



ARCHAEOLOGICAL WALKOVER
SURVEY

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TEES VALLEY ENERGY RECOVERY
FACILITY (TVERF)

REDCAR

TEESSIDE

prepared for
Stantec
on behalf of
The Councils

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Client Stantec on behalf of The Councils

Location Land at Redcar, Teesside

District Redcar and Cleveland

Grid Ref NZ 54449 21337

**TEES VALLEY ENERGY RECOVERY FACILITY (TVERF), GRANGETOWN, REDCAR,
TEESSIDE
ARCHAEOLOGICAL SURVEY REPORT**

Summary	3
1.0 Introduction	1
2.0 Location, topography, geology	2
3.0 Summary archaeological and historical background	3
4.0 Scope of works	6
5.0 Results	9
6.0 Conclusion and significance of the results	17
References	19

Illustrations

Figure 1: Site location

Figure 2: features identified in and round Area B

Figure 3: identified features overlain on OS 25 inch map of 1895

Figure 4: identified features overlain on 1978 demolition plan

Plates

Plate 1: aerial photo of Dorman Long Cleveland Works from mid 1960s; the bank of blast furnaces run up the centre of the photograph	1
Plate 2: the Dorman and Long works, 1959	3
Plate 3: the Cleveland Steel Works, Ordnance Survey 25" to 1-mile mapping 1893; the bank of three blast furnaces bottom of centre	4
Plate 4: the Cleveland Steel Works, Ordnance Survey 25" to 1-mile mapping 1913; the new arrangement of 'Yankee Furnaces' depicted	5
Plate 5: The Cleveland Steel Works in 1993, No 4 is in the middle, No 5 to the right, and gas cleaning plant to the left.	6
Plate 6: general view of Area B at commencement of watching brief on GI works, 13th July 2020	8
Plate 7: remains of furnaces north of Area B, facing north	10
Plate 8: the northern blast furnace base 01 – No. 4. Facing north	11
Plate 9: blast furnace 02 , facing south	12

Plate 10: blast furnace 03 , facing north (furnaces 02 and 01 in the background); displaced salamander in the foreground	13
Plate 11: salamander 04 , facing north	13
Plate 12: blast stove 05 , facing north	14
Plate 13: railway line 06 , facing north	15
Plate 14: gas washer bases, 08 and 09 , facing east	16

TEES VALLEY ENERGY RECOVERY FACILITY (TVERF), GRANGETOWN, REDCAR,
TEESSIDE
ARCHAEOLOGICAL SURVEY REPORT

Summary

This document presents the results of an archaeological walkover survey as part of a staged programme of mitigation works relating to a development at a former steel works site at Grangetown, Redcar, Teesside (NZ 54449 21337). It has been prepared by Northern Archaeological Associates Ltd (NAA) on behalf of Stantec, representing its client 'The Councils' in support of a planning application to create an Energy Recovery Facility.

The walkover survey of Area B, an area described in the previous desk-based assessment as being of archaeological interest, was carried out on the 6th August 2020, supplemented by a drone survey, carried out on the 21st October 2020. At the time of the survey, it was clear that some stripping of overburden had taken place across Area B, removing a large quantity of the demolition (and other imported) material which had been previously identified during the initial walkover survey undertaken by Tees Archaeology (Daniels 2019, Appendix 1). The 2020 walkover survey confirmed that, insofar as was possible through a cursory inspection, no apparent damage had occurred to the archaeological features which the material had been sealing, and in most cases the removal of the material had in effect allowed a better identification of the extant archaeological features.

The survey identified that there was no obvious surviving surface evidence for Eston Iron Works (1853), though sub-surface survival may be possible in view of culverts, flues and other remains identified in this area (NAA 2020b). In comparison, the remains of the 1874 Cleveland Works survived better, and it was clear that two of the three original blast furnaces constructed to serve the plant are in reasonable condition, albeit partially damaged by earlier demolition. Most of the remaining evidence, including the much larger blast furnace (No. 4, 1913) which is also in good condition, is of 20th century date and includes ancillary buildings, railway lines, gas washing plant, and unidentified concrete and brick structures.

Further mitigation and investigation of the remains is recommended, in particular in relation to the two 19th century original blast furnaces on the site.

1.0 INTRODUCTION

1.1 This document presents the results of an archaeological walkover survey as part of a staged programme of mitigation works relating to a development at a former steel works site at Grangetown, Redcar, Teesside (NZ 54449 21337, Fig. 1). It has been prepared by Northern Archaeological Associates Ltd (NAA) on behalf of Stantec, representing its client on behalf of Hartlepool Borough Council, Darlington Borough Council, Stockton on Tees Borough Council, Middlesbrough Borough Council, Redcar & Cleveland Borough Council, Newcastle City Council and Durham County Council (“the councils”) in support of a planning application to create an Energy Recovery Facility.



Plate 1: aerial photo of Dorman Long Cleveland Works from mid 1960s; the bank of blast furnaces run up the centre of the photograph

1.2 The National Planning Policy Framework (NPPF 2019; MHCLG 2019) establishes that where a site on which development is proposed has the potential to include heritage assets with archaeological interest, local authorities should require planning applicants to describe the significance of any heritage assets affected. The level of detail should be proportionate to the assets’ importance and sufficient to understand the potential impact of the proposal on their significance (para. 189).

- 1.3 Planning permission (Ref. R/2019/0767/OOM) was granted by Redcar and Cleveland Borough Council for the construction of the Energy Recovery Facility and associated development. Condition 6 requires the implementation of a programme of archaeological work in accordance with an approved Written Scheme of Investigation (WSI) (NAA 2020a), as outlined in the consultation advice (NEAR 2020).
- 1.4 The archaeological mitigation strategy outlined in the WSI was in accordance with the relevant standards and guidance published by Historic England (formerly English Heritage) (English Heritage 2008; Historic England 2015a, 2015b), and the Chartered Institute for Archaeologists (CIfA 2014a–h). All work was carried out in compliance with the Regional Statement of Good Practice (SYAS 2018).

2.0 LOCATION, TOPOGRAPHY, GEOLOGY

Location, topography and land use

- 2.1 The site is adjacent to the settlements of South Bank and Grangetown on the south bank of the River Tees, at NZ 54449 21337 (Fig. 1), and comprises a rectangular plot of c.10ha, at c.10m above Ordnance Datum. The site is bounded to the north by the main Middlesbrough to Redcar railway line (Tees Valley Railway); the Teesdale Way public footpath runs parallel to, and south of, the railway line alongside an above-ground pipeline. The site is bounded to the east by the site of Lackenby steel works, to the south by Bolckow industrial estate and beyond this the A66 road; it is bounded to the west by an above-ground pipeline, beyond which is South Tees Freight Park. The site comprises disused land and was originally the location of the Eston Iron Works (built c.1853) and later the Cleveland Steel Works (c.1874). The site was decommissioned during the 1990s.

Geology

- 2.2 The site lies on Mercia Mudstone, a sedimentary bedrock laid down over 200 million years ago in the Triassic period. It is overlain by Clay and Silt deposited up to two million years ago following glaciation of the area (BGS 2020). The drift geology comprises glacio-lacustrine clays and silts, with at least 1–2m of made ground above, from historic land reclamation during development of the iron- and steel-making industry along the Tees corridor (Daniels 2019, Stantec 2020). The made ground

comprises concrete on top of blast-furnace slag, with overlying spoil heaps possibly in the location of historical blast-furnace bases (*ibid.*). The site is currently waste ground (Plate 1).

3.0 SUMMARY ARCHAEOLOGICAL AND HISTORICAL BACKGROUND

Significance

3.1 The site was subject to an EA application, part of which (Chapter 10) focused on the cultural heritage of the site (Daniels 2019). The site is predominantly of industrial archaeological significance; the desk-based assessment summarises thus:

The extent of land reclamation means that there is little potential for archaeological finds of significance preceding the use of the site for iron and steel manufacture. While virtually all structures and plant have been cleared from the site there are sufficient remains to allow an understanding of the site and some of the processes which took place during its use in the production of iron and steel. There is a high potential for remains of significance relating to the 19th and 20th century use of the site. (Daniels 2019, 11)

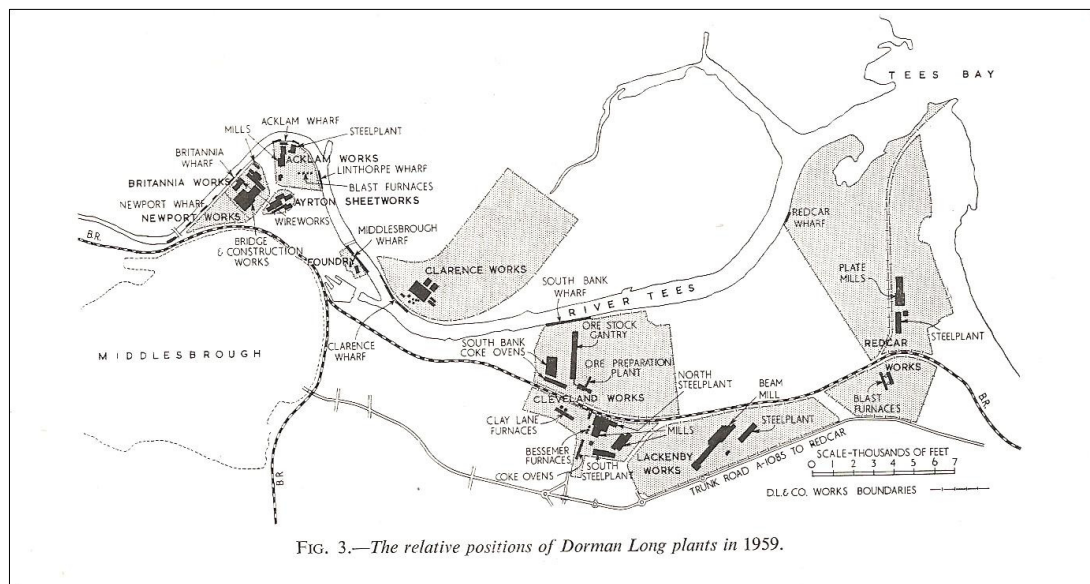


FIG. 3.—The relative positions of Dorman Long plants in 1959.

Plate 2: the Dorman and Long works, 1959

Industrial archaeology

- 3.2 Eston Iron Works (1853), the second set of blast furnaces built by Bolckow and Vaughan in the Middlesbrough area, comprised a line of six furnaces. The use of this set of furnaces led to the abandonment of earlier ones located in Middlesbrough because the Eston works were closer to the ironstone mines. In 1852, there were three blast furnaces on Teesside; in 1853 a further 113 were built as the development of the iron and steel industry on Teesside gathered pace. The construction of the Eston Iron Works marks the start of the iron and steel industry in this area and of the settlements that served them. The received wisdom is that the Eston Iron Works were destroyed when the Cleveland Steel Works were built in 1874. There are no visible signs above ground of these ironworks, but it is possible that remains survive below ground level.

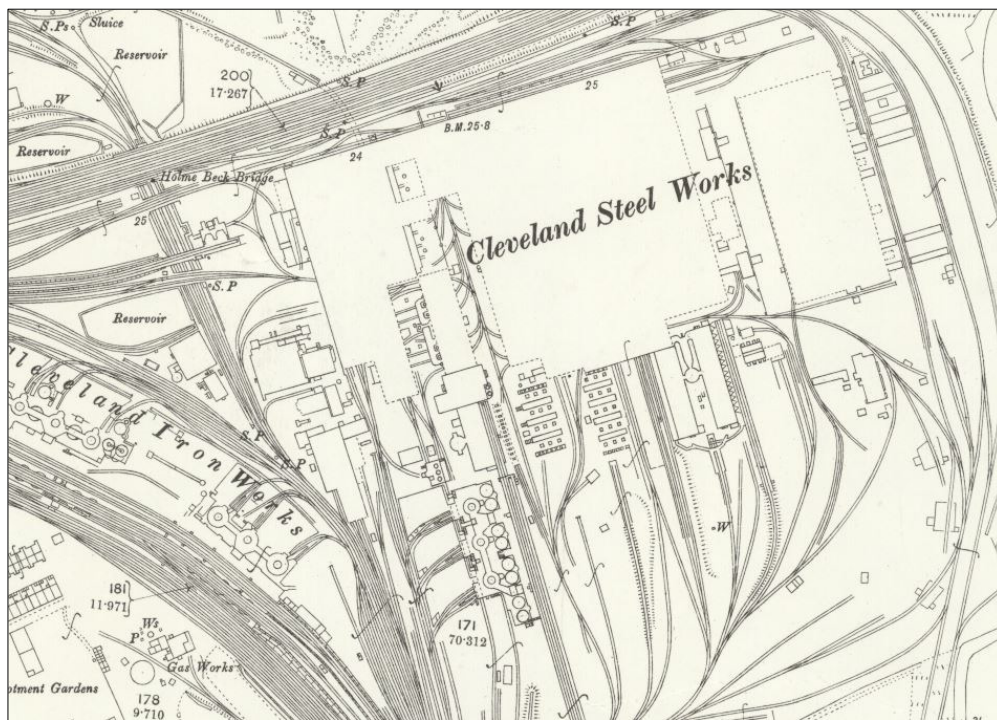


Plate 3: the Cleveland Steel Works, Ordnance Survey 25" to 1-mile mapping 1893; the bank of three blast furnaces bottom of centre

- 3.3 In 1874, the original Eston Iron Works were demolished and replaced by the Cleveland Works (1874–76). Bolckow and Vaughan was the leading firm on Teesside in developing steel production, as opposed to iron, which initially used Bessemer conversion vessels, to convert pig iron to steel. Four of these were located on 3.7m-high platforms in the north-western part of the development area but their precise location is unknown. They were served by a set of three 20m-high blast furnaces,

which were orientated north–south. The development area was the first location on Teesside at which steel was produced in bulk (Daniels 2019, 7).

3.4 The original three furnaces of the Cleveland Works were replaced by two Bessemer furnaces between 1911 and 1913. These were known as ‘Yankee’ furnaces in that they copied American practice. One of these (No. 4) continued in use until 1993. The other was demolished after the First World War and a further furnace (No. 5) was constructed in 1937. In 1947 they were modernised and rebuilt with 18’ 6” hearths and in this form two of them lasted into the 1990s. No. 5 continued in use until 1986. The furnaces were served by a ‘Hi Line’ where the charge was run straight to the top off an elevated rail line. The surviving embankment was part of this rail line and it was carried to the blast furnaces on metal trestles (Daniels 2019, 8). These furnaces were used to produce ferro manganese or spiegle iron, a lustrous, crystalline pig iron containing a large amount of manganese, sometimes 15 percent or more, used in making steel. Manganese and its ferro alloys were of strategic importance in particular to the military as manganese was essential in the production of armour plate.

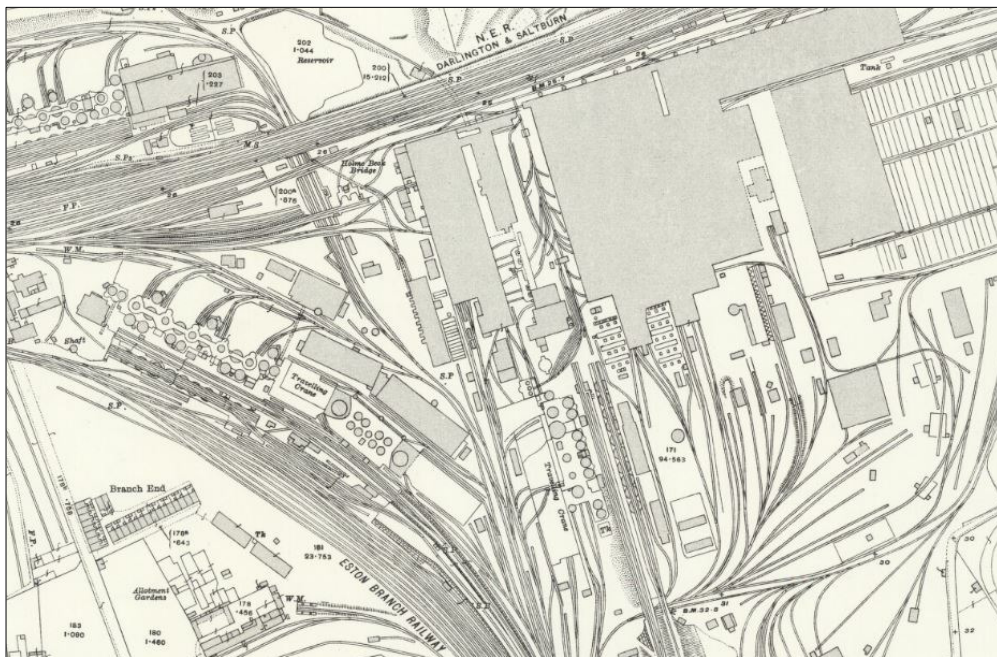


Plate 4: the Cleveland Steel Works, Ordnance Survey 25” to 1-mile mapping 1913; the new arrangement of ‘Yankee Furnaces’ depicted

3.5 The blast furnaces had blast stoves attached to them to provide the hot gases needed to achieve the blast, the location of which also lies in the development area, as do the remains of later coke ovens (in the south-western part of the site), part of a rolling mill,

and the laboratory and welfare facilities. To the immediate east of the furnaces were cooling towers (*ibid.*).

- 3.6 In 1913, Bolckow and Vaughan replaced the Bessemer converters with a set of open-hearth steel-making furnaces at the North Steel Plant; and a South Steel Plant was constructed during the First World War. The difficult economic circumstances after the war meant that they were shut down by 1928. In 1929, Bolckow and Vaughan was bought by Dorman Long and, as the economic situation improved prior to the Second World War, changes were made to the site. By 1940, rolling mills had been established to the east of the development area. Clearance of structures from the site took place from the late 1980s onwards and had been completed by the end of the 20th century (*ibid.*).
- 3.7 The northern boundary of the site comprises the line of the Middlesbrough to Redcar Railway, which began operating in 1846 and is still in use today. The south-western corner of the site is cut by the Eston Branch Railway (constructed in 1851), built by Bolckow and Vaughn to serve their ironstone mines at Eston (*ibid.*, 6).



Plate 5: The Cleveland Steel Works in 1993, No 4 is in the middle, No 5 to the right, and gas cleaning plant to the left.

4.0 SCOPE OF WORKS

- 4.1 Three Areas have been identified within the site boundary (Stantec 2020):

- Area A: the proposed Energy Recovery Facility (ERF) development area in the northern and eastern parts of the site;
- Area B: area of archaeological interest in the centre of the site; and
- Area C: the proposed biodiversity enhancement area in the south-western part of the site.

4.2 Area B (Fig. 2) is an area measuring c.100m by 50m, which has been identified as containing the remains of the bases of blast furnaces related to the 1870s steel works (see below), as well as the physical evidence for the methods of charging and blowing the furnaces. On-site rail lines and concrete structures were also in evidence (Daniels 2019). This area formed the focus of the walkover survey. The walkover survey was supplemented by a drone survey, to put the identified archaeological remains in context.

Aims and objectives

4.3 The proposed development had the potential to disturb unrecorded upstanding archaeological remains of regional and local significance. Furthermore, there was a moderately high potential for previously unknown below-ground remains to be impacted upon. The aim of the archaeological walkover survey was to identify and confirm the presence of archaeological remains within Area B, as previously identified in Daniels 2019. The objectives of the survey were to:

- establish the presence, nature, extent, preservation and significance of any archaeological remains within the area of development;
- provide a brief report of any such archaeological remains;
- undertake a programme of investigation that met with national and regional standards (Historic England 2015a; ClfA 2014b–d; South Yorkshire Archaeology Service 2018); and
- prepare an illustrated report on the results of the archaeological walkover survey to be deposited with the Historic Environment Record for Redcar and Cleveland.

Methodology

- 4.4 The walkover survey was undertaken to a Level 1 standard in line with guidance (Historic England 2017; ClfA 2014b). The objective of the Level 1 survey (Historic England 2017, 33) was to produce mainly a visual record, supplemented by the minimum of information needed to identify the archaeological site's location, possible date and type.
- 4.5 The walkover survey was undertaken on the 6th August 2020. A photographic record of all identified features was taken in digital format at a minimum resolution of 12 megapixels (Mp) and included a clearly visible, graduated metric scale. All photography followed current guidance (Historic England 2015c).
- 4.6 The walkover survey was supplemented by a drone survey, carried out on the 21st October 2020, in order to quickly and accurately locate the remains in Area B. The drone flight was carried out using a qualified drone pilot flying a DJI Inspire 1 with Zenmuse x3 camera (12Mp). The drone was flown in parallel flight lines at 80m above the ground and covered Area B and its peripheries. This process gives about 3.5cm per pixel resolution per image which was deemed to be enough for the task. The drone was also set to capture images with 80% front and side overlap which enabled, through photogrammetry and structure-from-motion (SfM) techniques, the team to create Digital Surface Model (DSM).



Plate 6: general view of Area B at commencement of watching brief on Ground Investigation (GI) works, 13th July 2020

5.0 RESULTS

5.1 During the initial visits to the site, undertaken as part of the watching brief (NAA 2020b), it was clear that some stripping of overburden had taken place across Area B, removing a large quantity of the demolition (and other imported) material which had been previously identified as part of the initial walkover survey undertaken by Tees Archaeology (Daniels 2019, Appendix 1). During that walkover, Tees Archaeology identified remains of blast furnaces, salamander (plug of iron, slag, furnace remains etc from final firing/misfiring), and concrete decking, all partially buried under a spread of demolition debris across the site.

5.2 The 2020 walkover survey confirmed that, insofar as was possible through a cursory inspection, no apparent damage had occurred to the archaeological features which the demolition material, now removed, had been sealing, and in most cases the removal of the material had in effect allowed a better identification of the extant archaeological features. Notwithstanding, this was flagged to the landowner immediately, and no further remediation works have taken place in the area since.

5.3 The remains of the steelworks had clearly been demolished to ground level, or close to ground level, and then the surviving remains sealed by a combination of imported materials and demolition material from the steelworks themselves. It was possible to identify on the surviving remains where metalwork had been sawn off or cut, and concrete or brickwork reduced, which seems to confirm good survival on the site, and the dating of any damage to the demolition of the steelworks in 1994. A number of distinct structures were identified, comprising:

- The remains of several blast furnaces
- Potential remains of some blast stoves
- Railway lines
- Gas-cleaning plant
- Concrete structures

- 5.4 Sub-surface archaeological remains, in the form of buried walls, flues and culverts, were identified during the monitoring of the ground investigation (GI) works undertaken in July 2020. These have been covered in a previous report (NAA 2020b), and will not be further discussed here, except where directly relevant to the findings of the walkover survey.



Plate 7: remains of furnaces north of Area B, facing north

The Eston Iron Works

- 5.5 No remains of the 19th century Eston Iron Works were identified; these were located north of Area B, and as such outside the direct area of survey, though a brief inspection of their location was carried out. The walkover did identify the remains of two probable furnaces (Plate 3) which lay close to the recorded position of the iron works, but these were probably much later in date, as they were respected by the concrete surfaces of the later industrial complex. The 1978 demolition plan (provided by Prospect Archaeology) indicates these to be positioned in a building marked "*ingot reheating furnace*" for the conversion of puddled wrought-iron bars to merchant bars, through piling, reheating and rolling. It seems most likely that these furnaces relate directly to this building.
- 5.6 No other archaeological remains were noted in this area, or indeed outside of Area B, during the walkover, but examination was only cursory and further remains could survive.

Blast Furnaces

- 5.7 The substantial remains of three blast furnace bases of single bell design were identified within Area B (Fig. 2), and these will be discussed from north to south. In each case, the remains stand approximately 2-3m in height and were associated with a large salamander either still *in-situ* or partially displaced.



Plate 8: the northern blast furnace base 01 – No. 4. Facing north

- 5.8 The northernmost blast furnace **01** corresponds with the position of No. 4, built in c.1913. The blast furnace was constructed on a thick concrete base c12m in diameter, onto which the iron super-structure was bolted. This latter structure comprised 14 iron I-beams in a radial arrangement, all of which had been sawn off at approximately 1.5m in height. The interior of the furnace was constructed of firebricks, with a scoria brick lining, and an in-situ salamander. The base was largely intact. Of the three bases identified, this was significantly the largest. A large square water-filled void **07**, c. 6m square, lies to the east of the blast furnace, and is clearly visible on the demolition plan of 1978. The function of this void is unclear, but inspection indicated it included stone and concrete in its construction. This appears to correspond with a rectangular structure on both the 25" OS mapping of 1895 and also the demolition plan of 1978, possibly related to the casting beds for the pigs.

- 5.9 The central blast furnace **02** and the southern blast furnace **03** were by contrast much smaller, at 6.5m in diameter. Both were entirely built of firebrick with no evidence of concrete or iron super-structure, in comparison to **01**. Furnace **02** was the most intact, having its salamander still in situ, and visible evidence of surviving lining just visible towards the top of the stack. Furnace **03** was more damaged, in comparison, with the salamander displaced onto its south-eastern side, and somewhat formless appearance. These two blast furnaces seem to correspond very closely to the positions of the southern two late 19th century blast furnaces shown on the 1893 Ordnance Survey mapping constructed in 1874, with the third blast furnace originally located just north of **01**, and demolished sometime around the latter's construction.



Plate 9: blast furnace 02, facing south

- 5.10 At the very southern end of the site, and just beyond the survey area, is a large, displaced salamander, previously identified by Tees Archaeology during their walkover in 2019 (Daniels 2019, Appendix 1). The salamander clearly does not relate to any of the existing blast furnaces, and may have originally come from No. 5, built in 1937, which was located at the south-western corner of the site. The possibility remains that the blast furnace lies close to, or beneath, this salamander, and has not been exposed by recent stripping, or that the blast furnace has been wholly demolished and removed.



*Plate 10: blast furnace **03**, facing north (furnaces **02** and **01** in the background); displaced salamander in the foreground*



*Plate 11: salamander **04**, facing north*

Blast Stoves

- 5.11 To the north-east of salamander **04**, a large circular iron structure **05** was identified, which lies very close to the blast stove (shown as No.17) on the 1978 demolition plan,

and which would have served No.5 blast furnace. The stove sits on a large circular concrete foundation 14m in diameter, with a circular raised concrete plinth 9m in diameter at its centre, onto which the iron super-structure is bolted. The interior of the stove appears to be heat affected, as would be expected. The walls of the structure had been cut down to the level of the top of the plinth, the whole structure now standing no more than 1m in height.

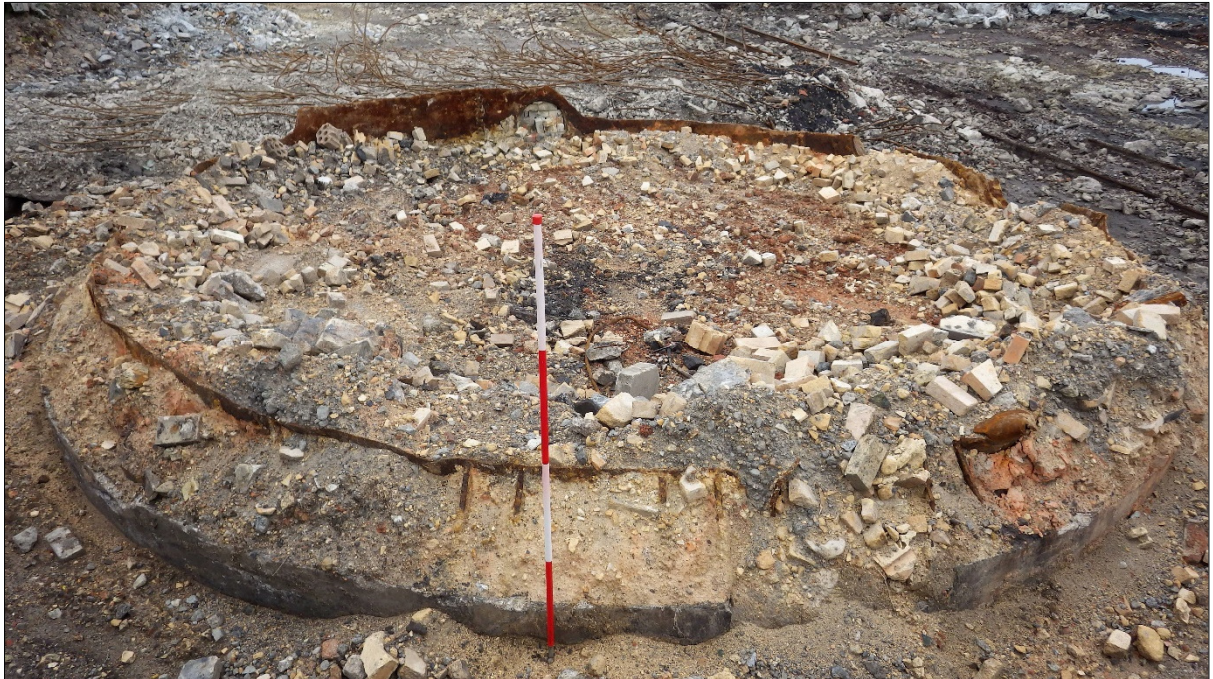


Plate 12: blast stove 05, facing north

- 5.12 No further stoves were identified. It seems probable that the other stove serving No.5 (labelled No. 19 on the demolition plan) has either been removed or has not been uncovered yet; a displaced circular iron structure to the south-west of its recorded position may be part of it (Fig.2), and a circular area of crushed concrete may mark its position originally. The two blast stoves serving No.4 (labelled No.14 and No.15 on the demolition plan) have been entirely removed.

Railway Line

- 5.13 A single section of railway **06**, 105m in length, runs north-south, just east of the blast stove **05**, and exposed in the recently stripped area. The railway survives in reasonably good condition and is 1.4m in width, with the rails laid on substantial concrete foundations with timber sleepers every 2.2m. The railway would have been

located west of (or perhaps beneath) the Hi-Line, which served to provide coal and ore for the respective bunkers which fuelled the blast stoves, and was removed at the time of the demolition in 1994. The position of the Hi-Line is suggested by the large, banked ramp to the south, which lead up to it. This lower railway line, with its position immediately adjacent to the stoves, was probably used to remove fuel ash from the stoves during cleaning for disposal elsewhere on site, and possibly the products of the furnace (pig iron). It seems likely that the slag was removed from the west side, into the main railway network, tipped directly into wagons during the smelting process.



Plate 13: railway line 06, facing north

Gas-cleaning plant

- 5.14 To the north of blast furnace **01**, two circular iron structures **08** and **09** were identified, both no more than 0.5m in height. The structures appeared to be partially or completely displaced, but or at least lie very close to the position of two similar structures shown on the 1978 demolition plan as 'gas washer plant', and visible on the 1993 photograph of the site (Plate 5). The plant, originally built in 1918, was designed to remove impurities (dust and chemicals) from the smoke produced by the blast furnaces, prior to release into the atmosphere. Both structures comprised iron walls affixed to a concrete base and were 7.8m in diameter.
- 5.15 South of these structures, and within the area reduced by machining, the base of a chimney **10** was also identified, comprising a 1.5m diameter iron wall bolted to a concrete base, with a north-south aligned wall just east the chimney. The function of this chimney was unknown but may also relate to the gas-washing process.



Plate 14: gas washer bases, 08 and 09, facing east

East and West sides of Area B

- 5.16 On both the east and west sides of Area B, a number of concrete structures were identified, in most cases not sufficiently exposed to allow their interpretation or demolished to such an extent that only their foundations survived.

- 5.17 On the west side, several low reinforced concrete walls and floor surfaces were identified forming an irregular lattice-like structure immediately south-west of blast furnace **01** (recorded as **11**). These structures did not seem to represent buildings but rather seem to be supports for an elevated working area. The working area may have marked the position of travelling cranes shown in this area on the 20th century Ordnance Survey mapping.
- 5.18 On the east side, several voids and concrete walls were exposed, which seem to relate to small ancillary buildings (pump house, joiners' shop, stores, electrical shop) and other offices. Nothing in this area was sufficiently coherent to be identifiable to a specific building but may prove suitable for further investigation at mitigation stage.

6.0 CONCLUSION AND SIGNIFICANCE OF THE RESULTS

- 6.1 The walkover survey has successfully achieved the objectives as outlined. In summary the results identified that:
- Surface evidence for Eston Iron Works (1853) does not survive clearly, though sub-surface survival may be possible in view of culverts, flues and other remains identified in this area (NAA 2020b);
 - Elements of the Cleveland Works (1874) survive, chiefly the remains of two of the three original blast furnaces constructed to serve the plant;
 - Substantial elements of the 20th century Cleveland Works also survive, in the form of concrete and brick structures, railway lines, ancillary buildings and No. 4 Blast Furnace, built in 1913. There is also tentative evidence for the survival of No.5, built in 1937, though currently unproven.
- 6.2 Further mitigation and investigation of the remains is recommended, in relation to the two 19th century blast furnaces on the site. Historic England had previously considered No. 4 for scheduling and concluded it was of National Importance. Tees Archaeology has also classed the remains High for Historical Value, Low for Aesthetic value and Medium for communal value (Daniels 2019). Of the recommendations, provided by Tees Archaeology, the following have been completed or are recommended:

- preservation and interpretation of all the blast furnace bases (*to be determined*)
- preservation and interpretation of other associated features, on their significance/ value (*to be determined through further investigation and consultation with NEAR*)
- a survey of the site to record surviving features (*walkover and drone survey completed but further detailed work needed*)
- analysis of GI works on site (*completed* - NAA 2020b)
- archaeological monitoring of groundworks around the blast furnaces (*to be completed*).

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