Former Gasworks, Dawes Lane, Scunthorpe

Phases 1 and 2

Historic Building Investigation and Recording

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Former Gasworks, Dawes Lane, Scunthorpe: Phases 1 and 2

Historic Building Investigation and Recording

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Summary

Oxford Archaeology was commissioned by Montagu Evans LLP on behalf of National Grid to create an Historic Building Record of two gasholders and their ancillary buildings at the former gasworks at Dawes Lane to the east of Scunthorpe centre.

Scunthorpe's gasworks was relocated to this site and began production in early 1924. The switch to natural gas during the 1970s led to the closure and demolition of the gasworks, although the gasholders were retained for storage and the site converted to a gasholder station. Changes in gas distribution in the previous decades have rendered gasholders redundant and the gasholders were isolated from the mains and decommissioned some time prior to this survey.

Gasholders 1 and 2 were above-ground spiral-guided gasholders; Gasholder 1 was constructed in 1922, although the two lifts were replaced in 1958, Gasholder 2 was built with three lifts in 1950.

The historic building recording has focussed upon researching the history of the site and photographing the structures and their context before and during their dismantling. Phase 1 of the project comprised the recording of the gasholders and associated structures in their context prior to work on site and Phase 2 comprised the recording of the gasholders during their demolition, and the information used to update the Phase 1 report.

The wider programme of recording work of the remaining gasholders across the country will allow a comparison of the structures between sites.

1 INTRODUCTION

1.1 Project Background

1.1.1 Oxford Archaeology (OA) was commissioned by Montagu Evans LLP, on behalf of National Grid, to undertake historic building recording of the decommissioned gasholders at the former gasworks at Dawes Lane, Scunthorpe in two phases: Phase 1 of recording, prior to their demolition, was undertaken and an illustrated report issued; Phase 2 was undertaken during the demolition work and incorporated the internal areas of the gasholders and the information and images used to create this updated report. Two ancillary buildings within the site boundary were also recorded during the project.

1.1.2 The work forms part of a wider national project agreed between Historic England and National Grid to record gasholders and gasworks before and during their dismantling, including those which are not listed or of only local interest.

1.1.3 The former gasworks at Dawes Lane, hereafter referred to as 'the site', is situated to the east of Scunthorpe town centre, approximately 1.3km or just over three quarters of a mile north-east of the Church of St Lawrence (Figure 1).

1.2 Aims and Objectives

1.2.1 The principal aim of this project is to document the history and development of the site and to record and interpret the structures on this site before and during their demolition. The information will be presented in the form of a written, illustrated report and archive.

1.3 Methodology

1.3.1 This report has been produced in accordance with the brief produced by Montagu Evans LLP on behalf of National Grid and is based upon on-site investigation and documentary research. As specified in the brief, a 'Basic Level 2 survey' was undertaken which was largely photographic and descriptive in nature. The level of recording undertaken in the wider project to record gasworks have previously been agreed with Historic England on a portfolio basis.

1.3.2 The 'Basic Level 2' record is adapted from the Historic England guidelines in *Understanding Historic Buildings: A Guide to Good Recording Practice* which states that a Level 2 is: *'… a descriptive record, made in similar circumstances to Level 1 but when more information is needed. It may be made of a building which is judged not to require a more detailed record, or it may serve to gather data for a wider project. Both the exterior and interior of the building will be seen, described and photographed. The examination of the building will produce an analysis of its development and use and the record will include the conclusions reached, but it will not discuss in detail the evidence on which this analysis is based. A plan and sometimes other drawings may be made but the drawn record will normally not be comprehensive and may be tailored to the scope of a wider project.*'

1.3.3 The work comprises three principal elements: a photographic, a drawn and a written record.

The *photographic record* is intended to act as a general record of the structures prior to demolition and includes photographs of the exterior and interior, and details and fixtures. Digital photographs, in jpeg format, were taken using a camera with up to 24-megapixel capability.

For the *drawn record*, the surviving engineering site plans were made available to OA by the National Gas Archive. These drawings were used as a basis for the archaeological recording; locations of features being verified, the addition of further annotations for interpretation, and recording additional information.

The *written record* consists of field notes and annotations that complement the photographic and drawn records and add further analytical and descriptive detail. The written record also incorporates documentary research carried out at the Lincolnshire County Record Office, the Local Studies collection of Scunthorpe Central Library and from secondary sources. A National Grid Gasholder Station Manual dated 2008 was provided by Advisian which informs much of the technical detail.

1.3.4 This site is not included in Historic England's Monument Protection Plan (MPP) Step 3 report for the gas industry.

1.3.5 The site visit to record the structures in their context was carried out on Friday 6th July 2018. Further visits were carried out on the 17th and 30th October 2019 during the demolition of the gasholders.

2 HISTORICAL BACKGROUND

2.1 Introduction

2.1.1 The formation of the town of Scunthorpe, particularly its industrial history which caused the amalgamation of the Scunthorpe, Frodingham, Brumby, Ashby and Crosby settlements into the new town of Scunthorpe, have been studied and widely published and so this historic description will concentrate solely upon the immediate area of the former gasworks.

2.1.2 The site lies upon the sedimentary bedrock of the Frodingham Ironstone Member. There are no recorded superficial deposits, although the sand deposits of the Sutton Sand Formation have been recorded in the areas surrounding the site.

2.1.3 There are no records for this site held by the North Lincolnshire Historic Environment Record which have been made available via the Heritage Gateway website; the closest find spot noted in this resource is the find spot of two Roman coins found in the former ironstone mine at Glebe Road, approximately 485m to the north-west of the site.

2.1.4 Three listed buildings are in the vicinity; the former Church of St John, a grade II* listed late 19th-century building is 170m to the west of the site; the Ukrainian Catholic Church, a grade II listed late 19th-century building, and Scunthorpe Mill, a mid 19th-century windmill tower are approximately 600m to the south. None of the listed buildings are associated with the site and only the former Church of St John is intervisible with the site, that being a glimpsed view obscured by buildings and trees.

2.1.5 The site is not within a Conservation Area and is neither associated with or intervisible with the closest, the Old Crosby, Scunthorpe Conservation Area 1km to the north-west.

2.1.6 The site appears to have been in agricultural use prior to the construction of the gasworks in the early 1920s, however, the surrounding area had been industrialised since the 1860s with the construction of the surrounding iron works. A map regression of the Ordnance Survey (OS) maps of 1886 onwards shows the vacant site to the north of Lindsey Iron Works and to the west of the houses along Trafford Street, demolished in the late 1960s or early 1970s. The Trent Iron Works were farther to the east of the site and Frodingham Iron Works farther to the south. To the north of the site was the railway line which ran between the iron works and the ironstone quarries to the north of the town. By the edition of 1907, an earthwork bank is shown at the south of the site which is still reflected in the present lie of the land. The reason for the bank is not evident in the OS maps, although in some of the plans of the later gasworks, it is marked ‘pond’, evidently dug into the top of the raised bank and possibly linked to the drainage scheme.

2.1.7 Dawes Lane has always formed the southern boundary of the plot of land and is presumably named after the Dawes brothers, William Henry and George, who, as ironmasters and owners of several successful iron works, set up the Trent Iron Works to the east of Scunthorpe in 1864, which marks the beginning of the industry in the area.

2.1.8 The railway to the west of the site is the Winteringham Branch of the North Lindsay Light Railway which opened in 1906. The gasworks had its own railway sidings

constructed at the western part of the site to enable the efficient transport of fuel and by-products.

2.2 Scunthorpe's Gasworks

2.2.1 The first gas supply, to the street lights and later some of the houses, was provided by the Frodingham Iron Company's gas works at their iron works from 1870, however, the expanding iron working industry in the area, and the subsequent increase in population in Scunthorpe and the surrounding villages required a much higher output and so The Scunthorpe Unitary District Council obtained an Act in 1899 and the first town gasworks in Scunthorpe was constructed in 1901 to the west of the town, some way from the built-up area. After a period of operating with the plant in disrepair, a new gasworks to the east of the town was commissioned in 1921 and, following delays by financial constraints and strikes, the new gasworks finally opened in early 1924. Municipal swimming baths were built on the old site in 1932.

2.2.2 The plant at the new gasworks was radical in its design and differed from the standard production at other sites (a general description of the most common gasworks processes and equipment is provided in Appendix A). This departure from the norm, at an almost experimental level, was designed mainly by the contractor, Ashmore, Benson, Pease and Co., and the engineer JF Simpson, who took over from his predecessor Samuel Moore mid-way through the design. A plan drawn by Moore in 1920 exists in the National Gas Archive for a column-guided gasholder with a reinforced concrete tank, although evidently this was not constructed.

2.2.3 The results of the output of the new works were discussed at length in two articles in the Gas Journal and appear to have had mixed results in the efficient production of high calorific gas supplied to the consumer at a reasonable pressure. Connections to the gasholders were as far apart as possible to facilitate mixing of the gas, but the calorific value of the gas piped to the town was still occasionally 'patchy' according to the fuel used.

2.2.4 Gasholder 1 was part of the original construction of the gasworks in 1922 (although its lifts were replaced in 1958). A small relief gasholder, with an approximate diameter of 58 feet (approximately 17.7m) was originally to the south of the site (Figure 2) but was replaced by Gasholder 2 in 1950.

2.2.5 In 1949, the gas industry was nationalised and the gasworks became part of the East Midlands Gas Board. The change from town gas to the cleaner natural gas during the 1970s caused the gasworks across the country to be decommissioned, although many gasholders were retained for storage and the gasworks sites converted to gasholder stations. The two gasholders had been decommissioned and isolated from the network for some time prior to their demolition.

3 DESCRIPTION OF THE SITE

3.1 Introduction

3.1.1 The site is located to the east of Scunthorpe at the western edge of the industrial area on which the iron works were first established in the 1860s. The site was much reduced in size when it was converted to a gasholder station and much of the gasworks site is now in other use. The gasholder station is bounded to the south by the Cadent compound which is now between the site and Dawes Lane to the south (Plate 1). To the west is a haulage company on part of the former gasworks site (Plate 2). To the north and east is a former chemical works which appears to be at least partially occupied by the haulage company (Plate 3). A portion of the former chemical works site to the north of the gasholder station was formerly part of the gasworks, but the eastern boundary of the current site has remained the same.

3.1.2 The site contained two gasholders and two brick buildings (Figure 3). The open-air pressure reduction station to the west of the gasholders (Plate 4) and several telemetry kiosks and other temporary buildings across the site are not included in the survey other than for context (Plates 5 & 6). The site is covered in gravel and clinker spread between tarmacadam areas. Figure 4 indicates the location and direction of the images included as plates.

3.1.3 The gasholders were visible from Brigg Road, the main through-road to the west, although this view is dominated by the large warehouse-style building to the roadside, partially obscured by trees and separated from the road by a car park. They were also visible from much of the industrial area.

3.2 Gasholder Number 1

3.2.1 Information from the gasholder station manual states that the gasholder was a spiral-guided gasholder with two lifts (Plate 7). The diameter of the tank was 115 feet (approximately 35m) and the depth 28 feet (approximately 8.5m); the two lifts were marginally smaller. The maximum capacity was 500,000 cubic feet (approximately 14,158 cubic metres). The steel tank was partially buried, the walkway at the top of the tank being approximately 24 feet (approximately 7.3m) above ground level. The ground level around the tank had been cut away slightly to minimise the contact between the ground and the metal and the underground portion of the tank had been treated with Protegol anti-corrosion coating. The tank dated to 1922 and was of riveted construction; the plates decreasing in thickness with the height of the tank. Each band was joined with one row of rivets to that above and below and each plate joined to the adjacent plate with two rows of rivets to the upper three bands, three rows to the fourth band from the top and four rows to the lowest visible band which was partially below ground level. Standards were riveted at regular intervals around the tank, supporting the walkway. Separate brackets supported the handrail (Plate 8). The external finish of the gasholder, according to the manual, had previously been dark green with yellow handrails and standards although the tank and standards were mid-brown with both yellow and orange handrails at the time of demolition.

3.2.2 The lifts were replaced in 1958 with lifts constructed from welded sheets between, according to the gasholder station manual, one-eighth and five-sixteenths of an inch (3.2-7.9mm) thick. The rise of the crown was approximately 5 feet (approximately 1.5m) and constructed of welded sheets of between three-sixteenths and half an inch (4.8-12.7mm) thick (Plate 9). There are no surviving records of the builders of the tank, although the replacement lifts were constructed by McKenna Construction Ltd.

3.2.3 Only the tank and crown were visible at the time of the Phase 1 survey as the lifts were all retracted in the tank. The slightly extended lifts of both gasholders can be seen on Google Streetview images dated October 2008, although little detail can be seen (Plate 10). The stairs for the lifts were at the north-west and south of the gasholder (Plates 11 & 12).

3.2.4 There was a pair of inlet and outlet pipes to the south-west of the tank (Plate 13). A further pair were previously to the north-west but the dry well had been covered with a metal grid (Plate 14), although it was evident where the supporting brackets had been removed from the tank. A steel staircase provided access at the west of the tank, which had been set unusually well away from the tank, the reason for which was not apparent (Plate 15). The lagged anti-freeze pipe ran around the lower part of the tank and rose behind the inlet and outlet pipes, supported above the tank and into the water (visible in Plates 13 and 15).

3.2.5 The walkway at the top of the tank was accessible during the initial visit. The arrangement of the roller carriages indicated the lifts rotated in alternating directions as they rose (Plate 16).

Interior:

3.2.6 The interior of the structure was photographed from the outside of the gasholder through newly-formed openings cut through the tank and lifts following the de-sludging of the tank and prior to the removal of the crown (Plate 17). During the mid-demolition visit to Gasholder 2, elements of Gasholder 1 which were still in-situ were photographed, the removal of its crown having exposed further details.

3.2.7 After the opening in the side of the tank and lifts had been cut, it was apparent that the panels of the lifts and the spiral guiding beams had welded joints (Plates 18 & 19). The lower band of the tank and the band above that were each 14mm thick and the following band 12mm, no others could be accessed to be measured (Plate 20). The thickness of the steel plates of the lifts had been provided by the gasholder station manual (discussed previously), but the individual measurements not given. The dross left on the metal from the cutting torch prevented accurate measurement, but the sheets of the inner lift which could be accessed were approximately 4mm thick, the sheets of the outer lift approximately 3mm thick (Plate 21). I-section universal columns were attached to the inner face of the inner lift which supported the edge of the domed crown structure.

3.2.8 The domed structure of the crown was covered with welded steel plates on a frame of concentric steel rings supported by radial members spanning between the inner lift and the central post (Plates 22 & 23). The trusses consisted of principal trusses with two intermediate trusses between each (Plate 24). The principal trusses were formed

from a tie bar spanning between the inner lift and the base of the steel post and braced to the radial members; the intermediate trusses consisted of four chords spanning between the second concentric ring and the inner lift, braced to the radial members. The central steel post of the crown supported the dome as it rose and fell and was itself supported by a further steel post in the centre of the tank when the gasholder was empty. Each structural element of the crown structure was rivetted.

3.2.9 The internal vertical members of the inlet and outlet pipes remained in the interior of the tank (Plates 25 & 26). The floor of the tank consisted of rivetted steel sheets over a concrete base (Plate 27).

3.3 Gasholder Number 2

3.3.1 Information from the gasholder station manual states that the gasholder was a spiral-guided gasholder with three lifts (Plate 28). The diameter of the tank was 126 feet (approximately 38.4m) and the depth 31 feet and five inches (approximately 9.5m); the lifts marginally smaller. The maximum capacity was 1.1 million cubic feet (approximately 31,149 cubic metres). The steel tank was partially buried, with approximately half a metre of the tank below ground; the ground level around the tank cut away slightly to minimise the contact between the ground and the metal. The underground portion of the tank had been treated with Protegol anti-corrosion coating. The tank dated to 1950 and was of riveted construction; the plates decreasing in thickness with the height of the tank, from thirteen-sixteenths to 3-eighths of an inch thick (approximately 20.6mm to 9.5mm). Each band was joined with one row of rivets to that above and below and each plate joined to the adjacent plate with two rows of rivets to the upper three bands, three rows to the fourth band from the top and six rows to the two lowest bands. Standards were riveted at regular intervals around the tank, supporting the walkway. Separate brackets supported the handrail.

3.3.2 The lifts were constructed of welded sheets between three-sixteenths and three-eighths of an inch thick (approximately 4.75mm to 9.5mm). The rise of the crown was approximately six feet (1.8m) and constructed of welded sheets of between three-sixteenths and quarter of an inch thick (approximately 4.75mm to 6.35mm) (Plate 29).

3.3.3 The gasholder was constructed by Newton, Chambers and Co Ltd of Thorncliffe near Sheffield, manufacturers of gas works and chemical plant, heating apparatus and, amongst other things, Izal disinfectant. The external finish of the gasholder, according to the manual, had previously been dark green, with yellow handrails and standards although the tank and standards were mid-brown with both yellow and orange handrails at the time of demolition.

3.3.4 Only the tank and crown were visible at the time of the Phase 1 survey as the lifts were all retracted in the tank. The slightly extended lifts of both gasholders can be seen on Google Streetview images dated October 2008, although little detail can be seen (Plate 10). The stairs for the lifts were at the north-west and south-west of the gasholder (Plates 30-33).

3.3.5 A pair of inlet and outlet pipes were to the north-west of the tank. A further pair were previously to the south-west but at the time of the initial survey the dry well was covered with a metal grid, although it was evident where the supporting brackets had

been removed from the tank (Plate 34). A steel staircase provided access at the north-west of the tank (Plate 35). Railings were around the perimeter walkway at the top of the tank. The lagged anti-freeze pipe ran around the lower part of the tank and rose at the south of the tank, supported above the tank and into the water (Plate 36).

3.3.6 The walkway at the top of the tank was accessible during the initial visit. The arrangement of the roller carriages indicated the lifts rotated in alternating directions as they rose (Plates 37 & 38).

Interior:

3.3.7 During the mid-demolition visit to Gasholder 1, the tank and lifts of Gasholder 2 were being cut and Plate 39 shows the tank, outer and middle lifts cut, exposing the inner lift prior to cutting. The interior of the gasholder was sound enough to be accessed through the newly formed openings cut through the tank and lifts following the de-sludging of the tank and prior to the removal of the crown (Plate 40).

3.3.8 Following the cutting through the tank, it was apparent that the lifts were formed from welded panels which, unusually, had been set diagonally, alternating in direction between lifts and opposite to the direction of the welded spiral guiding beams (Plate 41).

3.3.9 The thickness of the steel plates had been provided by the gasholder station manual (discussed previously), but the individual measurements not given. The lower band of the tank was approximately 21mm thick, the band above that was approximately 17mm thick, no others could be accessed to be measured. The dross left on the metal from the cutting torch prevented accurate measurement, but the lowest steel sheet of the inner lift was approximately 9mm thick, the sheet above was approximately 4mm. The lowest sheet of the middle lift was approximately 10mm thick, the sheet above approximately 3mm. The lowest sheet of the outer lift was approximately 9mm thick and the sheet above approximately 2.5mm (Plate 42). I-section universal columns were attached to the inner face of the inner lift which supported the edge of the domed crown structure.

3.3.10 The domed structure of the crown was covered with welded steel plates on a frame of concentric steel rings supported by radial members spanning between the inner lift and the central post (Plate 43). The trusses consisted of alternating principal trusses and intermediate trusses (Plate 44). The principal trusses were formed from a tie bar spanning between the inner lift and the base of the steel post and braced to the radial members (Plates 45 & 46); the intermediate trusses consisted of two chords spanning between the central, larger, concentric ring and the inner lift, braced to the radial members. The central steel post of the crown supported the dome as it rose and fell and was itself supported by a steel lattice frame in the centre of the tank when the gasholder was empty (Plate 47) with additional support to the edge of the base of the lift by I-section beams (Plate 48). Each structural element of the crown structure was rivetted.

3.3.11 The internal vertical members of the inlet and outlet pipes remained in the interior of the tank (visible in Plates 41 & 46). The floor of the tank consisted of rivetted steel sheets over a concrete base (Plate 49).

3.4 Control Building

3.4.1 The control building is the largest of the ancillary buildings and is located at the north-west corner of the site. It has not been scheduled for demolition as it is currently used in association with the PRS. It is a flat-roofed, single-storey brick building in stretcher bond. In the south, the front, elevation is a ventilated timber double door to the right of the centre of the elevation with a single timber door and an opening towards the western end of that elevation (Plate 50). A vented timber single door is in the west elevation (Plate 51) and a timber double door in the north (Plate 52). Terracotta vents are in all elevations.

3.4.2 The bituminous felt covered roof has slight parapets to either end and slopes slightly to the south, directing rain to grey plastic rainwater goods. The fascia boards are painted timber. Six aluminium flues are to the eastern half of the roof.

3.4.3 This building was constructed in the approximate location of the earlier purifiers and it is likely to have been constructed in the latter part of the 1970s as part of the conversion of the gasworks to a gasholder station. A satellite dish mounted on a pole is between the doors of the south elevation.

Interior:

3.4.4 Much of the interior of the building was not accessible at the time of the three surveys.

3.4.5 The shallow open store to the western end of the building has evidently previously been enclosed and is faced internally with common bricks. The store accessible from the west elevation occupies the space behind the open store and the partitions are also of commons.

3.4.6 The gasholder station manual contains photographs and details of the interior of the remainder of the building and shows the internal skin and partitions are of common bricks. The rooms contain the control panels, boilers and other plant.

3.5 Booster House

3.5.1 The booster house is to the west of Gasholder 1 and is a flat-roofed, single-storey brick building in stretcher bond. It has not been scheduled for demolition as it is currently used in association with the PRS. Vented timber double doors are to the north elevation (Plate 53), and a similar single door is in the east elevation (Plate 54). The south and west elevations contain only the openings for the pipes connected to the distribution plant. Terracotta vents are in all elevations. A grey plastic hopper and downpipe are to the south elevation.

Interior:

3.5.2 The interior of the structure was not accessible at the time of the three surveys.

3.5.3 The gasholder station manual contains photographs and details of the interior of the building and states that the booster installation is housed in this building while the controls are in the control building. The photographs of the interior show that internal skin is of common bricks and the plant is set on concrete blocks. The asbestos report states that the roof structure is of strawboard and the accompanying photograph of the interior shows that the roof is supported on an RSJ.

4 CONCLUSION

4.1.1 The gasworks were completed in 1924, replacing the earlier gasworks elsewhere in the town and included one gasholder – Gasholder 1 – and a small relief gasholder. The gasworks were built to an unconventional design, with mixed results initially. The relief gasholder was replaced with Gasholder 2 in 1950 and the lifts of Gasholder 1 were replaced eight years later.

4.1.2 The switch to natural gas in the 1970s lead to the closure of the gasworks and the site was converted to use as a gasholder station. The gasworks plant was demolished, the railway sidings removed, and redundant areas of the site sold off or used for other purposes. A new control building and a booster house were constructed, and distribution plant installed to the west of the gasholders. Gas distribution has improved in recent decades and the gasholders were rendered redundant and decommissioned.

4.1.3 This Historic Building Recording has researched the history of the site and created a photographic record of the structures and their context before and during their dismantling. An archive has been collated to provide a permanent record of the gasholders, the ancillary buildings, and the site which will be accessible at both the county and national research centres.

4.1.4 The wider programme of recording work of the remaining gasholders across the country will allow a comparison of the structures between sites.

APPENDIX A A SUMMARY OF GASWORKS' PLANT AND PROCESSES

INTRODUCTION

This account of the general development of the gas industry and the functions of gasworks plant and gas holders is based largely on several articles and presentations available online by Professor Russell Thomas, particularly The History and Operation of Gasworks (Manufactured Gas Plants), as well as the Monuments Protection Programme Step 1 report and the London Gasholders Survey by Malcolm Tucker.

Gasworks followed a general form, however, the types of each building, plant and equipment and the layout of each site varied widely according to the location, type of coal available, the likely size of the supply required and the manufacturer of the plant. The advancement of technology and the continuous obsolescence and replacement of plant resulted in a regular rebuilding of many gasworks operations.

This appendix describes the general operation of a gasworks and the principle functions of its plant, however, it does not seek to describe every combination of plant available and research should be carried out when investigating each site.

DEVELOPMENT OF THE GAS INDUSTRY IN BRITAIN

General history

The origins of the use of gas for artificial lighting lie in the 1790s when William Murdoch first used coal gas to illuminate his house in Redruth, Cornwall. Murdoch produced the gas by burning coal in a small retort in his back yard. In the following years he continued to experiment with gas lighting by improving the technology and in the first decade of the 19th century his methods were used to illuminate various mills and industrial works.

Other important individuals were also helping to develop the industry in this period including Samuel Clegg, an engineer whose work led to several technical advances, and Frederick Winsor who established the Gas Light and Coke Company in 1812. Winsor's vision, which was for an industry where gas was supplied to many customers from a single large gasworks, differed from Murdoch's which was for individual smaller plants supplying single sites.

Initially, gas was used for streetlighting and to light industrial works and the homes of the wealthier population, although municipal operations became widespread and by 1820 the principal English and Scottish towns were lit by gas; by 1830, over 200 and by 1859 there were over 1000 public gasworks built across Britain. The industry developed in the later 19th century with various innovations such as the vertical retort plant, which allowed continuous operation and used gravity to create a process flow, the gas mantle light and the greater use of by-products from the gas production process.

The Second World War had a major impact on the industry, particularly through bomb damage and loss of workers to the war effort and in an attempt to rebuild the industry after the war the Labour Government passed the Gas Act of 1948 which nationalised the 1064 local gas undertakings into 12 area gas boards. The boards would subsequently merge in 1972 to form British Gas, which was privatised in 1986.

In the later 1960s it was decided that the United Kingdom would phase out gas produced from coal and would instead move to an industry based on natural gas, some imported, and some obtained from North Sea gas fields. This led to extensive works during the 1970s to clear redundant facilities from gasworks and adapt or convert other plant which was to be reused; this change also resulted in the physical conversion of every gas appliance in the country. By the mid 1970s there were very few surviving sites where town gas was still being produced; these were mainly in remote parts of Scotland and the last site closed in 1981.

Some gasworks were partially demolished to create a gasholder station to store the natural gas, removing the gas production buildings and equipment but retaining the gasholders, transmission plant and distribution network. By the early 2000s, gas distribution technology had improved which rendered even the gasholder stations redundant and a programme to dismantle the gasholders was commenced.

ELEMENTS OF A GASWORKS

Introduction

A typical gasworks where coal gas was produced comprised many different elements of plant and processes, and followed the same basic principle, although some of these may only have been included at the larger sites.

Not all coal was suitable for gas manufacture and some coal fields were more suited to different types of retorts and so the gasworks design would be adapted to the coal available. The transport of the coal was also important: the proximity of canals, and later the railways, or sometimes docks in coastal areas, was essential. Many gasworks had their own railway sidings.

The retort

The retort is fundamentally a sealed container where coal would be heated to drive off moisture, gases and various other by-products. The retort house held 'benches' of retorts and the retort construction advanced from cast iron to fireclay to silica giving improved performance and the ability to withstand higher temperatures.

Retorts went through several stages of design; early retorts were horizontal and heated by radiant heat from the furnace below at relatively low temperatures. The coal shrank as it was heated and the resulting coke was raked out of the retort and more coal put in; mechanical stoking equipment was introduced with through-retorts. Inclined retorts were angled at 32° to horizontal, in theory creating less wear and tear and easier to load and unload, but they could be difficult to operate and were only suitable for certain types of coal and so were short-lived.

Vertical retorts were attempted throughout the 19th century but became successful by the turn of the 20th century. There were several types, but the basic principle was that tapered continuous vertical retorts, filled by hoppers above the retort, were heated by burning gas from separate producers. These could carbonise the coal continuously as it descended and the coke was extracted at regular intervals from the bottom of the retort, the residual heat sometimes being used for other purposes. The coke and breeze (the finer ash) which was not needed for reuse on the site was sold as fuel to industrial and domestic customers.

The gas extracted from the coal rose through an offtake pipe at the top of the retort.

Condensers

There were numerous designs for condensers, some using air, some using water, but all of which were used to reduce the temperature of the gas and also begin the process to remove the tarry impurities.

Exhausters

Exhausters drew gas off the retorts and pushed it through the purification system. This was essential to prevent the building up of pressure in the retort.

Cleaning and purification

The gas produced by heating the coal had many impurities which had to be removed before it could be transferred to the gasholder, including, but not limited to, ammonia, tar, hydrogen, sulphide, benzole and hydrocyanic acid.

Numerous machines and systems were patented for this purpose. The method employed was used according to the impurity, and included passing the gas through water or oil in the form of bubbles (washing) or passing the gas over a large area covered in the solvent liquid (scrubbing); in the later part of the 19th century, the distinction between the two was lost and tended to be referred to simply as 'washing'.

Dry purification involved passing the gas through trays of granular lime or iron oxide.

The impurities extracted were often valuable as by-products, such as coal tar, sulphate of ammonia, sulphuric acid, benzole, hydrocyanic acid and the spent lime from the purification, and these were also sold to other industries.

Metering, storage and distribution

The amount of gas produced would then be measured by the station meter before being stored in the gasholder.

The gas was stored in a gasholders to cope with peaks and troughs in demand and to ensure that there was always a ready supply; their form and function will be discussed in the following section

The station governor maintained the pressure of the gas leaving the holder when distributing it into the gas mains. Using a similar principle to the gasholder, the pressure was controlled using weights set onto a floating bell, although as with most other gasworks equipment, designs varied. Booster pumps were later developed to increase the pressure of the gas flowing into the gas main and were particularly used when the area supplied was far from the gasworks or where a gasholder station was used for the storage of gas between the gasworks and the remote location.

GASHOLDERS

Introduction

The introduction of gasholders removed the need for continuous gas production, the storage also acted as a buffer for periods of high demand and during halts in production and contained enough gas supply for 24 to 36 hours.

The basic principle of a gasholder is that it consists of two parts: a tank containing water and a cylindrical vessel called a 'lift'. The water provided a seal to prevent the gas from escaping and acted as a resisting surface to the incoming and exiting gas; the lift held the gas, rising and lowering according to the volume. The weight of the lift determined the pressure of the gas in the mains - and the back pressure on the gas making plant if no exhauster was used. Weights could be added to the lift or lifts if additional pressure was required, such as at times of high demand.

History

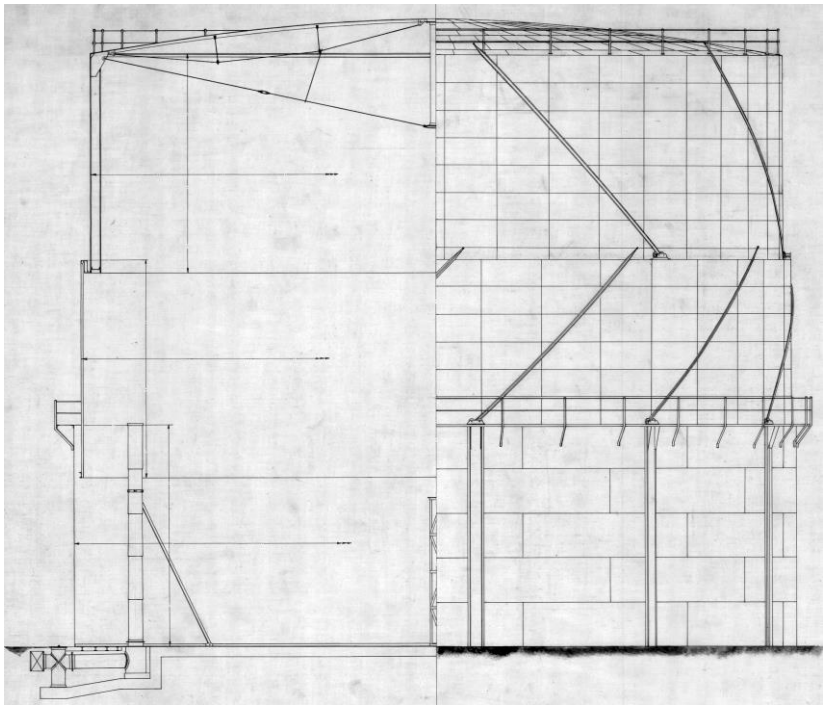
The earliest gasholders were small and built of iron or wood with the moving vessel guided by counter weights on chains. The wooden tanks particularly, sometimes repurposed from the brewing industry, were unreliable and prone to leaking.

From the early 19th century, the gas produced in retorts was stored in large holders and in the early phase of the industry these tended to be housed within separate buildings due to fears of explosion. In truth however the dangers of leaking gas becoming trapped and then exploding was considerably greater when the gasholder was enclosed by a separate building and this gradually led to the external cylindrical gasholder which became the most recognisable feature of any gasworks (Appendix Figure 1).

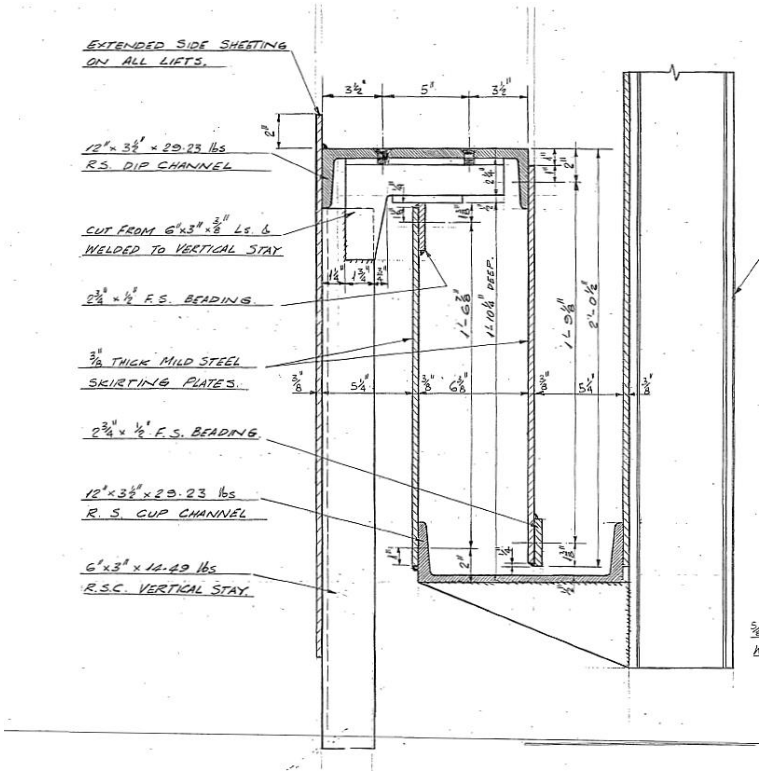
By the time the industry became established, above ground tanks were usually made from steel on a circular concrete slab. The steel floor plate was laid on top of the slab and the steel plates forming the sides of the tank were attached to the floor plate using a steel curb. The sides of the tank were constructed from rows of steel sheets, the bottom row thicker than those above it which often decreased in thickness with the height of the tank. The plates were usually rivetted, although some later tanks were welded.

Below-ground tanks were also used, built of brick, stone or concrete and sometimes cut into bedrock if it was suitable; each method must be made watertight, usually using puddle clay or render. The centre of the tank need not be excavated, leaving a dumpling in the centre of the tank.

The gas was prevented from escaping by a water seal in the tank and around each lift. The top of the tank and each lift returned towards the centre of the gasholder, called a 'dip' and the base of the next lift returned towards the outer edge of the gasholder, called a 'cup' (Appendix Figure 2). When the lifts rose, the cup and dip, which contained water, would interlock and form a seal against the gas within the gasholder.



Appendix Figure 1: A section and elevation of an above-ground two-lift spiral-guided gasholder (Extract of drawing EA/SA/FEG/E/T/1 National Gas Archive)



Appendix Figure 2: A cross-section of the cup and dip seal of the lifts of a gasholder which would be filled with water when the gasholder was in use (Extract of drawing NW/MA/DNE/E/E/6 National Gas Archive)

Originally, gasholders used a single lift, but later the telescopic gasholder was invented whereby separate close fitting vessels would be located within one another so that each inner lift would rise when the outer one reached its capacity. This allowed increased storage on the same footprint.

Initially the upper lifts of the early types of telescopic holders were guided by columns or frames; guide rails on the inner face of the columns guided wheels on arms attached to the top of the lifts, keeping the lift in place as it rose and fell. A short-lived cable-guided gasholder was developed whereby the lift was guided by a system of wire ropes and pulleys, although their use was not widespread.

In the late 1880s the spirally-guided gasholder was invented comprising a series of lifts which would rotate and spiral up or down with each chamber guided by the one below. Each lift would have diagonal guide rails fixed to its side which would engage with roller carriages fixed to the top of the vessel beneath. These guide rails could rotate the lifts in alternating directions or in the same direction, according to the design.

Waterless or Dry Gasholders were developed in the early 20th century which used an internal piston which moved with the aid of guide rollers within a static tank and fixed roof; three main types were developed: the MAN gasholder used a tar or oil seal, the Klonne used a grease seal and the Wiggins used a rubber seal.

There were many styles of gasholders, but with the exception of the waterless gasholders, the chief distinction between the types was regarding the method of guiding and support of the lift or lifts.

The crown

The nature of the support for the domed crown is among the most interesting aspects of any gasholder and it is also an area where a variety of approaches evolved in the 19th century.

The interest is partly as a result of the structure being required to function under two quite different conditions. When a holder is inflated the crown is naturally supported by gas pressure so in this situation there is no need for a large superstructure but when the holder is empty the crown needs to be supported.

Early holders tended to have a trussed crown with radial structures where the dome was self-supporting, albeit with a fixed prop which could support the centre of the crown when the holder was lowered. These trussed crowns were often technologically sophisticated and in the middle decades of the 19th century the spans of the larger holders often rivalled or exceeded the largest spans of industrial sheds or railway stations. This is of course a misleading comparison because the structure was supported by pressure when the holder was inflated and when it was deflated there was a fixed stanchion at the centre to help support the crown.

However, in c1850 another approach, that of the 'untrussed crown' was introduced (Tucker, 2000) in which the crown was either supported by gas pressure (when the holder was inflated) or by a fixed 'rest frame' when the holder was empty. The frame, of either timber of ironwork would not rise with the crown when the holder inflated, and this type of holder was widely used in the 1860s and 1870s.

Another slightly different approach to the trussed crown was introduced in the 1870s with 'radial girders'. These were ribs with plates or lattice webs beneath and the central fixed prop as with trussed crowns. All three types of crown continued to be used into the 20th century (Tucker, 2000).

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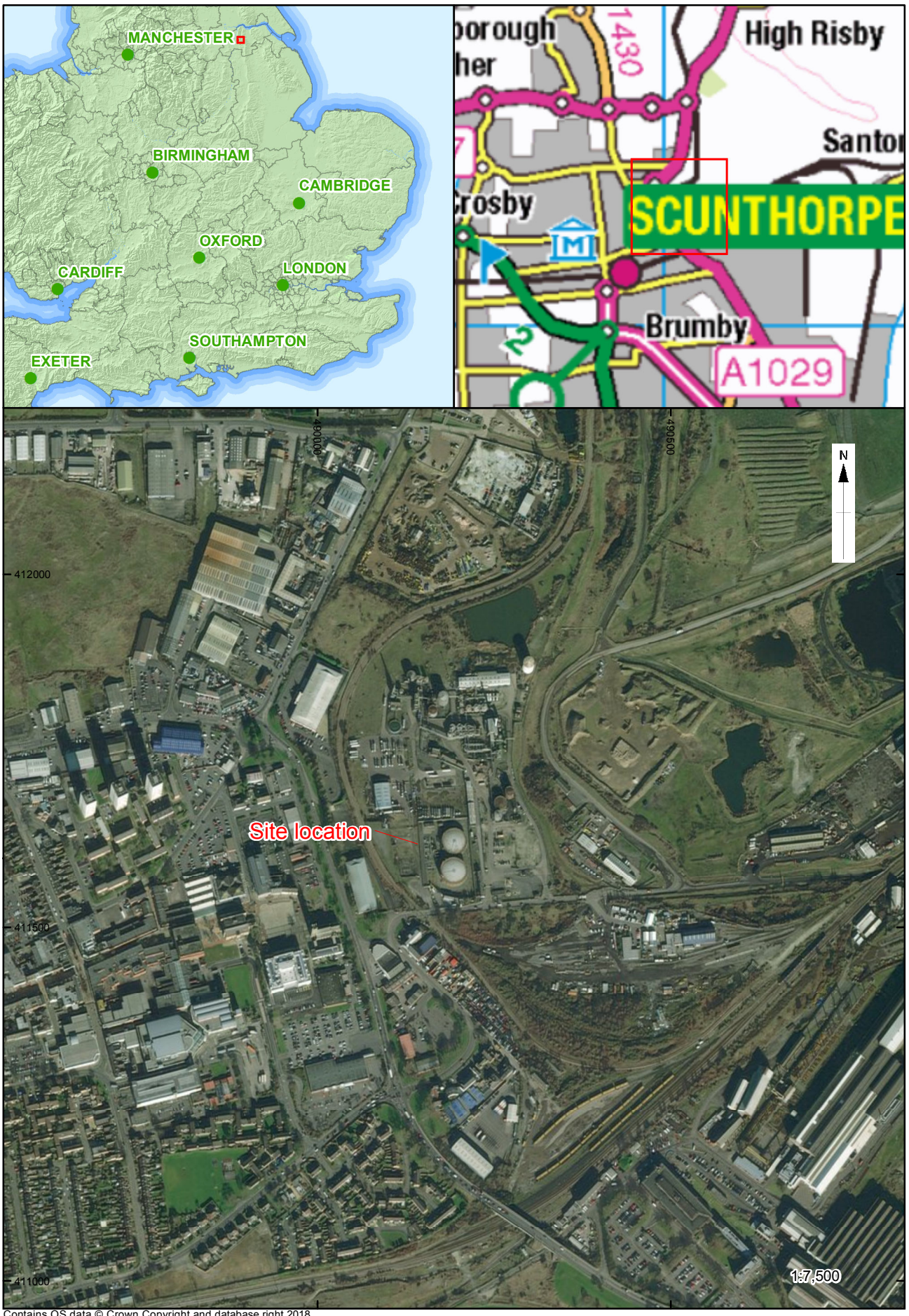
APPENDIX C OASIS FORM

PROJECT DETAILS		
Project name	Building Recording of gasholders at Dawes Lane, Scunthorpe	
Short description	Oxford Archaeology was commissioned by Montagu Evans LLP on behalf of National Grid to create an historic building record of two surviving gasholders at the former gasworks at Dawes Lane, Scunthorpe, before and during the dismantling of the structures. Gasholders 1 and 2 were above-ground spiral-guided gasholders; Gasholder 1 was constructed in 1922, although the two lifts were replaced in 1958, Gasholder 2 was built with three lifts in 1950. This forms part of a national programme of recording these distinctive structures which have formed familiar landmarks in towns and cities throughout much of the 19th and 20th centuries. The archive record that is being produced will allow comparison between different sites. The project has also included research on the history of the site.	
Project dates	Site work was undertaken on 6th July 2018 and 17th and 30th October 2019	
Project type	Building recording	
Previous work	None	
Future work	Potential for further historic investigation	
Monument type	Non-listed structure	
Significant finds	N/A	
PROJECT LOCATION		
Site location	Former Gasworks, Dawes Lane, Scunthorpe	
Study area	The area containing the gasholders is approximately 123m x 70m	
Site co-ordinates	SE 90193 11598	
PROJECT CREATORS		
Name of organisation	Oxford Archaeology	
Project brief originator	Montagu Evans	
Project design (WSI) originator		
Project Manager	Jonathan Gill	
Project author	Angela Warner	
PROJECT ARCHIVE		
		Content
Physical	North Lincolnshire Historic Environment Record	Site records, report, notes, digital photos
Paper		
Digital	ADS	



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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA,

Figure 1: Site location

P:\S_codes\SCUGASBS\SCUGASBS_fig_01.mxd*lucy.gane*29/08/2018

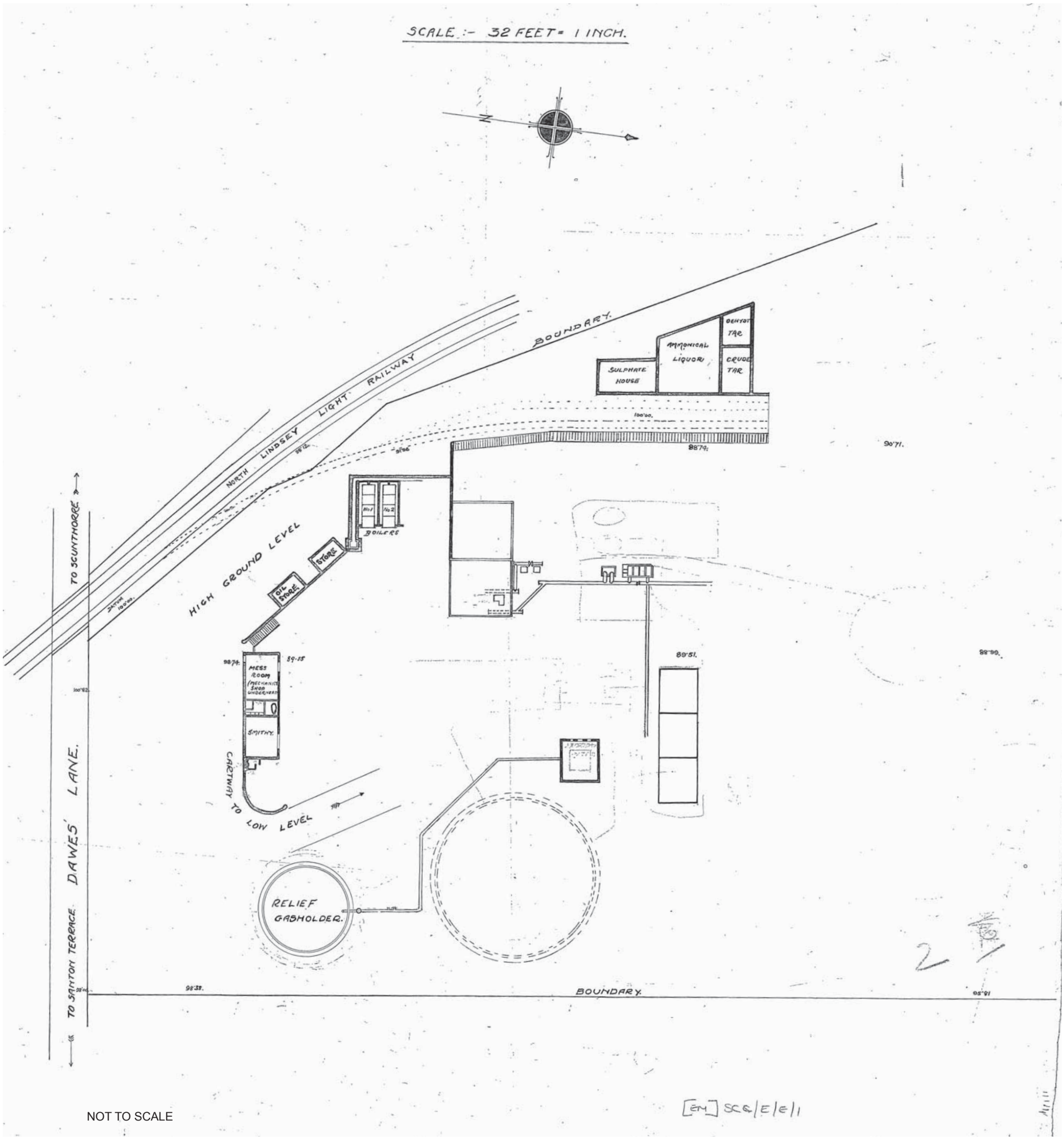

Figure 2: Site plan of the gasworks. Undated but pre-1950. National Gas Archive Document Reference: EMSCC/E/E/1

Revision	Drg No:	Title:
D	EE/U2D065/N/001	DAWES LANE, SCUNTHORPE HOLDER STATION TOPOGRAPHICAL SURVEY & DRAINAGE PLAN

DO NOT SCALE. IF IN DOUBT ASK. ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED.

Gasholder 1

Gasholder 2

Control building

Booster house

PERSONNEL GATE

HOLDER OVERFLOW

INTERCEPTOR INT01

INTERCEPTOR INT02

Land Drain

SECURITY FENCE

BOTTOM OF BANK

F MH01 CL29.86

F MH02 CL29.90

F MH03 CL29.91

F PUMPED CHAMBER MH04 CL29.91

OUTFALL TO PUBLIC FOUL WATER SEWER IN DAWES LANE

FENCED ENCLOSURE FOR HOLDER STEPS

HOLDER STEPS

TELEMETRY KIOSK

ABOVE GROUND PIPEWORK

MISCELLANEOUS STORES

A.G.I.SITE

RETAINING WALL

CONC

BOTTLED GAS STORE

EXIT PIPELINE

DATUM 30m FFL CONTROL BUILDING

ROAD

HOLDER STATION GATES

DEPOT GATES

BRICK STORE

ELLIOTT CONTAINER

DEPOT

DEPOT BLK LONG

W/C

FOUL RUN FROM WC & SINKS IN THE DEPOT

SPILL KIT

LAND DRAIN (ASSUMED)

DAWES LANE

To Mains

LEGEND

- Buildings/walls etc.
- Fences and other boundaries
- Kerbs/base edges etc.
- Foul drains
- Surface drains
- Combined water
- BG Transco Site boundary
- MH Manhole cover
- G Gully
- RWP Rain-water pipe
- Interceptor
- (X) Last point of exit from site (surface water)
- (Y) Last point of exit from site (Foul water)
- (Z) Last point of exit from site (Combined water)
- SPILL KIT Location of Emergency Spill Kit (s)

ABBREVIATIONS:-

MH - Manhole
IC - Inspection Chamber
BT - British Telecom Manhole
RG - Road Gulley
GV - Gas Valve
SC - Stop Cock
WM - Water meter
FH - Fire Hydrant
WT - Water Trough
MP - Marker Post
RS - Road Sign
LP - Lampost
EP - Electric Pole
TP - Telephone Pole
IL - Invert Level
B - Bush
T - Tree

Rev	Rev Ref	Date	Drn by	Chk by	Apr by	Description
A		0500	SAW	MH	SH	AMENDMENTS TO DRAWING FOLLOWING SITE VISIT BY M HIGGINS
B		1100	SAW	MH	SH	LOCATION OF SPILL KITS ADDED
C		0604	SAW	CJ	SH	AMENDMENTS TO DRAWING FOLLOWING ISO 14001 AUDIT
D		110706	DC			LAND DRAINS AND DRAIN RUN FROM MH01 TO MH02 - REDESIGNATED AS SURFACE DRAINAGE

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Drawn By	CR	01/11/99	1 OF 1
CAD Check by	M HIGGINS	01/11/99	Scale 1@ A1 1:200
ENG Check By	N/A	N/A	
Approved By	S HALL	16/06/04	

Site: DAWES LANE, SCUNTHORPE HOLDER STATION

Title: TOPOGRAPHICAL SURVEY & DRAINAGE PLAN

S.P. Ref: TRANSCO WAS DRG No. EM00098

Drg No: EE/U2D065/N/001

Revision: D

Figure 3: National Grid Site Drainage Layout showing the extant structures

Not to scale.
N.B. Plate 3 is a satellite image, so isn't shown on this figure.

Approximate location of openings

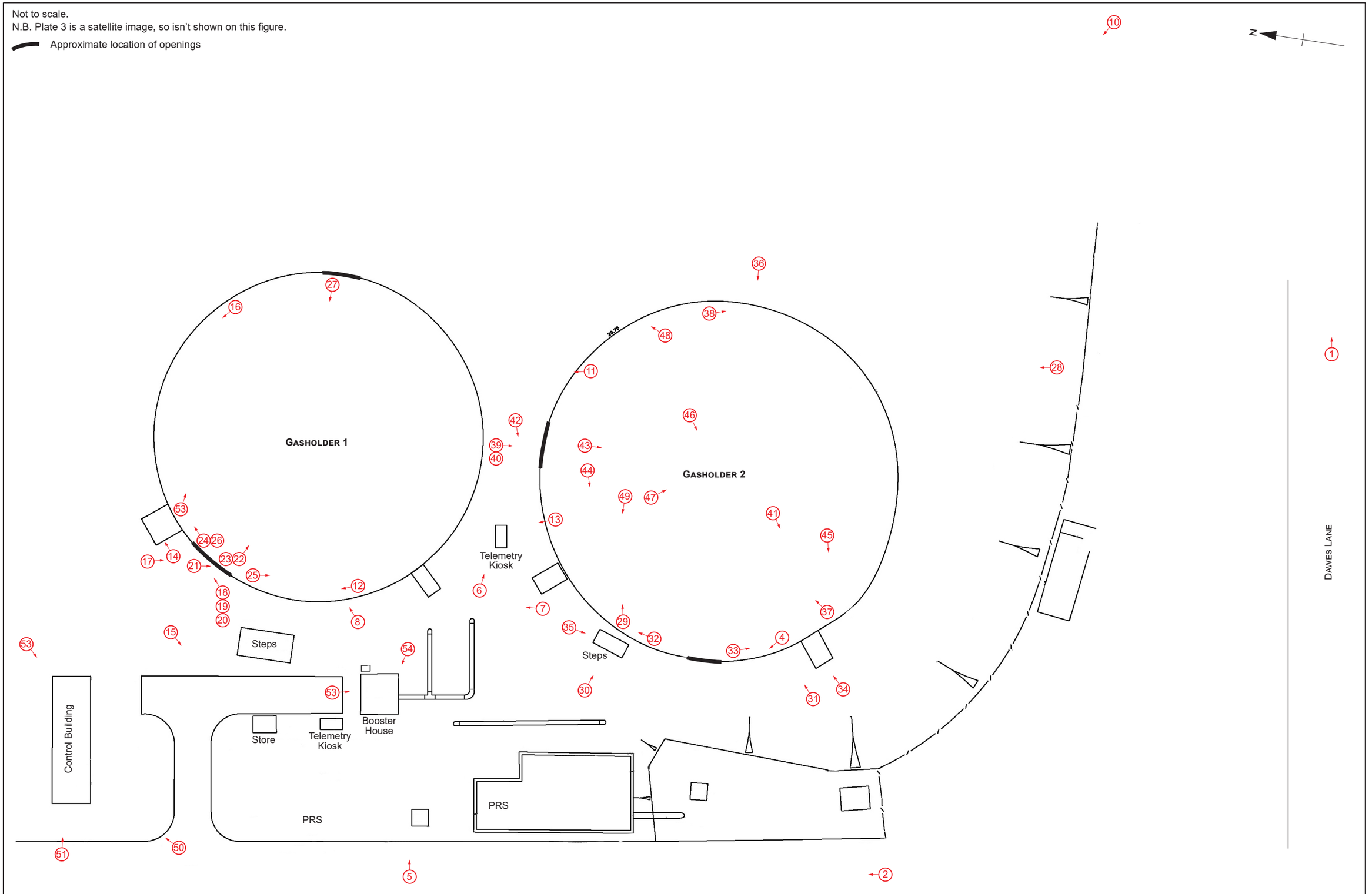

Figure 4: Photograph locations of plates. Plan based upon the National Grid Site Drainage Layout

Plate 1: Dawes Lane, looking east

Plate 2: Western site boundary, looking north

Plate 3: Aerial view of the site and surrounding areas. ©Google

Plate 4: The gas distribution plant to the west of the gasholders

Plate 5: The telemetry kiosk within the distribution plant

Plate 6: The telemetry kiosk between the gasholders

Plate 7: Gasholder 1, looking north-east

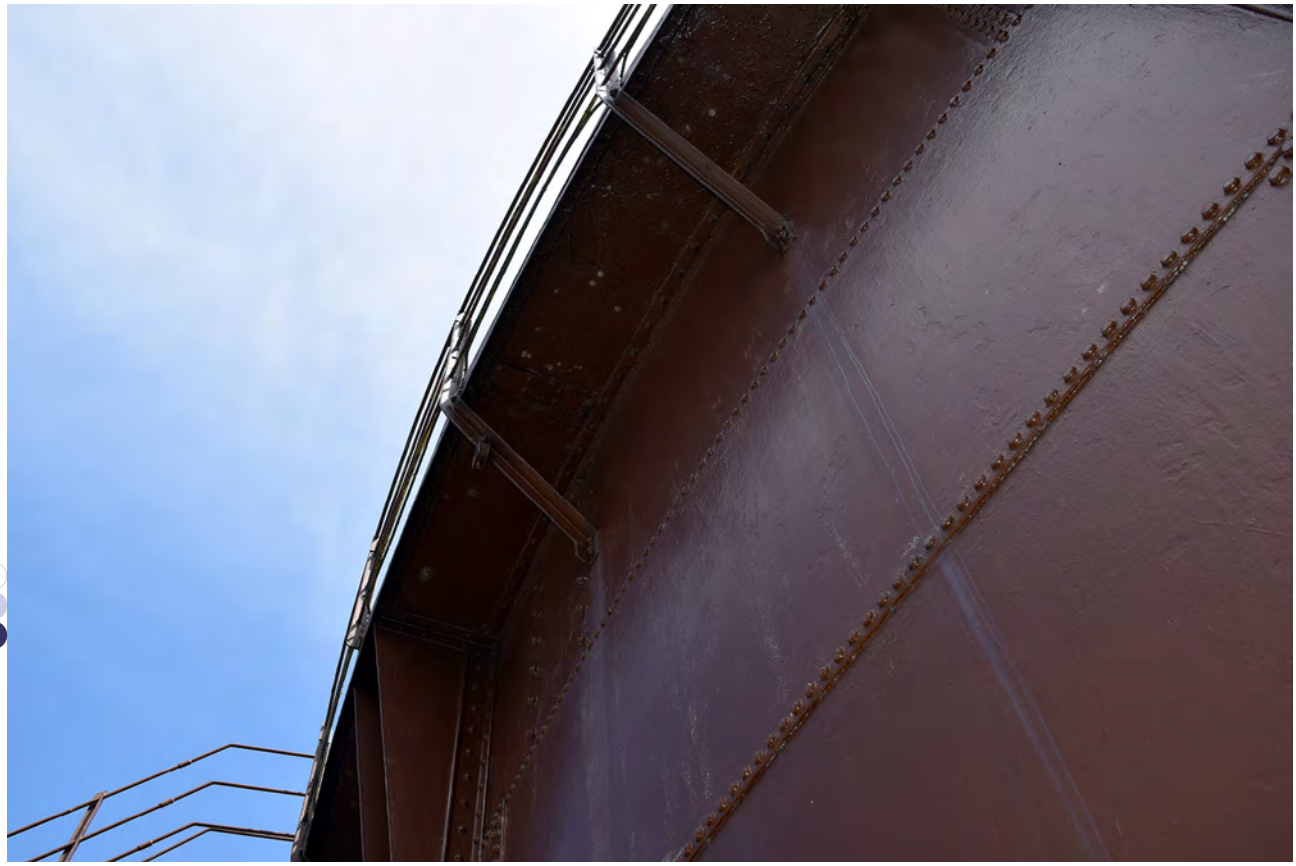

Plate 8: An example of the walkway brackets

Plate 9: The crown of Gasholder 1

Plate 10: The extended gasholders viewed from Dawes Lane in 2008. ©Google

Plate 11: Gasholder 1 viewed from the top of Gasholder 2

Plate 12: An example of the lift steps of Gasholder 1

Plate 13: The inlet and outlet pipes and the anti-freeze system of Gasholder 1

Plate 14: The covered disused dry well of Gasholder 1

Plate 15: The off-set staircase of Gasholder 1

Plate 16: An example of the roller carriages of Gasholder 1

Plate 17: The opening though the tank and lifts of Gasholder 1, looking south

Plate 18: The opening though the tank and lifts of Gasholder 1, looking east

Plate 19: A section though the tank and lifts of Gasholder 1

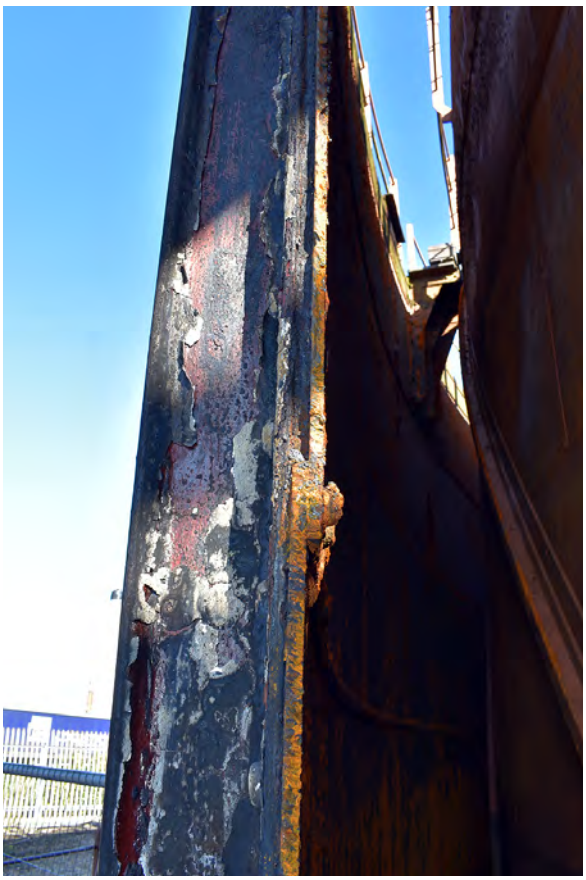

Plate 20: A section though the tank and lifts of Gasholder 1

Plate 21: A section though the tank and lifts of Gasholder 1

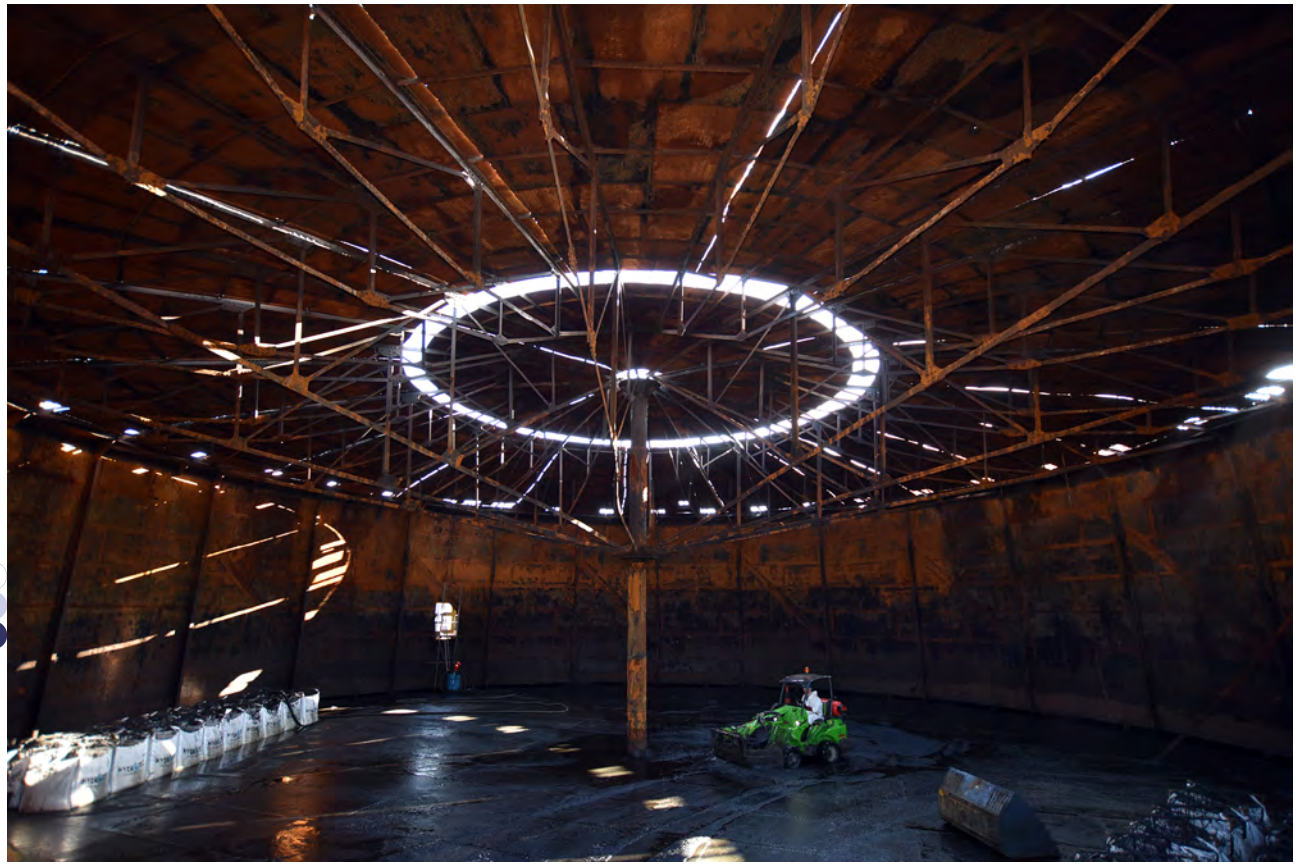

Plate 22: The interior of Gasholder 1, looking south-east

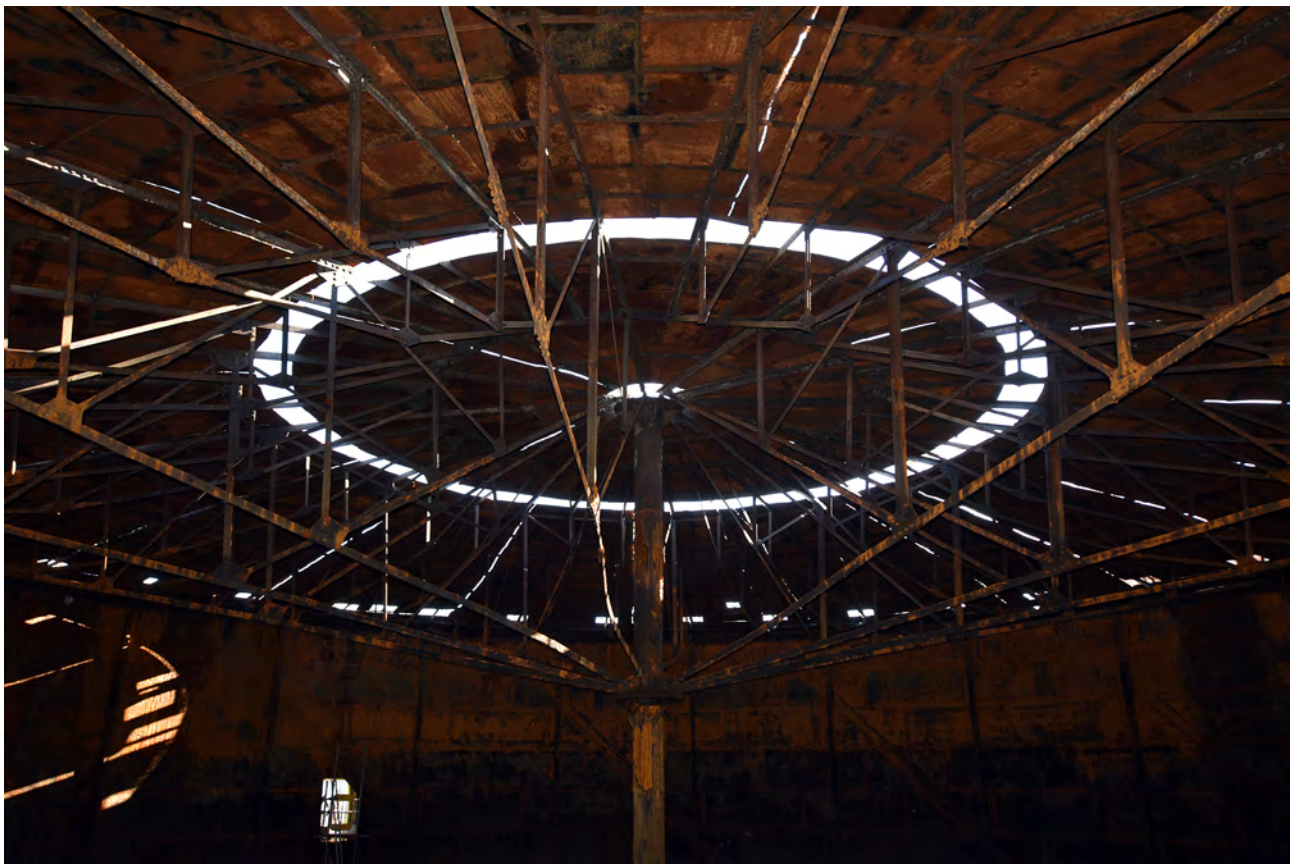

Plate 23: The crown structure of Gasholder 1

Plate 24: The trusses of Gasholder 1

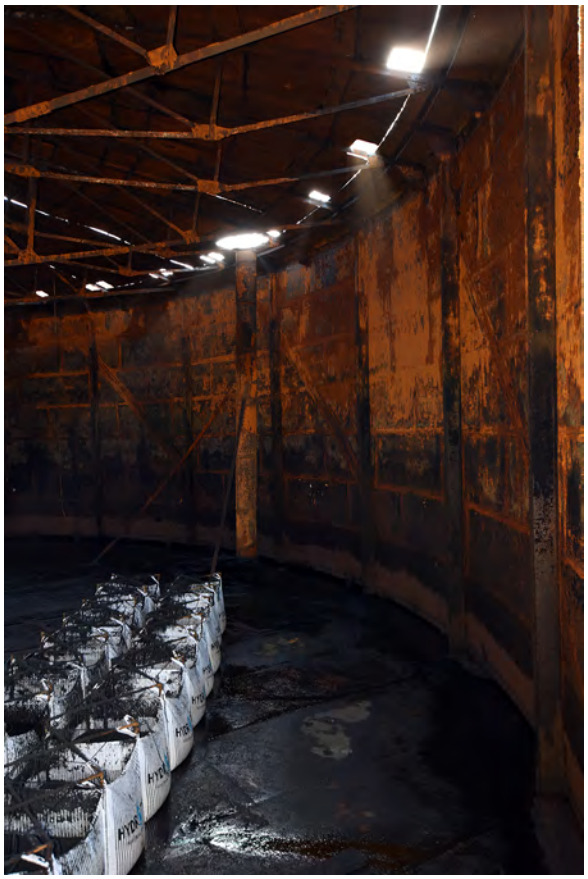

Plate 25: One of the inlet and outlet pipes in Gasholder 1

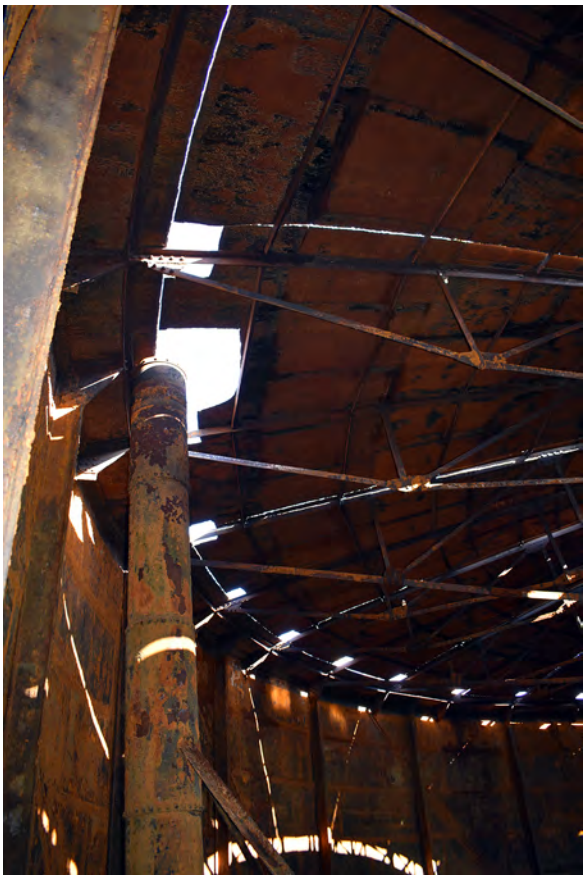

Plate 26: One of the inlet and outlet pipes in Gasholder 1

Plate 27: The floor of Gasholder 1

Plate 28: Gasholder 2, looking north-west

Plate 29: The crown of Gasholder 2

Plate 30: Gasholder 2, looking east

Plate 31: An example of the lift steps of Gasholder 2

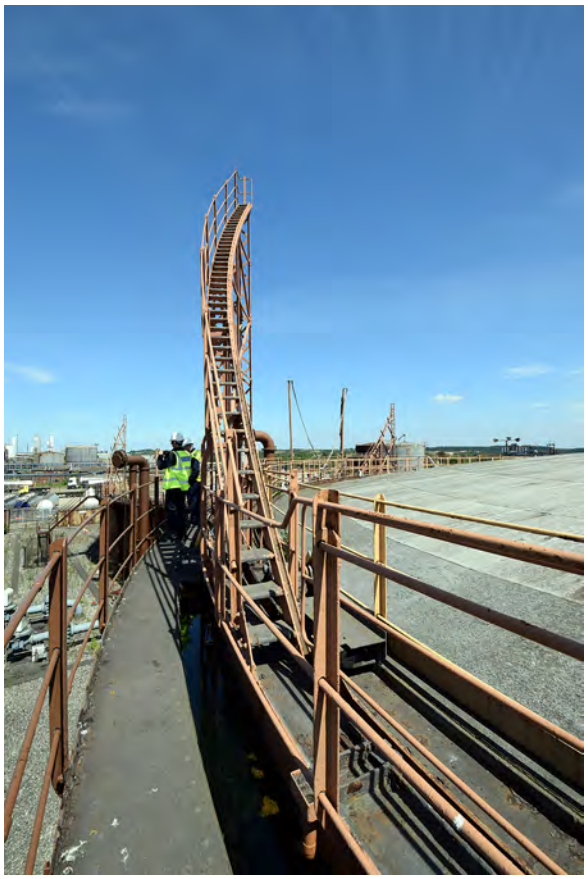

Plate 32: An example of the lift steps of Gasholder 2

Plate 33: An example of the lift steps of Gasholder 2

Plate 34: The disused dry well and remnants of removed brackets of Gasholder 2

Plate 35: The staircase of Gasholder 2

Plate 36: The anti-freeze system of Gasholder 2

Plate 37: An example of the roller carriages of Gasholder 2

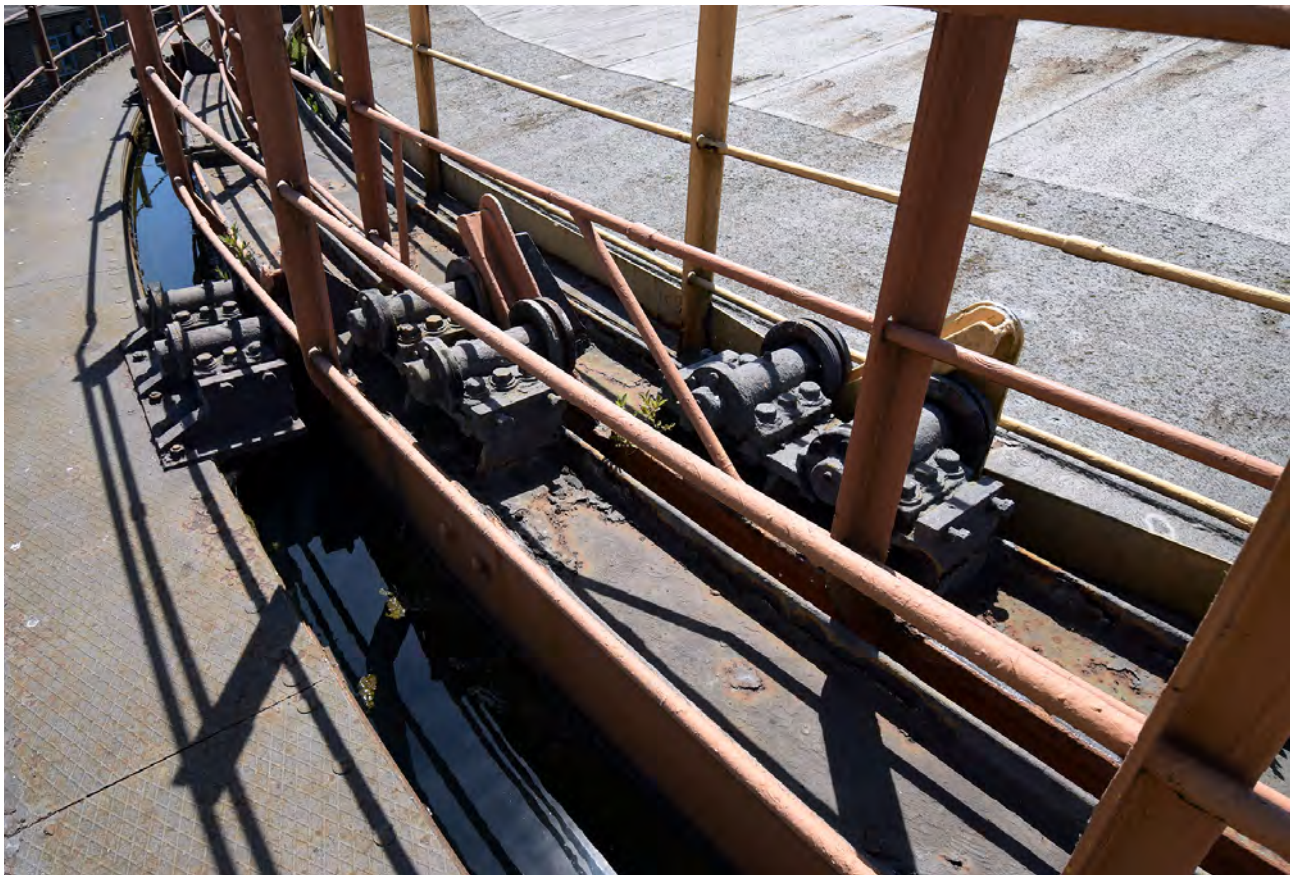

Plate 38: An example of the roller carriages of Gasholder 2

Plate 39: The opening being cut through Gasholder 2, looking south

Plate 40: The opening through the tank and lifts of Gasholder 2, looking south

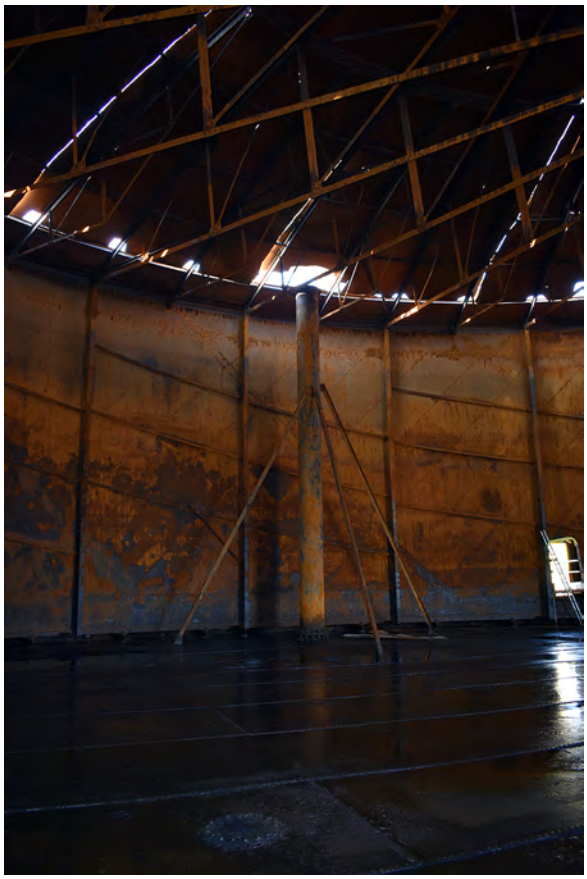

Plate 41: The diagonal panels of the inner lift and one of the inlet and outlet pipes in Gasholder 2

Plate 42: A section through the tank and lifts of Gasholder 2

Plate 43: The crown structure of Gasholder 2

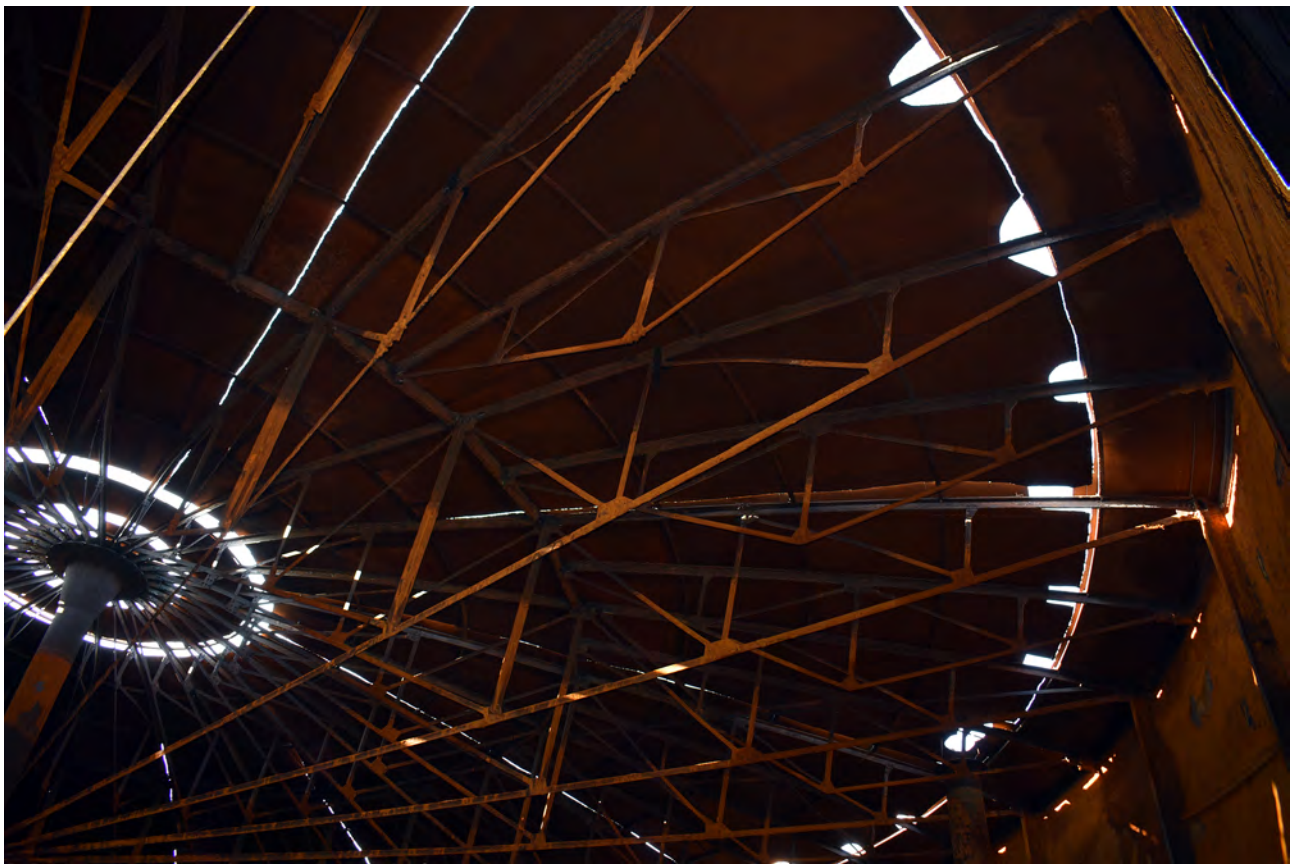

Plate 44: The trusses of Gasholder 2

Plate 45: The trusses fixed to the inner lift of Gasholder 2

Plate 46: The interior of Gasholder 2, looking south-west

Plate 47: The crown structure and post of Gasholder 2

Plate 48: The supports at the base of the inner lift of Gasholder 2

Plate 49: The floor of Gasholder 2

Plate 50: The south elevation of the Control Building

Plate 51: The west elevation of the Control Building

Plate 52: The north and east elevations of the Control Building

Plate 53: The north elevation of the Booster House

Plate 54: The east and south elevations of the Booster House

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