

## **3.2 TEST TRENCH METHODOLOGY**

As outlined in the Archaeological Research Design Report of March 2010 five trenches were opened and recorded between 9 June and 25 June 2010. Machine excavation took place in the first two days using a 7 tonne excavator with a 1500mm wide flat bucket. Hand cleaning and recording of the uncovered features was undertaken in the remaining days followed by backfilling and nominal compaction of the trenches on the last day. Additional hand clearing took place in the location of the northern Gasholder to reconfirm the existence of the brick annulus. A trench initially proposed near the two tar wells had to be moved to the eastern side of the Retort House, due to the likely presence of contamination originating from the wells. Some features in Trench 4 (described in Section 3.7.5 of this report) were at ground level and could therefore not be backfilled. They were covered with strong black plastic and fenced off with star pickets and safety tape.

The trenches were located to determine the extent and condition of the remains of the Purifying Shed (Trench 1 and Trench 2), the Retort House (Trench 3) and the Compressor and Tea Rooms joining the Retort House at the northeast corner (Trench 4). Trench 5 was intended to confirm a building referred to as the Superintendent's Residence but this was not possible as the footprint of this building was located under the current driveway and gravel wash bay.

## **3.3 LIMITATIONS**

The presence of soil contamination related to the operations of the former gasworks made it necessary to conduct all work wearing protective suits and respirator masks. All stockpiles were covered with plastic to keep odours and dust to a minimum. Impacted ground water, especially in Trenches 4 and 5, also limited the hand excavations and recording in those areas which also had to be kept covered.

Trench 1 was shortened due to the presence of a stockpile containing assorted building waste and non-fibrous asbestos, to the west of the northern Gasholder, in the originally planned alignment of the trench.

Due to the superintendent's residence being located under the current rubble driveway which also serves as a wash down bay, Trench 5 did not transect the building as intended. The presence of remains associated with the superintendent's residence was therefore not confirmed. However, given the general abundance of remains uncovered in the test trenches, it is highly likely that the foundations of the residence are also still present, if it was actually built.

Trenches 3 and 5 could not be located as close to the northwest perimeter fence as originally indicated because the area was raised for the post 1950s rail siding. The ballast for the tracks

is still in place. Therefore, the northeast perimeter of the Retort House and the superintendent's residence could not be confirmed.

### 3.4 CONTAMINATION<sup>7</sup>

Historic operation of the site as a gasworks generated considerable quantities of coal tar that remains on the site in a number of areas including the tar wells, underground pipework and the below ground remnants of the Northern Gasholder. Other sources of contamination include surface ash/coke fill and non-fibrous asbestos impacted demolition wastes. In August 2000 the Site was declared by the (former) NSW Environment Protection Authority (EPA) to pose a Significant Risk of Harm (SRoH) to human health and the environment. The declaration was made in consideration of the concentrations of contaminants in the soil and groundwater reported in the previous site investigations. Soils and groundwater are impacted to varying degrees by the following contaminants:

- monocyclic aromatic hydrocarbons (MAH), which include benzene, toluene, ethylbenzene & xylenes (BTEX));
- polycyclic aromatic hydrocarbons (PAH);
- nonhalogenated phenolic compounds;
- heavy metals (in localised fill materials); and
- asbestos (in localised fill materials)

### 3.5 COAL GAS PRODUCTION<sup>9</sup>

Coal gas is normally produced by the distillation of bituminous coal in retorts. This process could be better defined as the decomposition of coal into volatile products by the action of heat in the absence of air or oxygen. The retorts used for the distillation of coal are made of clay and usually have an oval or D form and are arranged in a furnace as a bench and heated by coke. The coal is charged into the retorts at fixed intervals.

During heating, about two-fifths of the coal's weight is converted into products which are vapours at the temperature of the retorts, and the remaining three-fifths is left in the retorts as a porous mass known as coke. After the volatile matter has been driven off, the coke is drawn from the retorts and quenched with water, and is either stored for sale or used for heating the bench.

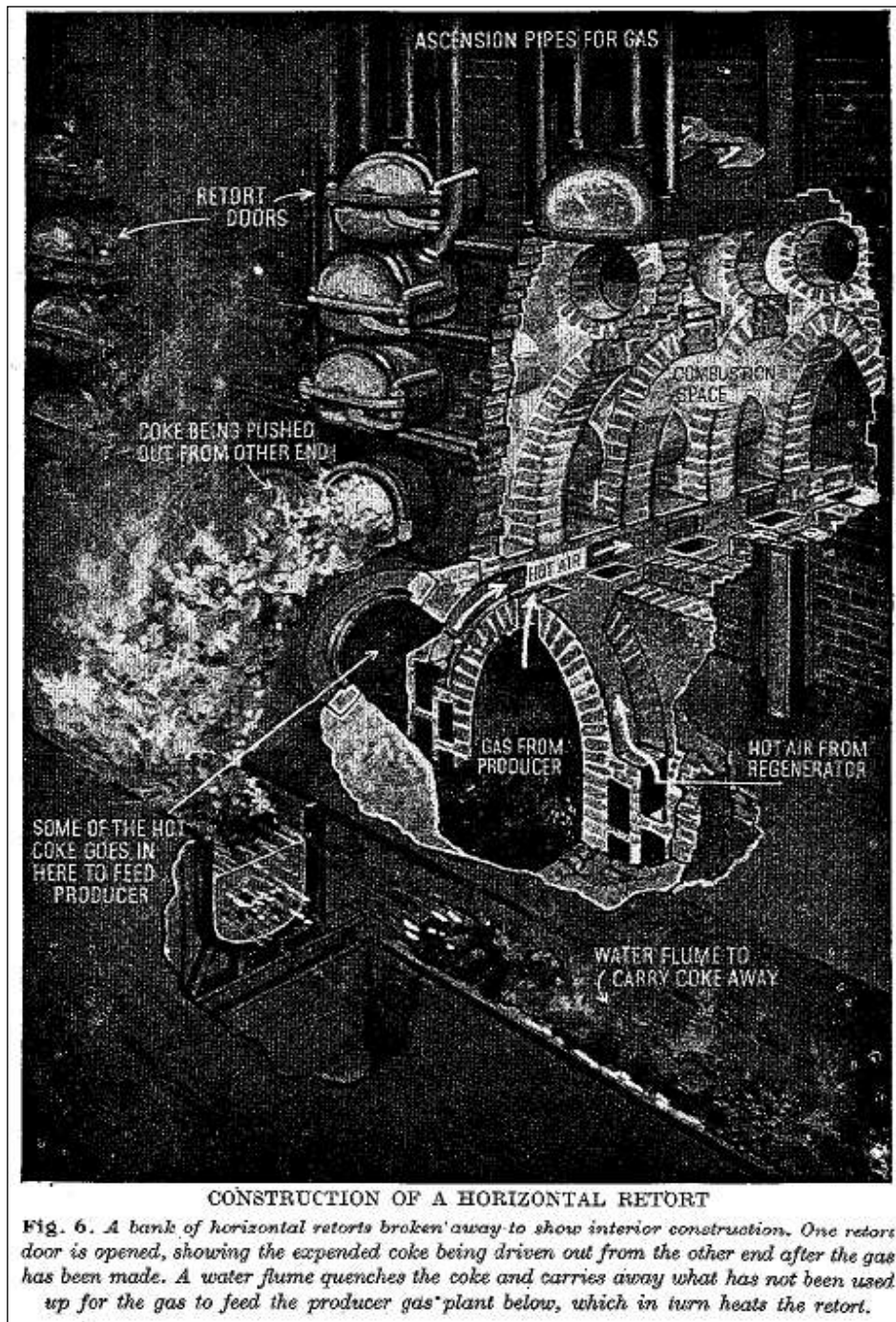
The vapours given off in the retorts are removed by vertical pipes which rise from one end and are connected to the hydraulic main placed horizontally above the bench. In the hydraulic main some of the vapours are condensed into liquids. These liquids are partially water and

<sup>7</sup> (Source: Railcorp Remedial Action Plan Former Macdonaldtown Gasworks – Burren Street, Erskineville, NSW, FROM CH2M HILL AUSTRALIA PTY LTD. report)

<sup>9</sup> Extract from 'History of the Manufactured Gas Business in the United States', Gonzalo J Mon, Woodward-Clyde Wayne, New Jersey, <http://epdocs.books.officelive.com/Documents/03-4-01.pdf>

partially tar; the gas leaving the hydraulic main still contains large amounts of condensable materials.

From the hydraulic main, the gas passes through a condenser. This is usually of such form that the gas passes through a long series of pipes which are either exposed to the air or surrounded by water, where the temperature of the gas is greatly reduced. By this cooling, more water and tars are condensed and removed.

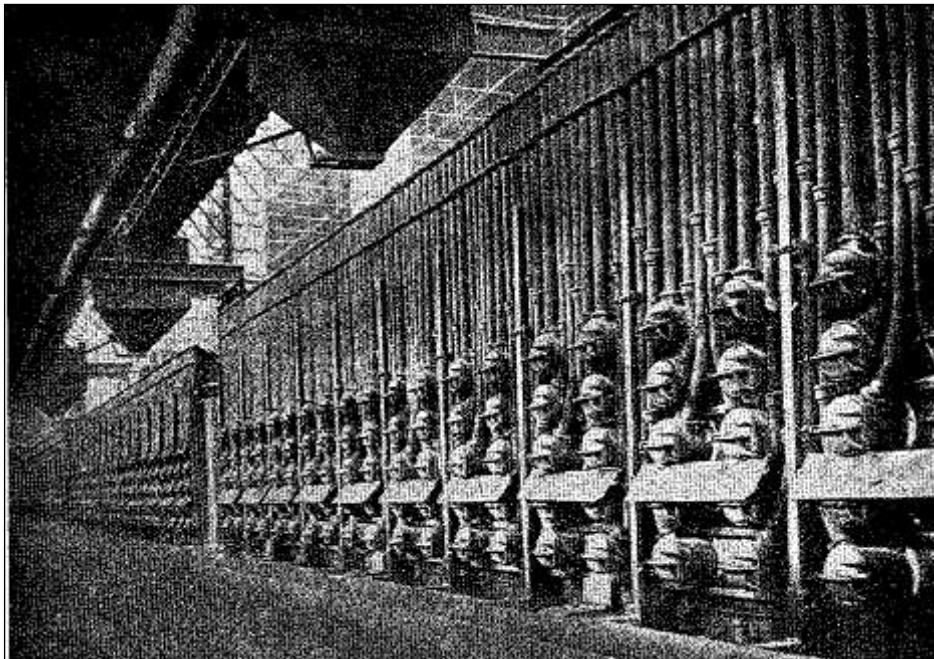


**Figure 13: Generic diagram of a cut-away horizontal retort.**

(Source: 'Gas and its byproducts' *Everyday things and their Story*, undated, Odhams Press Ltd London, p.131)

Next to the condenser or, in some gas works, between the gas condenser and the hydraulic main, there is an exhauster. The purpose of the exhauster is to relieve the pressure on the retorts. This pressure is caused by the friction of the gas in the pipes and various parts of the purifying apparatus where the gas is forced to pass through water and layers of solid materials.

The exhauster draws the gas from the retorts and forces it through the rest of the train. The gas, now freed from most of the liquid impurities, still contains ammonia and gaseous sulphur compounds which must be removed before the gas is commercially acceptable.



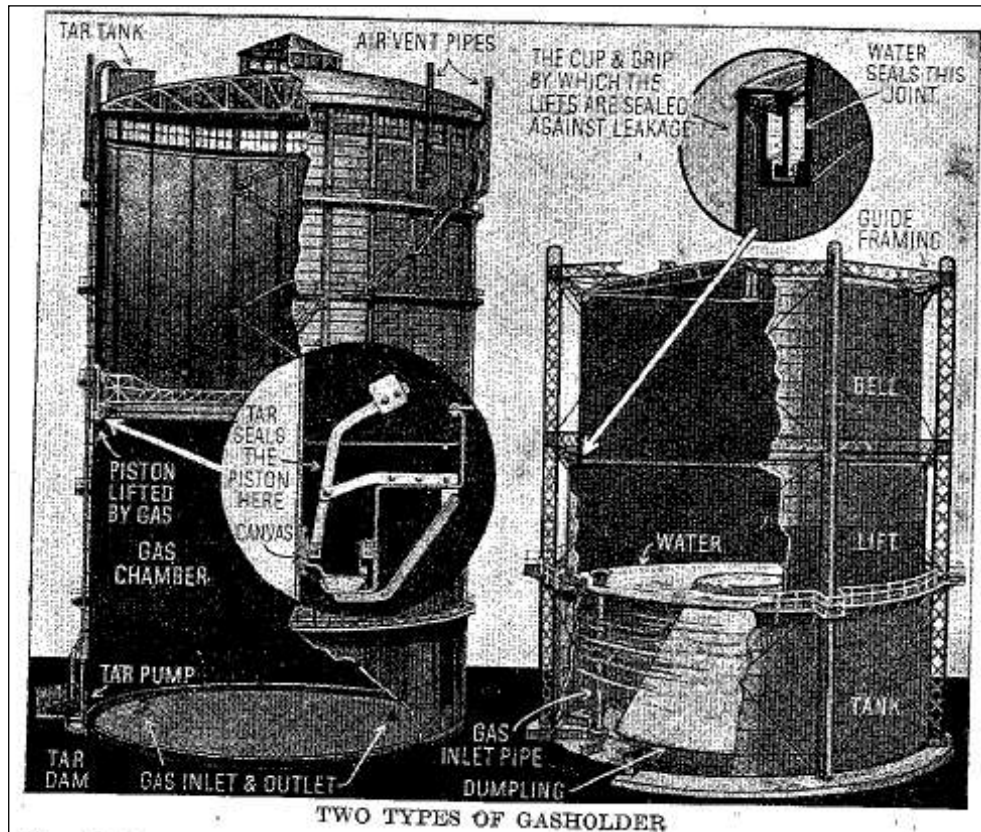
**Figure 14: Photographic view of a horizontal retort house, shows how the retorts are stacked here in groups of ten.**

(Source: 'Gas and its byproducts' *Everyday things and their Story*, undated, Odhams Press Ltd London, p.135)

The removal of the ammonia is easily accomplished by washing the gas with water. The water, after it has absorbed the ammonia, combined with the water product from the hydraulic main, is then known as ammoniacal liquor. When properly treated, ammonia is recovered from this liquor.

Two substances were commonly used to remove sulphur compounds: moist lime or moist iron oxide. These are arranged in iron vessels, called purifiers, through which the gas is forced. The hydrogen sulphide is then absorbed by (reacts with) the purifying materials.

From the purifiers, the gas passes to the station meter where it is measured and is then sent to the gas storage holder. From the holder, the gas is sent through the street mains to the customers.<sup>11</sup>



**Figure 15: The gasholder on the left has a fixed cylinder with a piston sealed by gas tar. The holder on the right – of similar type to the subject site – has a series of lifts with a top bell sealed by water.**

(Source: 'Gas and its byproducts', *Everyday things and their Story*, as above)

<sup>11</sup> Loc cit

### 3.6 LEGACIES OF COAL GAS PRODUCTION<sup>12</sup>

Both the era of consolidation of gas-works through high-pressure distribution systems (1900s - 1930s) and the end of the era of manufactured gas (1955-1975) saw gas-works being shut down due to redundancies. What brought about the end of manufactured gas was that pipelines began to be built to bring natural gas directly from the well to gas distribution systems. Natural gas was superior to the manufactured gas of that time, being cheaper, extracted from wells rather than manufactured in a gas-works, more user friendly, coming from the well it required little, if any, purification, and was also safer, due to the lack of carbon monoxide in the distributed product.

Upon being shut down, few former manufactured gas plant sites were brought to an acceptable level of environmental cleanliness to allow for their re-use, at least by contemporary standards. In fact, many were literally abandoned in place, with process wastes left in situ, and never adequately disposed of. As the wastes produced by former manufactured gas plants were persistent in nature, they often contaminated the site of former manufactured gas plants. The waste which generally caused greatest environmental concern was coal tar (mixed long-chain aromatic and aliphatic hydrocarbons, a by product of coal carbonization), while "Blue Billy" (a noxious by product of lime purification contaminated with cyanides) as well as other lime and coal tar residues are regarded as lesser, though significant environmental hazards. The environmental investigations at the former Macdonaldtown Gasworks have not shown the presence of these scrubbing by-products on the site.

Some former manufactured gas plants are still owned by the gas utilities of today, often in an effort to prevent contaminated land from falling into public use, and inadvertently causing the release of the wastes therein contained. Others have come into unofficial public use, and without proper reclamation, have caused health hazards for their users. When and where necessary, former manufactured gas plants are subject to environmental remediation laws, and can be subject to legally mandated cleanups.

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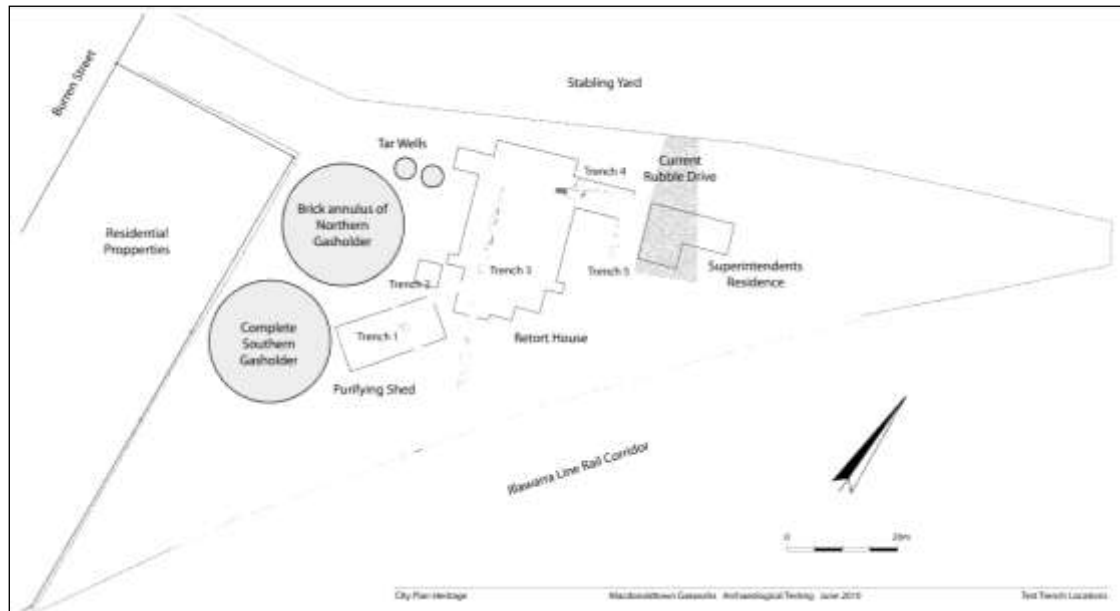
<sup>12</sup> Extract from 'History of manufactured gas', Wikipedia, the Free Encyclopedia

### 3.7 THE TEST TRENCHES

#### 3.7.1 FILL

The fill over the features within the area of the test trenches consisted of mainly clay, railway ballast, coke residue and demolition material which was probably a mixture of local and introduced material. There were metal objects relating to the railway such as metal spikes, bolts and plates for fixing tracks to sleepers as well as pieces of metal track and complete hardwood sleepers.

In parts of the site the overburden measures only a few centimetres but generally the depth of the fill was between 200mm and 300mm. Patches of topsoil were scattered over the site with slightly increased depths towards the northwest boundary around Trench 4 where an elevated rail siding was located after the demolition of the Gasworks.



**Figure 16: General plan showing the test trenches in relation to the property boundaries, the main standing features and the projected underground remains.**

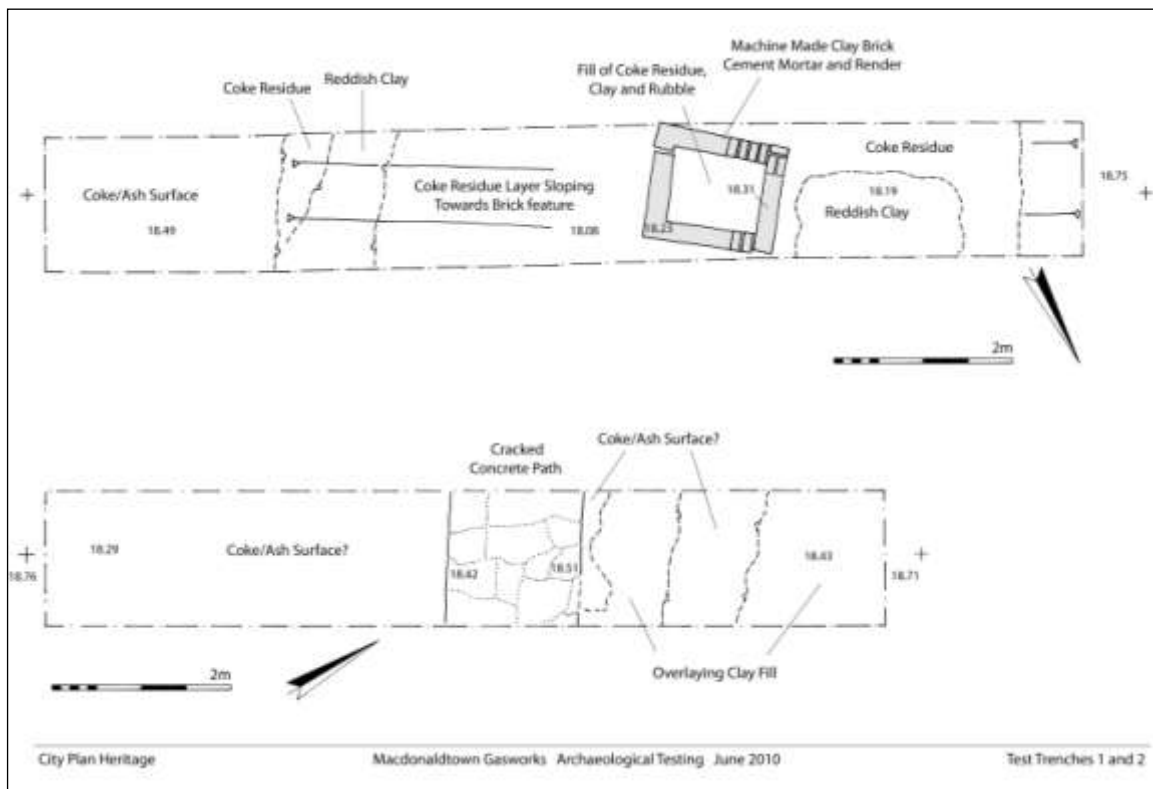
**A larger version of this plan in scale 1:500 – and a copy of all the plans - are attached to this report at Appendix 2.**

### 3.7.2 TRENCH 1

Trench 1 was located southeast of the northern Gasholder to transect the width of the Purifying shed. It was roughly oriented northwest to southeast and was 11.5m long, 1.5m wide with depths between 100mm and 650mm.

The defining context in this trench was a rectangular brick feature made of machine made clay bricks bonded with cement mortar. There were no marks or frogs (technical term for the depression on a brick) visible on the bricks. The internal measurements of the feature were 1020mm by 840mm and the walls were of a standard 230mm width. There was a coke ash surface present in the southeast end of the trench about 100mm under the current surface. The layer of coke residue which made up the surface slopes down towards the brick feature. The survey data places the brick feature in the centre just in the northwest half of the Purifying Shed.

No structures clearly identifying the perimeter of the building were found. In the c1917 photo (Figure 6) the Purifying Shed appears to have been an open sided building with its roof structure supported by metal posts and metal trusses.



**Figure 17: Detailed plan of Trench 1 and Trench 2, (a larger version of this plan in scale 1:50 is attached at Appendix 2)**



As previously mentioned, the uncovered brick structure was located centrally within the area of the Purifying Shed. On the plan also from c1917 (Figure 7) showing the general layout of the Gasworks, there are two rows of four purifiers indicated with perimeter and central piping. The brick structure or pit may have held an item related to the central piping.



**Figure 18: Trench 1, looking northwest, with coke ash surface in the foreground and rectangular brick structure in the background.**



**Figure 19: Trench 1, looking southeast, with rectangular brick structure in the centre**

### 3.7.3 TRENCH 2

Trench 2 was located to investigate the north east perimeter of the Purifying shed. This trench was 9.5m long and 1.5m wide and between 250mm and 350mm deep. It was oriented roughly southwest to northeast.

After the removal of the fill layers, which consisted mainly of clay, a coke ash surface was uncovered, which was most likely the surface within the Purifying Shed. The northeast perimeter of the Purifying Shed was marked by a cracked concrete path oriented southeast to northwest in the centre of the test trench. This path was running parallel to the northeast edge of the shed and represented a clear demarcation between the inside and the outside of the shed.



*Figure 20, above: Trench 2, looking east, cracked concrete path along north perimeter of Purifying Shed*

*Figure 21, left: Trench 2, looking north, coal tar surfacing and cracked concrete path in background*

### 3.7.4 TRENCH 3

Trench 3 was designed to transect the Retort House on its long axis. It was oriented southeast to northwest to pick up internal structures and the southeast perimeter. The trench was continued to the southeast to determine if any evidence of the train lines connected with the Gasworks was still present. In total the trench was 37m long and 1.5m wide and up to 200mm deep - with the exception of a small sondage at the southeast end of the trench which was about 450mm deep.

The interior of the Retort House within the test trench was entirely covered by a cracked concrete slab. The southeast boundary was marked by a clay filled trench with a lump of concrete in the centre which could have been the footing for a metal post. In parts the concrete visible in the trench was overlayed by a coke ash surface. The concrete slab continues south for about two thirds of the trench. There are various gaps within the slab. The condition of the concrete varies and there are two diagonal joints towards the southern end. The concrete used for the flooring was generally aggregate rich with aggregate sizes of around 30mm and there was no form of metal reinforcement present.

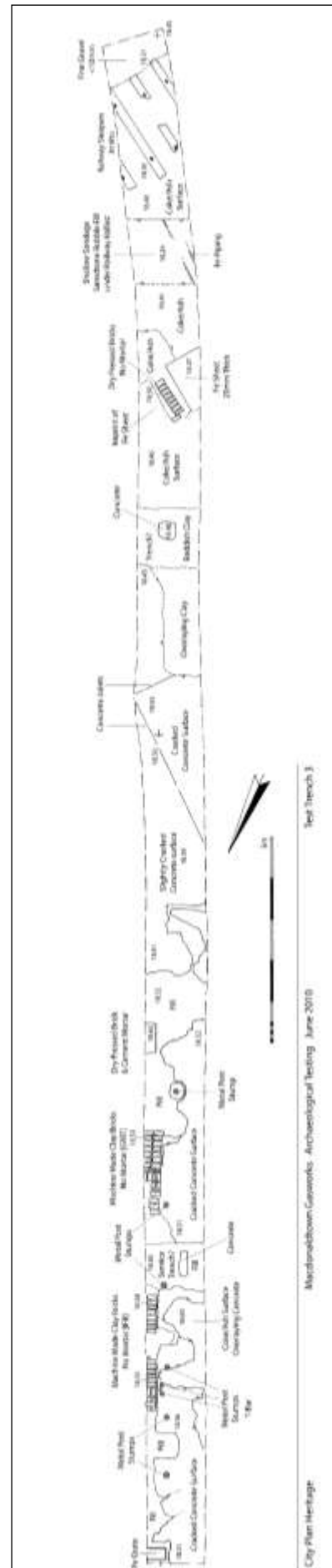
There were a total of eight metal posts, cut off at the level of the concrete visible at the north end of the trench. Six of them were in alignment with varying distances between them, of between 1.2m to 2.8m. The remaining two posts were about 250mm from each other with a vertically buried metal T-bar between them.

Also at the north end of Trench 3 there were segments of a brick wall or paving against the eastern side of the trench, with the total length remaining about 7m. Two of the segments appeared to be cut by a later trench. The bricks were machine made clay bricks, some stamped 'IFP' and others stamped 'GRIT'; or 'GRITA'. Slightly further south there was also a segment of dry pressed brick wall bonded with cement mortar. This could however just be floating within the fill. In the far north corner there was a rectangular metal grate with a width of 300mm. The length could not be determined as the feature was protruding into the east section.

A coke ash surface started to the south of the aforementioned trench at the end of the concrete slab. After about two metres there was a line of dry laid (unmortared) bricks about a metre long diagonal set in the centre of the trench, with a 20mm thick and 1.3m wide square or rectangular metal plate on the southern side and the imprint of a similar metal plate on the northern side of this brick feature. The trench plan is shown overleaf.



**Figure 22: Trench 3, looking northwest towards end of trench with cracked concrete surface in foreground, overlaying coke/ash surface in background and brick wall or paving to the right.**



**Figure 23: Detailed plan of Trench 3, a bigger version of this plan in scale 1:100 is attached as appendix**



About 4m towards the south there were four railway sleepers in situ diagonally to the trench with some metal spikes still attached to the timber. The sleepers were sitting in coke residue and there was fine gravel of less than 10mm in size immediately to the south. The fill over the sleepers was made up mainly of railway ballast.

A sondage between the bricks and metal plate and the railway sleepers was excavated about 250mm deeper and revealed two metal pipes of about 300mm diameter running diagonally. The fill within the sondage consisted mainly of sandstone rubble.

The Retort House also appeared to have been a structure of metal posts and trusses supporting a metal roof. The c1917 photo shows corrugated iron cladding for the walls of the building. The interior floor seemed to have been for the most part a concrete slab. Judging by the c1917 photo, which shows two chimneys in the centre ridgeline of the roof, the retorts were probably located in the centre of the building. The bricks in the northern end of the trench may have been part of a base for the retorts



**Figure 25: Trench 3, looking northwest showing the entire concrete surface seen from southern edge of the Retort House marked by the clay filled trench in the foreground**



**Figure 24, above: Trench 3, detail of the cut off metal pole**



**Figure 26: Trench 3, detail of brick line with metal plate on either side located towards southern end of the trench.**



**Figure 27: Trench 3, detail of brick**



**Figure 28: Trench 3, detail of row of bricks, the brick to the right is stamped 'IFB'**



**Figure 29: Trench 3, looking northeast, southern end of trench with in situ railway sleepers in foreground and concrete slab of Retort House in background**

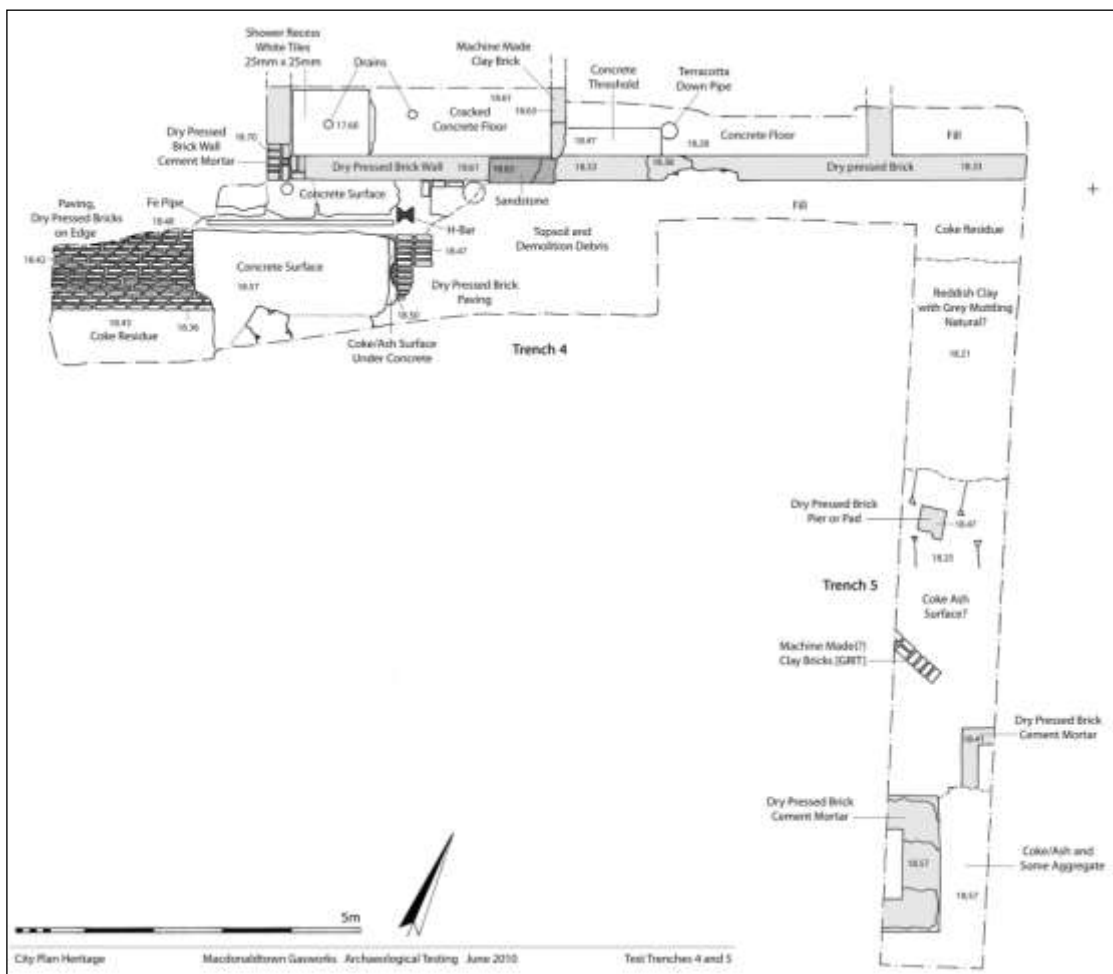


**Figure 30: Railway sleepers in Trench 3 with the Southern Gasholder in background and Trench 1 in centre right.**

### 3.7.5 TRENCH 4

In large parts of Trench 4 there was only a thin layer of topsoil and grass over the concrete and brick features present. The trench was located to pick up remains of the Compressor and Tea Rooms attached to the Retort House at the northeast corner. It was oriented roughly east west and was about 14m long and 1.5m wide at either end. The centre of the trench was about 3.5m wide. The depth varied between surface level and a maximum of 400mm.

The western end of the trench contained a brick paving which was partly overlaid by a layer of coke residue with a coke ash surface which in turn was overlaid by a concrete surface. The paving was made of bricks sitting on their long edges and it extended for about 5.5m from the west end of the trench towards the east. The concrete covered only the east half of the paving but continued south beyond the edge of the paving. The paving slopes slightly down towards the south and appears to end in a straight line. The fill abutting the bricks was the same coke residue as the fill overlaying the paving. The paving's east extent coincides with the eastern perimeter of the Retort House. Towards the north the paving and the concrete slab was cut by an east west running pipe trench with a metal pipe about 2.7m in length and about 70mm in diameter contained in the trench fill.



**Figure 31: Detailed plan of Trench 4 and Trench 5; a bigger version of this plan in scale 1:50 is attached at Appendix 2**



North of the pipe a patched section of concrete slab of varying quality extended north for about 500mm. It then abutted an east west oriented dry pressed brick wall with a corner turning north about 3m from the west end of the trench. The wall, which continues east for the entirety of the trench, was 350mm wide and the bricks were bonded with cement mortar.

On the north side of the wall there was a room which most likely served as a bathroom of about 3.8m internal length with the remains of an 1150mm by 950mm shower recess in the southwest corner. The recess was tiled with white square tiles measuring 25mm by 25mm and there was what appears to be a chrome plated floor waste in the centre of the recess. To the east of the recess was a cracked concrete floor with another chrome plated floor waste in the west half. The wall bordering this room at the east end was made of machine made clay bricks and was 230mm wide. Immediately west of this wall, sitting on the east west running wall, was a sandstone block, about 1.2m long, which was probably a threshold marking the doorway to the bathroom. To the west of the bathroom was a room of about 4.5m length with a smooth concrete floor about 300mm lower than the floor of the bathroom. It had a concrete step in the southwest corner and the east side of the room was marked by a 350mm wide dry pressed brick wall tying into the east west wall.



**Figure 32: Trench 4, looking northeast towards Redfern with Illawarra Line in background. Brick paving in foreground overlaid by concrete in centre and dry pressed brick wall with shower recess and concrete slabs to the left**



**Figure 33: Trench 4, looking northeast with corner of dry pressed brick wall and shower recess in foreground and concrete slabs in centre and background to the left of the wall**



The fill to the east of the brick paving and south of the dry pressed brick wall consisted mainly of clayey brown topsoil with some building debris inclusions.

According to the plan in Appendix 2 in which the test trenches are superimposed over the assumed building outlines - all the features within Trench 4 were either part of the buildings joining the Retort House at the northeast corner or part of the Retort House itself.



***Figure 34: Trench 4, looking southwest with concrete slab over coal tar and brick paving***



***Figure 35: Trench 4, looking northwest, concrete step into lower room with concrete floor***

### 3.7.6 TRENCH 5

This trench was about 12.5m long, 1.5m wide and oriented roughly north south. It joined Trench 4 at the east end of that trench which contains the aforementioned east west running dry pressed brick wall. Trench 5 is between 50mm and 500mm deep. Located about 5m to the south of the east west wall was a pier or pad made from dry pressed brick and cement mortar. This pier is in line with the expected southern wall of the Compressor and Tea Room.

Another 2m to the south was a row of dry pressed bricks without mortar bonding oriented diagonally within the trench. It started in the centre of the trench and disappeared into the west section. It was 230mm wide and a total length of 800mm of this wall was visible.

Another segment of wall was visible about 1m further south at the east section, possibly the corner of a rectangular or square pit, the function of which is unknown. It was also constructed of dry pressed brick and cement mortar. It was 230mm wide, ran south for about 800mm and was then obscured by an overlaying fill of coke residue which formed the base for a higher coke ash surface to the south. This surface bordered a solid dry pressed brick and cement foundation of a probably rectangular or square structure about 2m wide, which covers about half of the trench and disappears into the west section. The east wall of this structure is 550mm wide and the north and south walls closer to 450mm wide.



**Figure 36: Trench 5, view northeast, solid brick structure in foreground, two brick structures in centre, brick pier in background**



**Figure 37: Trench 5, view south east, dry pressed brick wall from Trench 4 in foreground, brick pier in centre. Ground water was seeping in over what appeared to be natural clay.**