

With compliments

Tom Loader

Slag assessment for St Stephen's Lane & School St. enclosed-Fransican Way to follow

Best wishes

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English Heritage

Ancient Monuments Laboratory Report 69/93

ASSESSMENT OF SLAG AND OTHER METALWORKING DEBRIS FROM
SCHOOL STREET, IPSWICH, 1983-85

D Starley

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Summary

A 10% sample of the metalworking debris, of largely late Saxon date, was visually examined to assess its potential for more detailed investigation. The assemblage was found to derive from the smithing of iron. Further, more detailed, examination might confirm the identification of possible smithing hearths on the site.

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Introduction

Excavations at School Street, Ipswich (IAS 4801), undertaken by Suffolk County Council Planning Department between 1983 and 1985 examined an area of 3000m². The site revealed a number of metalworking hearths with associated slag and other metalworking debris dating predominantly to the early late Saxon period. Preliminary quantification and phasing of the "iron working waste" had suggested the following totals:

Middle Saxon	(c650-850)	0.0kg
Early Late Saxon	(c850-900)	57.4kg
Middle Late Saxon	(C 10th)	11.1kg
Early Medieval	(C11-12th)	14.9kg
Late Medieval	(C 13-15th)	0.3kg
Late Medieval Transitional	(1.C15-16th)	0.0kg
Post Medieval		<u>0.0kg</u>
Total (including undated contexts)		<u>135.6kg</u>

Examination of the slags and metalworking debris was carried out to assess their potential for further analysis.

Due to the large quantity of metalworking debris recovered, only a small proportion of the assemblage, approximately 10%, was examined for the purpose of assessment. No records of contextual interpretation/phasing were available at the time of examination and material was randomly selected from the finds storage depot. The contexts visually examined, at least in part, were classified as follows:

CONTEXT	DATE	DESCRIPTION	TOT. WEIGHT CONTEXT (g)	SLAG TYPES
263	Middle late Saxon	Burnt layers of ash, yellow sand & charcoal.	0	Baked clay.
271	Early late Saxon	Layer of v. dark grey loam with silt streaks.	18230	Smithing hearth bottoms, undiagnostic ironworking slag.
285	Early late Saxon/middle late Saxon	Layer of dark brown loam.	13760	Smithing hearth bottoms.
304	Early late Saxon	Pit.	4225	Iron rich cinder, undiagnostic ironworking slag.
378	Early late Saxon?	Hard purple/brown burnt layer.	300	Vitrified hearth/furnace lining, cinder.
387	Early late Saxon	NE side of 309.	750	Smithing hearth bottoms, vitrified
409	Early late Saxon?	Pit. Top layer of fill. Cut by 291??	800	Ferruginous concretion, undiagnostic
456	Middle late Saxon??	Grave.	1370	Vitrified hearth/furnace lining, cinder.
1127	Middle late Saxon	Layer subsided into feature 1138.	150	Vitrified hearth/furnace lining, undiagnostic ironworking slag.
1136	Early Medieval	Brown sandy loam. Same as layer 1128?	3225	Smithing hearth bottoms, undiagnostic ironworking slag,
1140	Middle late Saxon	As 498.	2550	Vitrified hearth/furnace lining, Smithing hearth bottoms, undiagnostic ironworking slag.
1148	Early Medieval	Lower layers of pit filling.	8155	Vitrified hearth/furnace lining, cinder.
1177	Early late Saxon	Loose cobbled surface overlying 1195.	23335	Undiagnostic ironworking slag.
1604	Middle late Saxon?	Construction trench (?) on S. side of building	105	Undiagnostic ironworking slag, cinder, iron object.
1611	Early Medieval	Base layers of pit.	125	Vitrified hearth/furnace lining, undiagnostic ironworking slag.
1627	Late Medieval	Pit	1600	Dense ironworking slag.

A large proportion of the slag examined was identified as **smithing hearth bottoms** which are characteristic of the smithing, i.e. hot working, of iron. These slag lumps are recognisable by their characteristic plano-convex form, having a rough underside and a smoother, vitrified upper surface often hollowed as a result of downwards pressure from the air blast of the tuyère. Compositionally, hearth bottoms are of largely fayalitic (iron silicate) composition and result from high temperature reactions between the iron, iron scale and silica from either the sand used as flux or from the hearth lining.

Undiagnostic ironworking slag is of similar, fayalitic, composition to smithing hearth bottoms but has an amorphous, blocky, form. Similar material can originate from either iron smithing or iron smelting (extraction of metal from ore) and it is not normally possible to determine from which process the material derives on compositional or morphological grounds. However, on the School Street site its association with the smithing hearth bottoms suggests that here this class of material results from the smithing of iron. One context, a late Medieval pit, contained slag of sufficiently low vesicularity for it to be classified as dense ironworking slag. The significance of this different, later, material is limited by the small quantities present.

Material classified as **vitrified hearth/furnace lining** was found in most contexts. Again this is non-diagnostic and may derive from either iron smelting, iron smithing or non-ferrous metalworking structures. Vitrification occurs as a result of high temperature reactions, between the clay lining of the hearth/furnace and the alkali fuel ash or fayalitic slag, and the material may show the full compositional gradient from unmodified clay on one surface to an irregular cindery material on the other. Cinder is an associated material which comprises only the less dense portion of the vitrified hearth lining. It is a porous, hard and brittle slag formed by reactions between the alkali fuel ashes and either fragments of clay which had spalled away from the hearth/furnace lining or another source of silica, such as the sand used as a flux during smithing. Iron-rich cinder is a similar material but contains a significant iron content, making it denser.

Ferruginous concretion, identified only from one context, forms as a result of the redeposition of iron hydroxides. This "iron panning" is a common natural phenomenon, although the process may be enhanced by the surrounding archaeological deposits, particularly where iron artefacts or iron working debris are present.

Conclusions

Examination of the slag from School Street, Ipswich showed the assemblage to be dominated by debris deriving from the smithing, i.e. hot working, of iron rather than the primary smelting of iron from its ore, or the working of non-ferrous alloys.

Unfortunately, because context details were not available at the time of examination, no slags associated with the phase IV (c.870-c.925) "iron working hearths" were examined and it is not possible to provide further support for this interpretation.

Potential for further work

The total volume of slag and metalworking debris from School St. is relatively modest in comparison with other recently excavated sites from central Ipswich, especially when the large area of the excavation is considered. However, the existence of high temperature hearth structures on the site may justify a more detailed examination of the assemblage, or at least of those slags from contexts closely associated with the structures. Whilst the interpretation of the hearth structures as iron smithing hearths is not implausible it is felt that more confidence could be placed on this interpretation if it was supported by the evidence from the examination of associated slag, ironwork or hammer scale in the soil deposits.

Storage of slag

Ironworking slag, being predominantly fayalitic, is not prone to deterioration and requires no special storage treatment. It is recommended that all the slag should be saved.