



Foresite Projects Ltd
29A Wycliffe Road
London
SW19 1ES
t: +44 (0) 208 543 7774

MERTON STREET DEPOT BANBURY ENVIRONMENTAL SYNOPSIS REPORT

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Document Control

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1 INTRODUCTION

1.1 Background

Foresite Projects Ltd (FPL) has been commissioned by Grundon Waste Management Ltd to prepare an Environmental Synopsis Report, relating to geo-environmental ground conditions to support an outline planning application for residential end use at Merton Street Depot, Banbury.

This report will present data from previous ground investigations and assessments of the site and assess the geo-environmental risk in relation to the proposed development and present an outline remediation measures for the proposed development.

1.2 Site Location and General Description

The site, referred to as Merton Street Depot, is located at the following address:

Merton St, Banbury, Oxfordshire, OX16 4RN

Grid Reference: SP 46436 40257

The site is located east of Banbury town centre, immediately adjacent to the railway line, running northwest/southeast. The site is approximately 3Ha. and is broadly rectangular.

The site is currently held within two separate ownerships. The north western corner comprises a former concrete plant owned by Cemex UK. This site has been cleared and was most recently used as a construction compound. The remainder of the site comprises a former gasworks currently in operation by Grundon as a 'Refuse and Waste Collection Depot'. This area comprises hard standing in the north and west of the site and scrubland in the south/southeast.

The Grundon site can generally be divided into three main areas:

1. Former gasworks in the north/northwest, with remnant in ground structures including railway sidings, a retort house, gas purifiers, two tar pits, an underground diesel tank and gasholders (decommissioned in the late 1950's/early 1960's);
2. Scrap yard in the northern central area comprising a large warehouse factory building and office facilities; and

3. Disused ground in the south, which appears to have been raised with Made Ground and areas of fly tipping.

The site is bounded by the Chiltern Mainline railway line to the south-west, existing residential development to the north and playing fields and allotments to the east. A National Grid site is also located adjacent to the southwest. The site is accessed from Higham Way, which until recently comprised part of the wider land holding.

The site generally level and falls slightly in a south-westerly direction from approximately 90.5m AOD to 89.8m AOD.

A site layout plan is in Appendix A.

1.3 Proposed Development

The Outline Planning Application proposal comprises approximately 200 dwellings and associated landscaped public open space and infrastructure. No private gardens are proposed.

1.4 Ground Condition Assessment Methodology

The assessment of environmental risk from ground conditions has been assessed based on CLR11 'Model Procedures for the Management of Land Contamination Contaminated Land Report' published by the Environment Agency in 2004 and the source-pathway-receptor methodology.

2 INFORMATION SOURCES

The following Reports relating to the site were provided for review:

- i. *Banbury Gas Works Site Investigation (Ref. AEAT/4496). Prepared by AEA Technologies 1999;*
- ii. *Environmental Assessment, Banbury Gasworks (Ref. R/EN2498.PMK.1.1.3). Prepared by Waterman Environmental, October 2001;*
- iii. *Site Investigation of the Former Banbury Gasworks (Ref. R/EN2498.PN.2.1.5). Prepared by Waterman Environmental, March 2002;*
- iv. *Quantitative Risk Assessment Report, Merton Street Depot, Banbury (Ref. R1456/11/3999. Prepared by Celtic Technologies Ltd, March 2011; and*

- v. *Site Investigation – Interpretative Report, Merton Street Depot, Banbury (Ref. R1512/12/4293). Prepared by Celtic Technologies Ltd, June 2012.*

It should be noted, that some of the findings within the above reports may now be out of date due to changes in the legislation, guidance and ground conditions. Following the successful determination of the planning application an updated assessment of the risk to human health and controlled waters will be carried out based on the information sources and updated environmental monitoring, which will determine the extent of remediation required at the site and provide a basis for remediation options.

The above reports have been provided with client confidential information redacted.

3 HISTORICAL SITE USE

The site has been subject to significant industrial use including a Gasworks, Steel Fabricators and Scrap Yard.

The site was initially developed as a gasworks in the late 1880s and was further expanded in the 1930s and 40s with a railway line that was present in the central and western parts of the site. The site was decommissioned between 1955 and 1978, however, some historical structures remained.

Historical decommissioning of Gasworks generally comprised the levelling of a site with the retention of in ground structures. Previous site investigation has identified the remnants of below ground structures including the gasworks house, tar and liquor wells, retort house, carburetted water gas (CWG) plant and purifier and below ground storage tanks. More detailed information on remnant structures is provided in Section 5.

Following the decommissioning of the site as a gasworks the site was used for scrap metal storage, a steel fabricators and more recently a waste collection depot.

It is reported that the site was subject to significant bomb damage during the Second World War.

4 GEOENVIRONMENTAL SETTING

4.1 Geology

4.1.1 Published Geology

According to the BGS 1:50,000 scale geological map sheet 201, the site is underlain in succession by Lower Lias, which mainly comprises Clay of up to 100m thick. Alluvial deposits are indicated as being present in the east of the site.

4.1.2 Site Investigation Geology

The site has been subject to three phases of intrusive investigation, which detected the ground conditions detailed in Table 1, below.

Table 1, Ground Conditions

Strata	Description	Depth encountered	Thickness
Made Ground	Comprising reinforced concrete, gravelly silts and clays with abundant brick, concrete, metal, cables and railway sleepers. Automobile waste was encountered along the eastern and southern boundaries.	0m	0.5 – 5.5m
Alluvium – Silt	Greenish-grey, slightly organic Silt	0.8-1.9m	0.3-2.05m
Alluvium – Sand and Gravel	Orange-brown interbedded Sands and Gravels	1.6-3.05m	1.8-2.6m
Charmouth Mudstone Formation	Firm to stiff medium grey Clay	2.7-5.5m	>4.5m

Cement bound asbestos sheeting was also encountered during site investigation, mainly within the southern part of the site.

4.2 Hydrology and Aquifer Classification

4.2.1 Aquifer Classification

The superficial deposits (Alluvium) are classified as a Secondary A aquifer. Secondary A aquifers are permeable layers capable of supporting water supplies at a local rather than strategic scale,

and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers

The underlying Mudstone bedrock is classified as 'Secondary Undifferentiated' strata. The Secondary Undifferentiated classification has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.

4.2.2 Groundwater Level and Flow Direction

Groundwater was encountered within the Alluvial deposits between 1.2 and 2.9m bgl and was considered to flow towards the southwest.

4.2.3 Source Protection Zones

The site is not currently located in a Groundwater Source Protection Zone. No groundwater abstractions have been identified within 1km of the site.

4.3 Hydrology and Surface Water

The closest surface water feature is a ditch adjacent to the eastern boundary of the site. The River Cherwell is located 250m to the south west of the site. It is considered likely that the superficial Gravel deposits identified on site are in continuity with the River Cherwell.

5 REMNANT STRUCTURES

The site has been subject to rudimentary decommissioning of the former gasworks structures and its highly likely that in-ground remnant structures and foundations are present.

National Gas Archive plans show that the gasworks structures included the gasworks house, tar and liquor wells, retort house, CWG plant & purifier and miscellaneous storage tanks. The gasworks structures are generally located in the northern and central areas of the site. Appendix B contains drawings from the National Gas Archives, which detail the former gasworks buildings and infrastructure.

A large below ground diesel storage tank located in the northern part of the site in the area of the former waste transfer facility.

6 GROUND CONTAMINATION

6.1 Historical Site Investigation

The site has been subject to extensive site investigation by AEA, Waterman and Celtic. In total the previous investigation has comprised:

- 93 trial pits;
- 25 boreholes;
- 12 window sample holes;
- 160 soil sample chemical analyses;
- 41 water sample chemical analyses; and
- 25 soil leachate analyses.

6.2 Soil Contamination

Significant soil contamination has been identified, mainly associated with the former gasworks (particularly the tar wells) and former structures in the northwest of the site up to a depth of 5m below ground level. Additional contamination has been recorded in the south of the site including asbestos contaminated ground and fly-tipped rubbish.

The primary soil contaminants of concern have been identified to be Total Petroleum Hydrocarbons (TPH), Polycyclic Aromatic Hydrocarbons (PAHs), Ammonia, Cyanide, Heavy Metals, Phenols, asbestos and BTEX compounds.

Leachate analysis has shown that the soil contaminants are not significantly leachable.

6.3 Groundwater Contamination

Groundwater contamination has also been detected across the site, with the most significant contamination associated with the gasworks areas of the site. Light non aqueous phase (LNAPL or floating free product) has been detected in the north of the site.

The primary groundwater contaminants of concern have been identified to be Total Petroleum Hydrocarbons (TPH), Polycyclic Aromatic Hydrocarbons (PAHs), Ammonia, Cyanide, Heavy Metals, Phenols and BTEX compounds.

7 RISK ASSESSMENT

7.1 Human Health

The risk to human health has been assessed both qualitatively and quantitatively in detailed risk assessments, which has shown a residual risk of vapour exposure from the lighter end petroleum hydrocarbons and PAHs.

The proposed development will incorporate a number of mitigation measures which will break the pollutant linkage pathway for human exposure to contaminants including a vapour resistant damp proof membrane, passive venting, hardstanding and building cover and a 'clean' cover layer in landscaped areas.

Considering the development mitigation measures, the post development risk to end users is considered to be low.

7.2 Controlled Waters

A quantitative controlled waters risk assessment has been undertaken, which identified the River Cherwell as the main potential receptor. The groundwater risk assessment used a compliance point of 50m and concluded that there is not site wide groundwater impact. Localised groundwater risks from benzene, phenols, acenaphthalene, TPH C10-12 and Arsenic were identified in proximity to the former gasholder. Additionally, areas with free product are also considered a risk to controlled waters.

Considering the free product (LNAPL) identified and the dissolved phase concentrations of arsenic and hydrocarbons, the risk to controlled waters is medium to high and remediation is required prior to redevelopment of the site.

8 OUTLINE REMEDIATION ACTIONS

8.1 General

Upon review of the human health and groundwater risk assessments it is considered that the main driver for remediation is the risk to controlled waters, specifically the underlying groundwater and nearby Cherwell River (approx. 250m to the southwest).

Site remediation should be based on the principal of breaking the source-pathway-receptor pollutant pathway.

8.2 Preliminary Actions

A key part of the remediation will be to reassess the human health and controlled waters risk assessment with updated monitoring information and agree definitive Remediation Target Criteria (RTCS) in consultation with the Regulators. Furthermore, the establishment of development levels and the cut and fill balance will be an important exercise to minimise any offsite disposal and reduce costs.

Following the agreement of RTCs a detailed Remediation Strategy and Implementation Plan will be produced for regulatory approval.

8.3 Summary Remediation Actions

The following remediation actions are considered necessary:

- Decommissioning and emptying any existing underground tanks and associated pipework and infrastructure;
- Excavation, removal and crushing of remnant in ground structures and concrete slab;
- Excavation of impacted soils for treatment or off-site disposal;
- Soil treatment trials;
- Segregation and onsite treatment of the excavated soils;
- Off-site disposal of untreatable soils and deleterious materials;
- Non Aqueous Phase Liquids (NAPL) removal and disposal off site;
- Testing of treated materials for redeposition;
- Formation of clean cover layer in landscaped areas;
- Vapour protection measures within all site buildings; and
- Groundwater monitoring and remediation validation reporting.

Soil treatment may include a combination of bio-physical methods to both reduce the contaminant concentrations and immobilise them. The exact nature of the treatment would be established through treatment trials.

The current controlled waters QRA has determined that no diffuse phase groundwater remediation is required due to the soil source removal. Groundwater proposals include treating the soil source and LNAPL removal.

8.3.1 Validation

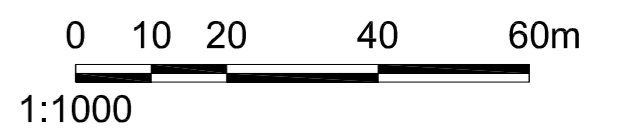
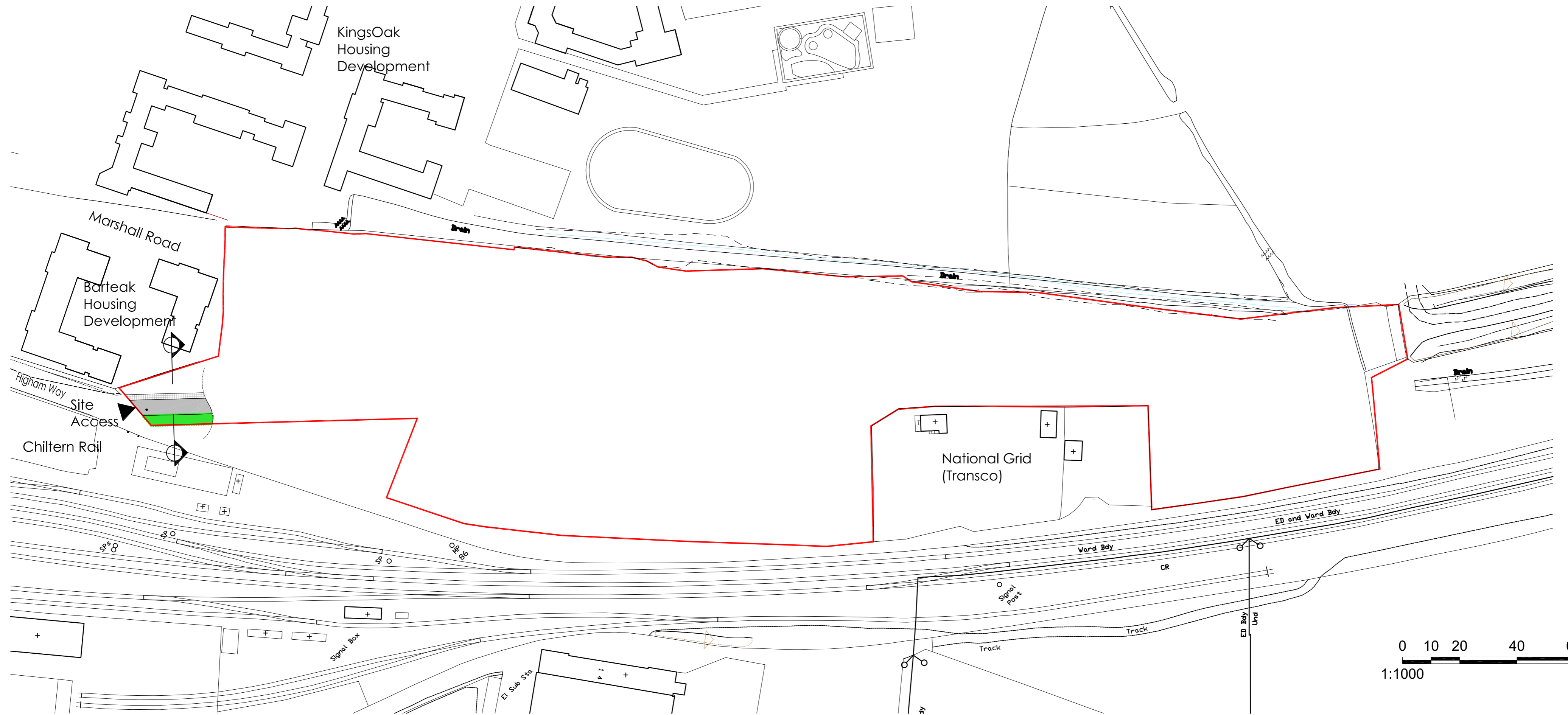
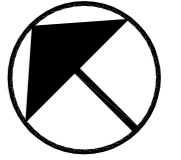
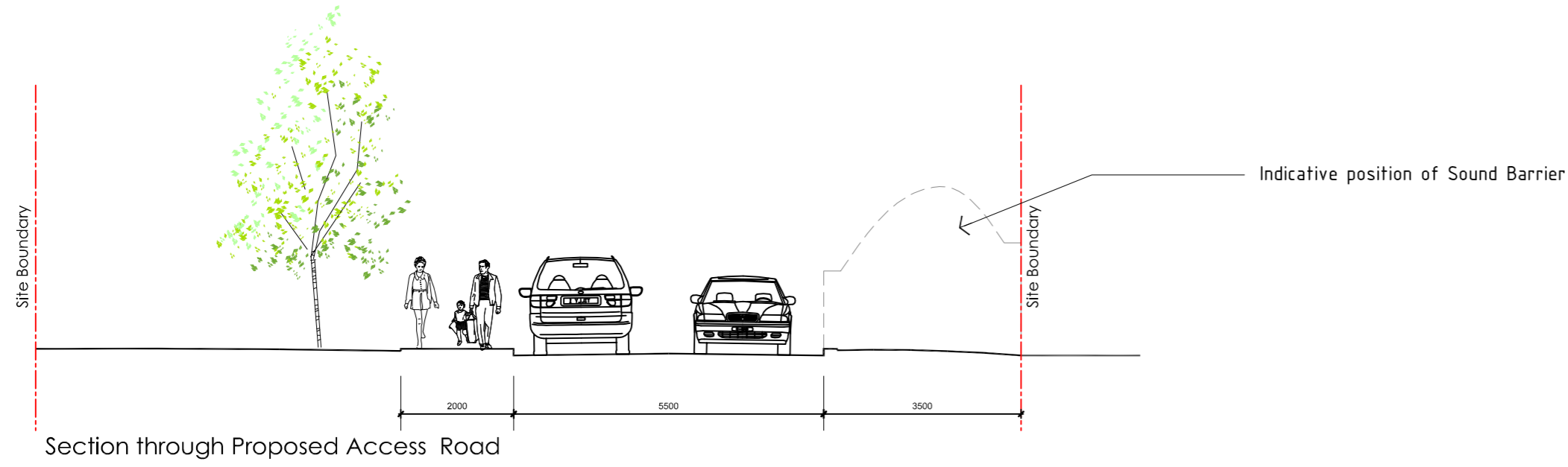
All excavated soils will be subject to testing to establish whether they can be reuse directly or whether they require treatment. Excavation voids and treated soils will also be subject to validation testing. Site operations will be based on a detailed materials management plan and grid system so that accurate records can be maintained and presented for Regulatory Approval.

Following completion of the works a report will be compiled detailing the remediation activities that have taken place; the report will include the following:

- A description of the works completed;
- The extent and location of any soil / pipework excavation (details to include figures illustrating the extent of excavation and location of soil sampling);
- Laboratory analysis reports associated with validation;
- Records of all soil treatment (including volumes and validation testing analytical results);
- Records of LNAPL removal;
- Records of any offsite disposal;
- Testing records for imported materials;
- A photographic record;
- A summary of environmental monitoring and complaints; and
- Full copies of key regulatory correspondence.

The Completion Report will be submitted to the Cherwell District Council Planning and Environmental Health Department and the Environment Agency.

APPENDIX A SITE PLANS



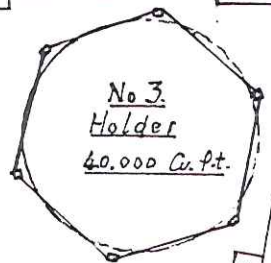
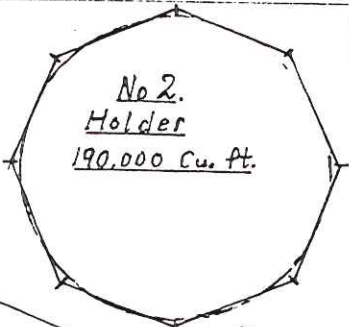
APPENDIX B- NATIONAL GAS ARCHIVES DRAWINGS

INTERMEDIATE SIDING FROM G.W.R.

Sulphate Settling Pits,
Condenser & Turbines

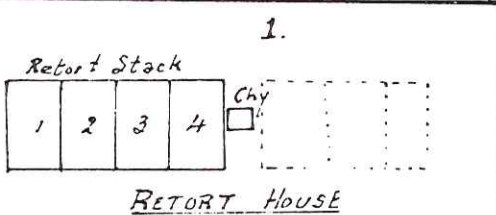
Coal Stack

METER
STORES
and
WORK SHOP

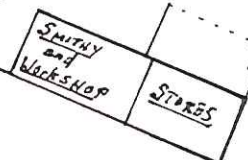
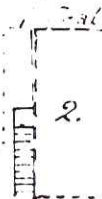


Coke Yard

Boiler House

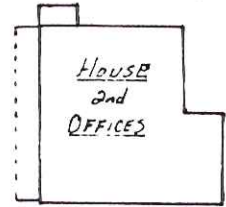
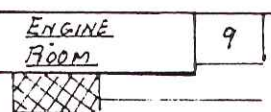


Coal Stack



4

W.M.



Garden

G.W.R.
SIDINGS

BANBURY GASWORKS (NORTH)

c 1910
Fig. 22



Scale 0 100 feet

G.C.H. 1985

1. Retort House showing 4 New Retort Beds. NOS. 5, 6, 7. Beds. Under Construction.
2. End of New Purifiers. (J.R. Duff. 1907)
3. Sulphate of Ammonia Plant.
4. Tar & Liquor Well (Site of original small gasholder)
5. Stoker's Messroom.
6. Station Meter House. (Benzole Evaporator also in here)
7. Weighbridge Office and Time Office.
8. Station Governor House.
9. Old Condensers. (Replaced in 1914)
10. Holder Valve Pit.

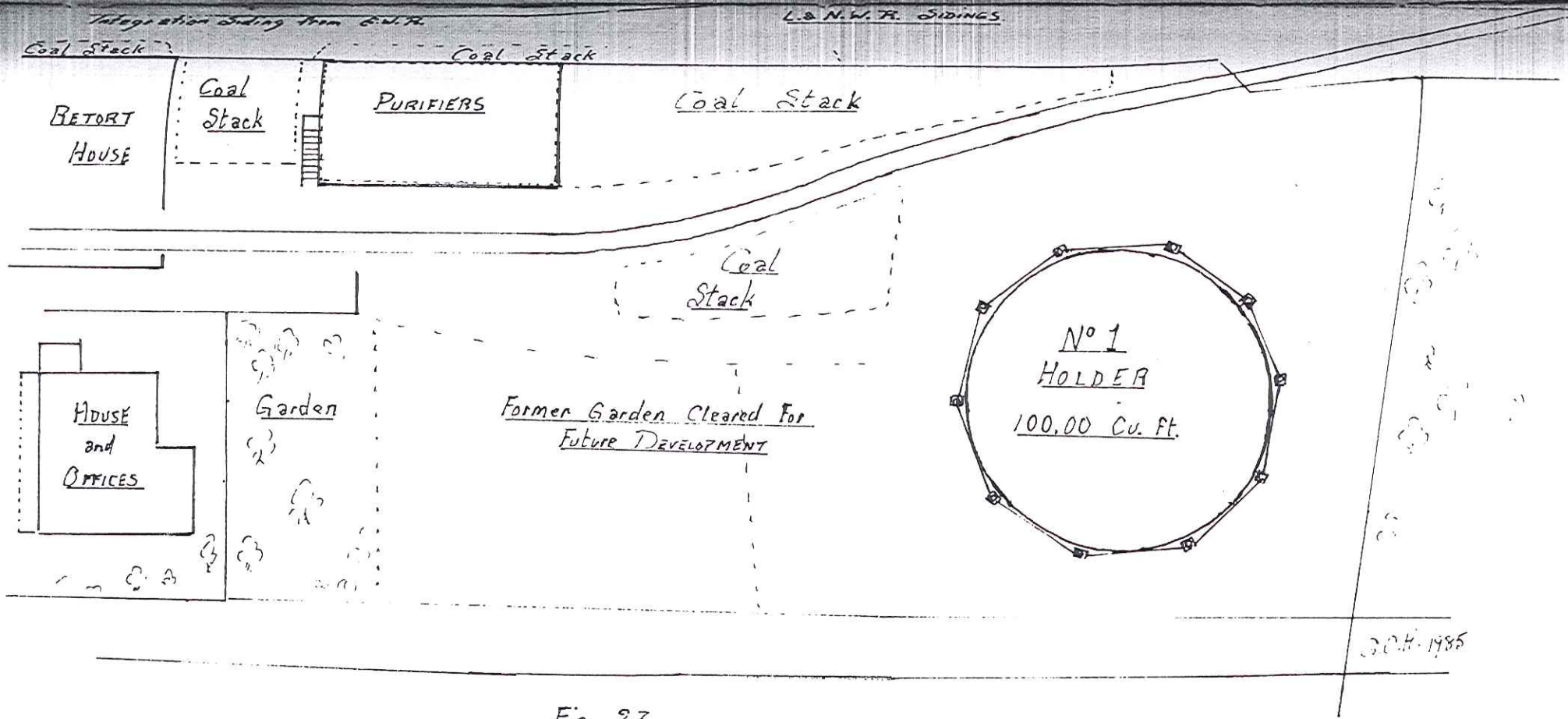


Fig. 23.
BANBURY GASWORKS (SOUTH)
 c 1910

Scale 0 ————— 100 feet.

The 100,000 Cubic Feet Gasholder was erected in 1892 on Land purchased in 1868. The new purifiers, erected on part of the works garden. Remainder of this land not developed until the 1930s.

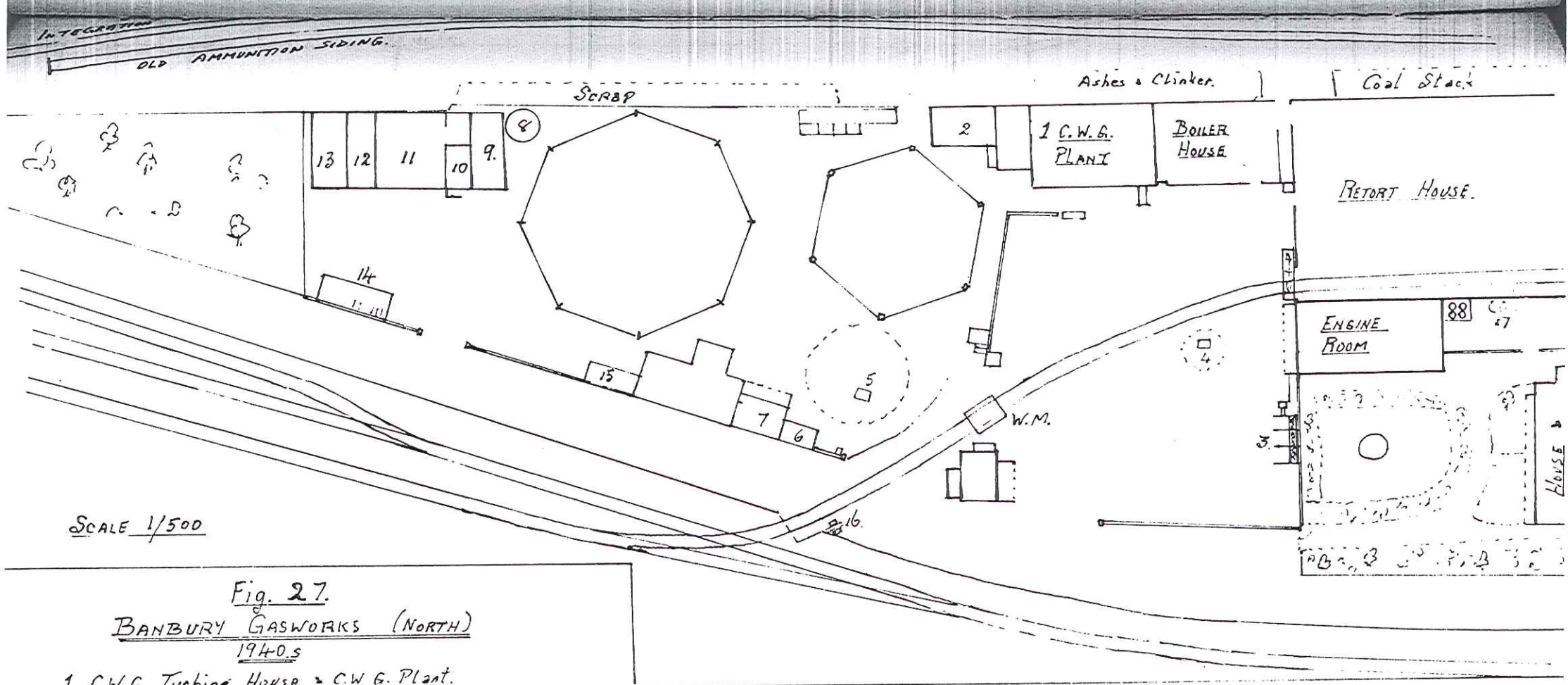


Fig. 27.

BANBURY GASWORKS (NORTH)
1940.5

1. C.W.G. Turbine House & C.W.G. Plant.
2. Sulphate Plant (Derelict.)
3. Coke Grading Plant. (G. Waller, Stroud, 1935)
4. & 5. Tar & Liquor Wells.
6. Works Foreman's Office
7. General Stores.
8. Gas-oil Storage Tank.
9. Garage.
10. Gas Testing Room.
11. Fitting and Cooker Cleaning Shop.
12. Distribution Foreman's Office.
13. Meter Repair Shop.
14. Bicycle and Slot Truck Shed.

15. Gas Service Pipe Racks.
16. Winding Rope Trolley Wheel
17. Tar & Liquor Well.

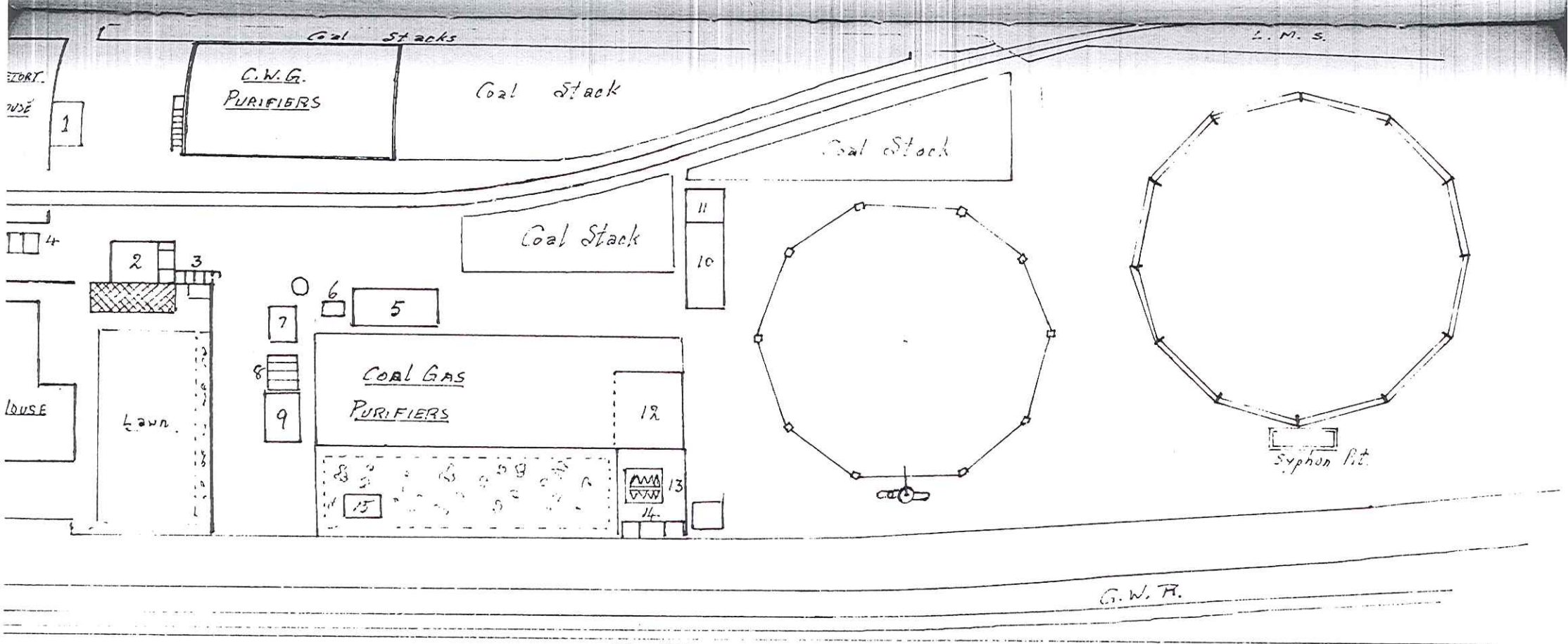


Fig. 28.
BANBURY GASWORKS (SOUTH)
 1940.5

1. Coal Elevator Engine House
2. Stoker's Mess Room / Washroom + Bathroom
3. Three W.C.s and Urinal. (Collinsons, 1935)
4. Old Holmes Washer Scrubber (Not used)
5. C.W.G. Exhauster House
6. C.W.G. Livesey Washer
7. Coal Gas Livesey Washer
8. Rotary Washer Scrubber
9. Scrubber Engine House.

10. Station Meter House
11. New Test Room.
12. Engine House, in which were situated
 a small National Gas Engine driving Circle Elevator,
 and a vertical gas engine driven J.C. generator.
13. & 14. Sewage Disposal Plant, incorporating two circular beds
 tumbler-distributor & sludge separating pits.
15. Air Raid Shelter.

SCALE 1/500

APPENDIX C – TERMS AND CONDITIONS

The opinions and recommendations expressed in this report are based on statute, guidance, and best practice current at the time of its publication. Foresite Projects Ltd (FPL) does not accept any liability whatsoever for the consequences of any future legislative changes or the release of subsequent guidance documentation, etc. Such changes may render some of the opinions and advice in this report inappropriate or incorrect and the report should be returned to us and reassessed if required for re-use after one year from date of publication.

Following delivery of the report FPL has no obligation to advise the Client or any other party of such changes or their repercussions. Some of the conclusions in this report may be based on third party data. No guarantee can be given for the accuracy or completeness of any of the third party data used. Historical maps and aerial photographs provide a “snap shot” in time about conditions or activities at the site and cannot be relied upon as indicators of any events or activities that may have taken place at other times.

The conclusions and recommendations made in this report and the opinions expressed are based on the information reviewed and/or the ground conditions encountered in exploratory holes and the results of any field or laboratory testing undertaken. There may be ground conditions at the site that have not been disclosed by the information reviewed or by the investigative work undertaken. Such undisclosed conditions cannot be taken into account in any analysis and reporting.

It should be noted that groundwater levels, groundwater chemistry, surface water levels, surface water chemistry, soil gas concentrations and soil gas flow rates can vary due to seasonal, climatic, tidal and man-made effects.

This report has been written for the sole use of the Client stated at the front of the report in relation to a specific development or scheme. The conclusions and recommendations presented herein are only relevant to the scheme or the phase of project under consideration. This report shall not be relied upon or transferred to any other party without the express written authorisation of FPL. Any such party relies upon the report at its own risk.

The interpretation carried out in this report is based on scientific and engineering appraisal carried out by suitably experienced and qualified technical consultants based on the scope of our engagement.

We have not taken into account the perceptions of, for example, banks, insurers, other funders, lay people, etc, unless the report has been prepared specifically for that purpose. Advice from other specialists may be required such as the legal, planning and architecture professions, whether specifically recommended in our report or not.

Public or legal consultations or enquiries, or consultation with any Regulatory Bodies (such as the Environment Agency, Natural England or Local Authority) have taken place only as part of this work where specifically stated.