	9	17	3036	260						
44	9	18	1139							
44	9	18	1140	80						40
44	13	1	3856							
44	13	1	3944					120		
44	13	2	2478	80	220					
44	13	2	3628				30			
44	15	2	3633							50
44	15	2	3636	650						
44	15	3	1296	100						
44	16	2	1473	15						
44	16	3	1436	25						
44	16	3	1437	50						
44	17	5	1609							
44	18	1	4502	320						
44	18	2	4308							
Total in Phase				4945	2335		85	120		2055

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Dorchester Greyhound Yard Slag Listing

P1	P2	P3	Cont	SSL	HB	SMLT	Cinder	HL	FAS	Ore
45	4	6	4734	20						
45	5	2	623	240						460
45	7	4	2688	10						
45	9	2	4664							
45	9	2	4668	75						
45	9	2	4672	275						
45	11	5	2121	15						
45	14	16	5100	50						
Total in Phase				685						460

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46	3	1	1623	15						
46	5	8	2028							
Total in Phase				15						

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51	1	1	934							175
51	1	2	926							25
51	1	2	944							20
51	2	5	2394	100						
51	5	1	1006	15						20
Total in Phase				115						240

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61	1	2	2349	25						
61	1	2	2387				15			
61	1	3	2350	140						
61	1	5	2347	60						
61	2	1	1060					25		
61	2	6	2141	25						
61	2	10	1372	15						
61	3	1	2217					375		
61	4	1	2178	60						
61	5	4	2145	50						
61	7	6	962							15
61	7	7	973	90						
61	9	2	1583							20
61	10	1	1428							
61	10	1	3364	180						
61	11	4	1385	10				20		
61	11	4	2202	2980						
61	11	5	2201	100						

Dorchester Greyhound Yard Slag Listing

P1	P2	P3	Cont	SSL	HB SMLT	Cinder	HL	FAS	Ore
61	12	2	3121	110					
61	12	2	3142	20					
61	12	5	975	20					
61	13	1	2034						
61	13	19	1459	10					
61	13	19	1460	10					
61	13	19	3164	110					
61	14	1	1295	980					
61	14	3	1030						15
61	14	3	1035						15
61	14	4	2107	20					
61	15	1	1237	75					
61	15	2	1422						
61	15	2	873						180
61	16	1	2208	10					
61	16	1	2231	175					
61	16	1	4696	610			70		
61	16	2	2185	80					
61	16	3	1391						
61	16	6	2213	10					
61	16	7	1352	75					
61	17	2	1203						
61	17	2	884	50					
61	17	2	980						150
61	17	4	865						20
61	17	6	1607	20					
61	17	6	3438	120					
Total in Phase				6240		15	490		415

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62	1	3	787						
62	1	8	1276	15					
62	1	12	1232	130					
62	1	13	1000						30
62	1	13	970	400					
62	1	14	961						200
62	6	1	1253	25					
62	6	1	965						
62	6	6	754	60					20
62	6	6	994						425
62	7	2	3147						
62	9	2	765	30					40
Total in Phase				660					715

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Dorchester Greyhound Yard Slag Listing

P1	P2	P3	Cont	SSL	HB	SMLT	Cinder	HL	FAS	Ore
63	1	2	1484	200						
63	1	4	1279	50						
63	1	6	1610	210						
63	1	6	1616	200						
63	2	3	1124							60
63	2	3	1151							30
63	2	3	1175				20			70
63	2	4	1122							
63	2	5	1131							15
63	2	6	1138							15
63	2	6	1155							60
63	2	6	1156	30						50
63	3	1	860							50
63	3	4	1912			30				
63	3	11	1071	40						15
63	3	18	1003						20	
63	3	20	711				20			
63	3	21	693						20	
63	3	22	725	25						
Total in Phase				755		30	40		40	365

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P1	P2	P3	Cont	SSL	HB	SMLT	Cinder	HL	FAS	Ore
71	1	2	986	225						40
71	1	4	951	620						
71	1	4	966	200						150
71	1	5	999							180
71	1	7	953	1100						
71	1	8	959	400						110
71	1	9	661	700						800
71	1	10	759	3100						
71	1	10	768	580						
71	1	10	776	450						
71	2	4	670							
71	2	6	954							20
71	2	6	995							375
71	2	9	654	110						
71	3	1	613	310						
71	3	3	864							50
71	3	5	1228	25						
71	3	7	755	100						
71	4	1	1149							300
71	4	3	940							20
71	6	6	3525							50
Total in Phase				7920						2095

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Dorchester Greyhound Yard Slag Listing

P1	P2	P3	Cont	SSL	HB	SMLT	Cinder	HL	FAS	Ore
72	3	1	645	380						
72	3	2	658	190						
72	3	2	779							
72	3	3	655	150						
72	3	4	647							
72	3	5	757							
72	4	9	956	30						
Total in Phase				750						

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Unphased Material

P1	P2	P3	Cont	SSL	HB	SMLT	Cinder	HL	FAS	Ore
**	**	**	3514					5		
**	**	**	1265	200						
**	**	**	3888	30						
**	**	**	941							120
**	**	**	1141							140
**	**	**	1163							175
**	**	**	5302							
**	**	**	945							30
**	**	**	1154							50
**	**	**	1270	120						
**	**	**	3144	20						
**	**	**	3448							160
**	**	**	3210							
**	**	**	784	300						
**	**	**	937							75
**	**	**	1137	15						
**	**	**	1143							110
**	**	**	2070	100						
Total in Phase				785				5		860

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	SSL	HB	SMLT	Cinder	HL	FAS	Ore
Total on Site	30860	3225	30	150	670	50	7205

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TABLE 3 Hearth Bottom Dimensions

Key
- P1 Phase(1)
- P2 Phase(2)
- P3 Phase(3)
- Cont Context Number
- HB Weight of Hearth Bottoms (in grammes)
- D1 Maximum Diameter (in mm)
- D2 Minimum diameter (in mm)
- Depth Maximum Depth (in mm)

P1	P2	P3	Cont	HB	D1	D2	Depth
42	9	6	1921	250	100	65	35
42	12	3	4161	320	80	70	40
43	6	2	3251	160	85	65	35
43	6	2	3279	160	70	65	30
44	4	10	3634	150	70	60	30
44	4	10	3824	825	120	100	45
44	4	10	3956	90	55	60	20
44	4	10	4028	250	60	70	35
44	4	10	4031	800	125	120	50
44	13	2	2478	220	95	75	30
Mean Values				320	85	75	35
Standard Deviation				270	25	20	10