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Project Report 1075b.2 (1)

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## Archaeological Watching Brief at Former Gas Works, Old Mill Lane, Barnsley, South Yorkshire



July 2008

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by Tobin Rayner

Prepared for:  
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# Former Gas Works, Old Mill Lane, Barnsley, South Yorkshire

National Grid Reference: SE 352 074 (centred)

## Archaeological Watching Brief

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## OASIS SUMMARY FORM

<b>PROJECT DETAILS</b>		
OASIS identifier	ARCUS	
Project title	Archaeological Watching Brief at Former Gas Works, old Mill Lane, Barnsley, South Yorkshire	
Short description of the project	Watching brief during the remediation work at the Old Mill Gas Works site, Barnsley	
Project dates	22 visits between 16 <sup>th</sup> October 2007 and 22 <sup>nd</sup> February 2008	
Previous/future work	Desk-based assessment	
Monument type and period	Structures of the Gas Works – 19 <sup>th</sup> -century	
Significant finds (artefact type and period)	N/A	
<b>PROJECT LOCATION</b>		
County/Parish	South Yorkshire/Barnsley	
Site address	Former Gas Works, Old Mill Lane, Barnsley, South Yorkshire	
Site co-ordinates	SE 352 074 (centred)	
Site area	12,600m <sup>2</sup>	
Height OD	44.5-45.5m AOD (surface)	
<b>PROJECT CREATORS</b>		
Organisation	ARCUS	
Project brief originator	SYAS	
Project design originator	ARCUS	
Project supervisor	Sean Bell, Helen Holderness, Katherine Baker	
Project manager	Richard O'Neill	
Sponsor or funding body	VHE Construction Plc, Phoenix House, Hawthorne Park, Coal Road, Leeds, LS14 1PQ	
<b>PROJECT ARCHIVES</b>		
Archive Type	Location/Accession no.	Content (e.g. pottery, metalwork, etc)
Physical	Doncaster Museum	Finds
Paper	Doncaster Museum	Report, drawings, photo prints
Digital	Doncaster Museum	Report –pdf file, images
<b>BIBLIOGRAPHY</b>		
Title	Archaeological Watching Brief at Former Gas Works, old Mill Lane, Barnsley, South Yorkshire	
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Author	Tobin Rayner	
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## **NON-TECHNICAL SUMMARY**

*ARCUS were commissioned by VHE Construction Plc to undertake an archaeological watching brief during remediation works at the Old Mill Gas Works site, Barnsley. A desk-based assessment of the land indicated that the site had industrial archaeological potential of local importance.*

*Documentary research revealed there were no known prehistoric, Roman, medieval or 16th- to 18th-century sites or find-spots within the development site. The area became developed when The Barnsley Gas light Company purchased the site in 1867, with the first OS map depicting the gas works dated 1890. The gas works continued production until some time during the early 1960s, with much of the gas works plant being demolished by 1964. By 1973 the gas works had been demolished fully apart from Gasholder No. 3, and the site was occupied by a depot.*

*The surviving structures of the Gas Works recorded during the watching brief were Gasholders No.1 and 2, the retort house, exhaustor house, coal store, tar and liquor tanks, possible meter house, purifiers, CWG (Carburetted Water Gas) plant, boiler house, oxide shed, oil tank, scrubbers, Dri gas plant and booster house. The investigations revealed that there was at least three phases of development of the Gas Works with the second phase being undertaken prior to 1930 with the construction of the CWG plant and associated buildings, and the third phase relating to the construction of Gasholder No.3 (to the south of the development site) and its associated buildings.*

*Features relating to the 1970s development were also revealed during the works, some truncating the Gas Works structures.*

*The results of the watching brief enhance our understanding of the development of the site, and correspond well with existing cartographic evidence.*

# 1 INTRODUCTION

In December 2006, ARCUS were commissioned by Barnsley MBC, to undertake a desk-based assessment of land along the route of the proposed Burton Road Bus Corridor, Barnsley, South Yorkshire. The assessment was required to support a planning application for the redevelopment of the site.

The assessment concluded that, with the exception of the former Old Mill Gas Works site, the proposed development area had low or no archaeological potential (Stenton 2007). The Gas Works site has industrial archaeological potential, but this is of only local archaeological interest.

On the basis of this report and the local importance of the archaeology, a condition was placed on the planning approval (2006/1509) requiring that an archaeological watching brief should be undertaken during site remediation works. The requirement was issued by the South Yorkshire Archaeology Service (SYAS) and was in line with government guidance as set out in Planning Policy Guidance – Archaeology and Planning (PPG16 1990).

ARCUS were commissioned by VHE Construction Plc to undertake the archaeological watching brief during remediation works in the area of the former Gas Works.

## 1.1 Site Location and Land Use

The development area (SE 352 074, centred) is located to the north-east of Barnsley town centre and lies immediately north of the River Dearne (**Illustration 1**). The underlying geology of the site comprises Upper Carboniferous Lower Coal Measures.

Areas of tarmac, hardstanding and vegetation overgrowth were present in the area formerly occupied by the late 20<sup>th</sup>-century depots and their yards (**Plate 1**). This area was formerly the site of the main Old Mill Gas Works buildings. No structures associated with the 19<sup>th</sup>-century works were observed during a site visit undertaken as part of the desk-based assessment.

# 2 HISTORICAL AND ARCHAEOLOGICAL SUMMARY

The archaeological desk-based assessment (Stenton 2007) undertaken by ARCUS and an environmental assessment (White Young Green Environmental 1998) contain the historical maps and plans relating to this site. A composite plan, recording the historical layout and the areas of investigation, is included in this report as **Illustration 2**.

There are no known prehistoric, Roman, medieval or 16<sup>th</sup>- to 18<sup>th</sup>-century sites or find-spots within the development area or within 1km of the site, with the possible exception of a timber-framed house at Church Street to the south-west.

The area appears to have been part of a field system within Monk Bretton's Burton township from the early post-medieval period, and is thus unlikely to have been the focus of settlement from the medieval period onwards. Industrial activity was recorded in the immediate vicinity from 1623, with Burton Smithies Paper Mill and the Old Mill Lane turnpike road was constructed at the west of the site during the 19<sup>th</sup> century.

The development area was first shown clearly on the 1854 OS map, when it was marked as part of a field system bounded by the River Dearne to the south, Old Mill Lane to the west and Burton Road to the north. With the exception of a number of field boundaries, no features were located within the site at this time. However, the road layout at the Old Mill Lane/Burton Road junction did not adhere to its present-day layout, with the turn into Burton Road being a sharply oblique angle that ran from Old Mill Lane in the vicinity of the present-day Tollgate Hotel and crossed the site of the current Wickes premises, before intersecting Burton Road to the east of the school.

The Barnsley Gas light Company purchased the northern section of the Old Mill lane site in 1867, although the earliest cartographic evidence for use of the site for gas manufacture and storage is an OS map dated 1890. This shows Old Mill Gas Works to have been developed to the north of the River Dearne, railway sidings extending into the site from the main railway to the north of the site. Two gasholders (Nos. 1 and 2) have been constructed: No. 1 adjacent to the west of the railway sidings and the larger holder, and No. 2 located adjacent to the river. Both gasholders possessed in-ground tanks, which were of brick construction and 8 m and 10 m depth, respectively. A large building (which later plans show to be the retort house) is located in the central area of this section. Other additional buildings present are adjacent to Old Mill Lane and to the west of gasholder No. 1. To the south of the river the land is undeveloped, with the exception of a tannery located adjacent to the river and Old Mill lane.

The OS plan dated 1906 shows there has been no further development of the gas works. However, by 1930 there had been several changes to the site; an additional building (with chimney) had been constructed to the north of gasholder No. 2; archive information records this is a Carburetted Water Gas (CWG) plant. Two small tanks are located adjacent to the south face of the CWG plant and tanks are also labelled to the west of gasholder No. 2, to the north of the retort house and to the north of gasholder No. 1. A new building had been constructed close to the western site boundary (later plans show this to be purifier apparatus, for the CWG plant) and tanks are also marked adjacent to the north-west face of these purifiers.

A site layout plan, dating to 1940, shows gasholders Nos. 1 and 2. The retort house is marked with an exhaustor and engine house adjacent to the north-west and a workshop and mess room to the south-east. To the south of the retort house the CWG plant, together with a boiler house, remain. To the north west of gasholder No. 1 an oxide shed, small purifiers, meter house and pump house are located, the larger purifiers servicing the CWG plant.

A 1949 site plan shows overhead and underground tar and liquor tanks to the west of gasholder No. 1, to the south-east and north-west of the small purifiers respectively. The proposed site for gasholder No. 3 is shown to the south of the river; the tan yard appears to have been cleared.

The site plan of 1952 shows gasholders Nos. 1 and 2 and the edge of gasholder No. 3. The latter appears to now be in use, as a gas pipe leads across the river from the holder to the booster house, located to the north of holder No.2. A small oil tank and two scrubbers are also located to the north of gasholder No. 2, adjacent to the booster house. There had been no further development of the site, apart from a small liquor store located close to gasholder No. 1. It is not known whether this was an above or below ground facility.

By 1964 the small stores shed to the west of gasholder No. 1 had been converted to a second oxide shed. The tar and liquor tanks remained to the north-west of the



gasholder, but the liquor store is no longer marked. To the north of gasholder No. 2 a Dri gas plant was located alongside several additional small structures, which are of unknown use. Gasholder No. 3 is shown to the south of the river.

The date on which gas production ceased at the Old Mill Lane Gas Works is not known, but is thought to be during the early 1960s. Previous studies of the site have suggested that much of the gas works plant had been demolished by 1964.

By 1973 the gas works had been demolished, and the site was occupied by a depot. The OS map shows two rectangular structures within a large, rectangular enclosure, while two smaller rectangular buildings and a series of associated compounds were located to the north. The building along the Old Mill Lane frontage and the works branch line from the railway are no longer shown.

A site plan dated 1985 shows that the gas works had been demolished and an area of the northern section of the site had been fenced off for use as a Gas Board depot; the main depot building was constructed on the old location of the retort house. The depot was used for pipe storage and also for refuelling; diesel and petrol facilities were installed, both with in ground tanks. A small building remained to the south of the depot, thought to be a pressure reduction unit (AGI). Gasholder No. 3 remained to the south of the river, the other two gasholders had been demolished.

### **3 AIMS OF THE ARCHAEOLOGICAL FIELDWORK**

The aims of the watching brief were:

- to record any archaeological deposits or structures exposed by the site works;
- to collect any artefacts disturbed by the site works;
- to produce a report detailing the recording and interpretation undertaken and setting that into local and historical context.

### **4 FIELDWORK STRATEGY AND METHODOLOGY**

All excavation and recording work was carried out in accordance with the methodologies outlined in the ARCUS project design (Bell and O'Neill 2007), with guidelines issued by the Institute of Field Archaeologists (IFA 1999) and with current industry best practice.

The removal of hard surfaces and the initial strip of fill within the gas holders were not subject to the archaeological watching brief. All further groundworks during remediation were monitored by ARCUS.

The remediation works were undertaken by VHE Construction. The programme was directed to removing contaminated infill deposits whilst leaving the majority of buried structures intact. All structures exposed were located by the on-site surveyor from White Young Green during the remediation programme as part of the validation record that will be handed on to the new owners. White Young Green also consulted the National Gas Archive to obtain any further details about the former use and development of the site.

ARCUS worked alongside VHE Construction and White Young Green to record the

structures revealed, producing a written, drawn and photographic record. White Young Green agreed to make available the archive information and survey data to ARCUS, to enable ARCUS to produce a report which places the structures exposed within their historical and archaeological context.

Fieldwork was supervised by Sean Bell, Helen Holderness, and Katherine Baker, ARCUS Project Archaeologists, and was co-ordinated by Richard O'Neill, ARCUS Project Manager.

## 5 RESULTS

Ten areas (A1 – A8, B1 and B2) within the site were archaeologically watched during the remediation work (**Illustration 2**). The watching brief comprised 22 visits between 16<sup>th</sup> October 2007 and 22<sup>nd</sup> February 2008.

### 5.1 Area A1: Gasholder No.1

Decontamination works within the gasholder revealed a brick-lined tank with iron carriers for holders visible within the sides of the tank. A square brick structure within the tank was revealed and was probably the housing for an outlet or inlet pipe (**Plate 2**).

### 5.2 Area A2: Retort House, Exhauster House and Coal Store (**Illustration 3**)

A test-pit excavated within this area revealed a wall with a circular outlet aligned northeast-southwest. Constructed of machine-made red brick laid stretcher and with a cement bond, this wall is likely to have divided the retort house and exhauster house. Demolition rubble was exposed to a depth of 2.5m on either side of this structure was.

Excavation within the south-east corner of the area revealed four walls constructed from machine-made bricks with rectangular frogs and black ash mortar bond. Two of the walls were orientated northeast-southwest [001, 002], whilst the other was positioned northwest-southeast [003]. This northwest – southeast wall was 0.35m thick and ran parallel to a substantial sandstone wall [004] to the north-east which was constructed from large blocks at least 0.9m thick (**Plate 3**). The relationship between these parallel walls and the other brick walls was unclear and it was not certain whether they were truncated, truncated themselves, or were contemporary as they continued to the north-west of them. Although heavily truncated walls [003] and [004] continued in a north-west direction before turning south-west with [003] being internal to [004]. Wall [004] also continued in a north-west direction for c. 10m before turning at right angles south-westerly and forming the exhauster house wall.

Machining in the east corner of Area A2 revealed concrete [020] within the section overlying large crushed brick aggregate and a large concrete block [021], measuring 1.5m x 1.5m x 1m, both of unknown function. This area of the site was filled with clinker cyanide and rubble and possibly associated with the coal shed to the south-west of the retort house.

The stratigraphy within the south-eastern end of this area comprised a thin layer of tarmac (0.1m) over crushed limestone (0.1m) overlying crushed brick (0.1m) and sealing made ground (1m). Light brown clay natural was revealed below this sequence of deposits.

A large concrete 'hopper' [005] was recorded adjacent to the south-west facing section at the butt end of wall [001] (**Plate 4**). The 'hopper' had 0.7m thick walls with the south-eastern internal wall sloping and the remaining three vertical. A tar tank and pipe was located to the south-west of the 'hopper' and to the north-east of [004] (**Plate 5**). A c. 1m square modern drain-head [006] was recorded adjacent to the north-east facing section and was believed to be associated with the depot. A row of RSJs [007] spaced 3m apart ran parallel with the south-west edge of the area and were likely to have supported a super-structure (**Plate 6**). Recorded in the south corner of Area A2, was a continuation of wall [003] running northwest-southeast with a concrete vaulted arch [008] (**Plate 7**), possibly a flue. Constructed from standard machine-made bricks, in a 3 stretcher and 1 header pattern, the wall was 20m long and stood 21 courses high, whilst the archway was stepped back with bull-nosed bricks. Approximately 3m to the north-west of the arch the wall was stepped back by 0.15m and the brick work pattern became 1 stretcher 1 header. The archway was in-filled with yellow stained rubble with large quantities of ash and clinker. To the north-east of the RSJ's was a 3m square feature that comprised 2 parallel concrete walls oriented northwest-southeast and in-filled with a red brick pad [009]. A concrete floor was observed running below this pad and situated within wall [003]. This is interpreted as the firebox within the retort house with the brick pad forming a platform in the centre.

To the north-west of the northeast-southwest section of sandstone wall [004] was a sandstone block [010] with a vertical iron bar measuring 0.5m long and 0.1m in diameter located in the centre. To the north of [010] was a concrete wall [011] (**Plate 8**); however, this was heavily truncated and the full extent was indiscernible. Butting up against [011] to the north was a pad [012] made from machine-made bricks with rectangular frogs and a cement mortar bond measuring c. 2m long, 4 courses thick and 9 courses high.

A 0.4m thick concrete wall [013] was recorded in the northern corner of the site, orientated east-west. This feature is likely to have been associated with the depot rather than the retort house. A large concrete block [014] measuring 4m x 2m x 2m was recorded to the north-east of [010] and [011]. Having a well-finished surface and roughly poured base this feature was built on sandstone wall [004] and is likely to have been associated with the depot. To the north-east of [014] was a 1m section of machine-made rectangular frogged brick wall [018] with a cementitious mortar bond.

A large 0.5m diameter iron pipe [015] was observed running 15m in a south-westerly direction from the north-east section of the area in to the exhaustor house before dividing into 6 pipes (3 on each side) (**Plate 9**). In the north-west corner of the exhaustor house was a 2.5m square machine made red brick pad [016] with a sandstone or concrete block measuring 1m x 0.7m located in the centre. This structure was heavily contaminated with tar.

To the north-west of the exhaustor house and running along the northwest section was a northeast-southwest orientated red brick drain [017] with a sandstone slab top and concrete base (**Plate 10**). Measuring at least 6 courses deep, drain [017] was constructed with machine made 'stairfoot' frogged bricks with a dark grey cement mortar bond.

In the western corner of this area of the site was a c. 3m long by 1m wide sandstone wall [019] running northwest-southeast. To the south-west of [019] was a 3m square concrete pad [022] of unknown function and date. A red brick rectangular frogged wall [023] constructed in a 3 stretcher and 1 header pattern was observed adjacent to

[022] within the south-west section. Being on the same alignment to wall [008] and of similar construction this wall was possibly an internal wall of the exhauster house.

Excavation of an 8m by 8m area to the north-west of area A2 revealed natural grey clay at a depth of only 1m suggesting limited activity within this area. Two large iron pipes 0.3m and 0.4m in diameter were recorded above the natural running northeast-southwest. Sealing these pipes was a 0.8m thick deposit of clinker sealed by tarmac. A modern red brick drain head associated with the depot was also revealed.

### 5.3 Area A3: Meter House and Pump House

Removal of contaminated material within this area revealed a 0.45m thick limestone hardcore sealing a carbon rich subsoil and demolition rubble deposit overlying contaminated natural at a depth of c. 3m. A ceramic land drain and disassociated lengths of pipes were recorded within the building debris. The south and east wall of the tar and liquor tank were exposed within the south facing section of the area (**Plate 11**). The south wall was 7.5m in length by 1.3m high while the exposed length of the eastern wall was 4.5m and at least 4m high with the maximum thickness of both being 4 courses. The walls were both constructed from machine-made red brick laid stretcher and were cement bonded. The remains of two parallel walls were revealed 4m to the east of the tar and liquor tank walls. Spaced 2m apart, these walls were heavily truncated, but were at least 2.5m high and also constructed from machine made red brick laid stretcher and cement bonded.

Several concrete beams were recorded within the area probably associated with the foundations of the meter house although this is uncertain; however, no remains of the pump house were recorded and it is believed that the footings for the building were shallow and removed during the 1970s, with the debris from these structures forming the present ground.

### 5.4 Area A4: Purifiers

A concrete slab (**Plate 12**) and northeast-southwest brick wall (2 header/skin thick – machine made frogged brick) c. 27m in length by 0.25m wide and 3 courses in height were revealed during the initial stripping of the area. The concrete slab was found to be on two levels, being 0.45m higher to the east and dropping onto a 2.5m wide section. A further wall was located in the north-west corner, running northwest-southeast and comprised of a 1.3m deep by 0.57m wide section. The bricks measured 0.23m x 0.11m x 0.08m and were marked 'stairfoot'. To the east of the wall was a homogenous dark grey clay and brick rubble deposit. Trial pits within the purifier revealed a 'home-made' concrete below the 20<sup>th</sup> century concrete slab sealing a c. 0.4m pebbled hardcore overlying natural grey and buff-mottled clay. A stratigraphic sequence was revealed in the south-east facing section comprising a 0.12m concrete slab, 0.08m brick (firebrick) surface, 0.3m slag/clinker deposit, 0.3m crushed slag/clinker, 0.2m mid yellowish grey clay, 0.3m brownish grey clay with occasional stone, below which was a grey clay alluvium.

### 5.5 Area A6: C.W.G Plant and Boiler House (Illustration 4)

Three test pits were excavated by machine within this area.

### **5.5.1 Test-pit 1**

Test-pit 1 revealed a 0.2m thick concrete slab with reinforcement bars below which was a 1.2m of yellowish brown clay and 1m of dark greenish grey clay with frequent organic inclusions.

### **5.5.2 Test pit 2:**

Removal of 1.2m of soil and brick ('stairfoot' and firebricks) overburden revealed a brick structure within which the test-pit was dug. A 0.6m concrete slab was recorded below the overburden and in turn sealed dark grey silt/sand/clay.

### **5.5.3 Test pit 3**

Test pit 3 was only 1m deep and contained modern back fill and 2 upstanding steel pipes.

Concrete foundation bases and red brick walls associated with the CWG plant were revealed during the works. Several large pipes [035] (either gas or steam) were observed cutting across the site whilst the general stratigraphy was 1 – 1.5m thick clinker made ground around and above the gas works structures. It is thought that the clinker may have derived from the demolition of the boiler house. Contaminated natural sandstone clay was below the clinker. To the north of the clinker was an area of brick and concrete rubble situated where structures associated with CWG plant stood. A large gas pipe [024] ran north-south along the western edge of this area, and several other pipes were also observed. The stratigraphy recorded in the north facing section comprised 0.4m loose mid-grey clay-silt with brick rubble inclusions, 0.6m firm mid yellowish brown silty clay (puddle clay), 0.5m contaminated firm mid yellowish grey clay natural. A 2.5m wide by 1.2m deep gas works concrete base [025] was recorded to the west of the oil tank [026] and was probably a base for machinery within the scrubbers building.

Located within the west facing section to the north of a clinker deposit was a structure [027] associated with the CWG plant and boiler house (**Plate 13**). Comprised of four red brick walls built on a 0.8 – 1m thick gas works concrete slab and sealing a contaminated natural, this structure was bonded with light brown cementitious mortar and recorded to 12 courses high (0.8m) and 2 skins wide (0.25m), the walls being placed 0.7m apart. This structure was overlain by 0.3m of modern yellow limestone hardcore. A further section of concrete was recorded to the north of this structure. This was sealed by a 0.5m thick modern grey concrete.

The south facing section revealed pipes [028] at the western end (**Plate 14**). To the east of these pipes were yellowish beige firebricks, possibly forming a wall associated with the boiler house. Further east, an area of brick rubble was recorded. This contained machine-made bricks with rounded frog and 'stairfoot' stamp. A red brick structure [029] protruded from the section at a slight angle to the east of the rubble. The wall measured 12 courses high (c. 1m) and was built from standard sized dark pinkish red machine-made bricks, with shallow square frog with two rounded indents and bonded with black ash mortar. To the east of the wall was a 1m high gas works concrete base [030]. The wall was flush with the base at the west end and the concrete base continued in section to the east. A surface constructed of modern blue engineering bricks laid on stretcher edge was recorded to the east of the concrete base.

A 3m square concrete structure [031] with a hollow centre was revealed within the middle of the area (**Plate 15**). The walls were 0.3m thick and exposed to 0.9m in depth and constructed from gas works concrete and built on a gas works concrete base that extended to the west and south of the structure. A further gas works concrete structure [032] with metal reinforcement bars sticking up was recorded to the west of the square concrete structure. This was interpreted as a possible machine base. A further concrete base [033], rectangular in shape, was located to the north-east. This structure was revealed on the edge of the machine access ramp exposing two sides. These were constructed from concrete with reinforcing bars sited on a gas works concrete base and measured c. 0.4m thick by at least 1m deep. Within the area behind the walls was a deposit of black clinker. A small thin concrete square pad [034], also constructed from gas works concrete, protruded southwards from the rectangular pad at the eastern end. Recorded at a lower level this pad was constructed on the underlying natural.

Two test pits were excavated to the north of area A6 for sample collection and revealed a stratigraphic sequence of 0.05m thick tarmac sealing a limestone hardcore overlying contaminated soil and demolition rubble to a depth of 3m.

Maps of the site show the boiler house on the west side of the CWG plant suggesting that the structures exposed in the south facing section were associated with the boiler house whilst the structures in the west facing section were related with the CWG plant.

## 5.6 Area A7

Excavation within this area revealed 2m of contaminated soil with a small quantity of building rubble overlying 0.75m of black-grey contaminated clay, sealing 1m of yellow contaminated natural clay. No structures were revealed.

## 5.7 Area A8: Oxide Shed

A large trench was excavated within this area and revealed brick walled structures at the western extent. A wall foundation with return northwest-southeast and northeast-southwest was observed with possibly the northwest-southeast wall recorded in the east facing section. All the bricks were frogged either standard square, 'stairfoot' or with two round indents and measured 0.235m x 0.11m x 0.075m. Seven courses in height and 4 courses in width were recorded, bonded with a dark grey mortar within the south facing section, c. 2m below the trench surface (**Plate 16**). The wall extended 3m northwest-southeast and 2m northeast-southwest. A concrete slab was recorded above the wall in the east facing section. Towards the eastern end of the trench were two further walls, recorded in the south facing section. Measuring 1m in length and 1m below the trench surface, these walls were 4 courses high and c. 0.15m wide. The layers between the walls comprised grey and brown clay, with occasional patches of bedrock or sandstone. At the eastern extent of the trench were two pipes that ran into Gasholder No. 1.

## 5.8 Area B1: Gasholder No.2

Initial stripping of the area revealed a wall 4 bricks wide comprising machine made frogged bricks with a rubble infill. The wall was carefully constructed in alternating stretcher and header bond. A series of vertical 0.05m diameter metal rods positioned

3m apart were recorded protruding from the upper surface of the brick work and were probably used to attach a super-structure. A brick tank lining wall c. 0.6m wide (2 courses) was revealed. The bricks measured 0.23m x 0.11m x 0.08m and were machine-made and frogged. A metal rail was recorded on the west side of the gasholder and two metal pipes approximately 2 inch in diameter were revealed on the east and south sides.

A sump excavated within the north-east corner revealed two large sandstone blocks laid into the inner face of the red brick structure with pipes sticking out above these. The bottom sandstone block was long and thin, whilst the upper one was small and square (**Plate 17**).

## 5.9 Area B2: Oil Tank and Scrubbers

A circular concrete base (**Plate 18**) measuring 6m in diameter was recorded. This was probably associated with the oil tank. Below this feature was concrete rubble. A pipe with a concrete casing was recorded within the east facing section, whilst wooden shuttering for puddle clay was also visible.

## 5.10 Area B2-A: Car Park (Illustration 5)

A large T-shaped steel reinforced concrete structure [036] at least 1.5m deep was recorded within the north-eastern half of the area and was likely to be associated with the depot although an association with the dri gas plant cannot be excluded. To the south-west of the concrete structure were two parallel dark grey concrete wall segments [037] (0.5m wide x 2m long x 1m deep) and an iron pipe [050] aligned northwest-southeast and positioned 1m apart. It is likely that these were associated with the Dri gas plant as they were on the same alignment as that depicted on the historical maps. To the south of these walls and pipe was an irregular shaped concrete block [038] measuring c. 2m square. Two red brick walls [039], each 2 skins thick, were observed in the south-east facing section. These are likely to be the remains of an out building associated with the depot constructed from rectangular frogged pink cementitious mortar-bonded bricks. An iron 'shut-off' valve [040] was recorded in-situ centrally positioned between the concrete and red brick walls (**Plate 19**).

Within the south-western corner of the area was a cast iron drain head [041] probably aligned northwest-southeast and associated with the pipe work. To the south-west of the drain head was a northwest-southeast aligned rectangular frogged red brick wall constructed on a concrete footing [042] that was probably associated with the Booster House. Measuring at least 5m long this wall was 3 skins thick with a light grey cementitious mortar bond. Two further red brick walls [043] and [044] (**Plate 20**), 2 skins thick and aligned northeast-southwest, were recorded in the northeast facing section and were likely to be internal structures and associated with the wall above. Large diameter steel and iron pipes [045] - [049] were also uncovered within the area and are thought to have been part of the depot.

# 6 ARTEFACTS

## Pottery by Dr C. Cumberpatch

A single sherd of pottery from the site was examined and proved to be part of a

transfer-printed Whiteware plate bearing the Albion design on the inner surface. The design was characterised by a rural scene in the centre surrounded by a border consisting of small vignettes separated by ferns. This pattern was manufactured widely by potteries throughout the country from the mid 19th century onwards, and was one of the commoner designs of the period (Willow, Asiatic Pheasants and Wild Rose enjoyed similar popularity). The thickness of the sherd suggests that it might be from a large plate or even a serving platter or carving plate.

## **7 DISCUSSION AND CONCLUSIONS**

### **7.1 Areas A1 and B1: Gasholder No.1 and No.2**

Although the decontamination works within the gasholders was not part of the watching brief several features were revealed. It is known that the two gasholders (Nos. 1 and 2) had been constructed by 1890. Both gasholders possessed in ground tanks which were of brick construction and measured 8m and 10m in depth, respectively. There was no evidence for significant rebuilding of the structures, although it would be impossible to identify the replacement of a smaller holder in the same position. The watching brief revealed iron carriers/rods within the sides of the tanks indicating the presence of a super structure. An unusual square brick structure within the centre of the tank was revealed and was probably a housing for an outlet or inlet pipe or a possible brick dumpling (upturned brick cone) in the centre to facilitate the movement of the holder using a minimum quantity of water. Further pipes recorded within the sides of the tanks probably functioned as inlet and/or outlets for the gas.

### **7.2 Area A2: Retort House, Exhauster House and Coal Store**

Area A2 revealed remains of the Retort House, Exhauster House and Coal Store that were first depicted on the Ordnance Survey map of 1890. Plans of the retort house indicated that it had changed little during its existence, apart from the addition of an Engine House, attached to the north-west corner of the building by 1940. The watching brief revealed that the retort house and exhauster house had been constructed from sandstone blocks, the retort house having a brick inner skin. The vaulted arch recorded within the south-west wall is believed to have been a flue, allowing sufficient draft to feed the firebox. None of the retorts within the building were recorded and it is unlikely that these would have survived on site after the site had been decommissioned in 1960s. However, it would appear that alterations within the retort house were undertaken during the lifetime of the building with the erection of a row of RSJs. Although it is unclear as to the exact function of these RSJs, whether they supported the retort structure itself or, possibly, flooring. These changes, however, were not uncommon as retorts had a maximum life expectancy of around 10 years and their replacement necessitated removal of the arched firebrick structure (called benches, beds or settings) surrounding them (Hamond 1989). Furthermore, designs of retort positioning etc. changed throughout the period of the buildings existence and it is unlikely that the same configuration existed continuously. The number of retorts and the direction in which the retorts were set is not known, and because they would have been held in at a higher level in the structure they would have been subsequently lost through truncation. Cast iron retorts were originally used in the early days of gas lighting, although these were almost universally



replaced by ceramic (fireclay) retorts. The retorts were initially horizontally set (although over time this changed either to inclined or vertical), and rounded, elliptical or D-shaped in cross section (Newbigging 1913). They were closed at one end and had a hinged-door at the front end. Low ash coal was fed into the length of the retorts. A firebox below the retort bench was fed with coke to heat the retorts and bake the coal at temperatures of around 1100c°. The coal gave off its gaseous content which passed up accession pipes into a hydraulic main, a water trough in which tar condensed out and was collected in adjacent tank. It is likely that the hopper [007] recorded to the north-east of the retort house was utilised to collect this tar. As the gas was given off, so the coal converted to coke. Once most of the gas had been removed the coke was removed from the retort and used in the firebox to bake more coal (Hamond 1989). Ash was collected in a pit below the firebox and was periodically emptied. A chimney often provided an exhaust for, and the necessary draught through, the firebox. The red brick pad [009] recorded adjacent to the RSJ's is possibly a chimney base although the lack of burning on the upper surface may indicate another function for this feature. A coal store is recorded on plans adjoining the retort house and although the watching brief failed to indicate the function of this building it is clear that the proximity to the retort house was essential to furnish the retorts with the material to produce gas.

The purpose of the exhauster, housed within the exhauster house, was to relieve the retorts of the pressure caused by the obstruction offered to the gas in its passage through the purification process (Newbigging 1913, 122). Brick pads [012] and [016] recorded within the exhauster house are likely to have supported the exhauster machinery, whilst pipe [015] was the outlet pipe for the gas after it had travelled through the exhauster house. Plans of the exhauster house record a small building attached to it on the western side and it is likely that this building was recorded during the watching brief with brick wall [023] being its western wall. A concrete pad [022] within this building suggested that it had housed some form of machinery, however, no remains of this equipment were recorded and it was unclear what function this building had served.

To the northwest of the exhauster house was a red brick drain [017] with a sandstone slab top and concrete base. Being constructed of 'stairfoot' frogged bricks it is likely to have been built when the site was redeveloped during the construction of the Carburetted Water Gas plant. It is probable that the drain serviced the buildings on the site and possibly fed into the river Dearne to the south.

Modern features were recorded within this area and truncated the gas works buildings and are likely to have been associated with the 1970s depot.

### **7.3 Area A3: Meter House and Pump House**

The tar and liquor tank built prior to 1904 appears to have been little changed throughout its history. Tar and ammoniacal liquor underground wells were generally built of either bricks laid in cement and carefully puddle or of cement concrete rendered over the whole inside surface, or formed of iron or steel plates (Newbigging 1913, 145). The watching brief revealed a brick and cement mortar bonded tank and although no puddling was recorded, the tank must have been of sufficient quality to perform its required function and to have functioned for the duration of the lifespan of the gas works. Furthermore, it is possible that the brick-lined tank contained a metal tank within that would have been removed during decommissioning of the site. Limited remains of the Meter and Pump House were recorded and it is assumed that

their foundations were not that substantial and had been removed during the demolition of the gas works site in 1964.

#### **7.4 Area A4: Purifiers**

The bulk of the machinery on a gas works site is generally given over to purification of the gas produced in the retort house (Hamond 1989). The three main impurities found in raw coal gas (tar, ammonia and hydrogen sulphide) had to be removed before the gas could be distributed to the consumer. Once through the hydraulic main the gas passed into condensers which cooled the gas and removed any residual tar not removed in the main. Tar collected in wells and was transferred to an external tank often being sold for refining into pitch or creosote or other by-products. Gas was then passed into an exhaustor, which transferred the gas through any remaining purification plant (washers and scrubbers to remove ammonia, beds of iron oxide to remove the hydrogen sulphide) to the gas holder via a station meter (which gas regulated production).

According to Newbigging (1913, 160) the housing for the purifiers should be lofty and well ventilated and this is best attained by having one side of the structure entirely open. Furthermore, it is convenient to build the house on two levels, placing the purifying vessels on the upper floor. It is known that the purifiers within Area A4 were utilised by the CWG plant, constructed between 1906 and 1930 and contained 16 purifying vessels. If the purifiers were of a similar construction to that described by Newbigging, it would explain the absence of any features associated with the purification process other than the concrete slab. The suggestion of an earlier 'home-made' concrete surface below the upper slab may indicate that the Purifying House had undergone at least one adaptation, although this may have simply been resurfacing. Furthermore, the use of two types of bricks (machine-made frogged brick and 'stairfoot') within the buildings construction probably suggests two phases of construction

#### **7.5 Area A6:C.W.G Plant and Boiler House**

Prior to the historical plan of 1930 no development had been recorded within this area of the site, suggesting that the Carburetted Water Gas (CWG) plant was the first building to have been constructed in this area. This is supported by the findings of the watching brief which did not reveal any earlier features. The Carburetted Water Gas method of gas-manufacturing was invented by T.S.C. Lowe and was able to make much more gas per day than could coal-gas benches, in addition, there was a saving on labour and operating space. By the early 1900s, the standard brick manufactured gas plant had given way to a steel-framed brick-facade generator building of slightly taller nature, to accommodate the usual two-story layout of carburetted water gas, probably explaining the limited structural remains of the building itself. Archive photographs of the CWG plant under construction show a steel-framed building with several concrete bases within. The CWG plant would have consisted of a generator, carburettor, superheater, condensers, purifiers and relief gas holder. In some cases the carburettor and fixing chamber were constructed in one.

The generator would have been a steel cylinder, fire brick lined, with furnace feeding door at the top and clinkering doors near the base. Between the steel shell and the fire brick lining a non conducting material was used to conserve the heat or minimize its loss.

The carburettor was of similar construction to the generator, and was filled with chequer bricks so arranged as to form a series of baffles to the gas. At the top of the carburettor heated oil was sprayed in the form of mist and would have met the gas from the generator.

From the carburettor the gas passes on to the superheater (or fixing chamber) which also contains chequer bricks similar to the carburettor, and in this chamber the gas is made permanent.

The gas was made by admitting superheated steam at 100 to 120 lbs pressure through the bed of incandescent coke in the generator, where it is decomposed into its constituent gases, oxygen and hydrogen. The resultant oxygen combined with the carbon of the coke, formed carbon dioxide, which, rising through the higher layers of the incandescent coke, was reduced to carbon monoxide, and this mixed with the hydrogen constitutes what is known as 'blue' gas. This is non luminous, and is afterwards enriched with oil in the carburettor as above mentioned, which imparts to the gas its light - giving properties ([www.hatheway.net](http://www.hatheway.net)).

The concrete base, structures and brick walls recorded during the watching brief clearly formed the bases on which the CWG equipment stood on or within; however, without detailed internal plans of the CWG plant it was difficult to determine which specific gas production processes individual structures related to. It is reasonable to state that the oil tank base supported the tank that supplied the oil sprayed within the carburettor. Furthermore, the concrete structure [031] with a hollow centre is likely to have been a tar tank, whilst the concrete structure [032] with metal reinforcement bars sticking up clearly retained machinery that required to be securely fastened, such as the air blower. The pipes recorded within the area either supplied steam for the CWG process, or were outlets for the gas to be purified.

## **7.6 Area A8: Oxide Shed**

The walls recorded within this area are likely to have been associated with a Liquor Store and Oxide Shed. Documentary evidence suggested that these were constructed prior to 1930 and probably part of the redevelopment of the site at the same time the CWG plant was built. As part of the purification process, beds of iron oxide were used to remove the hydrogen sulphide; the iron oxide shed was in the area where the spent material would have been spread to remove its sulphur content before being re-used. The liquor contained within the Liquor Store would have been sold to purchasing contractors. However, to dispense the liquor, an elevated cistern or tank would have been required to enable the liquor to be discharged. These would have been removed during the initial decommissioning of the site in the 1970s and therefore left no remains.

## **7.7 Area B2: Oil Tank and Scrubbers**

The site plan of 1952 shows a small oil tank and two scrubbers located to the north of gasholder No. 2. The principle function of the scrubbers was to remove the ammonia, other gaseous impurities and any floating particles of tar. This was undertaken by machinery that would have been removed when the site was decommissioned; however, the pipe sealed in concrete, recorded within the area, may have been associated with the scrubbing process and may have fed the apparatus. The puddle clay recorded nearby was probably utilised to ensure the pipes were fully sealed.

## 7.8 Area B2-A: Car Park

The large T-shaped steel reinforced concrete structure [036] recorded within this area is likely to be associated with the depot due to its orientation and the cartographic evidence indicating pipe work on a concrete base within the area.

Documentary evidence indicates that the Dri Gas plant had been constructed sometime between 1952 and 1964, whilst the Booster House was constructed c. 1952, around the same time as gasholder No. 3. The site plan for 1952 shows gasholder No. 3 with a gas pipe leading to the Booster House. No structural remains of the Dri Gas plant building were recorded during the watching brief; however, internal features including wall segments [037], pipes [050] and an irregular shaped concrete block [038] were recorded. The iron 'shut-off' valve [040] is likely to have been associated with the Dri Gas plant and was clearly used to stop the gas from flowing. Brick walls associated with the Booster House were recorded with other walls suggesting internal partitioning of the building. Large diameter steel and iron pipes [045] - [049] were also uncovered within the area and are thought to be associated with the later depot.

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## 9 ILLUSTRATIONS

## 10 PLATES