

**GEOTECHNICAL AND GEOENVIRONMENTAL
SITE INVESTIGATION**

**BONDFIELD CRESCENT
WOMBWELL**

FOR

GLEESON DEVELOPMENTS LTD



40547-001

11 November 2016

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Approved : 
Catherine Topliss

Also at:- Principle House, 121-123 Fleet Road, Fleet, Hampshire, GU51 3PD Tel: 01252 360580 Fax: 01252 360581

Directors: P Richardson BSc, CEng, MICE, MStructE S D Preston BEng, CEng, FICE, FIStructE N J Baines BSc, CEng, MICE, MCIWEM
S R Ellis BEng, CEng, MStructE, MICE K R Pursall BEng, CEng, MStructE
C A Topliss BSc, CEng, CSci, CGeol, SiLC, MICE, FGS S J English BEng, CEng, MStructE A R Priest BEng
Senior Associates: K Newsome BSc, CEng, MICE, MStructE S J Mitchell BSc, MSc, CEng, MEI, MCIBSE, MASHRAE A Allison BEng
M Young MA, CEng, MICE, MStructE C A Wood BSc, CEng, MStructE, MICE
Associates: K Edwards MSc, FGS A J Kerslake BEng A G Marshall BEng, CEng, MStructE C Hodge EngTech, TMICE P A Harrison BEng, CEng, MStructE
M P Chappell BEng, IEng, AMStructE P H Halberstadt MEng, ACGI, CEng, MICE M Dyson BSc, CEng, MStructE
Consultant: J M Wood BSc, CEng, MICE, FIStructE

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1.0 EXECUTIVE SUMMARY

1. The approximately 1.7 hectare site is located to the east of Bondfield Crescent and to the south of Bondfield Close, in Wombwell near Barnsley. It is generally level.
2. The site comprises an area of overgrown vegetation. An access road runs north south through the western side of the site, to the school to the south. A soil mound is present in the south eastern corner as well as a small area of macadam, and another mound with Heras fencing surround is located in the north east. Some mature and immature trees are present.
3. Precautions against the effects of shallow coal mining are not considered to be necessary.
4. Made ground was encountered up to 2 m, being recorded deepest in the south east and south west of the site. The natural ground comprises sandstone, which was weathered to gravelly sand with medium cobble content between depths of 0.3 m to 2.5 m. Natural clay was found in two pits in the south of the site. Sandstone bedrock was encountered from 0.7 m close to the centre of the site, and at 2.4 m in the south west. Groundwater was only encountered in one trial pit at 1.65 m, with seepages in the previous investigation.
5. The trial pit excavated within the bund in the south east corner reached a depth of 2 m and recorded made ground comprising gravelly slightly clayey sand, with gravel of concrete, brick, sandstone and glass fragments.
6. It is considered that strip or trench fill foundations should be appropriate across the site, taken through any made or locally soft ground and into the natural sand at a minimum depth of 750 mm. If any plots are founded in clay, the footings should be taken to a minimum depth of 900 mm.
7. Footings will need to be deepened in accordance with the NHBC Standards where they are within clay soils, and where past, present or proposed trees are within influencing distance. Heave precautions will be required if the footings need to be deepened more than 1500 mm due to existing or removed trees.
8. The majority of the natural ground was found to comprise sand, however two pits in the south of the site found natural clay as well as sand. Where the footings span different materials, e.g. sand and clay, it is considered prudent to reinforce the foundations. This is not however, expected to affect a large number of plots.
9. There is generally more than 600 mm of made ground present, indicating that reinforced suspended or precast concrete floors with an underlying minimum 150 mm void below will be required, increasing to 250 mm where clay is found and heave precautions are required.

10. No significant obstructions were encountered during the intrusive investigation. However, old foundations may remain where the former buildings were located. Suitable easements will need to be maintained around the existing services on site unless these are diverted. Strong sandstone bedrock was encountered from depths of between 0.7 m and 2.4 m, which may make deep excavations on the site difficult.
11. All soakaway tests drained. Soakaways are therefore considered likely to be a viable option for surface water drainage.
12. No radon or ground gas precautions are required.
13. Two samples of the made ground topsoil recorded elevated concentrations of arsenic, lead and two PAHs, however, the concentrations are not considered to be pose a significant risk to human health. The made ground topsoil contained extraneous materials such as brick occasional ceramic, metal, glass and coal fragments. After screening, the made ground topsoil is considered will be suitable for re-use in the residential development, subject to the approval of the regulators.
14. One sample of ashy made ground recorded an elevated arsenic concentration. The previous investigation also recorded high arsenic, lead and PAH concentrations in ashy made ground. Where ashy material is found, it should be either capped with 600 mm of clean cover, including 100 mm of topsoil, in gardens and landscaped areas, or placed below hardstanding.
15. The ashy material in the previous investigation recorded elevated naphthalene concentrations. Where the ashy material is below plots, a minimum 150 mm high ventilated void will be required below the floor slab to disperse the low concentrations which may migrate to the surface.
16. Fragments of asbestos containing material were noted within one trial pit. Where this material is to remain below gardens, a 600 mm clean capping over an anti-dig layer is proposed.
17. The chemical test results indicate that DS-2 AC-3z is required for subsurface concrete in contact with the made ground. Where concrete is in contact with natural ground only, DS-1 AC-3z will be appropriate.
18. The conclusions made in this report in relation to contamination are subject to agreement by the approving bodies such as the Local Authority and your warranty provider.

2.0 INTRODUCTION

2.1 Terms of Reference

This report presents the findings of a geotechnical and geo-environmental site investigation carried out by Eastwood & Partners (Consulting Engineers) Ltd for Gleeson Developments Ltd. Any other parties using the information in this report do so at their own risk and any duty of care is excluded.

2.2 Context

CoDa Structures (Consulting Civil and Structural Engineers) produced a Phase 1 and 2 Engineering and Environmental Assessment on behalf of Ackroyd and Abbott Homes Ltd, dated 29 March 2007, and referenced 6062.

2.3 Aims and Objectives

The aims and objectives of this investigation were as follows:

- Assimilate Phase 1 data to derive an outline conceptual model identifying potential contaminants, pathways and receptors, as well as possible linkages between these;
- Detail the ground conditions and their geotechnical properties enabling outline foundation proposals to be made.
- Obtain information enabling refinement and subsequent testing of the conceptual model;
- Carry out tiered risk assessment to establish the likely risks to future receptors, involving the use of generic assessment criteria and where unacceptable risks are identified, site specific assessment criteria within a detailed quantitative risk assessment;
- Identify feasible remediation options if unacceptable risks are highlighted; and
- Develop an appropriate remediation strategy where remediation is required.

2.4 Scope of Investigation

This document is split into two sections. These constitute the findings of the Phase 1 and Phase 2 investigations, consecutively.

2.4.1 Phase 1

The Phase 1 investigation involved a review of information extracted from published documentation. Information regarding the current and former land uses both on and surrounding the site, as well as

the environmental sensitivity of the site location as determined by factors including geology, hydrogeology and hydrology has been examined.

Information analysed in this section of the report has been obtained from a variety of sources and include historical maps, the Environment Agency website, the Coal Authority, geological maps and memoir, as well as a site walkover.

2.4.2 Phase 2

This part of the investigation consisted of intrusive works and laboratory analysis. The findings were used to test the conceptual model and produce a final risk assessment.

The intrusive works comprised the excavation of trial pits to enable:

- Examination of the upper few metres of ground;
- In situ description of soils, enabling any localised lateral and vertical changes in soil conditions to be logged;
- Assessment of infiltration drainage in the upper few metres of ground;
- Assessment of any contamination identified using visual and olfactory methods; and
- Collection of soil samples for chemical testing.

2.5 Limitations of Investigation

This report is based on the assumption that the site is to be developed for residential use, with low rise dwellings of conventional construction with private gardens and associated areas of soft landscaping. It is expected that existing ground levels will not alter significantly. If this is not the case, further advice may be needed.

Where assessments of site areas affected in particular ways are given, these are approximate. All information, comments and opinions given in this report are based on the ground conditions encountered during the site work, on the results of laboratory testing carried out as part of the investigation and information gained from a geological and historical desk study. However, there may be conditions at the site that have not been taken into account, such as unpredictable soil strata and water conditions between or below investigation points. It should be noted that groundwater and gas levels vary due to seasonal or other effects, and may at times differ from those measured during the investigation.

This report considers the ground and groundwater and does not cover any buildings or their fabric. Generally, testing has only been carried out for contaminants identified as potentially present with

no assessment made of biological contamination. Risks to ecological receptors, such as bats, have not been considered.

3.0 THE SITE

3.1 Description

The site is located to the east of Bondfield Crescent and to the south of Bondfield Close, in Wombwell near Barnsley, South Yorkshire. The site has an area of approximately 1.7 hectares and is centred on grid reference 439570, 402900. It is generally level.

The site comprises an area of overgrown vegetation. An access road runs north south across the western side of the site, to the school to the south. A soil mound is present in the south eastern corner as well as a small area of macadam, and another mound with Heras fencing surround is located in the north east. Some mature and immature trees are present across the site.

The site is currently bordered by Bondfield Close to the north, with palisade fencing to the south, Heras fencing to the north, a metal palisade fence and hedges to the south and west, and hedges and chain link fencing to the east. The site is surrounded by residential properties to the north, east and west and Kings Oak Primary Learning Centre to the south.

The 'Exploratory Hole Location Plan', drawing reference 40547/001A, and site photographs included in Appendix 1, show the site's main features.

3.2 History

Historical Ordnance Survey maps within the CoDa Structures report have been studied to assess the previous use of the site and surrounding area. Copies of the maps are presented in Appendix 2.

3.2.1 The Site

The earliest map reviewed, dated 1854 (1:10,560), shows the site to comprise part of two agricultural fields. By 1930 the field to the north of the site contains allotment gardens with a cluster of sheds shown in the northern site corner, whilst the field to the south is labelled as a football ground. An embankment is shown around the north western, northern and eastern boundaries of the football ground. A terrace is shown west of the football ground, in the site's south western corner.

By the early 1960s the football ground is labelled as 'Greyhound Stadium'. The stadium appears to have been cleared by 1980 and by 1982 'The Gables School' has been developed central to the site with an access road running from Bondfield Close north of the site.

The report by CoDA Structures includes a site walkover from 2007. The report states that at the time of the visit there were no buildings but there was a new road in place to the school to the south.

The site had been stripped of topsoil and evidence of fly tipping was evident. A tarmac footpath was also located in the south eastern sector.

3.2.2 The Surrounding Area

The earliest historical map reviewed, from 1854, shows the site to be surrounded by fields. The village of Wombwell is located around 250 m east of the site. An old quarry is also shown around 250 m north east of the site.

By 1893 Wombwell has expanded to the north west and south east. The quarry is no longer shown.

By 1930, significant residential development has taken place. Allotment gardens are shown north of the site and 100 m to the east. The football ground extends south of the site with housing beyond. By 1956, housing is shown on land adjacent to the west and east of the site. A training centre is shown adjacent to the north east of the site by 1976. By 1980, the school at the southern boundary of the site has been developed.

No further significant changes occur to the present day.

3.3 Geology

The geological map Sheet 283 NW (1:10,560) and the online British Geological Survey viewer show the site to overlie the Oaks Rock sandstone of the Middle Coal Measures.

The dip of the strata in this area is around 4° towards the north east.

No superficial deposits are shown to cover the site.

No faults or lines of weakness are shown to cross the site.

3.4 Hydrogeology

The Environment Agency website records the solid strata beneath the site to comprise a Secondary A aquifer. These are defined as 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.

The Environment Agency's website does not record any groundwater abstraction licences within 250 m of the site.

The site does not lie within a Groundwater Source Protection Zone.

3.5 Hydrology

The nearest surface water feature is approximately 469 m to the north east. This appears to be a section of a disused canal.

3.6 Coal Mining

The geological maps indicate that the shallowest named seam of coal expected below the site will be the Swinton Pottery Coal. This is conjectured to outcrop around 370 m south west of the site, trending north west to south east, although the outcrop discontinues towards the north west, and is cut off by a fault to the south east.

The geological memoir records the seam to be thin with dirt partings. The seam is not likely to have been worked. The clay seat-earth (around 0.3 to 0.6 m thick) below the coal was occasionally worked as pottery clay, mainly at Swinton Pottery located several kilometres south east of the site, where the coal was around 400 mm thick. The seam is probably thinner, or absent altogether, below the site given the progression to shale northwards across the area, according to the memoir.

The seam is expected at a depth of around 25 m below the site. Even if workings are present, there is expected to be sufficient thickness of competent rock cover between the coal and the surface.

The second shallowest seam of coal expected beneath the site is the Newhill coal which is around 30 m below the Swinton Pottery Coal. The geological memoir records the coal as being a poor seam around Wombwell and only around 0.3 m in thickness. The seam is not expected to be worked below the site.

A Coal Authority mining report has been obtained for the site. This states that the site is within the zone of likely influence from workings in eight seams of coal at 120 m to 600 m depth, and last worked in 1978. It does not mention the presence of any shallow coal seams (i.e. at depths of less than 30 m), which backs up the evidence from the geological map that workings within the Swinton Pottery Coal may be absent beneath the site.

There are no known mine entries on, or within 20 m of the site.

The site is not within the likely zone of influence from any present or currently proposed future underground coal workings. However, reserves of coal exist in the local area which could be worked at some time in the future subject to feasibility, licences and planning consents. The site does lie within an area where a notice to withdraw support was given in 1983. Future workings of the coal reserves below the site however, are considered unlikely due to the demise of the UK coal mining industry and the site's location within an urban area.

Precautions against the effects of shallow coal mining are consequently not considered to be necessary.

3.7 Ground Gas

According to BR211, the site lies in an area where no radon precautions are required.

According to the Environment Agency website, there are no recorded historical landfill sites within 250 m of the site boundary.

The site formerly featured allotments, a football ground and a school. Significantly deep made ground is not expected to be present across the most of the site but may be present below the former terraces associated with the football ground and the former school.

3.8 Flooding

According to the Environment Agency website, the site does not lie within a flood plain.

4.0 OUTLINE CONCEPTUAL MODEL

Historically, the site has been occupied by allotment gardens, a football ground (later becoming a greyhound stadium) and a school.

Made ground is expected locally beneath the former buildings and the associated hard standing. Any made ground which is present may contain elevated concentrations of heavy metals/metalloids such as arsenic, lead, nickel, copper or zinc, as well as elevated levels of PAHs, particularly if ashy materials are present. Asbestos containing material may be present due to the age of the buildings and the former allotment use.

The natural ground is not expected to be particularly contaminated, although some naturally elevated concentrations of metals/metalloids and sulphates may be recorded.

No radon precautions are required for proposed development on the site. Ground gas precautions are also not expected to be required, providing the made ground is not significantly deep and does not contain a significant proportion of degradable material.

The following table details the possible sources and associated contaminants of concern, pathways and receptors, highlighted by the Phase 1 investigation as potentially present:

Potential Contaminants	Pathway	Receptor
<p>Made ground with possible elevated concentrations of heavy metals/metalloids, PAHs, sulphates, and asbestos.</p> <p>Naturally elevated concentrations of heavy metals/metalloids and sulphates within natural ground.</p>	<p>Ingestion, inhalation, direct contact.</p> <p>Migration through soils.</p>	<p>Future residents and visitors to the site.</p> <p>Site construction workers.</p> <p>Plants.</p> <p>Secondary A aquifer.</p>
	<p>Direct contact.</p>	<p>Sub-surface concrete.</p> <p>Water supply pipes.</p>
<p>Ground gas, if degradable material is found.</p>	<p>Inhalation, direct contact.</p>	<p>Future residents and visitors to the site.</p> <p>Site construction workers.</p> <p>Buildings.</p>

5.0 REVIEW OF REPORTS BY OTHERS

CoDa produced a Phase 1 and 2 Engineering and Environmental assessment on behalf of Ackroyd and Abbott Homes Ltd, dated 29 March 2007, referenced 6062. The report does not contain an Exploratory Hole Location Plan. A copy of the CoDA Structures report is included in Appendix 2.

CoDa Structures undertook an intrusive investigation on 8 March 2007. The works involved the excavation of 9 trial pits to depths of between 1.2 m and 3.7 m and 6 window sample holes to between 1.2 and 3.5 m depth with installation of 4 wells for gas and groundwater monitoring.

The ground conditions were summarised as follows: topsoil to between 0.2 and 0.8 m, made ground to between 0.25 and 3.3 m, sand to between 0.9 and 1.8 m and weathered sandstone to between 0.45 and 1.8 m depth. The made ground comprised silty clay, ash, sand, gravel, brick fragments, clinker and occasional cobbles, plastic, concrete, macadam and stone chippings. The deeper made ground was found in a trial pit that was excavated within a mound. Sandstone was proved within the majority of trial pits and boreholes at a depth of between 1.2 and 3.5 m.

Groundwater seepage was encountered within three trial pits at 1.85 m, 0.3 m and 1.2 m depth. Groundwater monitoring on 28 March 2007 recorded no groundwater within any of the boreholes.

CoDa sent 4 samples of topsoil, 11 samples of made ground and 4 samples of natural ground for chemical testing. Two samples of the topsoil recorded elevated arsenic and one recorded elevated zinc. Three samples of the made ground recorded elevated arsenic concentrations and one sample recorded an elevated copper concentration. A number of made ground samples also recorded a number of elevated PAHs, including naphthalene. CoDa Structures noted that the majority of elevated values were within soils which included ash or clinker. None of the natural ground samples recorded any elevated concentrations.

No sulphate precautions were considered necessary within the made ground and natural ground.

CoDa Structures recommended a number of remediation measures. They suggested that the topsoil be removed from site to a licenced tip, the made ground around TP3 should be excavated and placed under hard cover, the soils in the mound in the south western corner should be excavated and placed under hardcover, the rest of the made ground should be capped with 600 mm of inert soil, incorporating 150 mm topsoil, and all service trenches should be backfilled with clean inert material.

One round of gas monitoring had been completed within the report. The results indicated that no methane was present and the highest carbon dioxide value was 1.1%. Therefore it was suggested no gas measures would be necessary.

Three infiltration tests were carried out, recording infiltration rates of 123×10^{-6} , 17.8×10^{-6} and 61.2×10^{-6} m/sec. Further testing was recommended.

6.0 PHASE 2 INVESTIGATION

6.1 Site Works

Eastwood & Partners visited the site on 19 and 20 October 2016 and excavated sixteen trial pits across the site to determine the underlying ground conditions. Eight of the pits were used to conduct soakaway tests. One trial pit was also excavated within the stockpile/bund in the south east of the site.

The trial pits reached depths of between 0.55 m and 2.5 m below ground level (bgl). The trial pit and soakaway positions were chosen to give good site coverage whilst avoiding the various services that are present on the site.

The trial pit and soakaway locations are shown on the Exploratory Hole Location Plan, drawing number 40547/001A in Appendix 1.

6.2 Laboratory Testing

Disturbed samples were obtained from each of the trial pits and were generally taken at each significant change of strata.

Eight samples of made ground topsoil, eight samples of made ground (two of which were obtained from the bund) and three samples of the natural ground were submitted for chemical testing at Chemtest Limited in Newmarket. The chemical test results are covered in Section 9 and are in Appendix 5.

7.0 GROUND CONDITIONS

7.1 Surface Covering

The majority of the site is covered by made ground topsoil, comprising dark brown slightly gravelly sand, with gravel of mixed lithologies including brick, glass, ceramic, clinker, coal, metal and sandstone. The material varied in thickness between 0.05 and 0.7 m.

7.2 Made Ground

Made ground was encountered across the site to around 0.5 to 1.5 m depth, except in the south east corner where the base of the made ground was found at 1.9 m and in the south west corner at 2 m bgl.

Made ground comprising gravelly sand was encountered in TP11 and TP12, to depths of 1.85 m and 0.9 m respectively. The gravel was found to include concrete, brick, sandstone, metal, rubber, glass, ceramic, and coal. Cement bound asbestos was also found within TP11. Beneath this layer in TP12, made ground comprising reworked gravelly sand with gravel of sandstone was encountered to 2 m bgl, expected to have been placed to raise ground levels adjacent to the former access road.

Slightly clayey slightly gravelly sand was found between depths of 0.4 m to 0.8 m bgl in TP1, with gravel comprising brick, sandstone and coal fragments. Clayey sand with gravel of sandstone and brick was found in TP15 between 0.5 m to 0.8 m, overlying ashy gravel of coal, ceramic, metal, brick, glass bottles and rare batteries to 1.5 m bgl. Silty clay with occasional gravel of coal and sandstone was found beneath this to 1.9 m depth.

Made ground comprising pink/white slightly sandy gravel of limestone was encountered within TP7, TP13, TP10 and TP14 generally between 200 and 300 mm in thickness apart from TP7 which encountered it from 0.7 to 1.7 m bgl.

Sandy gravel was encountered to 0.2 m bgl in TP6, overlaying dark grey sandy clay with coal fragments to a depth of 0.5 m bgl. Made ground comprising sandy clay with coal fragments was also found in TP14, to a depth of 0.7 m bgl.

Within TP2, a thin layer of macadam gravel was encountered from 0.3 m to 0.5 m depth. Concrete was encountered in TP16 between 0.5 m and 0.55 m bgl.

The trial pit excavated within the bund in the south east corner reached a depth of 2 m and recorded made ground comprising brown gravelly slightly clayey sand, with gravel of concrete, brick, sandstone and glass fragments.

7.3 Natural Ground

In the south of the site, TP14 encountered firm natural clay below the made ground to 1.5 m bgl and TP15 recorded a 100 mm band of clay below the made ground to 2 m bgl.

Sandstone was encountered in all of the trial pits from between 0.4 m and 2 m bgl up to 2.5 m bgl. The sandstone was generally weathered in the upper 1 m to 1.5 m and was recovered as gravelly sand with medium cobble content, progressing into sandstone recovered as cobbles which was difficult to excavate at the base.

7.4 Obstructions

TP16 was terminated due to encountering concrete that was too difficult to progress.

Two clay pipes were encountered. These were recorded within TP10 at 0.4 m depth and TP14 at 0.3 m depth, thought to be associated with the former school.

7.5 Groundwater

Slight groundwater ingress was encountered within one trial pit, TP8, at 1.65 m depth.

7.6 Evidence of Contamination

Cement bound asbestos was encountered within TP11 within the made ground.

8.0 GEOTECHNICAL APPRAISAL

8.1 General

Made ground was encountered up to 2 m, being recorded deepest in the south east and south west of the site. The natural ground comprises sandstone, which was weathered to gravelly sand with medium cobble content between depths of 0.3 m to 2.5 m. Natural clay was found in two pits in the south of the site. Sandstone bedrock was encountered from 0.7 m close to the centre of the site, and at 2.4 m in the south west. Groundwater was only encountered in one trial pit at 1.65 m, with seepages in three of the previous trial pits.

The natural ground is predominantly granular, and can therefore be regarded as being non-shrinkable.

An allowable bearing capacity of 125 and 150 kN/m² is considered can be assumed for the natural clay and sand respectively, which will increase rapidly in the bedrock.

8.2 Foundations

The proposed development is to comprise low rise residential dwellings of conventional construction.

It is considered that strip or trench fill foundations will be appropriate across the site, taken through any made ground or locally soft ground and into the natural sand at a minimum depth of 750 mm below finished level.

If any plots are founded in clay, the footings should be taken to a minimum of 900 mm below existing or proposed ground level, whichever is the lowest. The footings will need to be deepened in accordance with the NHBC Standards, Chapter 4.2, where they are within clay soils, and where past, present or proposed trees are within influencing distance. Heave precautions will be required if the footings need to be deepened more than 1500 mm due to existing or removed trees.

The majority of the natural ground was found to comprise sand, however two pits in the south of the site found natural clay as well as sand. Where the footings span different materials, e.g. sand and clay, it is considered prudent to reinforce the foundations. This is not however, expected to affect a large number of plots.

8.3 Ground Floors

There is generally more than 600 mm of made ground present, indicating that reinforced suspended or precast concrete floors with an underlying minimum 150 mm void below will be required, increasing to 250 mm where clay is found and heave precautions are required.

8.4 Superstructure Precautions

At this stage, additional superstructure precautions should not be required based on the ground conditions encountered on site.

8.5 Excavation Problems

Slight groundwater ingress was encountered at the base of TP8 at 1.65 m and seepage in three of the previous trial pits at 1.85 m, 0.3 m and 1.2 m depth.

The sides of any excavation may be unstable where groundwater or made ground is present, but excavations are generally expected to be relatively stable in the short term.

Support will be required in accordance with current Health & Safety Regulations wherever access is required to trenches deeper than 1.2 m, or less where there is risk of collapse.

8.6 Obstructions

No significant obstructions were encountered during the intrusive investigation. However, old foundations may remain where the former buildings were located.

Suitable easements will need to be maintained around the existing services on site unless these are diverted away from the site.

Strong sandstone bedrock was encountered from depths of between 0.7 m and 2.4 m, which may make deep excavations on the site difficult.

8.7 Roads

A CBR value of at least 2% is likely to be appropriate for road design. The ground should be assumed to be frost susceptible and a minimum capping thickness of 450 mm will therefore apply.

It is recommended that CBR tests are undertaken along any proposed roads prior to construction so that more accurate CBR values can be obtained.

8.8 Surface Water Drainage

Infiltration tests were carried out within the natural ground. Tests were carried out in eight pits referenced SA1 and SA8. The locations of the pits are indicated on the Exploratory Hole Location Plan in Appendix 1 and the results are in Appendix 4.

The results of the soakaway tests are summarised in the table below.

Location	Test Number	BR365 Soil Infiltration Rate ($\times 10^{-6}$ m/s)	Average Infiltration Rate ($\times 10^{-6}$ m/s)
SA1	1	180	160
	2	120	97
SA2	1	110	140
	2	85	64
SA3	1	30	41
SA4	1	18	19
SA5	1	100	110
	2	85	110
SA6	1	190	160
	2	120	140
	3	110	93
SA7	1	85	79
	2	51	63
	3	54	54
SA8	1	60	74
	2	39	46

In some tests, the bases had silted up, however all tests still drained. Based on the infiltration rates recorded, soakaways are considered likely to be a viable option when placed within natural granular soils.

9.0 REFINEMENT OF OUTLINE CONCEPTUAL MODEL

9.1 Source Characterisation

An outline conceptual model, detailing the possible sources and associated contaminants of concern, potential pathways and receptors identified in the Phase 1 was detailed in Section 4.

This section of the report documents the works undertaken to obtain information to test and refine this model enabling a risk assessment to be produced and, where significant risks are expected, remediation recommendations.

9.2 Ground Gas

No radon precautions are required for proposed development on the site.

A significant thickness of made ground (i.e. over 2 m) was not encountered and there are no landfill sites within 250 m of the site. Ground gas precautions are therefore not considered to be required.

9.3 Chemical Testing

Eight samples of made ground topsoil, eight samples of made ground (two of which were obtained from the bund in the south east) and three samples of natural ground were submitted for chemical testing. Each of the samples was analysed for the suite of contaminants listed below:

Contaminant Type	Actual Contaminants
Metals/Metalloids	Arsenic, cadmium, chromium (III and VI), lead, mercury, nickel, selenium copper and zinc
PAHs	Speciated PAH
Asbestos*	Fibres
Sulphates**	Total sulphur, water soluble sulphate, acid soluble sulphate, pH

*Made ground and topsoil samples only

**Made ground samples only

Three samples, TP1 0.3 m, TP9 0.1 m and TP15 0.9 m, were sent for additional testing. TP1 and TP9 were tested for total organic carbon and four subsamples were taken from TP1 and TP15 and tested for arsenic. Four subsamples were also taken from TP1 and tested for lead.

Testing was undertaken by Chemtest Limited, using MCERTs accredited methodologies, where available. A copy of the test results is included in Appendix 5.

9.4 Assessment Criteria

The proposed development of the site is to be residential use with private gardens and associated hardstanding and communal soft landscaping. Therefore the assessment criteria relating to a

residential with home-grown produce end use have been used. Tables detailing the relevant assessment concentrations used are included in Appendix 5.

9.5 Chemical Test Results

9.5.1 Made Ground/Topsoil

Total organic carbon of 3 and 16% was recorded in the two samples tested. Assessment values derived using 6% soil organic matter can therefore be used in this assessment.

Two samples of made ground topsoil recorded concentrations above their respective generic assessment values as shown in the table below:

Contaminant	Assessment Value mg/kg	Concentration mg/kg		Modified/Corrected Mean mg/kg
		TP1 0.3 m	TP9 0.1 m	
Arsenic	37	81	-	39.3
Lead	200	300	-	116
Benzo[b]fluoranthene	3.7	5.4	2.8	2.7
Benzo(a)pyrene	3.0	4.4	2.4	2.2

Four subsamples were tested from TP1 0.3 m for arsenic and lead. The arsenic results were recorded between 65 and 85 mg/kg, creating a sample average of 77.4 mg/kg, and the lead concentrations were recorded between 290 and 330 mg/kg, creating a sample average of 308 mg/kg.

In the previous investigation, four samples of topsoil were tested. Two of these samples recorded elevated lead concentrations of 324.3 and 373.6 mg/kg. One sample also recorded slightly elevated benzo(b)fluoranthene and benzo(a)pyrene concentrations of 3 mg/kg. Including these results in the modified means, and the sample averages noted above, the following is calculated:

Contaminant	Assessment Value mg/kg	Modified/Corrected Mean mg/kg
Arsenic	37	31.9
Lead	200	141
Benzo[b]fluoranthene	3.7	2.3
Benzo(a)pyrene	3.0	2.0

None of the modified or corrected means exceed the generic assessment values.

9.5.2 Made Ground

One sample of made ground, referenced TP15 0.9 m, recorded an elevated arsenic concentration of 48 mg/kg in comparison to the generic assessment value of 37 mg/kg. Four subsamples were additionally tested for arsenic. None of the results were elevated above the assessment value, and a sample average of 36.2 mg/kg is calculated.

The samples obtained from the stockpile/bund in the south east did not record any elevated concentrations.

In the previous investigation, eleven samples of made ground were sent for chemical testing. The elevated values are summarised in the table below:

Contaminant	Assessment Value mg/kg	Concentration mg/kg			
		WS6 0.5 m	TP3 0.2 m	TP6 0.8 m	TP8 2.4 m
Arsenic	37	-	66	63.5	57.3
Lead	200	-	-	254.4	-
Naphthalene	2.3	7.1	5.9	5.3	13.1
Phenanthrene	95	139.5	-	-	-
Benzo[a]anthracene	7.2	93.4	43.3	-	-
Chrysene	15	84.3	37.5	-	-
Benzo[b]fluoranthene	3.7	95.9	50.2	4.9	-
Benzo(a)pyrene	3.0	89.6	36.1	3.9	-
Indeno[1,2,3-cd]pyrene	27	56.5	-	-	-
Dibenz[a,h]anthracene	0.24	11.6	5.6	0.6	-

9.5.3 Natural Ground

None of the samples recorded concentrations above their respective assessment values.

9.5.4 Sulphates

The site has been taken as a Brownfield location in relation to the Aggressive Chemical Environment for Concrete classifications. Groundwater is expected to be mobile through the shallow soils.

Within the previous investigation, all samples of topsoil, made ground and natural ground were tested for water soluble sulphate and pH. The results are included in the sections below.

Made Ground Topsoil

The total potential sulphate concentrations were typically between 0.09 and 0.57%.

The concentrations of water soluble sulphate are all at or below 22 mg/l.

The pH values were recorded between 6.5 and 8.1.

Made Ground

The total potential sulphate concentrations were typically between 0.03 and 0.72%. A characteristic value of 0.53% can be calculated.

The concentrations of water soluble sulphate are all at or below 427 mg/l.

The pH values were recorded between 5.2 and 11.4. A characteristic value of 5.8 can be calculated.

Natural Ground

Three samples of natural ground were tested. The total potential sulphate concentrations were between 0.03% and 0.12%.

The concentrations of water soluble sulphate are all at or below 115 mg/l.

The pH ranged between 4.6 and 8.2. A characteristic value of 5.4 can be calculated.

9.5.6 Asbestos

The made ground found between 0.1 and 1.85 m depth in TP11 recorded pieces of asbestos containing material, however, the sample obtained from 1 m depth did not record any fibres. No fibres were recorded across any other sample tested.

9.6 Significant Pollutant Linkages

Potential Contaminants	Pathway	Receptor
Made ground topsoil with arsenic, lead, PAHs. Made ground with arsenic, lead and PAHs. Made ground with asbestos containing material.	Ingestion, inhalation, direct contact. Migration through soils.	Future residents and visitors to the site. Site construction workers. Plants Secondary A aquifer
Sulphates in made ground	Direct contact	Subsurface concrete
Made ground/topsoil with PAHs.	Direct contact	Water supply pipes

10.0 RISK ASSESSMENT

10.1 Human Health – Future Residents and Visitors

Made Ground Topsoil

Two samples of the made ground topsoil recorded elevated concentrations of benzo[b]fluoranthene and benzo[a]pyrene and one of these samples (TP1 at 0.3 m) also recorded an elevated arsenic and lead concentration. Two topsoil samples from the previous investigation also recorded elevated lead and PAHs. However, none of the modified or corrected means exceed the generic assessment values. This made ground topsoil is therefore not considered to pose a significant risk to human health.

The made ground topsoil contained extraneous materials such as brick, occasional ceramic, metal, glass and coal fragments. After screening, the made ground topsoil is considered will be suitable for re-use in a residential development, subject to the approval of the regulators.

Made Ground

Made ground was encountered across the site. However, only one sample of the made ground recorded any elevated concentrations. The material in this location (TP15 at 0.9 m) contained fragments of coal, metal, batteries and glass, and was recorded as 'ashy'. These soils were not encountered anywhere else on site. It is possible that this is the reason for the elevated arsenic concentration of 48 mg/kg. It is therefore likely that the elevated arsenic concentration is contained within a localised area and can be treated as a 'hotspot'.

Made ground within the previous investigation also recorded ashy and clay made ground, and samples tested recorded elevated concentrations of arsenic, lead and PAHs, including naphthalene. The report reviewed does not contain an exploratory hole location plan, so it is not known where the samples were obtained from. However, based on the results and the description of the material, the ash content of the soil is most likely the source of the elevated concentrations. Where this ashy material is found, it should be either capped with 600 mm of clean cover, including 100 mm of topsoil, in gardens and landscaped areas, or placed below areas of hardstanding.

The ashy material in the previous investigation recorded elevated naphthalene concentrations. Where the ashy material is present below plots, a minimum 150 mm high ventilated void is proposed to disperse the low concentrations which could migrate to the surface.

Fragments of asbestos containing material were noted within TP11 from between 0.1 and 1.85 m bgl. Where this material is to remain below gardens, a 600 mm clean capping over an anti-dig layer is proposed.

10.2 Human Health – Construction Workers

Ground workers employed during the construction phase of the development are most at risk of harm due to them having direct contact with the affected soils. However, the contact is generally of short duration, and all competent ground workers will be aware of the potential risks associated with soils of this nature.

All ground workers employed on the site should be made aware that made ground has been encountered and normal site procedures such as the wearing of gloves when handling soils and the washing of hands prior to eating should be implemented.

Any unusual, brightly coloured, ashy or odorous material encountered during construction should be brought to the attention of the site staff and investigated.

10.3 Plants

The proposed capping is considered will mitigate any significant risks to plants.

10.4 Construction Materials

The chemical test results indicate that DS-2 AC-3z is required for concrete in contact with the made ground, mainly due to the low pH values recorded in a number of the samples.

Where concrete is in contact with natural ground only, DS-1 AC-3z will be appropriate.

All chemical test results should be forwarded to the water supplier to determine the level of protection required for water supply pipes.

10.5 Controlled Waters

The site overlies a Secondary A aquifer, and the nearest surface water feature is approximately 470 m north east of the site. The site does not lie within a Groundwater Source Protection Zone.

Although the made ground and made ground topsoil recorded elevated heavy metal/metalloid and PAH concentrations, the underlying natural ground did not record any significantly elevated concentrations, indicating that the natural material has not been impacted with migrating contaminants.

Based on this, the overall conclusion is that the risk to controlled waters from materials encountered on site is low.

10.6 Disposal of Material

If material needs to be removed, it should to be taken to a suitably licensed landfill or waste treatment facility. The costs of disposal and landfill tax can be substantial. The disposal of material should therefore be seen as a last resort with options such as treatment and reuse either on-site or off-site considered where possible.







The category of landfill which can accept the waste (inert, non-hazardous or hazardous) would need to be determined and will also have a significant effect on the costs. Additional testing may be required by the landfill operator and the acceptance of material is generally at their discretion.

Appendix 1

Exploratory Hole Location Plan, 40547/001 Revision A
Site Photographs



INFORMATION WITHIN THIS DRAWING IS NOT NECESSARILY PRODUCED TO SCALE.
ALWAYS USE FIGURED DIMENSIONS AND CO-ORDINATES - IF IN DOUBT, ASK.

- Key:**
-  Approximate location of trial pit excavated by Eastwood and Partners on 19-20 October 2016.
 -  Approximate location of trial pit / soakaway pit excavated by Eastwood and Partners on 19-20 October 2016.
 -  Approximate location of former building.
 -  Site Boundary
 -  Approximate location of bund
 -  Approximate location of trial pit placed within bund.

A	First Issue.			
REV	DESCRIPTION	SIG	CHK	DATE

GLEESON DEVELOPMENTS LTD

BONDFIELD CRESCENT, WOMBWELL

EXPLORATORY HOLE LOCATION PLAN

Eastwood & Partners
CONSULTING ENGINEERS **EOP**

St. Andrew's House
23 Kingfield Road
Sheffield
S11 9AS

Tel 0114 255 4554
Fax 0114 255 4330

mail@eastwoodandpartners.com
www.eastwoodandpartners.com

SCALE WHEN PLOTTED AT A3 1:1000			DRAWING STATUS INFORMATION	
DRAWN JRB	CHECKED SRI	DATE 21.10.16	DRAWING NUMBER 40547-001	REV A



View looking south along the access road into site

View of the southern side of the site

Prepared	SRI	Checked	KLG	Date	01.11.2016	Photograph No	1/2
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EOP
Eastwood & Partners
 CONSULTING ENGINEERS

St Andrew's House
 23 Kingfield Road
 Sheffield S11 9AS
 Tel: (0114) 2554554 Fax: (0114) 2554330

BONDFIELD CRESCENT, WOMBWELL

GLEESON DEVELOPMENTS LTD

SITE PHOTOGRAPHS



Manhole on site to the combined sewer



Fenced off mound at the north east corner

Prepared	SRI	Checked	KLG	Date	01.11.2016	Photograph No	3/4
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EOP
Eastwood & Partners
 CONSULTING ENGINEERS

St Andrew's House
 23 Kingfield Road
 Sheffield S11 9AS
 Tel: (0114) 2554554 Fax: (0114) 2554330

BONDFIELD CRESCENT, WOMBWELL

GLEESON DEVELOPMENT LTD

SITE PHOTOGRAPHS



Example - TP1



Example - TP15

Prepared	SRI	Checked	KLG	Date	01.11.2016	Photograph No	5/6
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E+P
Eastwood & Partners
 CONSULTING ENGINEERS

St Andrew's House
 23 Kingfield Road
 Sheffield S11 9AS
 Tel: (0114) 2554554 Fax: (0114) 2554330

BONDFIELD CRESCENT, WOMBWELL

GLEESON DEVELOPMENTS LTD

SITE PHOTOGRAPHS

Appendix 2

CoDa Structures Phase 1 and 2 Engineering and Environmental Assessment Report Coal Authority Report

**PHASE 1 & 2 ENGINEERING & ENVIRONMENTAL
ASSESSMENT**

**FORMER GABLES SCHOOL
BONDFIELD CRESCENT WOMBWELL**

VOLUME 2

APPENDICES

APPENDIX A	-	LIST OF DOCUMENTS REFERRED TO
APPENDIX B	-	SITE LOCATION PLAN - Fig. 1
APPENDIX C	-	SITE TOPOGRAPHICAL SURVEY - Fig. 2
APPENDIX D	-	SITE PHOTOGRAPHS
APPENDIX E	-	HISTORIC ORDNANCE SURVEY PLANS
APPENDIX F	-	MINING SEARCH
APPENDIX G	-	TRIAL PIT LOGS
APPENDIX H	-	WINDOW SAMPLING BOREHOLE LOGS
APPENDIX I	-	TIER ONE INTERVENTION VALUES
APPENDIX J	-	CHEMICAL TEST RESULTS
APPENDIX K	-	GEOTECHNICAL TEST RESULTS
APPENDIX L	-	EXTRACTS FROM STATUTORY SERVICES RECORDS & Yorkshire Water Letter Dated 26 March 2007 Ref: H002849

APPENDIX 'A'

LIST OF DOCUMENTS REFERRED TO:

- Geological Map
- Ordnance Survey Sheets:

1854/55	1:10,000	1938	1:10,000	1989	1:10,000
1892/92	1:2,500	1956	1:10,000	1993	1:2,500
1893-94	1:10,000	1962	1:2,500	2000	1:10,000
1903-06	1:10,000	1966-67	1:10,000	2004	1:10,000
1905-07	1:10,000	1976	1:2,500		
1930-31	1:2,500	1982	1:2,500		

- Envirocheck Report
- Extracts from Statutory Services Records
- Mining Search prepared by D Bellis Consulting Surveyors
- Yorkshire Water Drainage Desk Top Study (awaited)

APPENDIX B

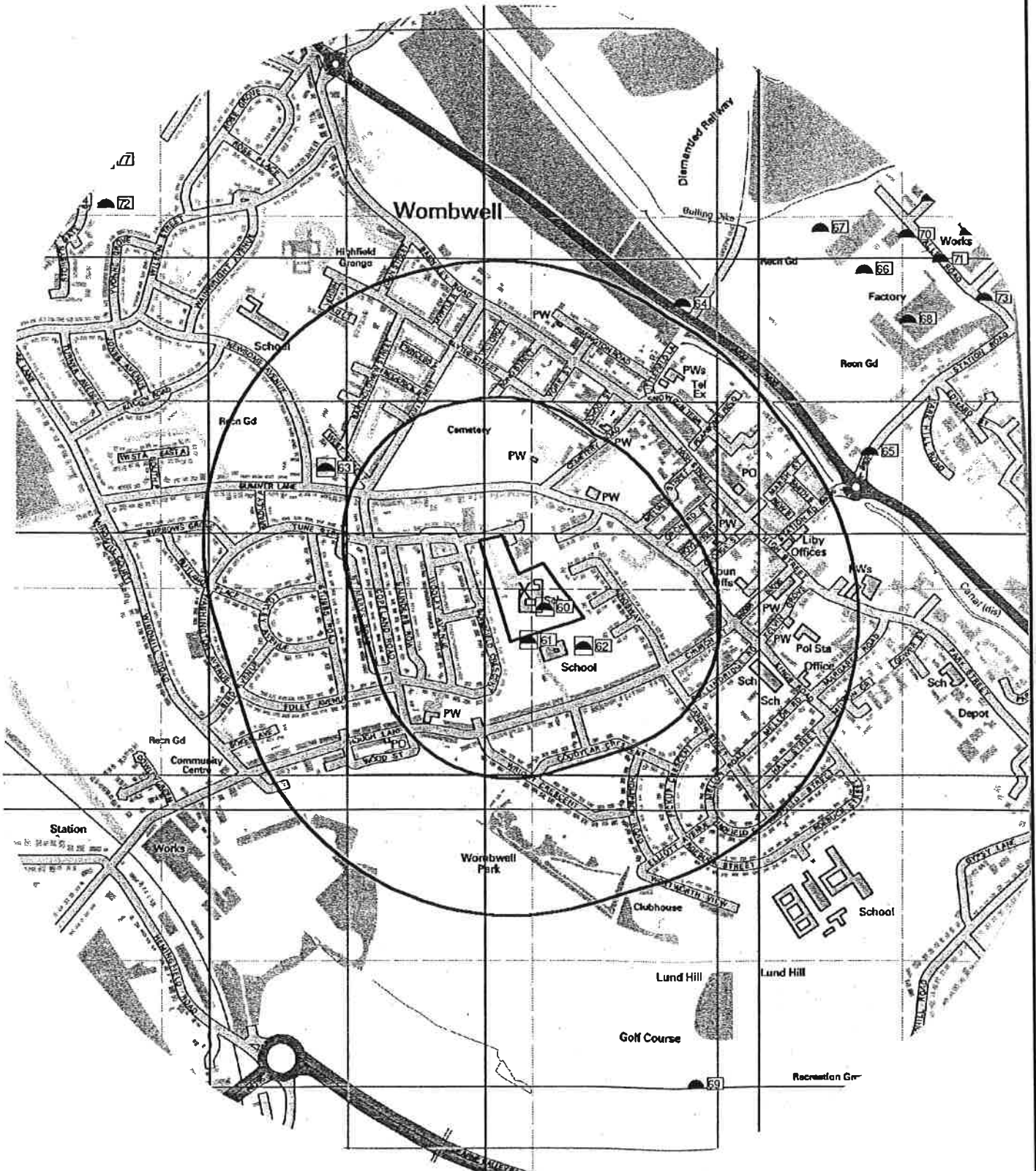
SITE LOCATION PLAN - Fig. 1

CoDa+ Structures

Consulting Civil & Structural Engineers

No 2 Harewood Yard
Harewood
Leeds LS17 9LF
Tel: 0113 288 6766
Fax: 0113 288 6765

Project	Bondfield Crescent Wombwell		
Title	Site Location Plan		
Drawn	JL	Date	03.07
Scale	1:10000	Checked	JL
		Drwg. No.	6062/Fig1
		Rev.	-



CoDa Structures

Consulting Civil & Structural Engineers
No. 2 Harewood Yard,
Harewood, Leeds
LS17 9LF

**PHASE 1 & 2 ENGINEERING & ENVIRONMENTAL
ASSESSMENT
FORMER GABLES SCHOOL
BONDFIELD CRESCENT WOMBWELL**

APPENDIX C

SITE TOPOGRAPHICAL SURVEY - FIG. 2

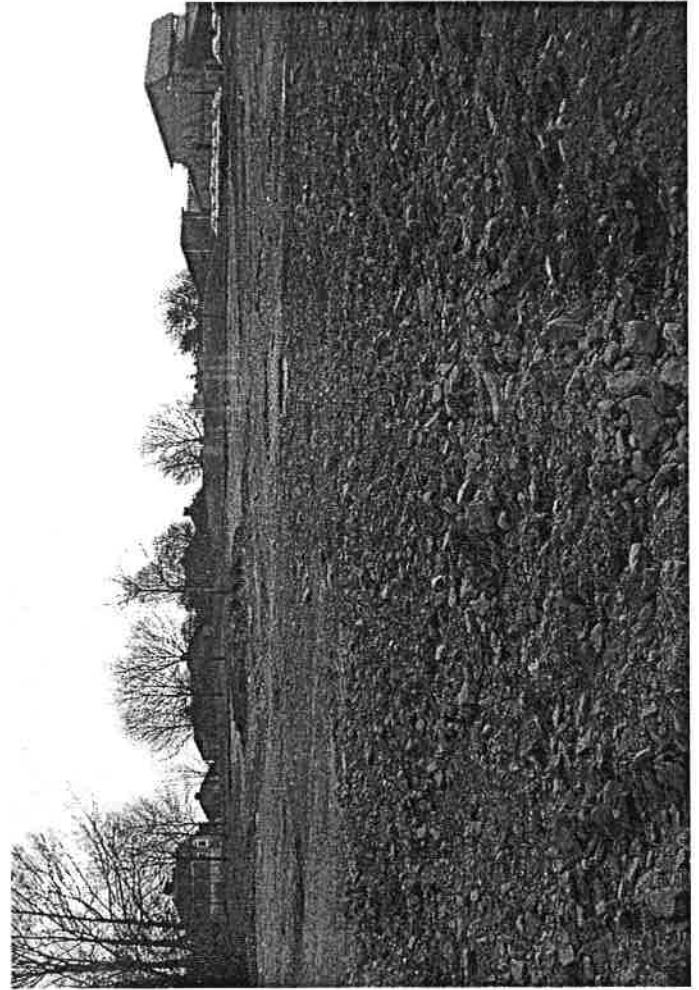
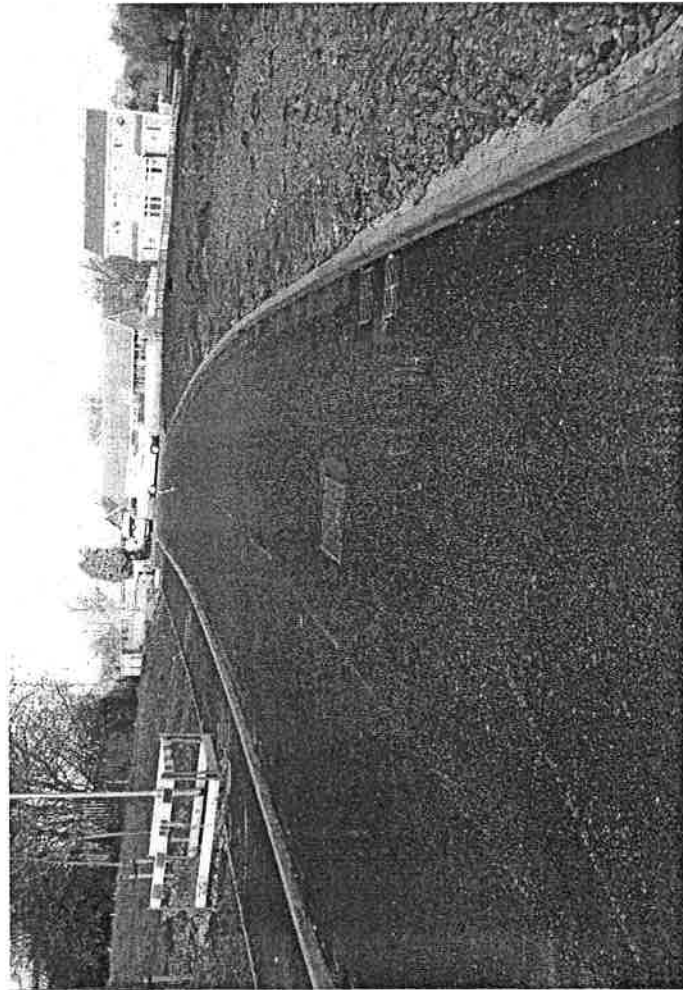
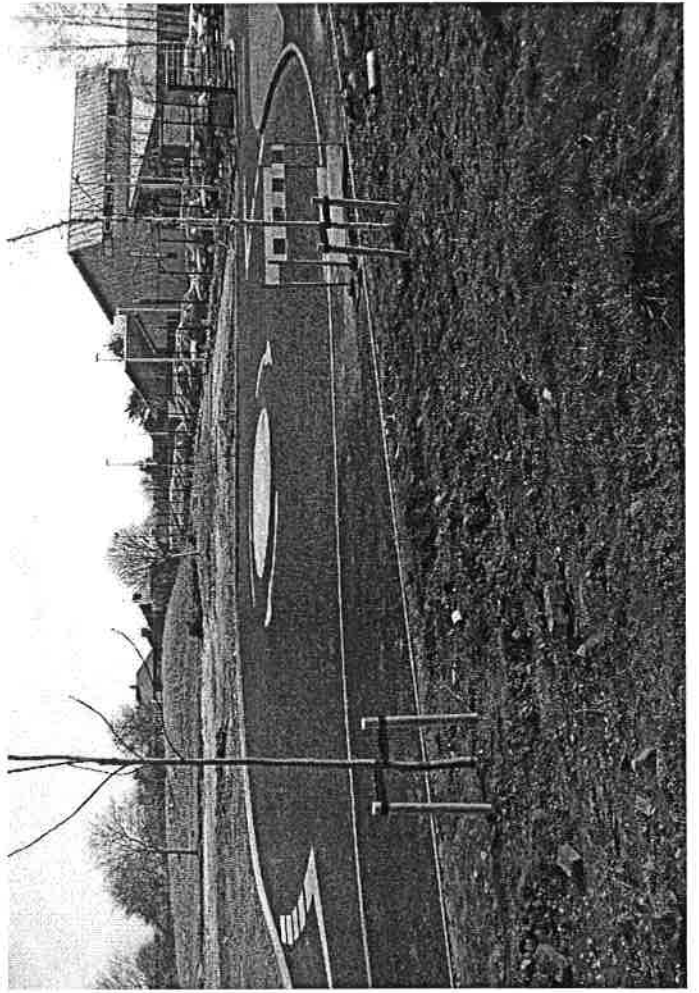
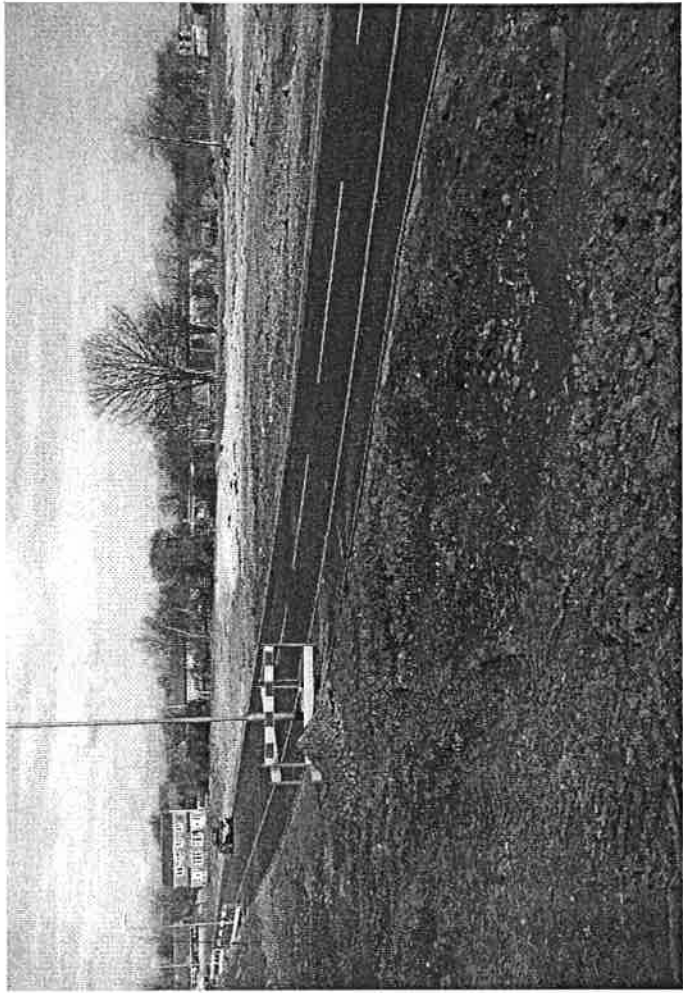
CoDa Structures

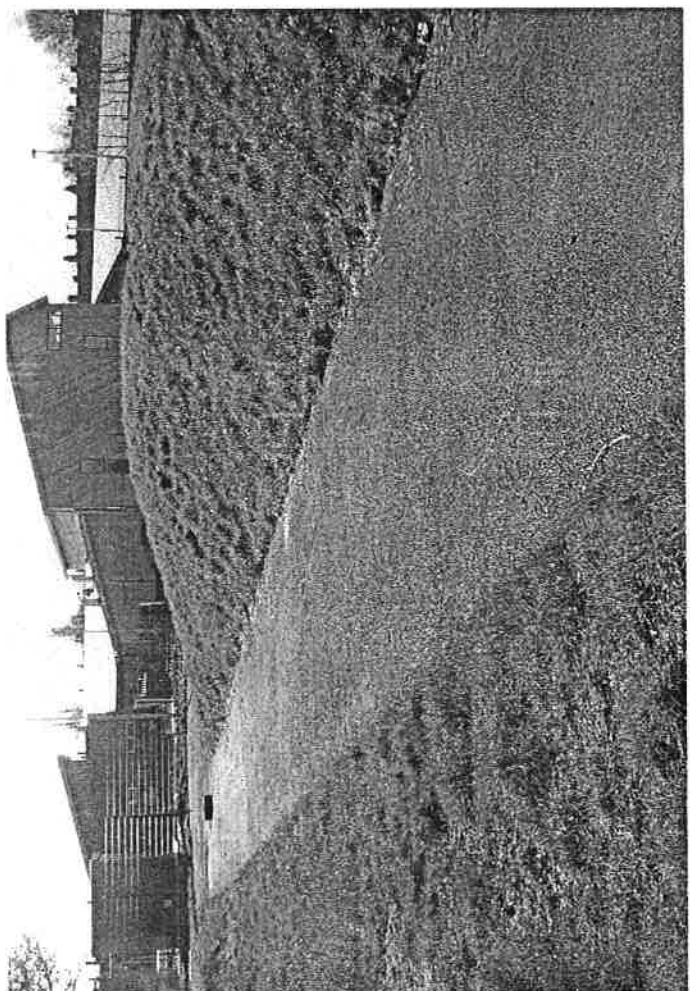
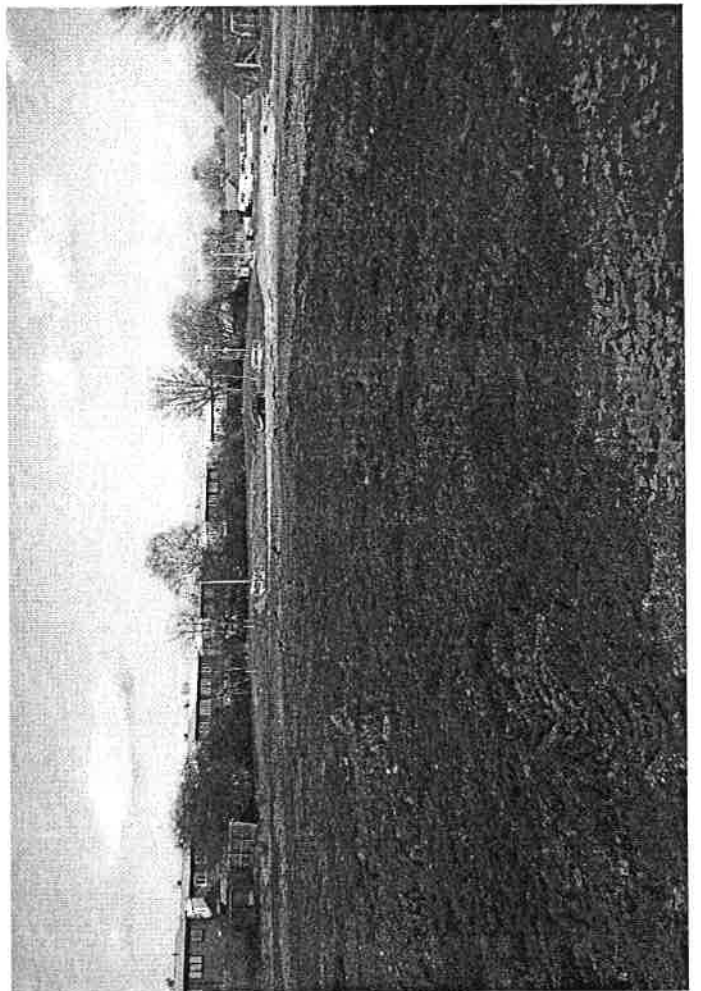
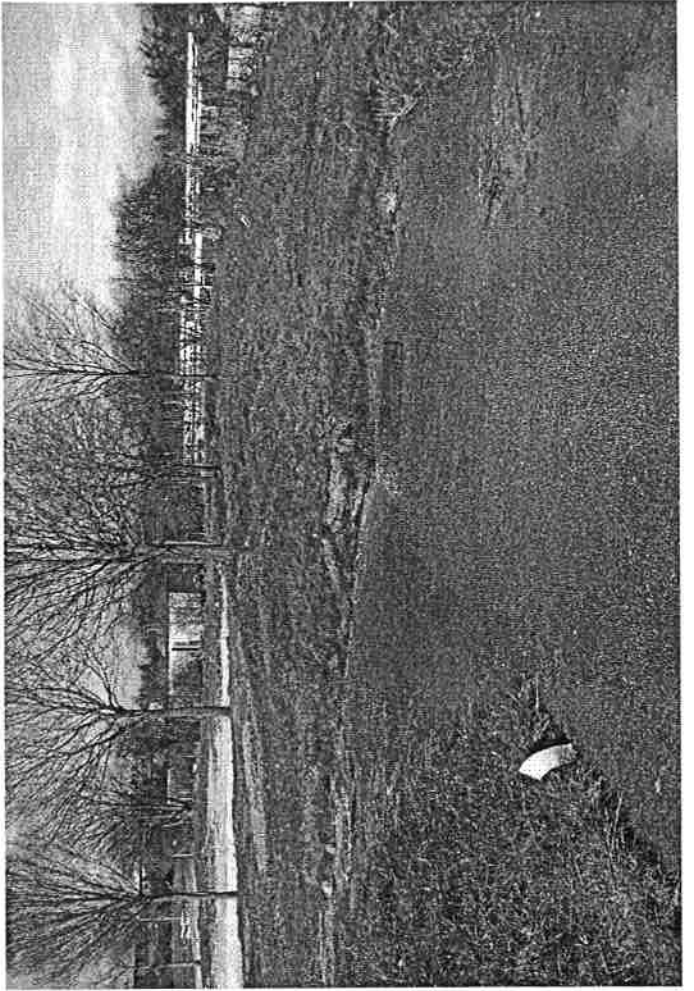
Consulting Civil & Structural Engineers
No. 2 Harewood Yard,
Harewood, Leeds
LS17 9LF

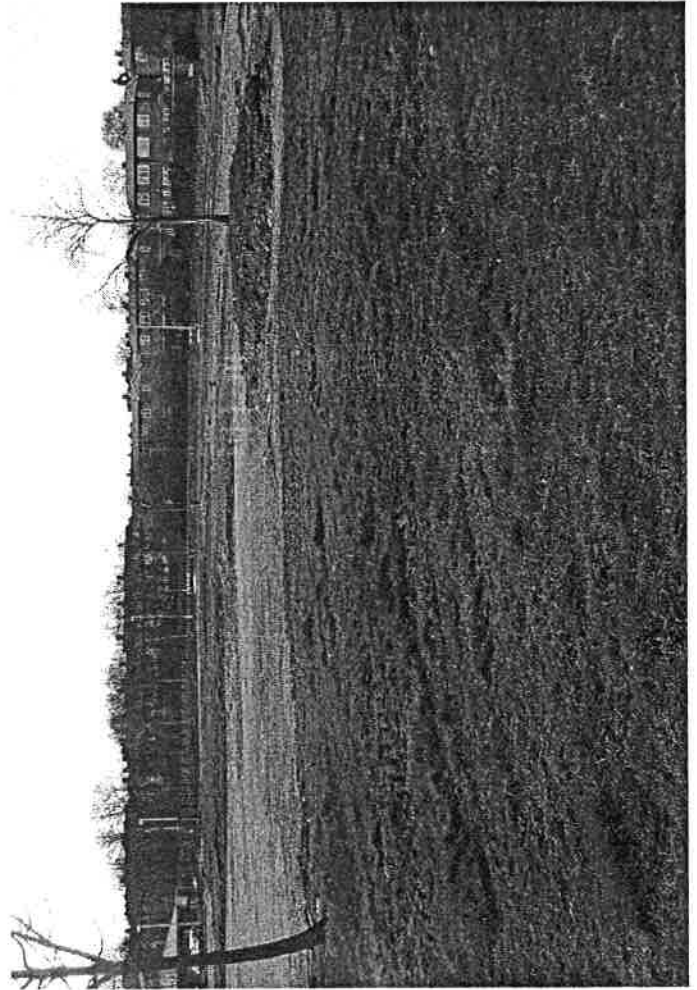
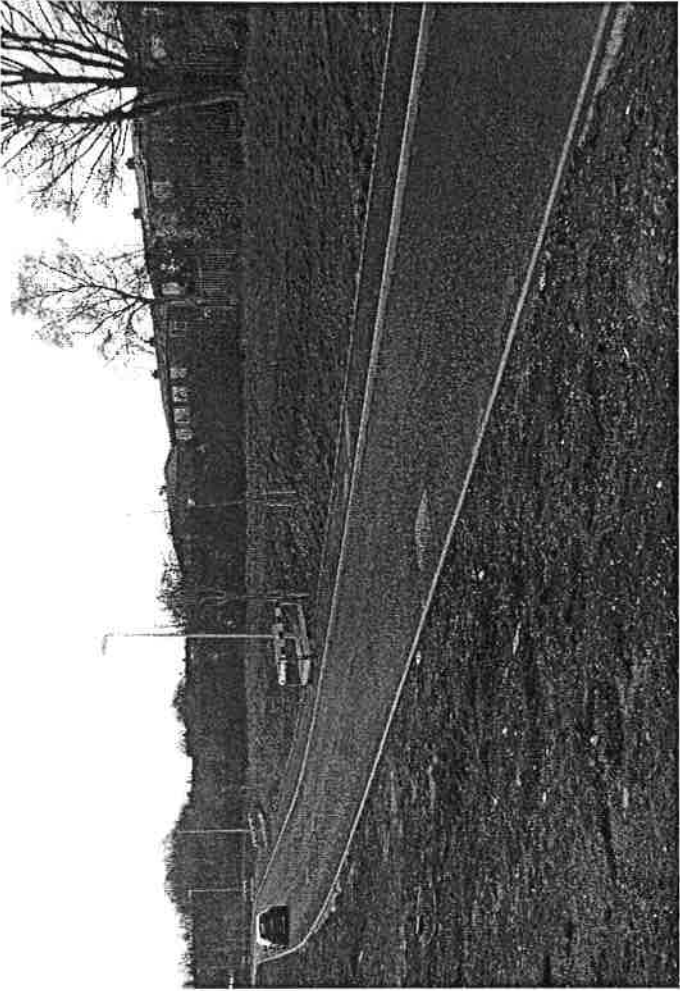
**PHASE 1 & 2 ENGINEERING & ENVIRONMENTAL
ASSESSMENT
FORMER GABLES SCHOOL
BONDFIELD CRESCENT WOMBWELL**

APPENDIX D

SITE PHOTOGRAPHS







CoDa Structures

Consulting Civil & Structural Engineers
No. 2 Harewood Yard,
Harewood, Leeds
LS17 9LF

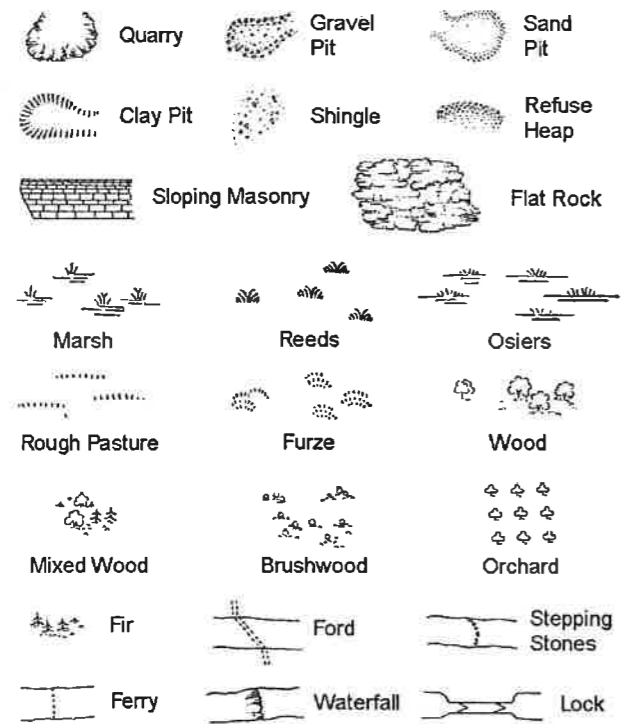
**PHASE 1 & 2 ENGINEERING & ENVIRONMENTAL
ASSESSMENT
FORMER GABLES SCHOOL
BONDFIELD CRESCENT WOMBWELL**

APPENDIX E

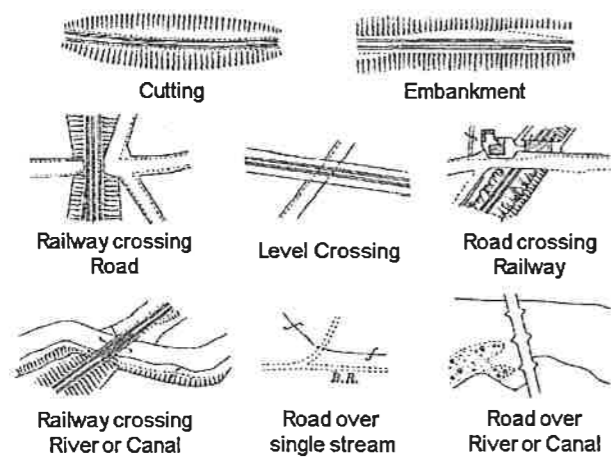
HISTORIC ORDNANCE SURVEY PLANS

Historical Mapping Legends

Ordnance Survey County Series and Ordnance Survey Plan 1:2,500



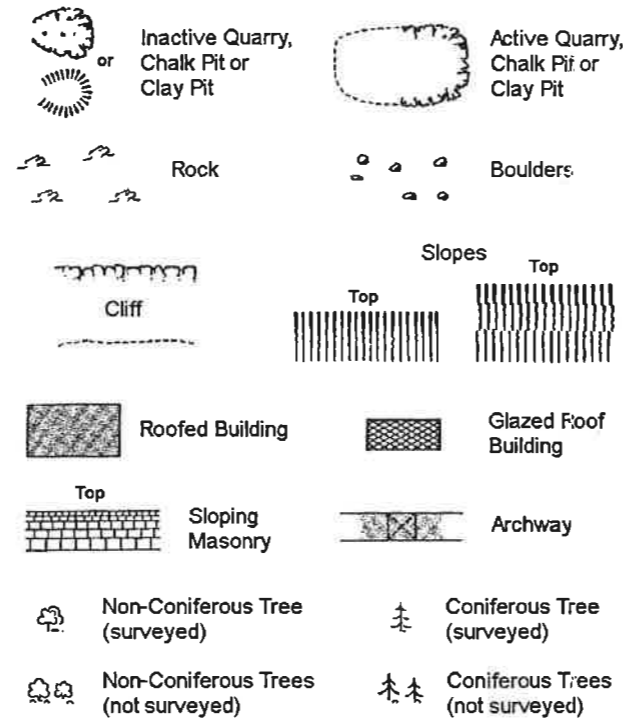
Δ Trig. Station 507 Δ Altitude at Trig. Station
 B.M. 325.9 ↑ Bench Mark 342 + Surface Level
 ← Arrow denotes flow of water ⚡ Antiquities (site of)



- - - - - County Boundary (Geographical)
 - . - . - County & Civil Parish Boundary
 + . + . + Administrative County & Civil Parish Boundary
 - - - - - County Borough Boundary (England)
 Co. Boro. Bdy.
 - - - - - County Burgh Boundary (Scotland)
 Co. Burgh Bdy.

B.P. B.S. Boundary Post or Stone P.C.B. Police Call Box
 B.R. Bridle Road P. Pump
 E.P. Electricity Pylon S.P. Signal Post
 F.B. Foot Bridge Sl. Sluice
 F.P. Foot Path Sp. Spring
 G.P. Guide Post or Board T.C.B. Telephone Call Box
 M.S. Mile Stone Tr. Trough
 M.P. M.R. Mooring Post or Ring W. Well

Ordnance Survey Plan, Additional SIMs and Supply of Unpublished Survey Information 1:2,500 and 1:1,250



BH Beer House P Pillar, Pole or Post
 BP, BS Boundary Post or Stone PO Post Office
 Cn, C Capstan, Crane PC Public Convenience
 Chy Chimney PH Public House
 D Fn Drinking Fountain Pp Pump
 EI P Electricity Pillar or Post SB, S Br Signal Box or Bridge
 FAP Fire Alarm Pillar SP, SL Signal Post or Light
 FB Foot Bridge Spr Spring
 GP Gulde Post Tk Tank or Track
 H Hydrant or Hydraulic TCB Telephone Call Box
 LC Level Crossing TCP Telephone Call Post
 MH Manhole Tr Trough
 MP Mile Post or Mooring Post Wr Pt, Wr T Water Point, Water Tap
 MS Mile Stone W Well
 NTL Normal Tidal Limit Wd Pp Wind Pump

- - - - - County Boundary (Geographical)
 - . - . - County & Civil Parish Boundary
 + . + . + Administrative County & Civil Parish Boundary
 - - - - - County Borough Boundary (England)
 Co. Boro. Bdy.
 - - - - - County Burgh Boundary (Scotland)
 Co. Burgh Bdy.
 L B Bdy London Borough Boundary
 Symbol marking point where boundary mereing changes

BH Beer House P Pillar, Pole or Post
 BP, BS Boundary Post or Stone PO Post Office
 Cn, C Capstan, Crane PC Public Convenience
 Chy Chimney PH Public House
 D Fn Drinking Fountain Pp Pump
 EI P Electricity Pillar or Post SB, S Br Signal Box or Bridge
 FAP Fire Alarm Pillar SP, SL Signal Post or Light
 FB Foot Bridge Spr Spring
 GP Gulde Post Tk Tank or Track
 H Hydrant or Hydraulic TCB Telephone Call Box
 LC Level Crossing TCP Telephone Call Post
 MH Manhole Tr Trough
 MP Mile Post or Mooring Post Wr Pt, Wr T Water Point, Water Tap
 MS Mile Stone W Well
 NTL Normal Tidal Limit Wd Pp Wind Pump

Large-Scale National Grid Data 1:2,500 and 1:1,250



- - - - - Civil parish/community boundary
 - - - - - District boundary
 - - - - - County boundary
 Boundary post/stone
 Boundary mereing symbol (note: these always appear in opposed pairs or groups of three)

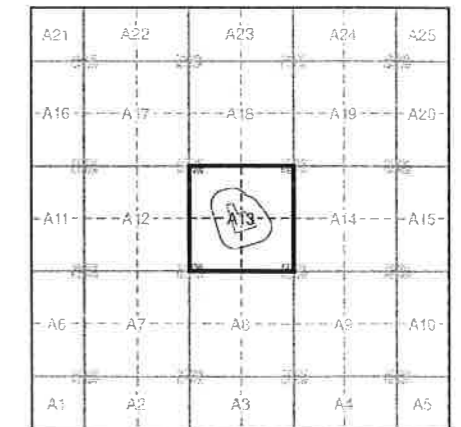
Bks Barracks P Pillar, Pole or Post
 Bty Battery PO Post Office
 Cem Cemetery PC Public Convenience
 Chy Chimney Pp Pump
 Cis Cistern Ppg Sta Pumping Station
 Dismtd Rly Dismantled Railway PW Place of Worship
 EI Gen Sta Electricity Generating Station Sewage Ppg Sta Sewage Pumping Station
 EI P Electricity Pole, Pillar SB, S Br Signal Box or Bridge
 EI Sub Sta Electricity Sub Station SP, SL Signal Post or Light
 FB Filter Bed Spr Spring
 Fn / D Fn Fountain / Drinking Ftn. Tk Tank or Track
 Gas Gov Gas Valve Compound Tr Trough
 GVC Gas Governor Wd Pp Wind Pump
 GP Guide Post Wr Pt, Wr T Water Point, Water Tap
 MH Manhole Wks Works (building or area)
 MP, MS Mile Post or Mile Stone W Well



Ordnance Survey mapping included:

Mapping Type	Scale	Date	Pg
Yorkshire	1:2,500	1892 - 1893	2
Yorkshire	1:2,500	1903 - 1906	3
Yorkshire	1:2,500	1930 - 1931	4
Ordnance Survey Plan	1:2,500	1962	5
Ordnance Survey Plan	1:2,500	1971	6
Ordnance Survey Plan	1:1,250	1982	7
Additional SIMs	1:2,500	1962	8
Supply of Unpublished Survey Information	1:2,500	1976	9
Large-Scale National Grid Data	1:1,250	1993	10
Large-Scale National Grid Data	1:1,250	1994	11

Historical Map - Segment A13



Order Details

Order Number: 21109285_1_1
 Customer Ref: 6062
 National Grid Reference: 439570, 402900
 Sheet: A
 Site Area (Ha): 1.71
 Search Buffer (m): 100

Site Details

12 Princess Gardens, Wombwell, BARNESLEY, South Yorkshire, S73 0ED



Tel: 0870 850 6670
 Fax: 0870 850 6671
 Web: www.envirocheck.co.uk

Historical Mapping Legends

Ordnance Survey County Series and Ordnance Survey Plan 1:10,560

- Gravel Pit
- Sand Pit
- Other Pits
- Quarry
- Shingle
- Orchard
- Osiers
- Reeds
- Marsh
- Mixed Wood
- Deciduous
- Brushwood
- Fir
- Furze
- Rough Pasture
- Arrow denotes flow of water
- Trigonometrical Station
- Site of Antiquities
- Bench Mark
- Pump, Guide Post, Signal Post
- Well, Spring, Boundary Post
- 285** Surface Level
- Sketched Contour
- Instrumental Contour
- Main Roads
- Minor Roads
- Sunken Road
- Raised Road
- Road over Railway
- Railway over River
- Railway over Road
- Level Crossing
- Road over River or Canal
- Road over Stream
- Road over Stream
- County Boundary (Geographical)
- County & Civil Parish Boundary
- Administrative County & Civil Parish Boundary
- Co. Boro. Bdy. County Borough Boundary (England)
- Co. Burgh Bdy. County Burgh Boundary (Scotland)
- R.D. Bdy. Rural District Boundary
- Civil Parish Boundary

Ordnance Survey Plan 1:10,000

- Chalk Pit, Clay Pit or Quarry
- Gravel Pit
- Sand Pit
- Disused Pit or Quarry
- Refuse or Slag Heap
- Lake, Loch or Pond
- Dunes
- Boulders
- Coniferous Trees
- Non-Coniferous Trees
- Orchard
- Scrub
- Coppice
- Bracken
- Heath
- Rough Grassland
- Marsh
- Reeds
- Saltings
- Building
- Glasshouse
- Sloping Masonry
- Pylon
- Electricity Transmission Line
- Pole
- Cutting
- Embankment
- Standard Gauge Multiple Track
- Standard Gauge Single Track
- Siding, Tramway or Mineral Line
- Narrow Gauge
- Geographical County
- Administrative County, County Borough or County of City
- Municipal Borough, Urban or Rural District, Burgh or District Council
- Borough, Burgh or County Constituency (Shown only when not coincident with other boundaries)
- Civil Parish (Shown alternately when coincidence of boundaries occurs)
- BP, BS Boundary Post or Stone
- Ch Church
- CH Club House
- F E Sta Fire Engine Station
- FB Foot Bridge
- Fn Fountain
- GP Guide Post
- MP Mile Post
- MS Mile Stone
- Pol Sta Police Station
- PO Post Office
- PC Public Convenience
- PH Public House
- SB Signal Box
- Spr Spring
- TCB Telephone Call Box
- TCP Telephone Call Post
- W Well

1:10,000 Raster Mapping

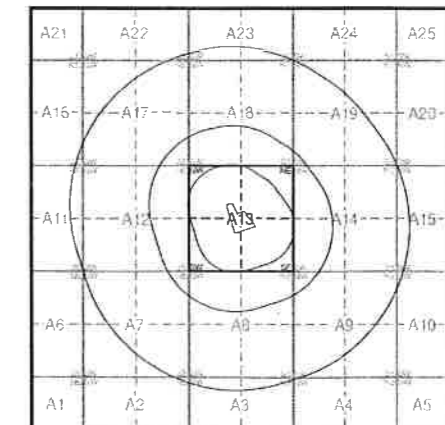
- Gravel Pit
- Refuse tip or slag heap
- Rock
- Rock (scattered)
- Boulders
- Boulders (scattered)
- Shingle
- Mud
- Sand
- Sand Pit
- Slopes
- Top of cliff
- General detail
- Underground detail
- Overhead detail
- Narrow gauge railway
- Multi-track railway
- Single track railway
- County boundary (England only)
- Civil, parish or community boundary
- District, Unitary, Metropolitan, London Borough boundary
- Constituency boundary
- Area of wooded vegetation
- Non-coniferous trees
- Non-coniferous trees (scattered)
- Coniferous trees
- Coniferous trees (scattered)
- Orchard
- Coppice, or Osiers
- Rough Grassland
- Heath
- Scrub
- Marsh, Salt Marsh or Reeds
- Water feature
- Flow arrows
- MHW(S) Mean high water (springs)
- MLW(S) Mean low water (springs)
- Telephone line (where shown)
- Electricity transmission line (with poles)
- Bench mark (where shown)
- Point feature (e.g. Guide Post or Mile Stone)
- Site of (antiquity)
- Triangulation station
- General Building
- Important Building
- Pylon, flare stack or lighting tower
- Glasshouse



Ordnance Survey mapping included:

Mapping Type	Scale	Date	Pg
Yorkshire	1:10,560	1854 - 1855	2
Yorkshire	1:10,560	1893 - 1894	3
Yorkshire	1:10,560	1905 - 1907	4
Yorkshire	1:10,560	1938	5
Ordnance Survey Plan	1:10,560	1956	6
Ordnance Survey Plan	1:10,560	1966 - 1967	7
Ordnance Survey Plan	1:10,000	1980	8
Ordnance Survey Plan	1:10,000	1989	9
10K Raster Mapping	1:10,000	2000	10
10K Raster Mapping	1:10,000	2004	11

Historical Map - Slice A



Order Details

Order Number: 21109285_1_1
 Customer Ref: 6062
 National Grid Reference: 439570, 402900
 Sheet: A
 Site Area (Ha): 1.71
 Search Buffer (m): 1000

Site Details

12 Princess Gardens, Wombwell, BARNESLEY, South Yorkshire, S73 0ED

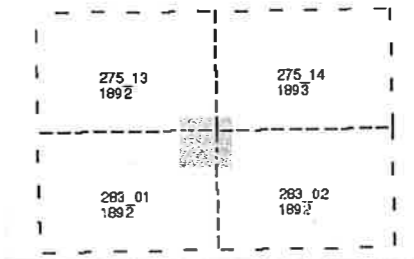


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 Web: www.envirocheck.co.uk

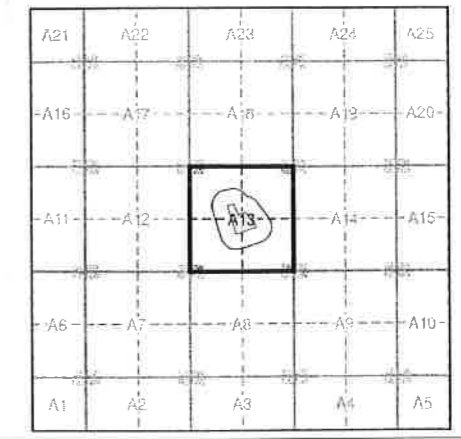
Yorkshire
Published 1892 - 1893
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)

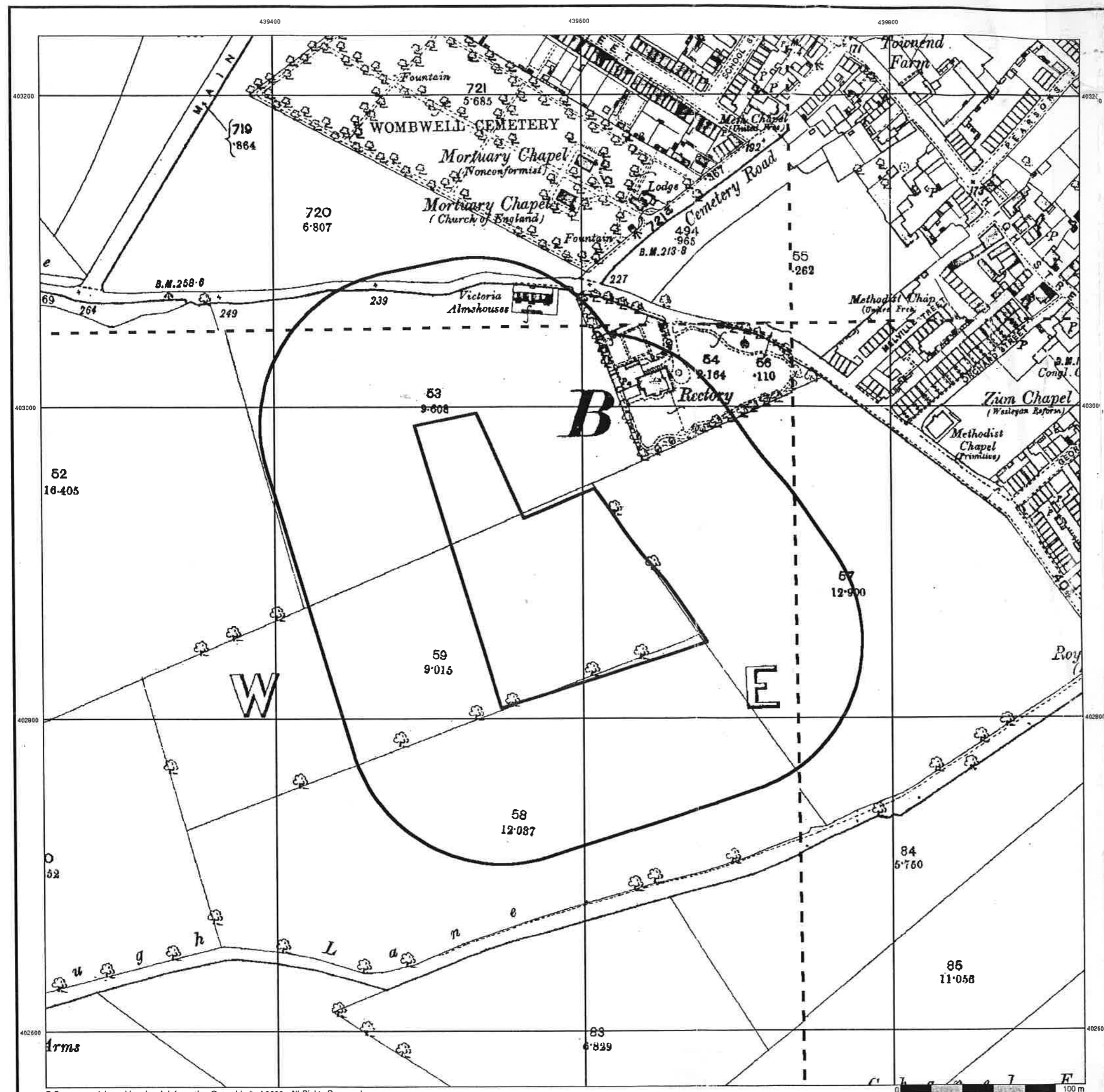


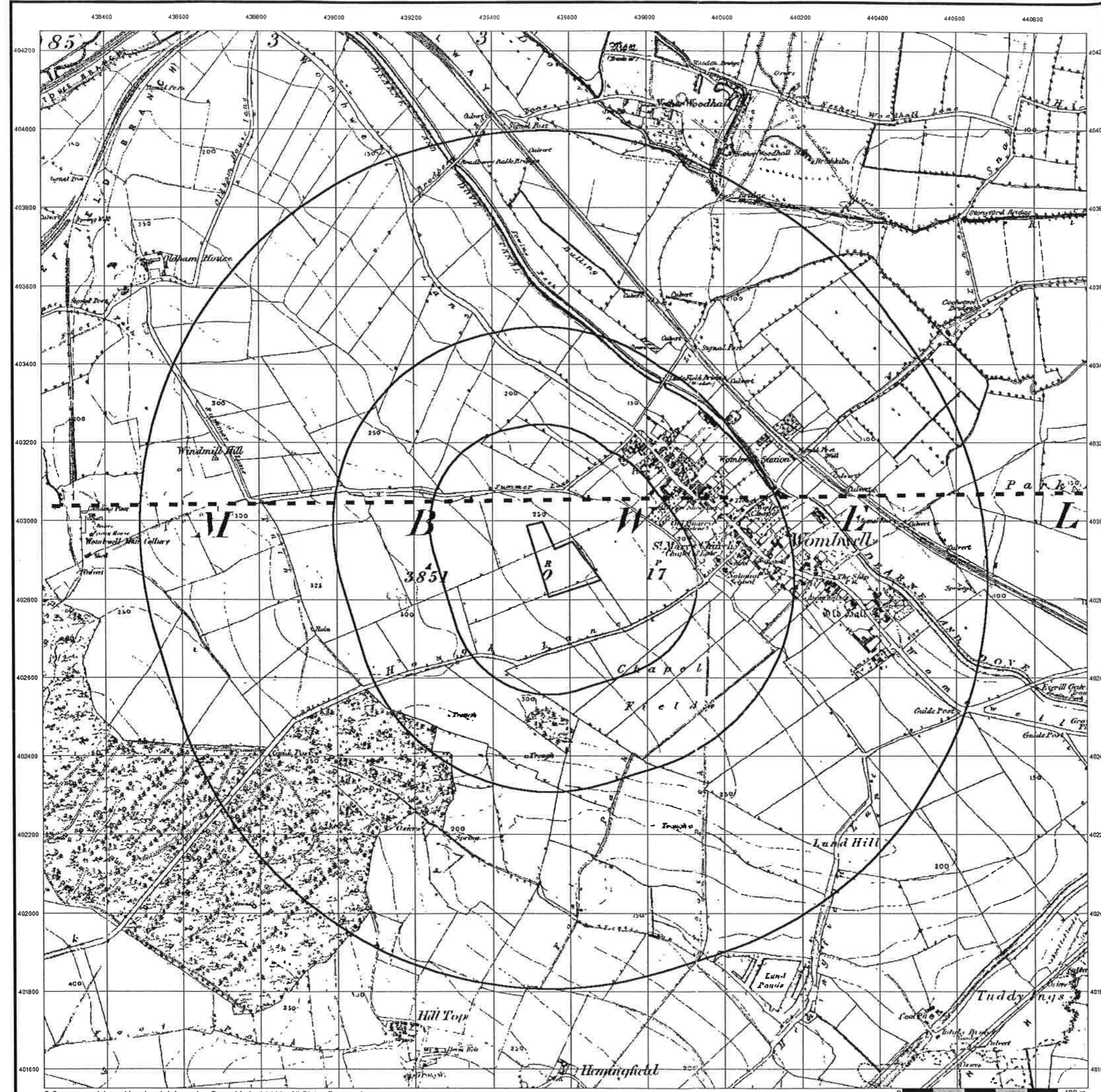
Historical Map - Segment A13



Order Details
 Order Number: 21109285_1_1
 Customer Ref: 6062
 National Grid Reference: 439570, 402900
 Sheet: A
 Site Area (Ha): 1.71
 Search Buffer (m): 100

Site Details
 12 Princess Gardens, Wombwell, BARNSELY, South Yorkshire, S73 0ED

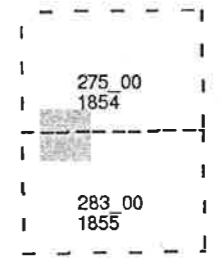




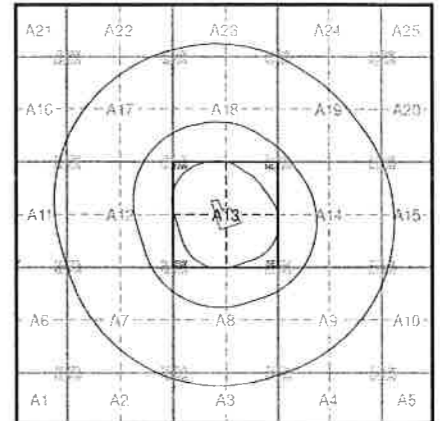
Yorkshire
Published 1854 - 1855
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details
Order Number: 21109285_1_1
Customer Ref: 6062
National Grid Reference: 439570, 402900
Sheet: A
Site Area (Ha): 1.71
Search Buffer (m): 1000

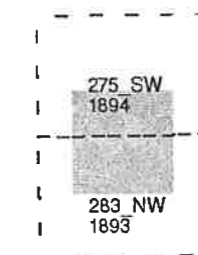
Site Details
12 Princess Gardens, Wombwell, BARNSELY, South Yorkshire, S73 0ED

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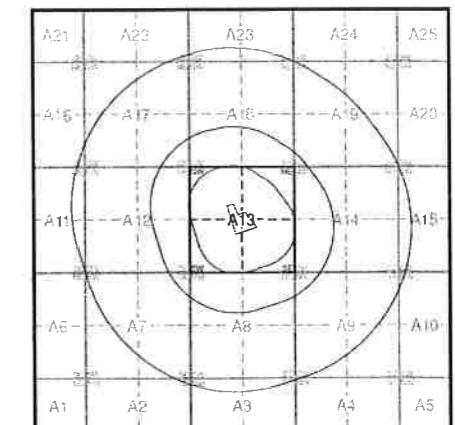
Yorkshire
Published 1893 - 1894
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A

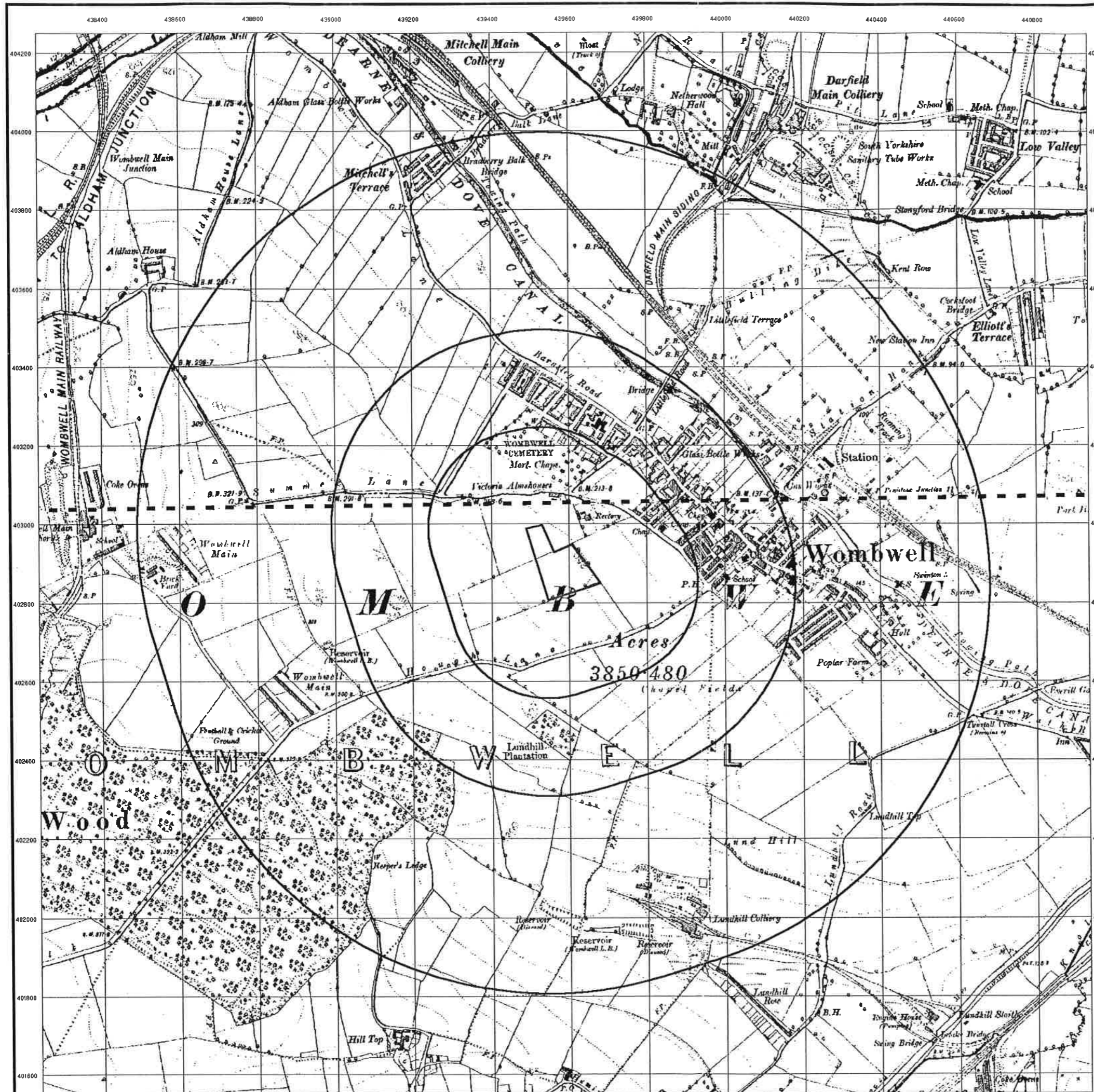


Order Details

Order Number: 21109285_1_1
Customer Ref: 6062
National Grid Reference: 439570, 402900
Sheet: A
Site Area (Ha): 1.71
Search Buffer (m): 1000

Site Details

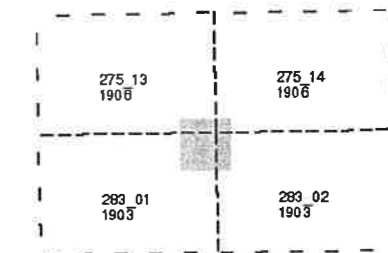
12 Princess Gardens, Wombwell, BARNSELY, South Yorkshire, S73 0ED



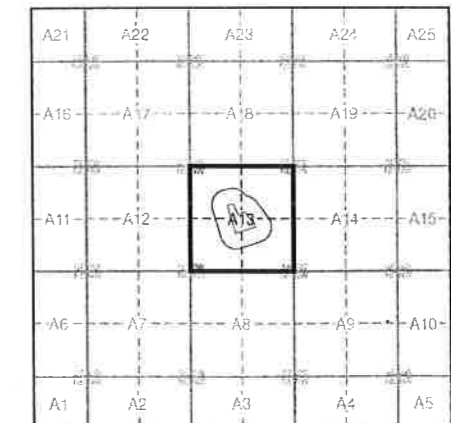
Yorkshire
Published 1903 - 1906
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13

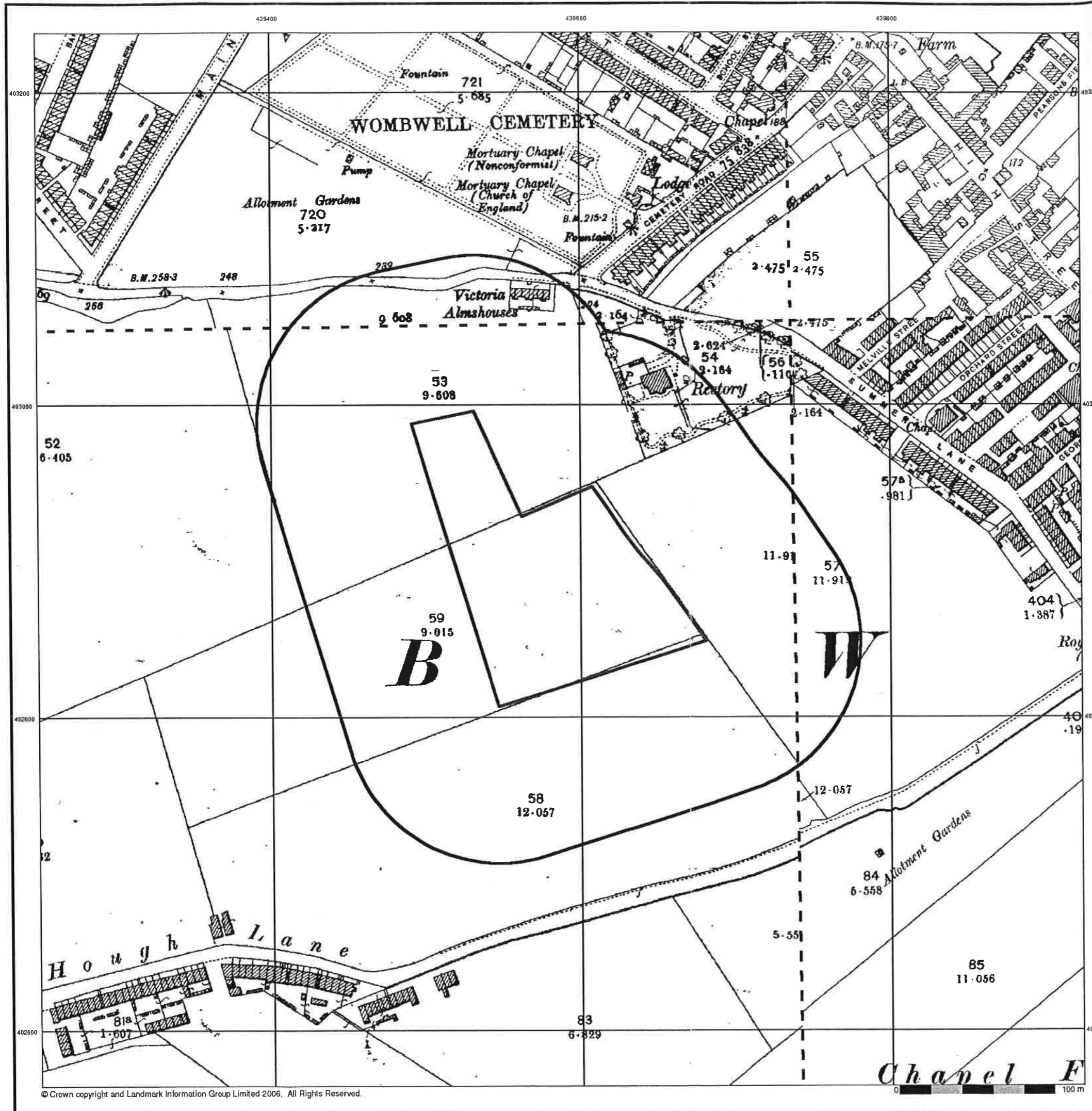


Order Details

Order Number: 21109285_1_1
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Sheet: A
Site Area (Ha): 1.71
Search Buffer (m): 100

Site Details

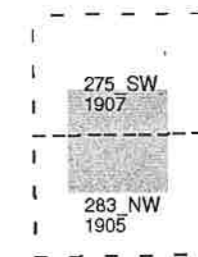
12 Princess Gardens, Wombwell, BARNSELY, South Yorkshire, S73 0ED



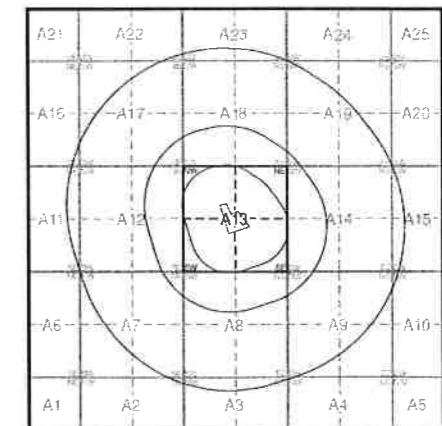
Yorkshire
Published 1905 - 1907
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A

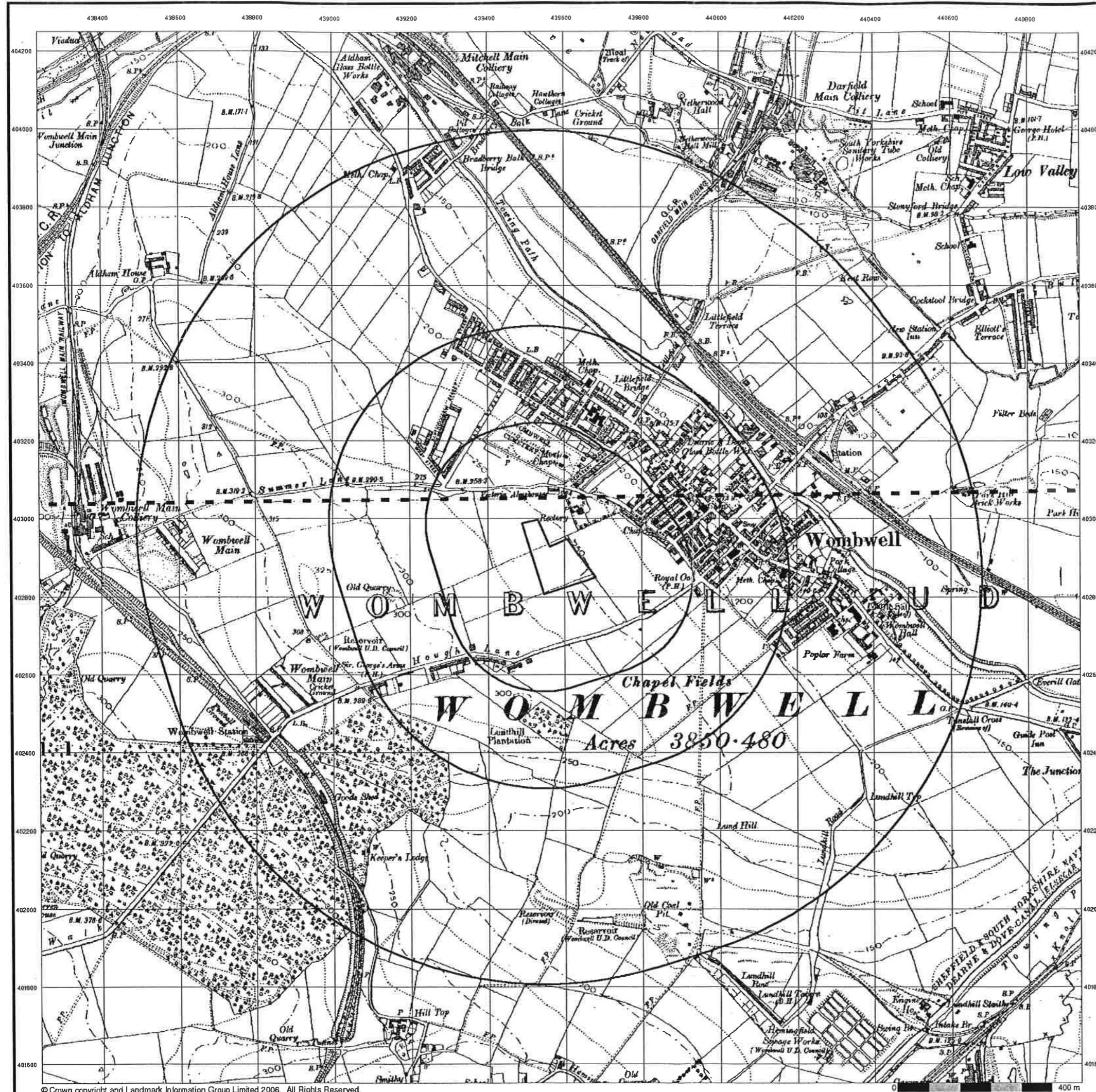


Order Details

Order Number: 21109285_1_1
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Sheet: A
Site Area (Ha): 1.71
Search Buffer (m): 1000

Site Details

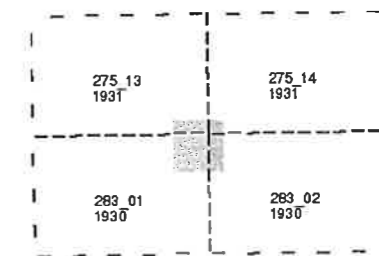
12 Princess Gardens, Wombwell, BARNSELY, South Yorkshire, S73 0ED



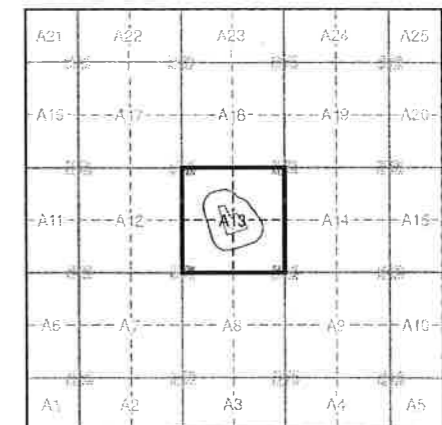
Yorkshire
Published 1930 - 1931
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13

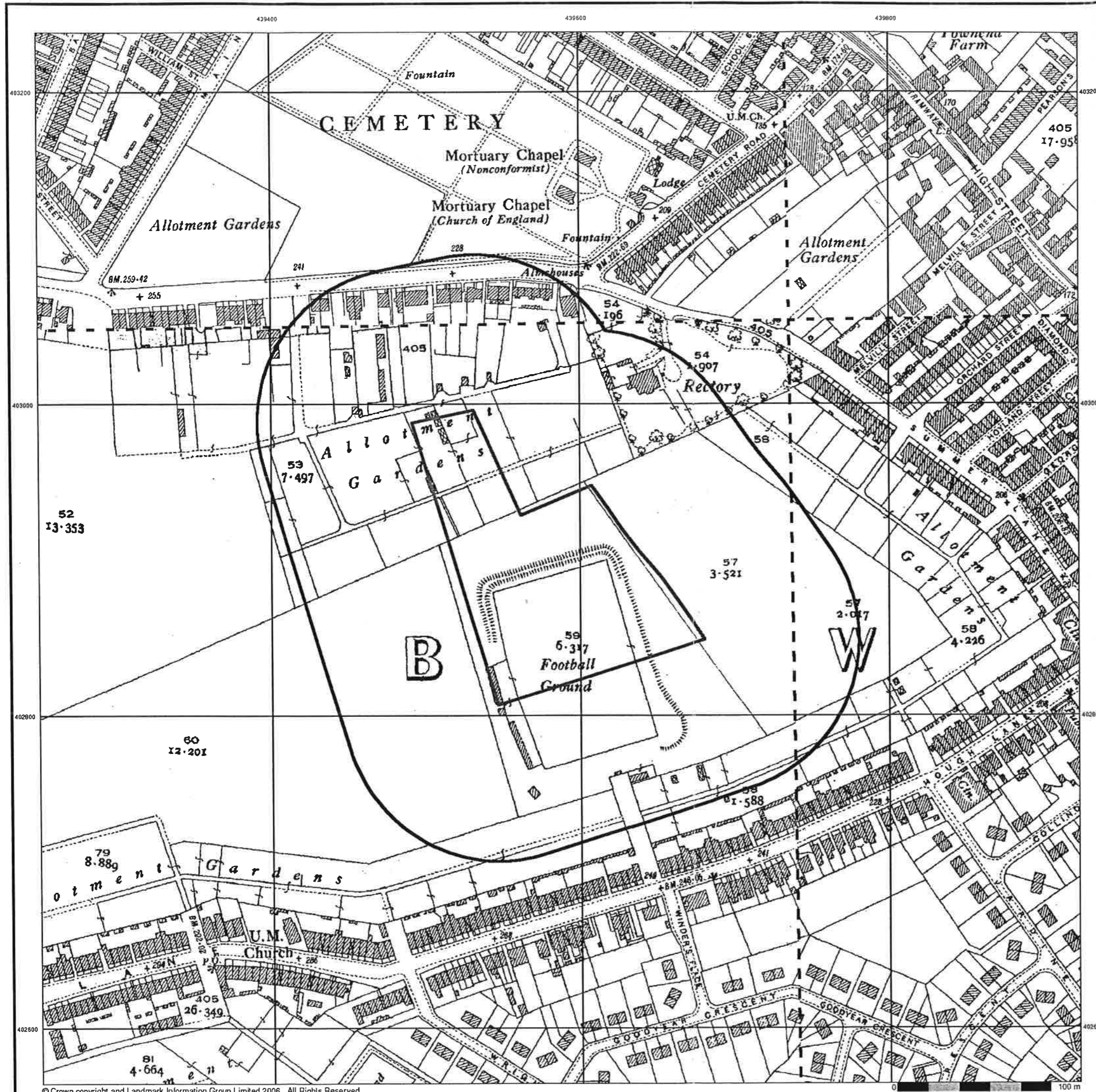


Order Details

Order Number: 21109285_1_1
Customer Ref: 6062
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Sheet: A
Site Area (Ha): 1.71
Search Buffer (m): 100

Site Details

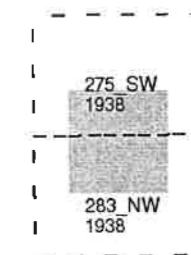
12 Princess Gardens, Wombwell, BARNSELY, South Yorkshire, S73 0ED



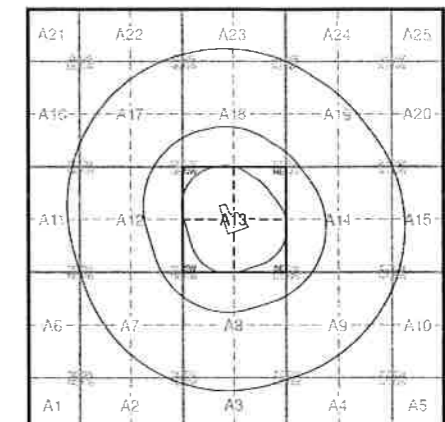
Yorkshire
Published 1938
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overlaid with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A

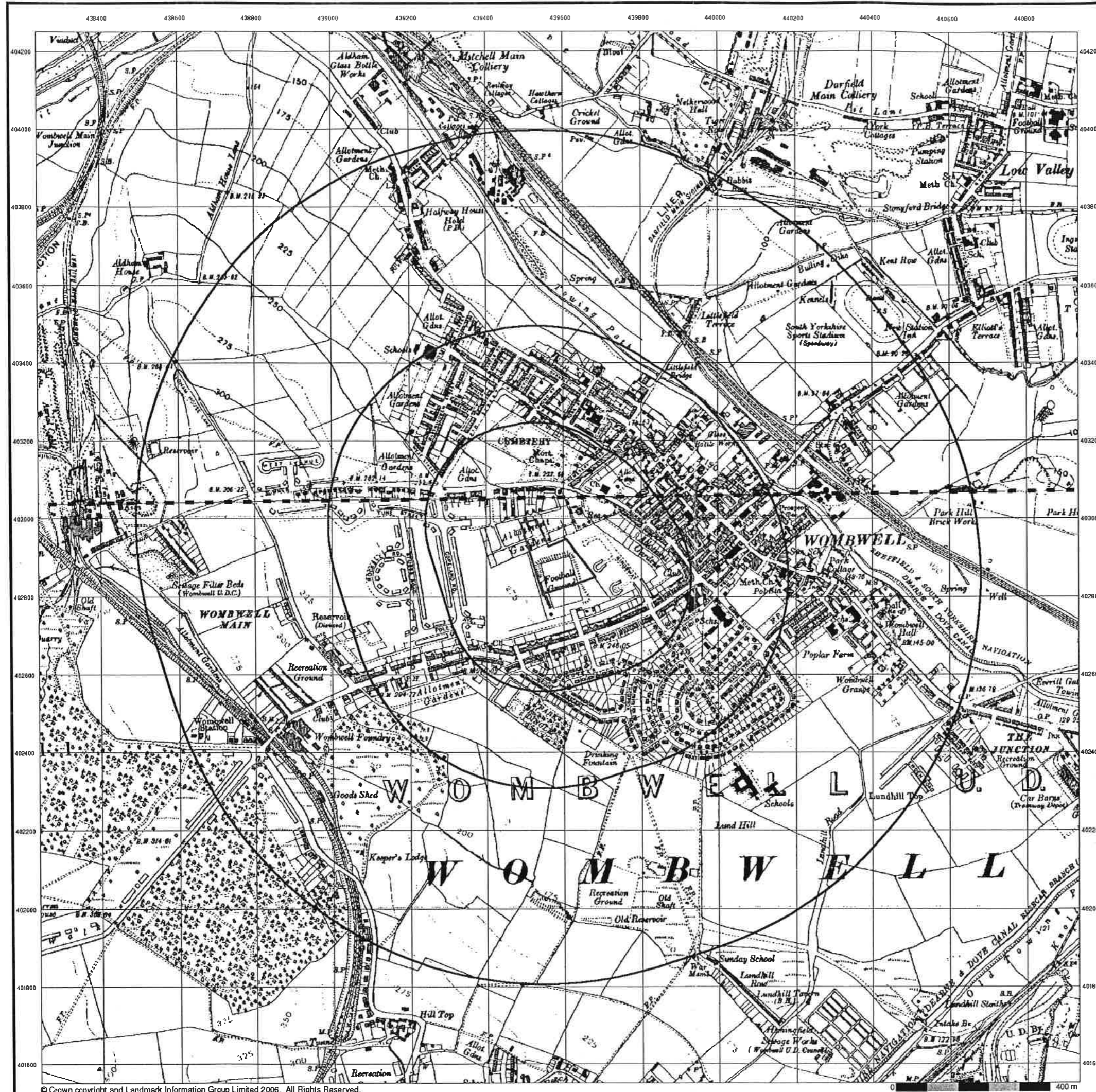


Order Details

Order Number: 21109285_1_1
Customer Ref: 6062
National Grid Reference: 439570, 402900
Sheet: A
Site Area (Ha): 1.71
Search Buffer (m): 1000

Site Details

12 Princess Gardens, Wombwell, BARNSELY, South Yorkshire, S73 0ED



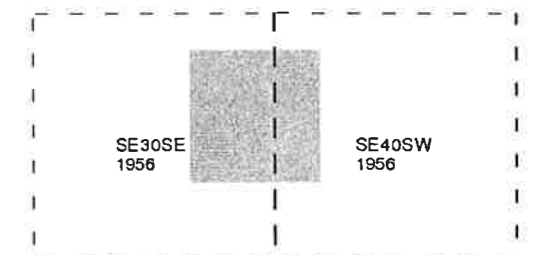
Ordnance Survey Plan

Published 1956

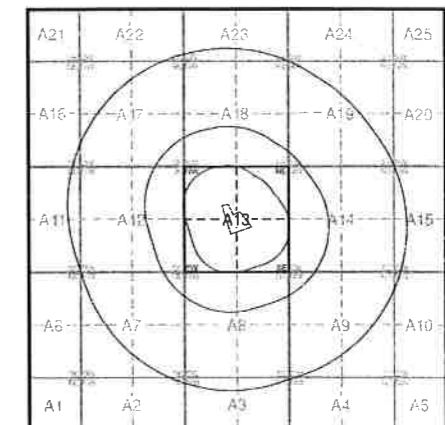
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A

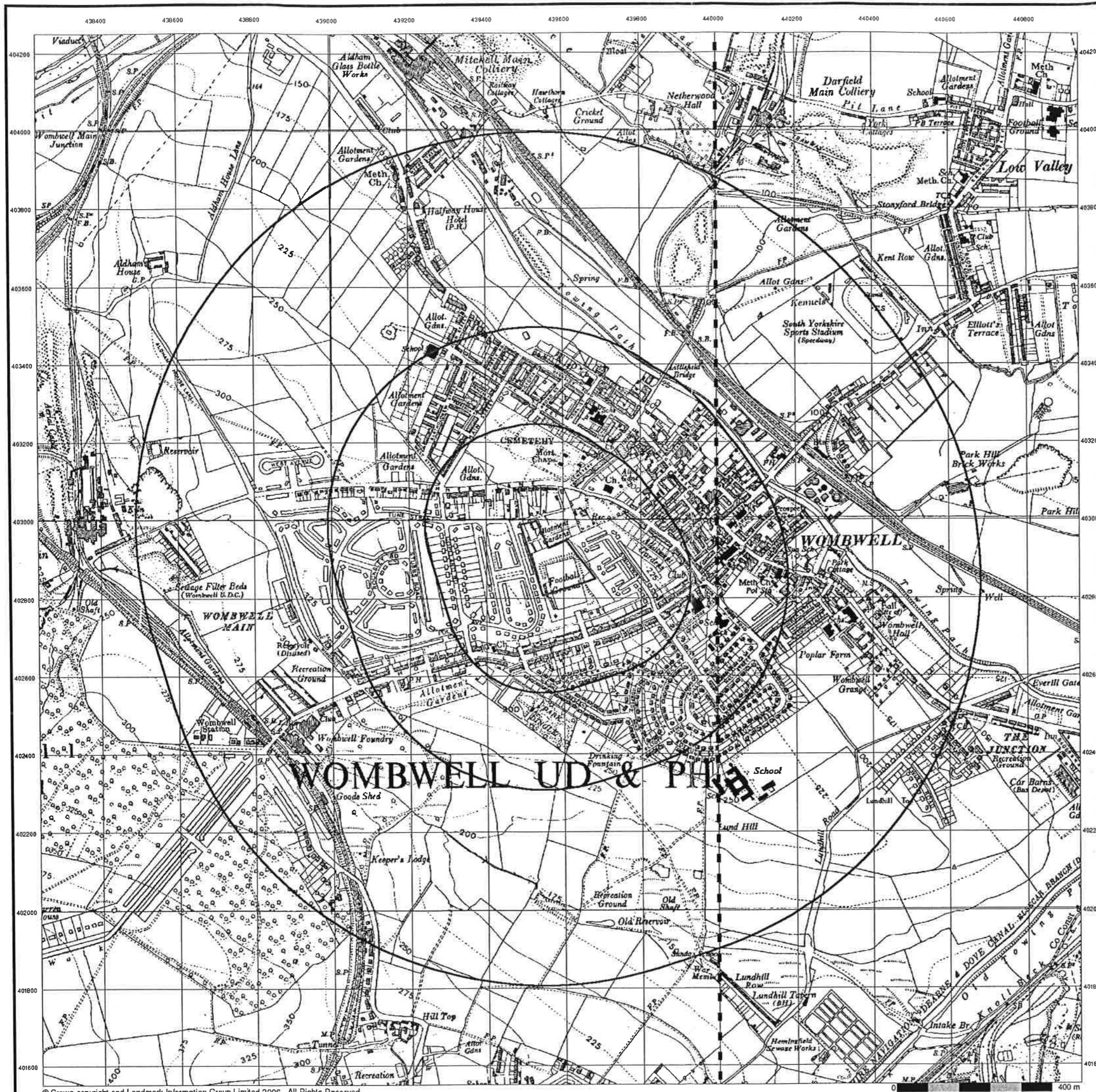


Order Details

Order Number: 21109285_1_1
Customer Ref: 6062
National Grid Reference: 439570, 402900
Sheet: A
Site Area (Ha): 1.71
Search Buffer (m): 1000

Site Details

12 Princess Gardens, Wombwell, BARNSELY, South Yorkshire, S73 0ED



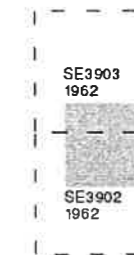
Ordnance Survey Plan

Published 1962

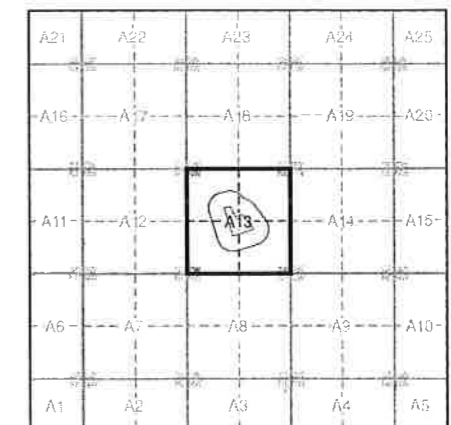
Source map scale - 1:2,500

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13

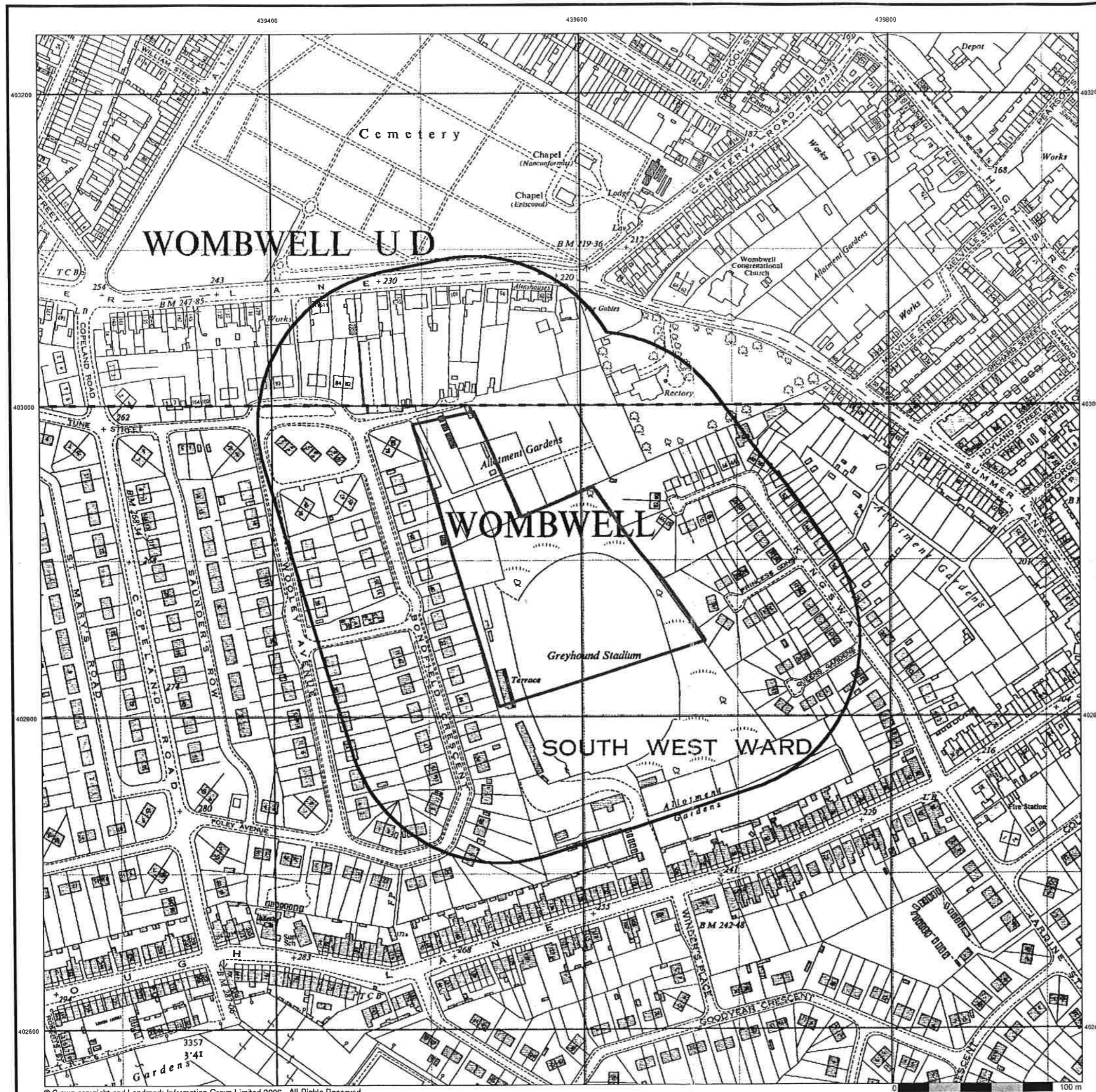


Order Details

Order Number: 21109285_1_1
 Customer Ref: 6062
 National Grid Reference: 439570, 402900
 Sheet: A
 Site Area (Ha): 1.71
 Search Buffer (m): 100

Site Details

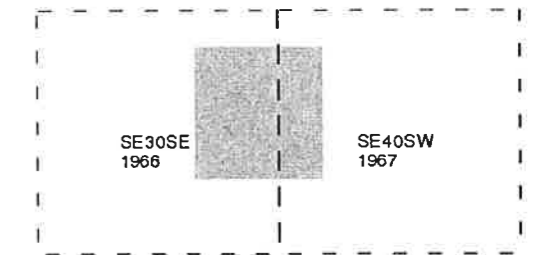
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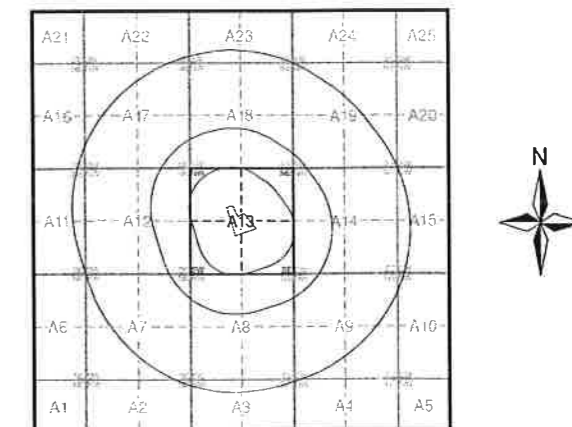
**Ordnance Survey Plan
Published 1966 - 1967
Source map scale - 1:10,560**

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

Order Number: 21109285_1_1
Customer Ref: 6062
National Grid Reference: 439570, 402900
Sheet: A
Site Area (Ha): 1.71
Search Buffer (m): 1000

Site Details

12 Princess Gardens, Wombwell, BARNSELY, South
Yorkshire, S73 0ED



Supply of Unpublished Survey Information

Published 1976

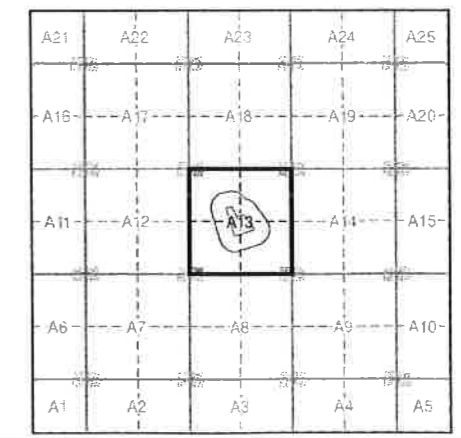
Source map scale - 1:2,500

SUSI maps (Supply of Unpublished Survey Information) were produced between 1972 and 1977, mainly for internal use at Ordnance Survey. These were more of a 'work-in-progress' plan as they showed updates of individual areas on a map. These maps were unpublished, and they do not represent a single moment in time. They were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13

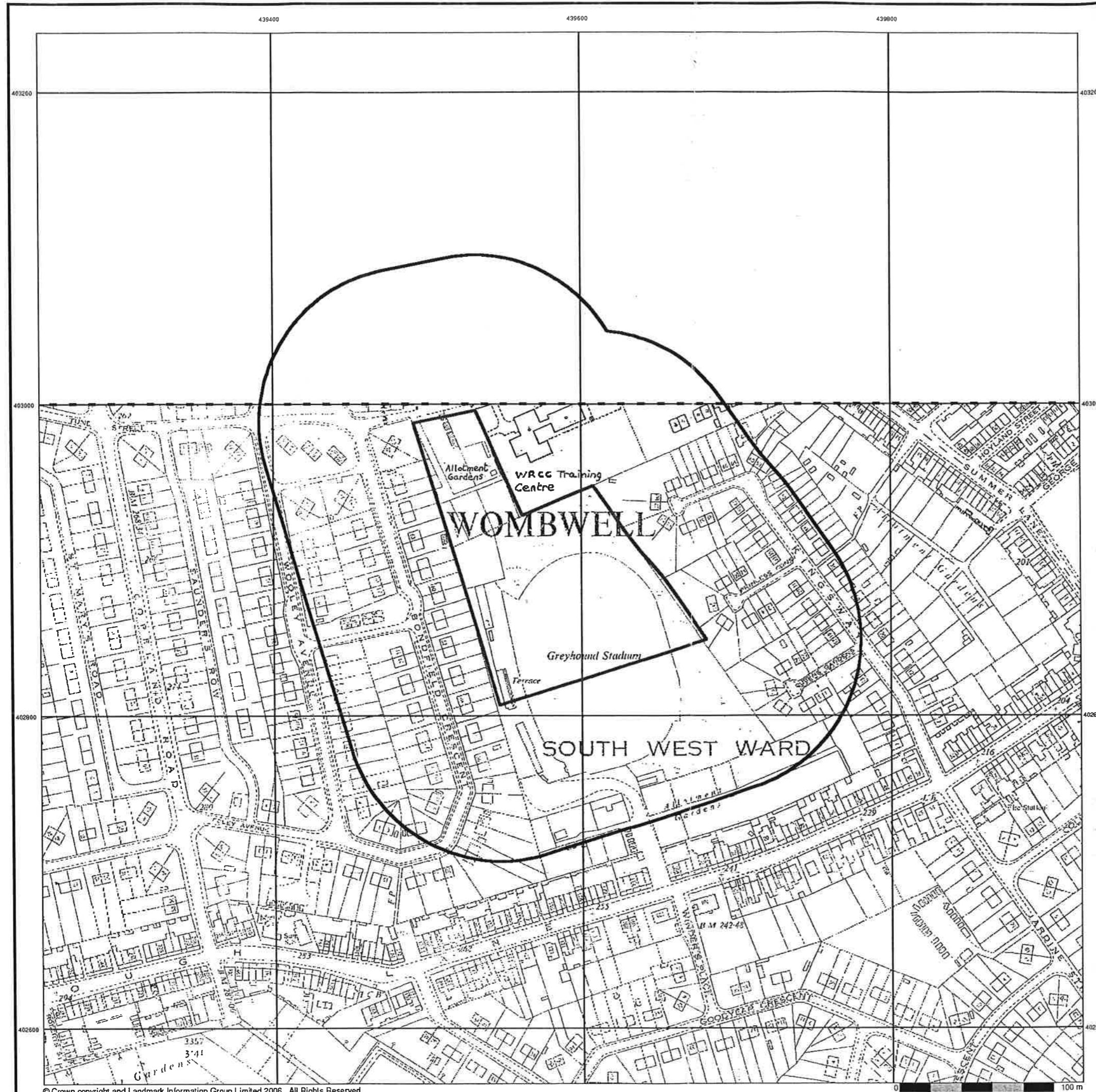


Order Details

Order Number: 21109285_1_1
 Customer Ref: 6062
 National Grid Reference: 439570, 402900
 Sheet: A
 Site Area (Ha): 1.71
 Search Buffer (m): 100

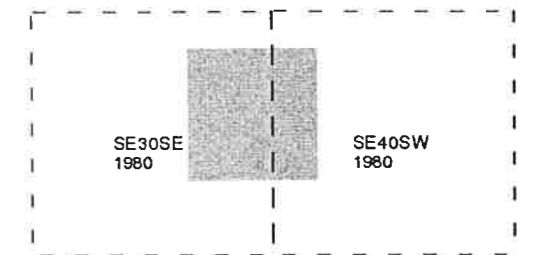
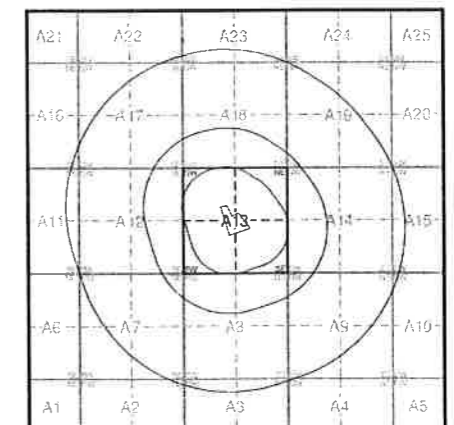
Site Details

12 Princess Gardens, Wombwell, BARNSELY, South Yorkshire, S73 0ED



Ordnance Survey Plan
Published 1980
Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

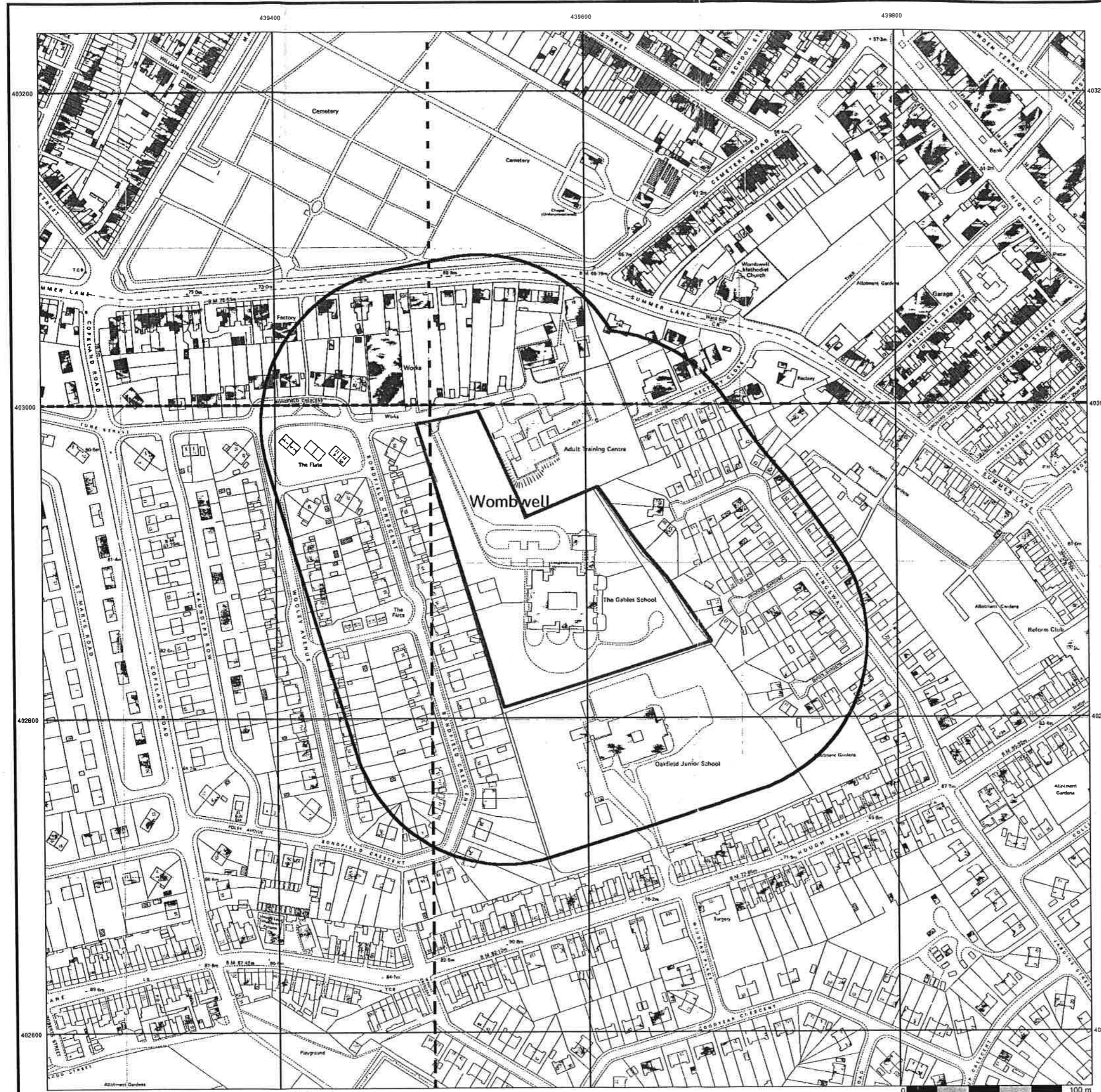
Map Name(s) and Date(s)

Historical Map - Slice A

Order Details

Order Number: 21109285_1_1
 Customer Ref: 6062
 National Grid Reference: 439570, 402900
 Sheet: A
 Site Area (Ha): 1.71
 Search Buffer (m): 1000

Site Details

12 Princess Gardens, Wombwell, BARNSELY, South Yorkshire, S73 0ED

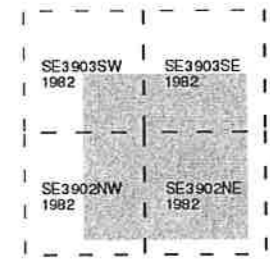




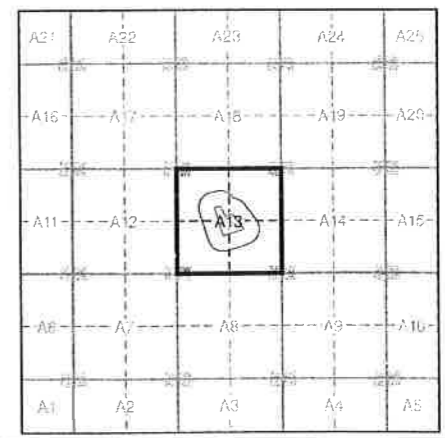
Ordnance Survey Plan
Published 1982
Source map scale - 1:1,250

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given below is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

Map Name(s) and Date(s)



Historical Map - Segment A13



Order Details
Order Number: 21109285_1_1
Customer Ref: 6062
National Grid Reference: 439570, 402900
Sheet: A
Site Area (Ha): 1.71
Search Buffer (m): 100

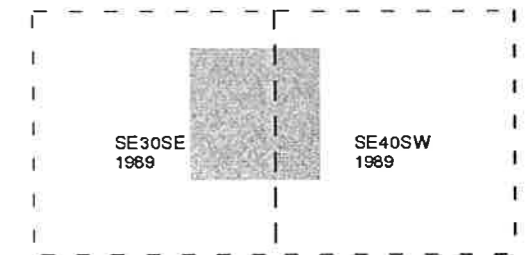
Site Details
12 Princess Gardens, Wombwell, BARNSELY, South
Yorkshire, S73 0ED

**Ordnance Survey Plan
Published 1989**

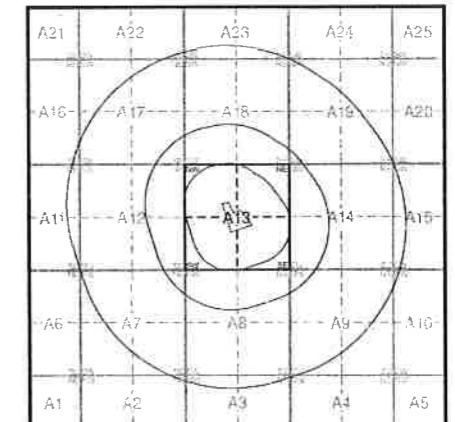
Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

Order Number: 21109285_1_1
 Customer Ref: 6062
 National Grid Reference: 439570, 402900
 Sheet: A
 Site Area (Ha): 1.71
 Search Buffer (m): 1000

Site Details

12 Princess Gardens, Wombwell, BARNSELY, South Yorkshire, S73 0ED

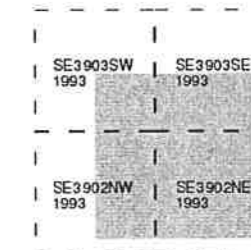


**Large-Scale National Grid Data
Published 1993**

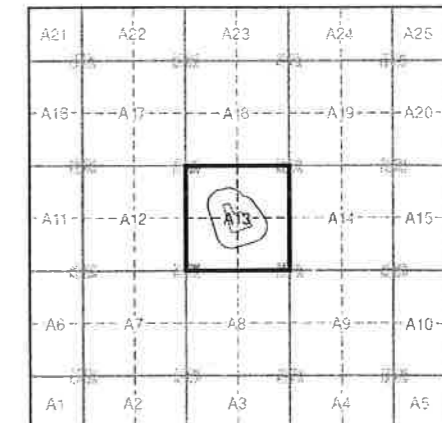
Source map scale - 1:1,250

'Large Scale National Grid Data' superseded SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') in 1992, and continued to be produced until 1999. These maps were the fore-runners of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1,250 scales.

Map Name(s) and Date(s)



Historical Map - Segment A13

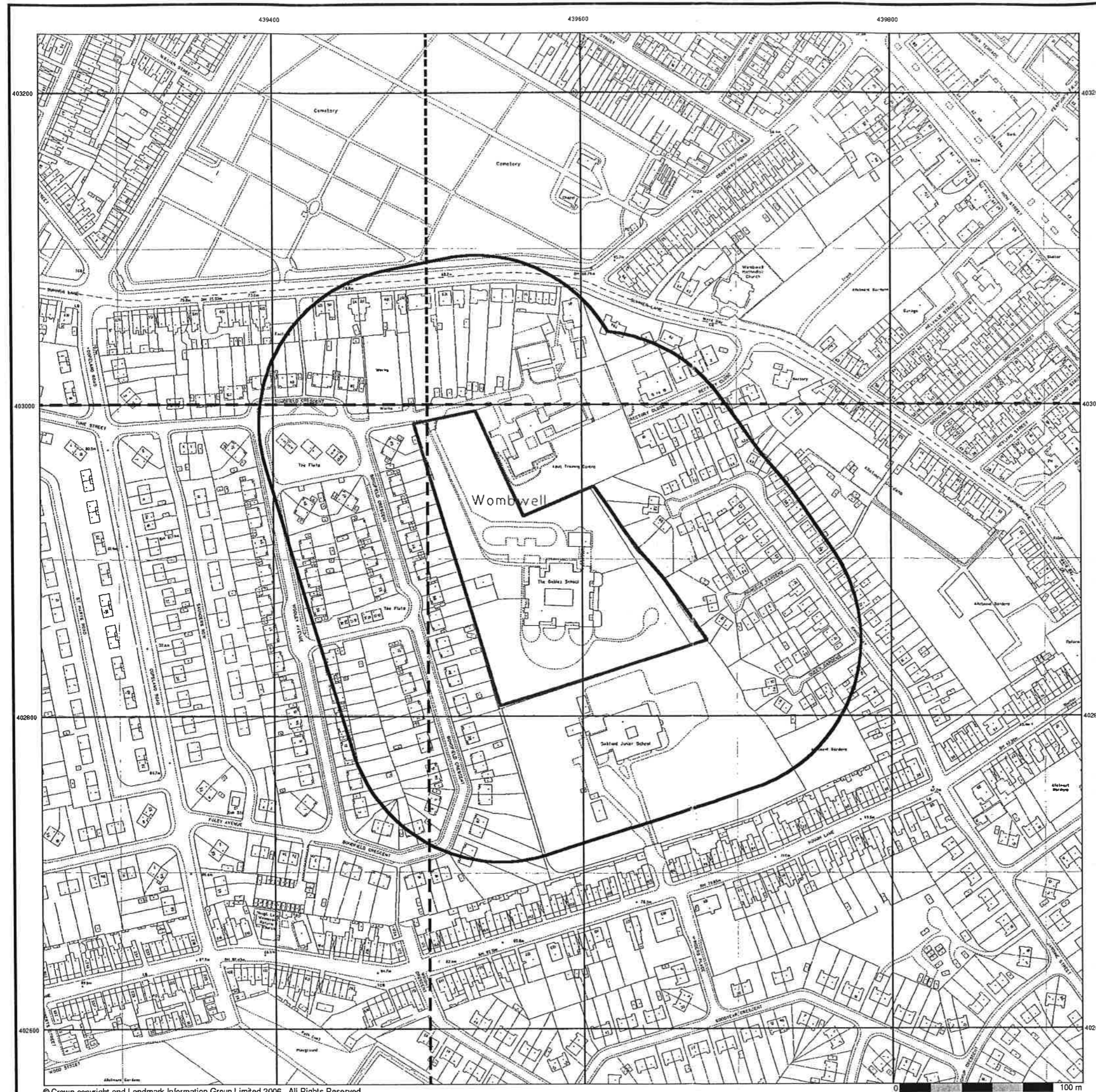


Order Details

Order Number: 21109285_1_1
 Customer Ref: 6062
 National Grid Reference: 439570, 402900
 Sheet: A
 Site Area (Ha): 1.71
 Search Buffer (m): 100

Site Details

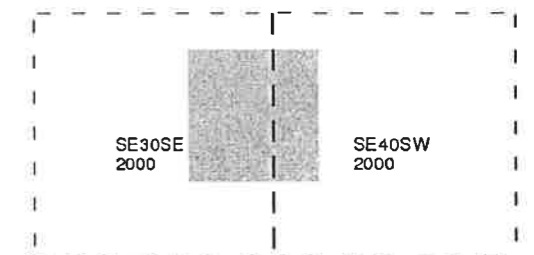
12 Princess Gardens, Wombwell, BARNSELY, South Yorkshire, S73 0ED



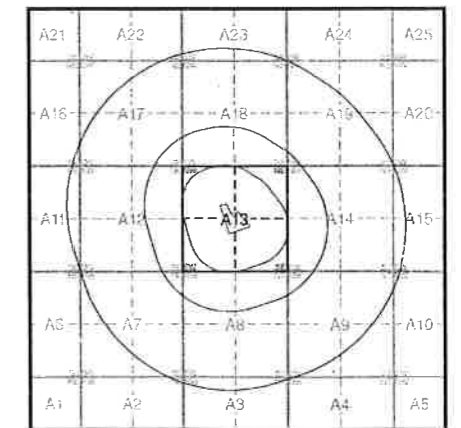
10K Raster Mapping
Published 2000
Source map scale - 1:10,000

The historical maps shown were produced from the Ordnance Survey's 1:10,000 colour raster mapping. These maps are derived from Landplan which replaced the old 1:10,000 maps originally published in 1970. The data is highly detailed showing buildings, fences and field boundaries as well as all roads, tracks and paths. Road names are also included together with the relevant road number and classification. Boundary information depiction includes county, unitary authority, district, civil parish and constituency.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

Order Number: 21109285_1_1
Customer Ref: 6062
National Grid Reference: 439570, 402900
Sheet: A
Site Area (Ha): 1.71
Search Buffer (m): 1000

Site Details

12 Princess Gardens, Wombwell, BARNSELY, South Yorkshire, S73 0ED



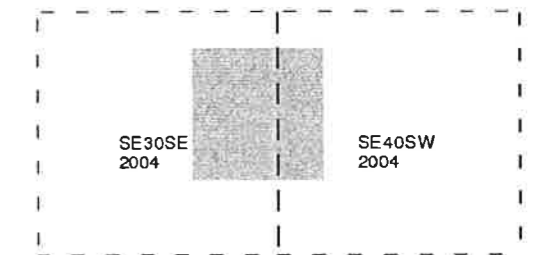
10K Raster Mapping

Published 2004

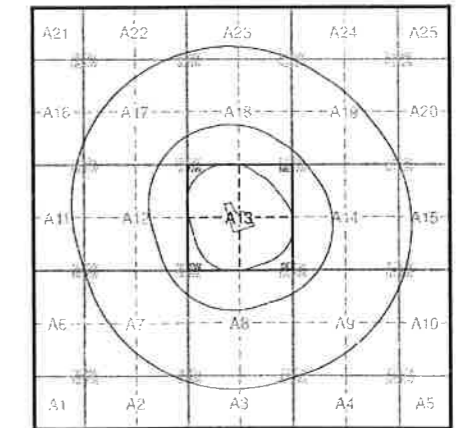
Source map scale - 1:10,000

The historical maps shown were produced from the Ordnance Survey's 1:10,000 colour raster mapping. These maps are derived from Landplan which replaced the old 1:10,000 maps originally published in 1970. The data is highly detailed showing buildings, fences and field boundaries as well as all roads, tracks and paths. Road names are also included together with the relevant road number and classification. Boundary information depiction includes county, unitary authority, district, civil parish and constituency.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

Order Number: 21109285_1_1
 Customer Ref: 6062
 National Grid Reference: 439570, 402900
 Sheet: A
 Site Area (Ha): 1.71
 Search Buffer (m): 1000

Site Details

12 Princess Gardens, Wombwell, BARNSELY, South Yorkshire, S73 0ED



CoDa Structures

Consulting Civil & Structural Engineers
No. 2 Harewood Yard,
Harewood, Leeds
LS17 9LF

**PHASE 1 & 2 ENGINEERING & ENVIRONMENTAL
ASSESSMENT
FORMER GABLES SCHOOL
BONDFIELD CRESCENT WOMBWELL**

APPENDIX F

MINING SEARCH

CoalSearchPlus+
8, Mornington Terrace
Harrogate
North Yorkshire
HG1 5DH

Tel : 01423 529911
Fax : 01423 529922
DX 720352 Harrogate



By

David Bellis
CONSULTING SURVEYORS

Coal Mining Search Report

Incorporating Cheshire Brine Enquiries



WWW.COALSEARCH.PLUS.COM

Serial Number 209042

Client detail :

CoDa Structures
Civil & Structural Engineers
2 Harewood Yard
Harewood
Leeds
LS17 9LF

CoalSearchPlus+ by David Bellis Consulting
Surveyors
8 Mornington Terrace
Harrogate
North Yorkshire
HG1 5DH
(DX 720352 Harrogate)

Tel 01423 529911
Fax 01423 529922

Practice Principal M JPeace BSc PgDip FGS

Property details:

Former Gables School
Bondfield Crescent
Wombwell
Barnsley
S73 8TL

Your ref : 6062

Purchaser :

Vendor :

In accordance with your instructions received 07 Mar 2007 we have inspected plans and records of coal mine workings and have made enquiries with respect to Cheshire brine extraction in relation to the above property and can report as follows :

1. SEAM DETAILS FOR PAST UNDERGROUND COAL MINING : In relation to the property the undermentioned seam(s) have been worked within the likely zone of physical influence on the surface.

Seam	Depth (m)	Sect (cm)	Date	Remarks
Abdy	126	78	1956	Subjacent
Low Beamshaw	155	63	1939	Subjacent
Barnsley	259	180	pre 1900	Subjacent
Swallow Wood	312	80	1967	Subjacent
Fenton	491	180	1970	Subjacent
Parkgate	507	114	1939	Subjacent
Silkstone	592	91	1977	Subjacent

2. SEAM DETAILS FOR CURRENT AND FUTURE UNDERGROUND COAL MINING : The undermentioned seam(s) are currently being worked, or licenses to work are being determined, or have been granted to work, within the likely zone of physical influence on the surface in relation to the property.

Seam	Depth (m)	Sect (cm)	Date	Remarks
				Coal in reserve - no workings currently planned.

Serial Number 209042

3. UNDERLYING GEOLOGY :

The property is situated in an area of Oaks Rock over Middle Coal Measures, shales and mudstones.

There are no faults or abnormal features relevant to the property.

4. OPENCAST COAL MINING :

Past Opencast Workings : The property is not situated within the boundary of a former opencast coal mining site.

Present Opencast Workings : The property is not situated within 200m of the boundary of a currently operating opencast coal mining site.

Future Opencast Workings : The property is not situated within 800m of the boundary of an opencast site for which a license to extract coal by opencast methods has been granted or a license to do so is currently being determined.

5. SHAFTS, ADITS (MINE ENTRIES) AND ADDITIONAL INFORMATION :

We have no knowledge of any shafts or adits within 20 metres of the property or the boundary of the property.

There are no tips or lagoons in the vicinity of the property.

6. NOTICES IN RELATION TO FUTURE COAL MINING ACTIVITY :

We have no knowledge of any intention to work coal by underground methods , within influencing distance on the surface in the vicinity of the property, for which notices have been issued under the Coal Mining Subsidence Act 1991.

7. PAST COAL MINING RELATED SUBSIDENCE :

Our investigations have shown no evidence of coal mining related subsidence claims in relation to the property in the past 10 years.

8. CONCLUSION (COAL MINING) : In the light of the above facts we conclude that in relation to coal mining :

Old workings are present but all settlement is likely to have completed long ago. In our opinion it is unlikely that coal will be worked in the foreseeable future.

COAL MINING RISK LEVEL : We recommend that the transaction is treated as :

If development of the site is intended then it would be wise in our opinion to undertake all necessary enquiries and investigations prior to the commencement of works.

Serial Number 209042

Please note that the overall coal mining risk level above is based upon an assessment of the detailed information contained in the body of the report. The risk assessment must be used in conjunction with the detailed report.

CHESHIRE BRINE EXTRACTION INFORMATION :

The property lies outside the Cheshire Brine Compensation District as prescribed by the Cheshire Brine Pumping (Compensation for Subsidence) Act 1952.

With respect to coal mining there is nothing to prevent a claim being made under the provisions of the Coal Mining Subsidence Act 1991 and subsequent legislation, but it must not be inferred that the Coal Authority or their licensees will necessarily accept that any damage has been caused as a result of mining subsidence.

If you require any further information or amplification please contact CoalSearchPlus+ on 01423 529911 or via our website www.coalsearch.plus.com.

Note:

This search report is based upon plans and records currently available from third party organisations and the CoalSearchPlus+ mining record database. Third party organisations reserve the right to vary their proposals and intentions as to their future mining operations without prior notice save as provided in the Coal Mining (subsidence) Act 1991 and the Coal Industry Act 1994.

This is a Coal Mining Search Report and is not to be interpreted as being part of an Environmental Assessment of the property.

We cannot be held responsible for the accuracy of the information provided to us by third party organisations.

The information and/or material supplied is composed from data based in many cases on measurements and records of various standards of reliability and age. We cannot be held responsible for the accuracy of such information.

This report is prepared in accordance with the CoalSearchPlus+ terms and conditions as published on the CoalSearchPlus+ website (www.coalsearch.plus.com) on the date of issue of this report.

Date : 09 Mar 2007

Signed : *M. J. Peace*

PLEASE NOTE

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UNSATISFACTORY PLAN SUPPLIED WITH INSTRUCTIONS
Search based on assumed position of the property
from the address given in instructions.

© copyright M. J. Peace – March 2006.

CoDa Structures

Consulting Civil & Structural Engineers
No. 2 Harewood Yard,
Harewood, Leeds
LS17 9LF

**PHASE 1 & 2 ENGINEERING & ENVIRONMENTAL
ASSESSMENT
FORMER GABLES SCHOOL
BONDFIELD CRESCENT WOMBWELL**

APPENDIX G

TRIAL PIT LOGS



SUB SURFACE
 SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
 3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Site
 BOUNDFIELD CRESCENT, WOMBWELL, BARNSLEY

Trial Pit Number
TP1

Excavation Method
 MECHANICAL EXCAVATOR

Dimensions

Ground Level (mOD)

Client
 CODA STRUCTURES

Job Number
 NE2713

Location
 AS PLAN

Dates
 08/03/2007

Engineer
 CODA STRUCTURES

Sheet
 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.20	D				(0.38)	TOPSOIL		
0.60	D				0.38 0.40	Friable brown silty CLAY Very weak brown highly to moderately weathered medium grained SANDSTONE with sand		
1.40	D				(1.80)			
			08/03/2007		2.20 (0.10) 2.30	Weak brown fresh medium grained SANDSTONE		
						Complete at 2.30m		

Plan

Remarks

No groundwater entries encountered.
 Pit sides remained generally vertical.

Scale (approx)

1:25

Logged By

DS/DP

Figure No.

NE2713.TP1



Excavation Method
 MECHANICAL EXCAVATOR

Dimensions

Ground Level (mOD)

Client
 CODA STRUCTURES

Job Number
 NE2713

Location
 AS PLAN

Dates
 08/03/2007

Engineer
 CODA STRUCTURES

Sheet
 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.30	D				(0.80)	MADE GROUND: brown silty clay with slight sand sized ash and old electric cable at 0.75m		
0.50	D				0.80from 0.30m to 0.60m: wedge of friable brown silty clay		
1.20	D				(0.90)	Brown medium grained SAND with lithorelicts of sandstone		
					1.70 (0.10)	Weak brown fresh medium grained SANDSTONE		
			08/03/2007		1.80	Complete at 1.80m		

Plan

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Remarks

No groundwater entries encountered.
 Pit sides remained generally vertical.

Scale (approx) 1:25	Logged By DS/DP	Figure No. NE2713.TP2
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SUB SURFACE

SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
 3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Site

BOUNDFIELD CRESCENT, WOMBWELL, BARNSLEY

Trial Pit Number
TP4

Excavation Method
 MECHANICAL EXCAVATOR

Dimensions

Location
 AS PLAN

Ground Level (mOD)

Dates
 08/03/2007

Client

CODA STRUCTURES

Engineer

CODA STRUCTURES

Job Number
 NE2713

Sheet
 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	D				(0.20)	MADE GROUND: grey fine gravel sized stone with some brown sand and occasional plastic fragments		
0.40	D				0.20	Very weak brown completely to highly weathered brown medium grained SANDSTONE with brown sand		
					(0.80)			
					1.00	Weak brown fresh medium grained SANDSTONE		
			08/03/2007		(0.20)			
					1.20	Complete at 1.20m		

Plan

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Remarks

No groundwater entries encountered.
 Pit sides remained generally vertical.

Scale (approx)

1:25

Logged By

DS/DP

Figure No.

NE2713.TP4



SUB SURFACE

SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
 3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Site
 BOUNDFIELD CRESCENT, WOMBWELL, BARNSLEY

Trial Pit
 Number
TP5

Excavation Method
 MECHANICAL EXCAVATOR

Dimensions

Ground Level (mOD)

Client
 CODA STRUCTURES

Job
 Number
 NE2713

Location
 AS PLAN

Dates
 08/03/2007

Engineer
 CODA STRUCTURES

Sheet
 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.15	D				(0.25)	MADE GROUND: topsoil with some brown clay and occasional brick and stone fragments		
0.60	D				0.25	Brown silty SAND with lithorelicts of sandstone (completely weathered sandstone or possible made ground)		
1.60	B				(1.35)			
					1.60	Weak brown fresh medium grained SANDSTONE		
					(0.25)			
					1.85	Complete at 1.85m		
			Seepage (1) at 1.85m, rose to 1.80m in 20 mins. 08/03/2007					

Plan



Remarks
 Groundwater seepage at 1.85m, rising to 1.80m after 20 minutes.
 Pit sides remained generally vertical.

Scale (approx)	Logged By	Figure No.
1:25	DS/DP	NE2713.TP5



SUB SURFACE

SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Site
BOUNDFIELD CRESCENT, WOMBWELL, BARNSLEY

Trial Pit
Number
TP5

Excavation Method
MECHANICAL EXCAVATOR

Dimensions

Ground Level (mOD)

Client
CODA STRUCTURES

Job
Number
NE2713

Location
AS PLAN

Dates
08/03/2007

Engineer
CODA STRUCTURES

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.15	D				(0.25)	MADE GROUND: topsoil with some brown clay and occasional brick and stone fragments		
0.60	D				0.25	Brown silty SAND with lithorelicts of sandstone (completely weathered sandstone or possible made ground)		
					(1.35)			
1.60	B				1.60	Weak brown fresh medium grained SANDSTONE		
					(0.25)			
			Seepage (1) at 1.85m, rose to 1.80m in 20 mins. 08/03/2007		1.85	Complete at 1.85m		

Plan
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Remarks		
Groundwater seepage at 1.85m, rising to 1.80m after 20 minutes. Pit sides remained generally vertical.		
Scale (approx)	Logged By	Figure No.
1:25	DS/DP	NE2713.TP5



SUB SURFACE
 SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
 3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Site
 BOUNDFIELD CRESCENT, WOMBWELL, BARNSELY

Trial Pit
 Number
TP6

Excavation Method
 MECHANICAL EXCAVATOR

Dimensions

Ground Level (mOD)

Client
 CODA STRUCTURES

Job
 Number
 NE2713

Location
 AS PLAN

Dates
 08/03/2007

Engineer
 CODA STRUCTURES

Sheet
 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	D				(0.25)	MADE GROUND: topsoil with occasional brick and stone fragments		
0.40	D				0.25 (0.45)	MADE GROUND: brown silty sand with occasional gravel and clayey bands		
0.80	D				0.70 (0.40)	MADE GROUND: dark grey sand sized ash and fine gravel sized clinker		
1.15	D				1.10 (0.10)	Friable brown silty CLAY		
1.50	D				1.20 (1.10)	Very weak brown completely to highly weathered medium grained SANDSTONE with brown sand		
2.30	D		08/03/2007		2.30 2.35	Weak brown fresh medium grained SANDSTONE		
						Complete at 2.35m		

Plan

Remarks

No groundwater entries encountered.
 Partial collapse of pit sides to 1.50m.

Scale (approx)

1:25

Logged By

DS/DP

Figure No.

NE2713.TP6



SUB SURFACE

SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Site
BOUNDFIELD CRESCENT, WOMBWELL, BARNSELY

Trial Pit Number
TP7

Excavation Method
MECHANICAL EXCAVATOR

Dimensions

Ground Level (mOD)

Client
CODA STRUCTURES

Job Number
NE2713

Location
AS PLAN

Dates
08/03/2007

Engineer
CODA STRUCTURES

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	D		Seepage(1) at 0.30m.		(0.30)	MADE GROUND: light grey fine angular gravel (stone chippings)		Σ1
						0.30	Dark grey silty CLAY	
0.50	D				0.32	Brown silty SAND with clayey bands		
					(0.38)			
					0.70	Brown silty SAND with lithorelicts of sandstone		
1.20	D				(1.40)			
					2.10	Weak brown slightly weathered medium grained SANDSTONE		
2.20	D				(0.30)			
		08/03/2007			2.40	Complete at 2.40m		

Plan

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Remarks
Groundwater seepage at 0.30m.
Pit sides remained generally vertical.

Scale (approx) 1:25	Logged By DS/DP	Figure No. NE2713.TP7
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SUB SURFACE
 SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
 3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Site
 BOUNDFIELD CRESCENT, WOMBWELL, BARNSELY

Trial Pit
 Number
TP8

Excavation Method
 MECHANICAL EXCAVATOR

Dimensions

Ground Level (mOD)

Client
 CODA STRUCTURES

Job
 Number
 NE2713

Location
 AS PLAN

Dates
 08/03/2007

Engineer
 CODA STRUCTURES

Sheet
 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.30	D				(0.60)	MADE GROUND: brown silty sand with some topsoil and occasional brick and plastic fragments		
0.70	D				0.60	MADE GROUND: brown sand and gravel sized stone with some brick and occasional old kerbstone fragments		
1.80	D				(1.70)			
2.40	D				2.30	MADE GROUND: dark grey sand sized ash and fine gravel sized clinker with occasional glass bottles		
					(1.00)			
3.50	D				3.30	Brown silty SAND		
3.60	D				(0.20)	Brown silty SAND with lithorelicts of sandstone (possible made ground or completely weathered sandstone)		
			08/03/2007		3.50			
					(0.20)			
					3.70	Complete at 3.70m		

Plan

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Remarks

No groundwater entries encountered.
 Major collapse of pit sides prevented further progress.

Scale (approx)	Logged By	Figure No.
1:25	DS/DP	NE2713.TP8



SUB SURFACE

SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Site
BOUNDFIELD CRESCENT, WOMBWELL, BARNSLEY

Trial Pit Number
TP9

Excavation Method
MECHANICAL EXCAVATOR

Dimensions

Ground Level (mOD)

Client
CODA STRUCTURES

Job Number
NE2713

Location
AS PLAN

Dates
08/03/2007

Engineer
CODA STRUCTURES

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	D				(0.20)	MADE GROUND: topsoil with some gravel sized stone		
					0.20	MADE GROUND: brown silty sand with some gravel sized stone and occasional brick		
0.70	D				(1.00)			
			Medium inflow(1) at 1.20m, rose to 1.10m in 5 mins. 08/03/2007		1.20	Complete at 1.20m		▽1 ▽1

Plan

Remarks

Medium water entry at 1.20m, rising to 1.10m in 5 minutes. Partial collapse of pit sides. Borehole terminated due to possible presence of old land drains or spring water.

Scale (approx)

1:25

Logged By

DS/DP

Figure No.

NE2713.TP9



SUB SURFACE

SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
 3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Site
 BOUNDFIELD CRESCENT, WOMBWELL, BARNSELY

Trial Pit Number
TP10

Excavation Method
 MECHANICAL EXCAVATOR

Dimensions

Ground Level (mOD)

Client
 CODA STRUCTURES

Job Number
 NE2713

Location
 AS PLAN

Dates
 08/03/2007

Engineer
 CODA STRUCTURES

Sheet
 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.30	D				(0.80)	MADE GROUND: topsoil with occasional brick and plastic fragments		
0.90	D				0.80 (0.35)	Brown silty SAND with clayey bands		
1.60	D				1.15 (1.05)	Brown silty SAND with lithorelicts of sandstone		
					2.20 (0.30)	Weak brown slightly weathered medium grained SANDSTONE		
			08/03/2007		2.50	Complete at 2.50m		

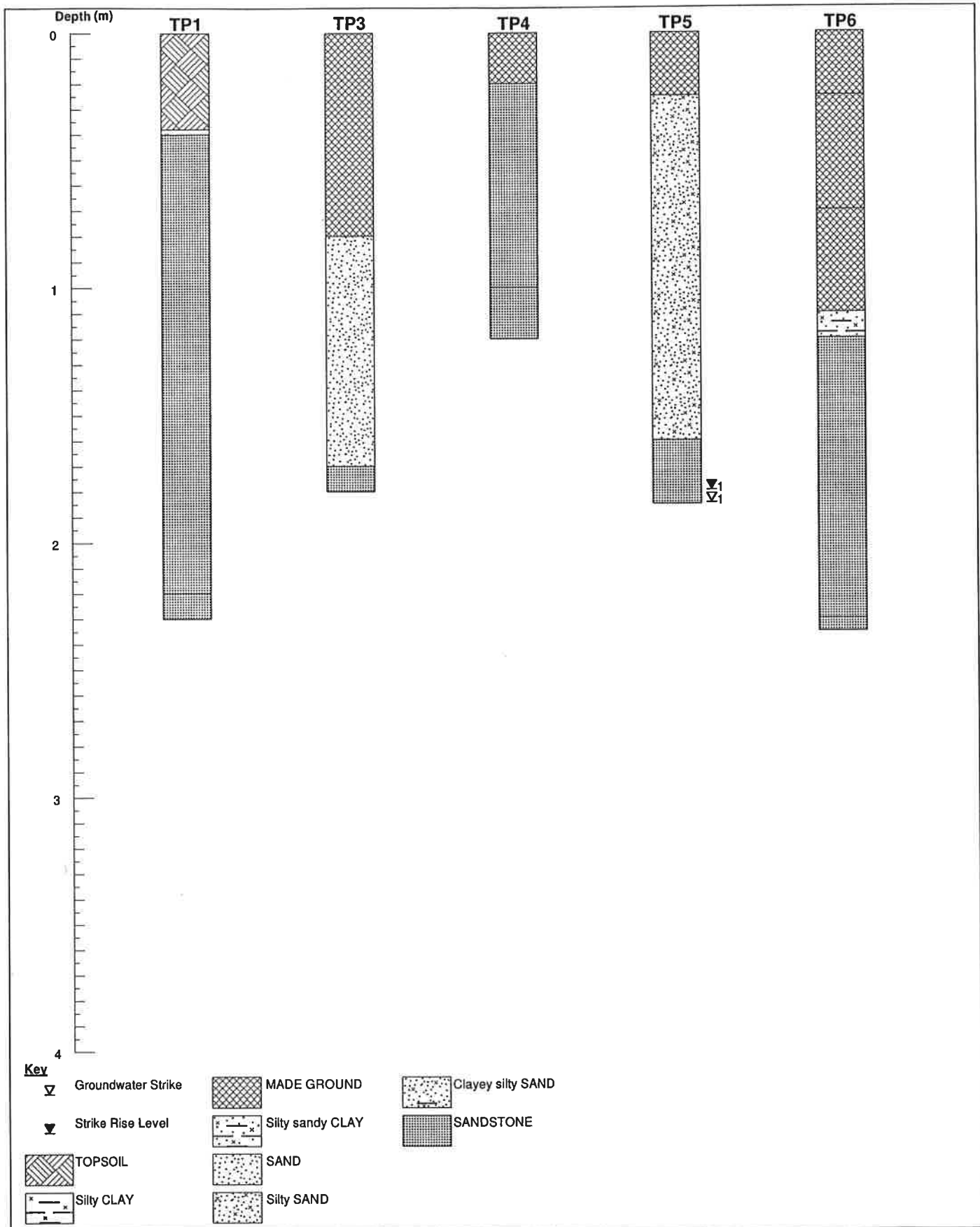
Plan

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Remarks

No groundwater entries encountered.
 Pit sides remained generally vertical.

Scale (approx) 1:25	Logged By DS/DP	Figure No. NE2713.TP10
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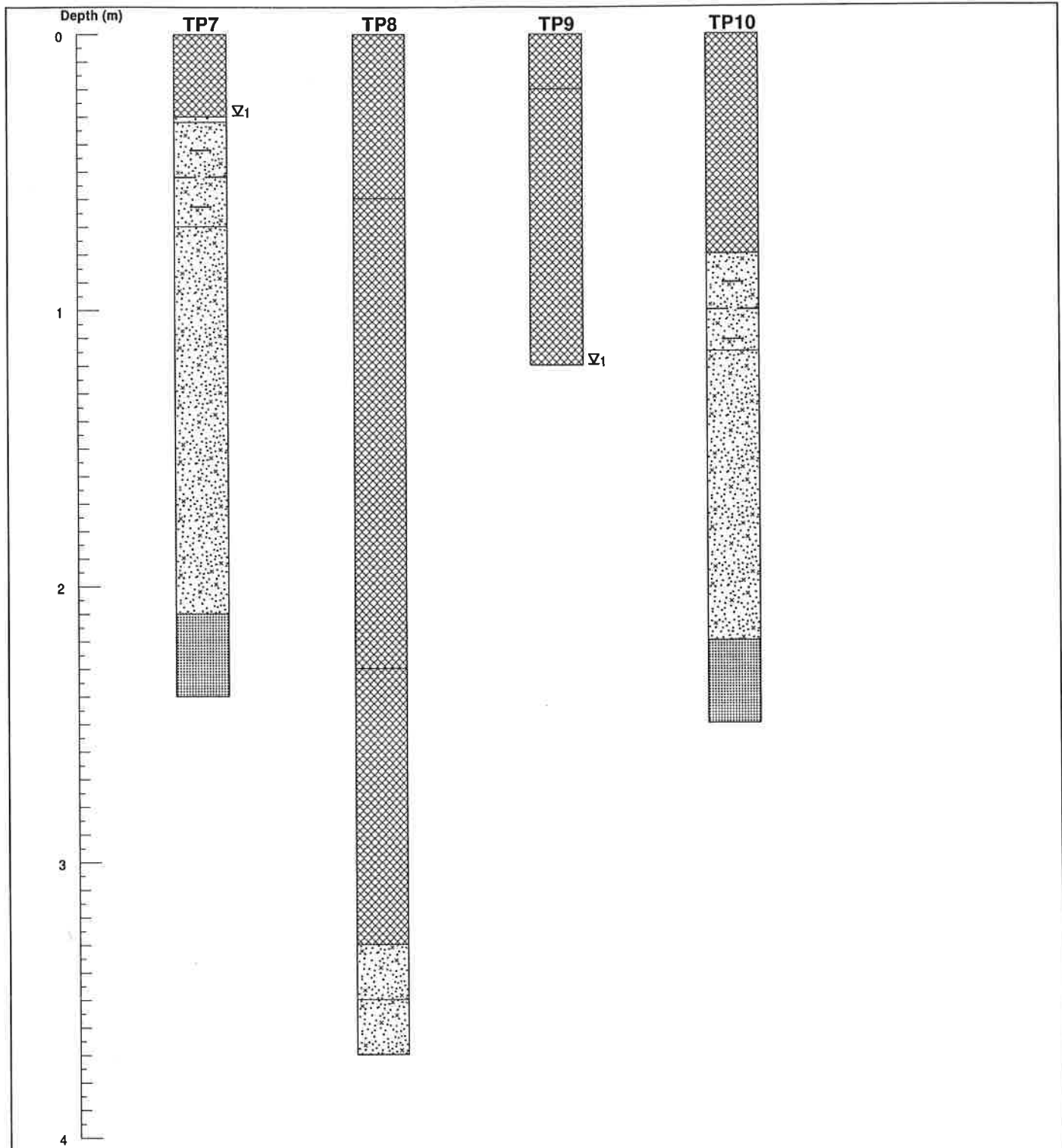


SUB SURFACE

SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Nominal Section

Site BOUNDFIELD CRESCENT, WOMBWELL, BARNSELY	Date Drawn 29/03/2007	Date Checked	Sheet 1/2	Job Number NE2713
Client CODA STRUCTURES	Drawn By	Checked By	Scale 1:20[V]	Figure No. NE2689A.1



Key

∇ Groundwater Strike	MADE GROUND	Clayey silty SAND
∇ Strike Rise Level	Silty sandy CLAY	SANDSTONE
TOPSOIL	SAND	
Silty CLAY	Silty SAND	

SS **SUB SURFACE**
 SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
 3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Site
 BOUNDFIELD CRESCENT, WOMBWELL, BARNLEY

Client
 CODA STRUCTURES

Nominal Section

Date Drawn 29/03/2007	Date Checked	Sheet 2/2	Job Number NE2713
Drawn By	Checked By	Scale 1:20[V]	Figure No. NE2689A.1

CoDa Structures

Consulting Civil & Structural Engineers
No. 2 Harewood Yard,
Harewood, Leeds
LS17 9LF

**PHASE 1 & 2 ENGINEERING & ENVIRONMENTAL
ASSESSMENT
FORMER GABLES SCHOOL
BONDFIELD CRESCENT WOMBWELL**

APPENDIX H

WINDOW SAMPLING BOREHOLE LOGS



SUB SURFACE

SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Site
BOUNDFIELD CRESCENT, WOMBWELL, BARNSELY

Borehole
Number
WS1

Boring Method
MINI PERCUSSIVE

Casing Diameter

Ground Level (mOD)

Client
CODA STRUCTURES

Job
Number
NE2713

Location
AS PLAN

Dates
12/03/2007

Engineer
CODA STRUCTURES

Sheet
1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.10	D					(0.25)	MADE GROUND: topsoil			
						0.25	MADE GROUND: light brown sandstone fragments			
0.35	D					0.35 (0.15)	MADE GROUND: topsoil and brown silty clay			
0.55	D					0.50 (0.15)	Friable brown silty CLAY			
						0.65	Very weak brown highly to moderately weathered becoming fresh medium grained SANDSTONE (weathered to sand in parts)			
0.90	D									
1.00-1.45	CPT N=41			3,8/8,9,11,13						
						(1.63)				
1.50	D									
2.00-2.28	CPT 50/125			4,11/25,25						
				12/03/2007		2.28				
							Complete at 2.28m			

Remarks

On completion installed a 50mm diameter mdpe gas monitoring standpipe with a gas valve and gravel surround from 2.28m to 1.00m, a Bentonite seal from 1.00m to 0.50m and a concreted in lockable steel protective cover from 0.50m to GL.

Scale (approx)

1:25

Logged By

DS/DP

Figure No.

NE2713.M1



SUB SURFACE

SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
 3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Site
 BOUNDFIELD CRESCENT, WOMBWELL, BARNSELY

Borehole Number
WS2

Boring Method
 MINI PERCUSSIVE

Casing Diameter

Ground Level (mOD)

Client
 CODA STRUCTURES

Job Number
 NE2713

Location
 AS PLAN

Dates
 12/03/2007

Engineer
 CODA STRUCTURES

Sheet
 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.20	D					(0.50)	MADE GROUND: topsoil and friable brown silty clay			
0.80	D			5,7/9,10,12,15		0.50	Very weak brown completely to highly weathered medium grained SANDSTONE (weathered to sand in parts) and possibly fresh by 2.25m			
1.00-1.45	CPT N=46					(1.75)				
1.90	D			5,7/42,8		2.25				
2.00-2.25	CPT 50/95			12/03/2007			Complete at 2.25m			

Remarks

On completion installed a 50mm diameter mdpe gas monitoring standpipe with a gas valve and gravel surround from 2.25m to 1.00m, a Bentonite seal from 1.00m to 0.50m and a concreted in lockable steel protective cover from 0.50m to GL.

Scale (approx)

1:25

Logged By

DS/DP

Figure No.

NE2713.WS2



SUB SURFACE

SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Site

BOUNDFIELD CRESCENT, WOMBWELL, BARNSELY

Borehole Number

WS3

Boring Method
MINI PERCUSSIVE

Casing Diameter

Ground Level (mOD)

Client
CODA STRUCTURES

Job Number
NE2713

Location
AS PLAN

Dates
12/03/2007

Engineer
CODA STRUCTURES

Sheet
1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.25	D					(0.20) 0.20	MADE GROUND: topsoil			
0.90	D						MADE GROUND: firm brown silty clay with bands of sandy clay, occasional brick, concrete and stone fragments			
1.00-1.45	CPT N=13			3,5/3,3,3,4		(2.20)				
2.00-2.45	CPT N=15			3,2/3,4,4,4						
2.50	D					2.40	Very weak brown completely to highly weathered medium grained SANDSTONE (possible made ground in part)			
2.90	D					(1.15)				
3.00-3.40	CPT 50/245			3,9/12,13,20,5						
3.40	D									
3.50-3.55	CPT 50*/50			50/ 12/03/2007		3.55	Complete at 3.55m			

Remarks

No recovery from 1.00m to 2.00m due to pushing obstruction.
On completion installed a 50mm diameter mdp gas monitoring standpipe with a gas valve and gravel surround from 3.55m to 1.00m, a Bentonite seal from 1.00m to 0.50m and a concreted in lockable steel protective cover from 0.50m to GL.

Scale (approx)

1:25

Logged By

DS/DP

Figure No.

NE2713.M3



SUB SURFACE
 SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
 3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Site
 BOUNDFIELD CRESCENT, WOMBWELL, BARNSELY
 Borehole Number
WS4

Boring Method MINI PERCUSSIVE	Casing Diameter	Ground Level (mOD)	Client CODA STRUCTURES	Job Number NE2713
	Location AS PLAN	Dates 12/03/2007	Engineer CODA STRUCTURES	Sheet 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	D					(0.75)	MADE GROUND: brown silty sand, bituminous macadam fragments and a band of light brown stone "chippings"		
0.60	D					0.75	Very weak brown slightly weathered SANDSTONE		
0.95 1.00-1.18	D SPT 14*/75 50/105			14/30,20 12/03/2007		(0.43) 1.18	 Complete at 1.18m		

Remarks	Scale (approx)	Logged By
	1:25	DS/DP
	Figure No. NE2713.WS4	



SUB SURFACE

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3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Site
BOUNDFIELD CRESCENT, WOMBWELL, BARNSELY

Borehole Number
WS5

Boring Method
MINI PERCUSSIVE

Casing Diameter

Ground Level (mOD)

Client
CODA STRUCTURES

Job Number
NE2713

Location
AS PLAN

Dates
12/03/2007

Engineer
CODA STRUCTURES

Sheet
1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.15	D					(0.12)	MADE GROUND: concrete fragments with some brown sand		
0.30	D					(0.13) (0.25)	MADE GROUND: dark brown silty clay with occasional stone fragments		
0.95 1.00-1.45	D CPT N=36			5,9/11,8,8,9		(0.20) (0.45) (1.45)	Brown silty CLAY with occasional stone fragments Very weak brown completely to highly weathered medium grained SANDSTONE with sand bands		
1.50	D								
1.95 2.00-2.21	D CPT 50/60			8,16/50 12/03/2007		1.90 (0.31) 2.21	Very weak brown moderately weathered silty SANDSTONE with thin brown clay bands		
							Complete at 2.21m		

Remarks

Scale (approx)

1:25

Logged By

DS/DP

Figure No.

NE2713.M5



SUB SURFACE

SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Site
BOUNDFIELD CRESCENT, WOMBWELL, BARNSELY

Borehole Number
WS6

Boring Method
MINI PERCUSSIVE

Casing Diameter

Ground Level (mOD)

Client
CODA STRUCTURES

Job Number
NE2713

Location
AS PLAN

Dates
12/03/2007

Engineer
CODA STRUCTURES

Sheet
1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.10	D					(0.40)	MADE GROUND: topsoil			
0.50	D					0.40 (0.20)	MADE GROUND: topsoil and slight sand sized ash with fine gravel sized stone			
0.70	D					0.60	MADE GROUND: brown gravel sized stone with brown sand and "stone chippings"			
1.00-1.45	CPT N=26			2,3/5,4,8,9		1.15	Medium dense brown silty SAND with clayey bands			
1.20	D					1.35	Dense becoming very dense brown silty SAND with lithorelicts of sandstone			
1.70	D					(1.03)				
2.00-2.38	CPT 50/225			8,8/12,13,25		2.38	Complete at 2.38m			
				12/03/2007						

Remarks

On completion installed a 50mm diameter mdpe gas monitoring standpipe with a gas valve and gravel surround from 2.38m to 1.00m, a Bentonite seal from 1.00m to 0.50m and a concreted in lockable steel protective cover from 0.50m to GL.

Scale (approx)

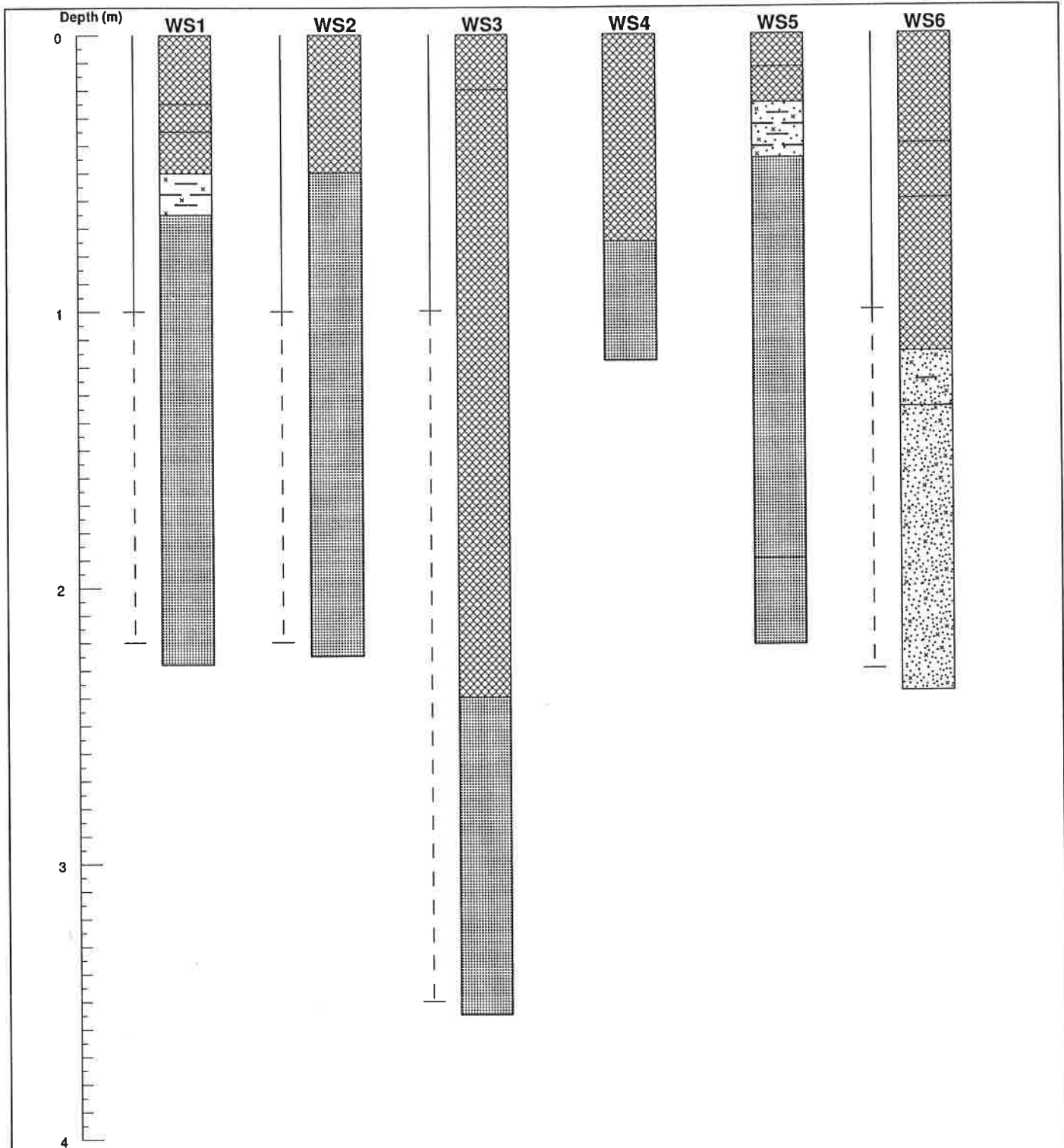
1:25

Logged By

DS/DP

Figure No.

NE2713.M6



Key

	Groundwater Strike		Slotted Standpipe		Silty SAND
	Strike Rise Level		MADE GROUND		Clayey silty SAND
	Highest recorded piezo level		Silty CLAY		SANDSTONE
	Piezometer Tip		Silty sandy CLAY		

SUB SURFACE SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS 3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907	Nominal Section			
	Site BOUNDFIELD CRESCENT, WOMBWELL, BARNSELEY	Date Drawn 29/03/2007	Date Checked	Sheet 1/1
Client CODA STRUCTURES	Drawn By	Checked By	Scale 1:20[V]	Figure No. NE2689A.1

APPENDIX I

TIER ONE INTERVENTION VALUES

SOIL - TIER ONE HUMAN HEALTH INTERVENTION VALUES

14-Mar-07

Determinand	Units	Residential Use with Plant Uptake	Residential Use Without Plant Uptake	Commercial/Industrial Use	Pathway	Derivation Tool
pH	Value	<5	<5	<5		ICRCL
Asbestos	%	Presence	Presence	Presence		Lab Screening
PHENOLICS						
Phenol	mg/kg	150	34400	430000		SGV Report 8
PAH 16 EPA						
Acenaphthene	mg/kg	45	150	360		CLEA 2002 V1.3
Acenaphthylene	mg/kg	5	18	45		CLEA 2002 V1.3
Anthracene	mg/kg	140	680	5600		CLEA 2002 V1.3
Benzo (a) Anthracene	mg/kg	3.4	5.2	35		CLEA 2002 V1.3
Benzo (a) pyrene	mg/kg	1.1	1.3	29.7		LQM Ltd.
Benzo (b) fluoranthene	mg/kg	1.3	4	25		CLEA 2002 V1.3
Benzo (k) fluoranthene	mg/kg	4	7	50		CLEA 2002 V1.3
Benzo (g, h, i) perylene	mg/kg	340	520	5800		CLEA 2002 V1.3
Chrysene	mg/kg	23	46	290		CLEA 2002 V1.3
Di-benzo (a, h) anthracene	mg/kg	1.1	1.3	29.7		LQM Ltd.
Indeno (1, 2, 3-cd) pyrene	mg/kg	3.6	7.1	54		CLEA 2002 V1.3
Fluoranthene	mg/kg	21	43	275		CLEA 2002 V1.3
Fluorene	mg/kg	184	2640	59000		LQM Ltd.
Naphthalene	mg/kg	3.4	6.9	290		LQM Ltd.
Phenanthrene	mg/kg	110	630	3400		CLEA 2002 V1.3
Pyrene	mg/kg	160	450	2850		CLEA 2002 V1.3
Total PAHs	mg/kg	no sum	no sum	no sum		
VOCs						
Trichloroethylene	mg/kg	0.16	0.16	6.9		RISC WORKBENCH 4
1,1,1 Trichloroethanes	mg/kg	27.2	29.8	1280		LQM Ltd.
1,1,2,2, Tetrachloroethene	mg/kg	1.25	8.05	332		LQM Ltd.
Vinyl Chloride	mg/kg	0.0018	0.0025	0.113		LQM Ltd.
1,2 Dichloroethane	mg/kg	0.017	0.026	0.049		LQM Ltd.
Tetrachloroethene	mg/kg	2.32	3.39	146		LQM Ltd.
Chlorobenzene	mg/kg	24.8	79.3	143000		LQM Ltd.
Hexachlorobutadiene	mg/kg	0.013	0.12	4.72		LQM Ltd.
Trichloroethene	mg/kg	0.31	0.35	14.8		LQM Ltd.
Trichloromethane	mg/kg	2	3.9	180		LQM Ltd.
GENERAL INORGANICS						
Easily Liberatable Cyanide (free)	mg/kg	36	36	36		Acute effects infant 1 dose 3g soil
HEAVY METAL/METALLOIDS						
Arsenic	mg/kg	20	20	500		SGV Report 1
Cadmium	mg/kg	1(pH6); 1(pH7); 8 (pH8)	30	1400		SGV Report 3
Chromium (VI)	mg/kg	130	200	5000		SGV Report 4
Lead	mg/kg	450	450	750		SGV Report 10
Mercury	mg/kg	8	15	480		SGV Report 5
Nickel	mg/kg	50	75	5000		SGV Report 7
Selenium	mg/kg	35	260	8000		SGV Report 9
Boron	mg/kg	3	3	3		ICRCL
Copper	mg/kg	111	2080	45700		LQM Ltd.
Zinc	mg/kg	330	8250	188,000		LQM Ltd.
Beryllion	mg/kg	12.1	84.9	1950		LQM Ltd.
Vanadium	mg/kg	140	150	4250		LQM Ltd.
MONOAROMATICS						
Benzene	mg/kg	0.05	0.05	2.2		RISC WORKBENCH 4
Toluene	mg/kg	7	8	350		SGV Report 15
Ethylbenzene	mg/kg	21	41	48000		SGV Report 16
Xylenes (mixed isomers)	mg/kg	8.9	8.9	380		RISC WORKBENCH 4
Styrene	mg/kg	7	7	15		CLEA 2002 V1.3
ALIPHATIC HYDROCARBONS						
TPH Aliphatic>EC5-6	mg/kg	3.7	3.7	168		LQM Ltd.
TPH Aliphatic>EC6-8	mg/kg	11.9	11.9	535		LQM Ltd.
TPH Aliphatic>EC8-10	mg/kg	3.6	3.6	160		LQM Ltd.
TPH Aliphatic>EC10-12	mg/kg	20.8	21.2	30600		LQM Ltd.
TPH Aliphatic>EC12-16	mg/kg	93.4	101	30600		LQM Ltd.
TPH Aliphatic>EC16-35	mg/kg	16400	27600	631000		LQM Ltd.
TPH Aliphatic>C35-44	mg/kg	16400	27600	631000		LQM Ltd.
TPH Aromatic>EC5-7	mg/kg	1.3	1.4	52.1		LQM Ltd.
TPH Aromatic>EC7-8	mg/kg	1.5	1.6	71.1		LQM Ltd.
TPH Aromatic>EC8-10	mg/kg	2.7	5.9	263		LQM Ltd.
TPH Aromatic>EC10-12	mg/kg	4.8	34.1	1450		LQM Ltd.
TPH Aromatic>EC12-16	mg/kg	5.9	152	12500		LQM Ltd.
TPH Aromatic>EC16-21	mg/kg	132	336	9400		LQM Ltd.
TPH Aromatic>EC21-35	mg/kg	161	417	9460		LQM Ltd.
TPH Aromatic>EC35-44	mg/kg	161	417	9460		LQM Ltd.
PESTICIDES						
Atrazine	mg/kg	0.049	6.86	157		LQM Ltd.

NOTES

- Derived Intervention Values are calculated using a Fraction Organic Carbon (FOC) value of 1.45%, which is e equivalent to a Soil Organic matter (SOM) of 2.5%. For reference FOC = 0.58* SOM. Check FOC/SOM against your Conceptual Site Model.
- Individual analyte values are screened initially and if exceedences are noted the 95% UCL of the mean value of the analyte is calculated.
- These values are for initial screening for potential risk to human health only. They are not necessarily remediation thresholds.
- LQM Ltd. - Refers to LQM Ltd. Generic Assessment Criteria for Human Health Risk Assessment

CoDa Structures

Consulting Civil & Structural Engineers
No. 2 Harewood Yard,
Harewood, Leeds
LS17 9LF

**PHASE 1 & 2 ENGINEERING & ENVIRONMENTAL
ASSESSMENT
FORMER GABLES SCHOOL
BONDFIELD CRESCENT WOMBWELL**

APPENDIX J

CHEMICAL TEST RESULTS



Client: Coda Structures
2 Harewood Yard
Harewood
Leeds
West Yorkshire
LS17 9LF

FAO: Mr J Lawrence

Analytical Report Number: R07/0532

Client Project Name:	Wombwell
Client Project Number:	6062
Your Order Number:	None Specified
Order Receipt Date:	19/03/07
Reporting Date:	Tuesday 27 March 2007

If you have any queries regarding this report please contact our Customer Services Section



Client Project Name: Wombwell

Client: Coda Structures

Project Number: 6062

Reporting Date: Tuesday 27 March 2007

Comments

All analyses are carried out using the laboratory's standard methods unless otherwise agreed.

The test results in this report refer only to the actual samples on which testing has been performed.

Any opinions and/or interpretations expressed herein are outside the scope of the testing laboratory's UKAS accreditation.

The test report shall not be reproduced, except in full, without the testing laboratory's written approval.

This testing laboratory cannot be held responsible for the condition or suitability of samples submitted for testing by a third party or for the competency of personnel other than its own staff.

This testing laboratory cannot be held responsible for the accuracy of test sample locations or descriptions when supplied by a third party.

Soil Samples

Results are expressed based on dried mass @ 40°C unless otherwise stated.

See key in Notes section for explanation of numerical categories for asbestos results, if applicable.

Stones (for example inert flints and inorganic minerals) >10mm are removed prior to analysis. Unless otherwise stated, results have not been corrected for this loss.

Samples submitted for leachate determination were prepared using agreed procedures and analysed using UKAS accredited methodology where appropriate.

Results are expressed without correction for recovery factors.

Sample Pretreatment (Appended to Method of Detection)

AD = Assisted drying @ 40°C

R = As Received

Sample Type

B = Bulk disturbed sample

C = Core Sample

D = Small disturbed sample

P = Piston sample

U = Undisturbed sample - open drive

W = Water Sample

Sample Results

Analysis not requested

*** Test not completed. Please see notes on last page

Signed: _____

For and on behalf of EC&S Environmental Limited

Approved signatories:

Name	Position
J R Brown	Business Development Manager
L Dewell	Production Manager
P Richardson	Section Head
J Stoddart	Technical Manager



Client Project Name: Wombwell
 Project Number: 6062

Client: Coda Structures
 Reporting Date: Tuesday 27 March 2007

Soil Samples

Method Statement

Determinand	Method of Detection	Sample Pretreatment	Limit of Detection	UKAS Accreditation	Sub-Contracted	Result Date
Arsenic	ICP-OES	AD	0.1 mg/kg	Yes	No	23/03/07
Cadmium	ICP-OES	AD	0.2 mg/kg	Yes	Yes	23/03/07
Chromium (total)	ICP-OES	AD	0.2 mg/kg	Yes	No	23/03/07
Lead	ICP-OES	AD	0.5 mg/kg	Yes	No	23/03/07
Mercury	ICP-OES	AD	0.1 mg/kg	Yes	No	23/03/07
Selenium	ICP-OES	AD	1.0 mg/kg	Yes	No	23/03/07
Boron (water soluble)	ICP-OES	AD	0.5 mg/kg	Yes	No	27/03/07
Copper	ICP-OES	AD	0.2 mg/kg	Yes	No	23/03/07
Nickel	ICP-OES	AD	0.2 mg/kg	Yes	No	23/03/07
Zinc	ICP-OES	AD	0.2 mg/kg	Yes	No	23/03/07
pH	pH-meter	AD	N/A	Yes	No	26/03/07
Sulphate (water soluble)	HPLC-IC	AD	0.001 g/l SO ₄	Yes	No	16/03/07
PAH (sum of EPA 16)	GC-MS	AD	0.1 mg/kg	Yes	No	27/03/07
Naphthalene	GC-MS	AD	0.1 mg/kg	Yes	No	27/03/07
Acenaphthylene	GC-MS	AD	0.1 mg/kg	Yes	No	27/03/07
Acenaphthene	GC-MS	AD	0.1 mg/kg	Yes	No	27/03/07
Fluorene	GC-MS	AD	0.1 mg/kg	Yes	No	27/03/07
Phenanthrene	GC-MS	AD	0.1 mg/kg	Yes	No	27/03/07
Anthracene	GC-MS	AD	0.1 mg/kg	Yes	No	27/03/07
Fluoranthene	GC-MS	AD	0.1 mg/kg	Yes	No	27/03/07
Pyrene	GC-MS	AD	0.1 mg/kg	Yes	No	27/03/07
Benzo(a)anthracene	GC-MS	AD	0.1 mg/kg	Yes	No	27/03/07
Chrysene	GC-MS	AD	0.1 mg/kg	Yes	No	27/03/07
Benzo(b)fluoranthene	GC-MS	AD	0.1 mg/kg	Yes	No	27/03/07
Benzo(k)fluoranthene	GC-MS	AD	0.1 mg/kg	Yes	No	27/03/07
Benzo(a)pyrene	GC-MS	AD	0.1 mg/kg	Yes	No	27/03/07
Indeno(1,2,3-cd)pyrene	GC-MS	AD	0.1 mg/kg	Yes	No	27/03/07
Dibenz(a,h)anthracene	GC-MS	AD	0.1 mg/kg	Yes	No	27/03/07
Benzo(g,h,i)perylene	GC-MS	AD	0.1 mg/kg	Yes	No	27/03/07
Fraction Organic Carbon	Titration	AD	0.001	No	No	27/03/07



Client Project Name: Wombwell
Project Number: 6062

Client: Coda Structures
Reporting Date: Tuesday 27 March 2007

Hole No./Sample ID	WS1	WS1	WS3	WS4	WS5	
Top Depth / m	0.10	0.55	0.90	0.60	0.15	
Bottom Depth / m						
Sample No.	323	325	332	329	336	
Sample Type						
Date Sampled						
Receipt Date	19/03/07	19/03/07	19/03/07	19/03/07	19/03/07	
EC6S Sample ID	S0704059	S0704060	S0704061	S0704062	S0704063	
Matrix Type	Soil	Soil	Soil	Soil	Soil	
Determinand	Units					
Arsenic	mg/kg	28.2	6.7	7.3	2.7	12.2
Cadmium	mg/kg	0.2	<0.2	<0.2	<0.2	0.7
Chromium (total)	mg/kg	18.9	10.0	12.5	10.1	12.0
Lead	mg/kg	373.6	27.0	60.7	12.9	42.7
Mercury	mg/kg	0.2	<0.1	<0.1	<0.1	<0.1
Selenium	mg/kg	1.8	1.2	1.0	<1.0	1.0
Boron (water soluble)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Copper	mg/kg	59.3	12.1	14.0	5.1	20.9
Nickel	mg/kg	19.6	12.2	16.2	11.4	15.6
Zinc	mg/kg	271.8	49.7	72.6	40.5	241.6
pH	N/A	7.1	7.4	8.0	11.4	7.4
Sulphate (water soluble)	g/l SO4	0.017	0.010	0.012	0.282	0.062
PAH (sum of EPA 16)	mg/kg	15.5	<0.1	2.6	<0.1	2.5
Naphthalene	mg/kg	0.6	<0.1	<0.1	<0.1	0.3
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	1.6	<0.1	0.5	<0.1	0.3
Anthracene	mg/kg	0.3	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	2.9	<0.1	0.9	<0.1	0.4
Pyrene	mg/kg	2.4	<0.1	0.7	<0.1	0.3
Benzo(a)anthracene	mg/kg	1.1	<0.1	0.3	<0.1	0.2
Chrysene	mg/kg	1.3	<0.1	0.3	<0.1	0.2
Benzo(b)fluoranthene	mg/kg	1.5	<0.1	<0.1	<0.1	0.3
Benzo(k)fluoranthene	mg/kg	0.6	<0.1	<0.1	<0.1	0.1
Benzo(a)pyrene	mg/kg	1.5	<0.1	<0.1	<0.1	0.2
Indeno(1,2,3-cd)pyrene	mg/kg	0.8	<0.1	<0.1	<0.1	0.2
Dibenz(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	0.8	<0.1	<0.1	<0.1	0.2
Fraction Organic Carbon	N/A	#	#	0.009	#	#



Client Project Name: Wombwell
Project Number: 6062

Client: Coda Structures
Reporting Date: Tuesday 27 March 2007

Hole No./Sample ID	WS6	TP1	TP3	TP5	TP6
Top Depth / m	0.50	0.20	0.20	0.60	0.10
Bottom Depth / m					
Sample No.	342	255	270	253	240
Sample Type					
Date Sampled					
Receipt Date	19/03/07	19/03/07	19/03/07	19/03/07	19/03/07
EC&S Sample ID	S0704064	S0704065	S0704066	S0704067	S0704068
Matrix Type	Soil	Soil	Soil	Soil	Soil

Determinand	Units					
Arsenic	mg/kg	15.4	30.2	66.0	2.8	11.7
Cadmium	mg/kg	0.3	0.4	<0.2	<0.2	<0.2
Chromium (total)	mg/kg	30.4	20.8	17.2	11.0	15.5
Lead	mg/kg	82.4	324.3	123.9	9.2	43.4
Mercury	mg/kg	<0.1	0.2	0.1	<0.1	<0.1
Selenium	mg/kg	3.6	1.6	3.1	<1.0	1.2
Boron (water soluble)	mg/kg	1.8	<0.5	0.7	<0.5	<0.5
Copper	mg/kg	24.0	68.4	78.4	6.6	20.6
Nickel	mg/kg	12.6	21.8	41.1	16.1	16.7
Zinc	mg/kg	108.9	485.3	112.6	36.7	81.0
pH	N/A	9.7	7.2	6.6	7.5	8.0
Sulphate (water soluble)	g/l SO4	0.203	0.012	0.059	0.007	0.018
PAH (sum of EPA 16)	mg/kg	1153.1	28.4	393.4	0.9	19.8
Naphthalene	mg/kg	7.1	1.3	5.9	<0.1	0.5
Acenaphthylene	mg/kg	3.4	0.2	2.3	<0.1	0.2
Acenaphthene	mg/kg	19.6	0.2	0.3	<0.1	0.2
Fluorene	mg/kg	14.6	0.2	2.0	<0.1	0.2
Phenanthrene	mg/kg	139.5	2.5	28.5	<0.1	1.8
Anthracene	mg/kg	46.7	0.5	9.8	<0.1	0.4
Fluoranthene	mg/kg	215.3	4.4	62.6	0.1	3.5
Pyrene	mg/kg	184.6	3.7	53.2	0.1	2.9
Benzo(a)anthracene	mg/kg	93.4	2.3	43.3	0.1	1.7
Chrysene	mg/kg	84.3	2.3	37.5	<0.1	1.6
Benzo(b)fluoranthene	mg/kg	95.9	3.0	50.2	0.1	2.1
Benzo(k)fluoranthene	mg/kg	38.4	1.2	17.3	0.1	0.8
Benzo(a)pyrene	mg/kg	89.6	3.0	36.1	0.1	1.9
Indeno(1,2,3-cd)pyrene	mg/kg	56.5	1.9	19.2	<0.1	1.1
Dibenz(a,h)anthracene	mg/kg	11.6	0.2	5.6	<0.1	0.2
Benzo(g,h,i)perylene	mg/kg	53.0	1.8	20.0	0.1	1.2
Fraction Organic Carbon	N/A	#	#	0.100	#	#



Client Project Name: Wombwell
 Project Number: 6062

Client: Coda Structures
 Reporting Date: Tuesday 27 March 2007

Hole No./Sample ID		TP6	TP6	TP8	TP8	TP8
Top Depth / m		0.80	1.15	0.70	2.40	3.50
Bottom Depth / m						
Sample No.		242	243	247	249	250
Sample Type						
Date Sampled						
Receipt Date		19/03/07	19/03/07	19/03/07	19/03/07	19/03/07
EC&S Sample ID		S0704069	S0704070	S0704071	S0704072	S0704073
Matrix Type		Soil	Soil	Soil	Soil	Soil
Determinand	Units					
Arsenic	mg/kg	63.5	7.8	9.0	57.3	13.7
Cadmium	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Chromium (total)	mg/kg	22.3	12.7	15.4	20.1	11.7
Lead	mg/kg	254.4	28.6	26.8	83.3	42.4
Mercury	mg/kg	0.5	<0.1	<0.1	<0.1	<0.1
Selenium	mg/kg	1.6	1.4	<1.0	2.1	1.5
Boron (water soluble)	mg/kg	0.6	<0.5	<0.5	1.0	0.5
Copper	mg/kg	152.5	14.5	14.7	90.7	20.0
Nickel	mg/kg	33.3	15.6	20.3	37.6	13.2
Zinc	mg/kg	171.8	55.3	80.7	305.2	53.4
pH	N/A	6.6	6.7	8.5	7.2	4.6
Sulphate (water soluble)	g/l SO4	0.051	0.021	0.033	0.427	0.115
PAH (sum of EPA 16)	mg/kg	53.0	0.5	8.4	28.3	1.7
Naphthalene	mg/kg	5.3	<0.1	0.3	13.1	0.3
Acenaphthylene	mg/kg	0.6	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	0.2	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	0.4	<0.1	0.2	0.3	<0.1
Phenanthrene	mg/kg	6.1	0.1	1.0	5.2	0.3
Anthracene	mg/kg	1.1	<0.1	0.2	0.3	<0.1
Fluoranthene	mg/kg	8.4	0.1	1.6	1.8	0.3
Pyrene	mg/kg	7.0	<0.1	1.3	1.8	0.2
Benzo(a)anthracene	mg/kg	4.2	<0.1	0.6	0.9	0.2
Chrysene	mg/kg	4.1	<0.1	0.6	1.2	0.2
Benzo(b)fluoranthene	mg/kg	4.9	<0.1	0.8	1.0	0.2
Benzo(k)fluoranthene	mg/kg	2.0	<0.1	0.3	0.4	<0.1
Benzo(a)pyrene	mg/kg	3.9	<0.1	0.6	0.8	<0.1
Indeno(1,2,3-cd)pyrene	mg/kg	2.0	<0.1	0.3	0.3	0.1
Dibenz(a,h)anthracene	mg/kg	0.6	<0.1	0.1	0.2	<0.1
Benzo(g,h,i)perylene	mg/kg	2.4	<0.1	0.5	0.7	<0.1
Fraction Organic Carbon	N/A	#	#	0.007	#	#



Client Project Name: Wombwell

Client: Coda Structures

Project Number: 6062

Reporting Date: Tuesday 27 March 2007

Hole No./Sample ID		TP9	TP9	TP10	TP10
Top Depth / m		0.10	0.70	0.30	0.90
Bottom Depth / m					
Sample No.		268	269	265	266
Sample Type					
Date Sampled					
Receipt Date		19/03/07	19/03/07	19/03/07	19/03/07
EC&S Sample ID		S0704074	S0704075	S0704076	S0704077
Matrix Type		Soil	Soil	Soil	Soil
Determinand	Units				
Arsenic	mg/kg	10.4	5.5	14.1	4.3
Cadmium	mg/kg	<0.2	<0.2	0.3	<0.2
Chromium (total)	mg/kg	12.3	23.0	12.5	10.3
Lead	mg/kg	37.3	14.8	67.8	22.0
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1
Selenium	mg/kg	1.0	11.6	1.2	1.3
Boron (water soluble)	mg/kg	<0.5	<0.5	<0.5	<0.5
Copper	mg/kg	16.9	5.7	30.1	11.1
Nickel	mg/kg	14.4	40.7	14.3	11.5
Zinc	mg/kg	74.9	44.5	110.6	140.8
pH	N/A	7.5	6.3	6.5	7.3
Sulphate (water soluble)	g/l SO4	0.007	0.042	0.008	0.009
PAH (sum of EPA 16)	mg/kg	7.6	<0.1	11.4	0.3
Naphthalene	mg/kg	0.3	<0.1	0.4	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.6	<0.1	1.2	0.1
Anthracene	mg/kg	0.2	<0.1	0.2	<0.1
Fluoranthene	mg/kg	1.3	<0.1	2.3	0.1
Pyrene	mg/kg	1.1	<0.1	1.8	0.1
Benzo(a)anthracene	mg/kg	0.6	<0.1	0.7	<0.1
Chrysene	mg/kg	0.8	<0.1	1.1	<0.1
Benzo(b)fluoranthene	mg/kg	0.8	<0.1	1.1	<0.1
Benzo(k)fluoranthene	mg/kg	0.3	<0.1	0.5	<0.1
Benzo(a)pyrene	mg/kg	0.6	<0.1	0.8	<0.1
Indeno(1,2,3-cd)pyrene	mg/kg	0.4	<0.1	0.5	<0.1
Dibenz(a,h)anthracene	mg/kg	<0.1	<0.1	0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	0.5	<0.1	0.6	<0.1
Fraction Organic Carbon	N/A	#	0.002	#	#



Client Project Name: Wombwell
Project Number: 6062

Client: Coda Structures
Reporting Date: Tuesday 27 March 2007

Notes and Preservation Details

Cadmium analyses undertaken by UKAS laboratory number 2531.

APPENDIX K

GEOTECHNICAL TEST RESULTS



SUB SURFACE

SITE INVESTIGATION, GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

Standard Penetration Test Results

Site : BOUNDFIELD CRESCENT, WOMBWELL, BARNSELY

Job Number
NE2713

Client : CODA STRUCTURES

Sheet
1 / 1

Engineer: CODA STRUCTURES

Borehole Number	Base of Borehole (m)	End of Seating Drive (m)	End of Test Drive (m)	Test Type	Seating Blows per 75mm		Blows for each 75mm penetration				Result	Comments
					1	2	1	2	3	4		
WS1	1.00	1.15	1.45	CPT	3	8	8	9	11	13	N=41	
WS1	2.00	2.15	2.28	CPT	4	11	25	25			50/125mm	
WS2	1.00	1.15	1.45	CPT	5	7	9	10	12	15	N=46	
WS2	2.00	2.15	2.25	CPT	5	7	42	8			50/95mm	
WS3	1.00	1.15	1.45	CPT	3	5	3	3	3	4	N=13	
WS3	2.00	2.15	2.45	CPT	3	2	3	4	4	4	N=15	
WS3	3.00	3.15	3.40	CPT	3	9	12	13	20	5	50/245mm	
WS3	3.50	3.55	3.55	CPT	50						50*/50mm 0/0mm	
WS4	1.00	1.08	1.18	SPT	14		30	20			14*/75mm 50/105mm	
WS5	1.00	1.15	1.45	CPT	5	9	11	8	8	9	N=36	
WS5	2.00	2.15	2.21	CPT	8	16	50				50/60mm	
WS6	1.00	1.15	1.45	CPT	2	3	5	4	8	9	N=26	
WS6	2.00	2.15	2.38	CPT	8	8	12	13	25		50/225mm	



SUB SURFACE

SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS
3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907

In-Situ Test Results

Site: BOUNDFIELD CRESCENT, WOMBWELL, BARNLSLEY
Client: CODA STRUCTURES
Engineer: CODA STRUCTURES

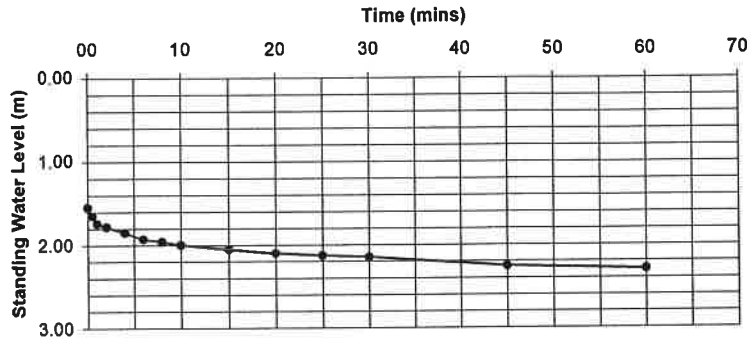
Job Number
NE2713

Sheet:
1 / 3

Trial Pit Soakaway Test

SOAKAWAY TEST PIT NO: TP 1

TEST NO: 1
DATE: 08/03/2007



Time (min)	Depth (m)
00	1.55
0.5	1.65
01	1.74
02	1.78
04	1.85
06	1.93
08	1.96
10	2.00
15	2.05
20	2.10
25	2.13
30	2.15
45	2.26
60	2.30

Length of pit: L = 2.60 m
Width of pit: W = 0.60 m
Depth of pit: D = 2.30 m
Base area of pit: A = 1.56 m²

100% effective depth D100 = 1.55 m
75% effective depth D75 = 1.74 m
50% effective depth D50 = 1.93 m
25% effective depth D25 = 2.11 m

time to D75 T75 = 60 sec
time to D25 T25 = 1260 sec

time from D75 to D25 t_{p75-25} = 1200 sec
(T25 - T75)

volume between D75 & D25 V_{p75-25} = 0.59 m³
(A x (D25 - D75))

surface area to D50 inc. base a_{p50} = 3.96 m²
((2x(D-D50)x(W+L)) + A)

SOIL INFILTRATION RATE

$$f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

$$f = 1.23E-04 \text{ m/sec}$$

Test Strata: (see Trial Pit) Very weak brown highly to moderately weathered medium grained SANDSTONE with sand

Remarks:

**SUB SURFACE**SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS
3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907**In-Situ Test Results**

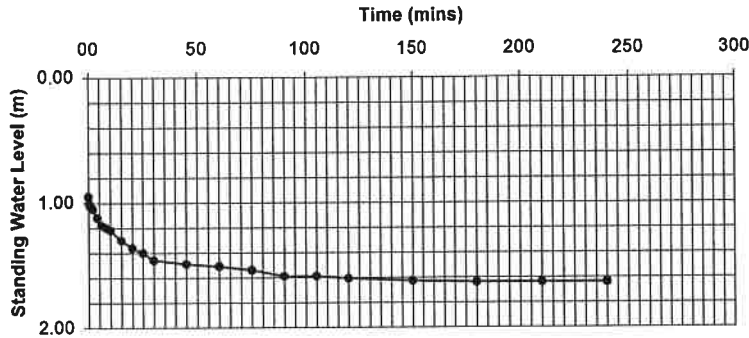
Site: BOUNDFIELD CRESCENT, WOMBWELL, BARNSELEY
 Client: CODA STRUCTURES
 Engineer: CODA STRUCTURES

Job Number
NE2713
 Sheet:
2 / 3

Trial Pit Soakaway Test

SOAKAWAY TEST PIT NO: TP 5

TEST NO: 2
 DATE: 08/03/2007



Time (min)	Depth (m)
00	0.95
0.5	1.01
01	1.03
02	1.05
04	1.12
06	1.18
08	1.20
10	1.22
15	1.30
20	1.36
25	1.40
30	1.46
45	1.49
60	1.51
75	1.54
90	1.59
105	1.59
120	1.61
150	1.63
180	1.64
210	1.64
240	1.64

Length of pit: L = 2.10 m
 Width of pit: W = 0.60 m
 Depth of pit: D = 1.85 m
 Base area of pit: A = 1.26 m²

100% effective depth D100 = 0.95 m
 75% effective depth D75 = 1.18 m
 50% effective depth D50 = 1.40 m
 25% effective depth D25 = 1.63 m

time to D75 T75 = 360 sec
 time to D25 T25 = 9000 sec

time from D75 to D25 t_{p75-25} = 8640 sec
 (T25 - T75)

volume between D75 & D25 V_{p75-25} = 0.57 m³
 (A x (D25 - D75))

surface area to D50 inc. base a_{p50} = 3.69 m²
 ((2x(D-D50)x(W+L)) + A)

SOIL INFILTRATION RATE

$$f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

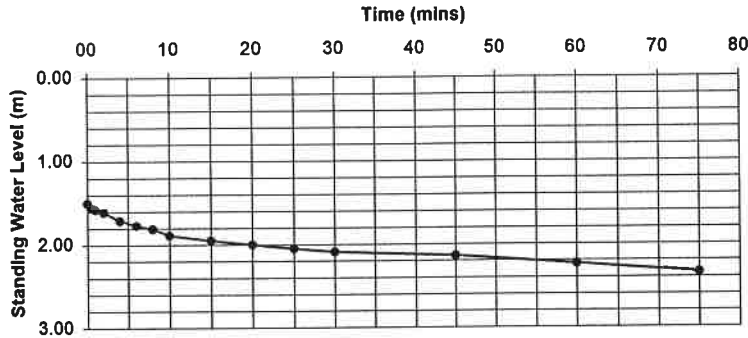
$$f = 1.78E-05 \text{ m/sec}$$

Test Strata: Brownilty SAND with lithorelicts of sandstone.
 (see Trial Pit) (Weak brown fresh medium grained SANDSTONE 1.60m to 1.85m)

Remarks: Natural standing water level in pit at 1.80m after 20 mins

**SUB SURFACE**SITE INVESTIGATION AND SPECIALIST GEOTECHNICAL CONSULTANTS
3 Peel Street, Preston, PR2 2QS. Tel. (01772) 561135 Fax (01772) 204907**In-Situ Test Results**

Site: BOUNDFIELD CRESCENT, WOMBWELL, BARNSLEY
 Client: CODA STRUCTURES
 Engineer: CODA STRUCTURES

Job Number:
NE2713Sheet:
3 / 3**Trial Pit Soakaway Test**SOAKAWAY TEST PIT NO: **TP 6**TEST NO: **3**
DATE: **08/03/2007**

Time (min)	Depth (m)
00	1.50
0.5	1.56
01	1.58
02	1.61
04	1.71
06	1.77
08	1.81
10	1.89
15	1.95
20	2.00
25	2.05
30	2.09
45	2.14
60	2.24
75	2.35

Length of pit: L = 2.10 m
 Width of pit: W = 0.60 m
 Depth of pit: D = 2.35 m
 Base area of pit: A = 1.26 m²

100% effective depth D100 = 1.50 m
 75% effective depth D75 = 1.71 m
 50% effective depth D50 = 1.93 m
 25% effective depth D25 = 2.14 m

time to D75 T75 = 240 sec
 time to D25 T25 = 2700 sec

time from D75 to D25 t_{p75-25} = 2460 sec
 (T25 - T75)

volume between D75 & D25 V_{p75-25} = 0.54 m³
 (A x (D25 - D75))

surface area to D50 inc. base a_{p50} = 3.56 m²
 ((2x(D-D50)x(W+L)) + A)

SOIL INFILTRATION RATE f = $\frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$

f = 6.12E-05 m/sec

Test Strata: Very weak brown completely to highly weathered medium grained SANDSTONE with brown sand.
 (see Trial Pit)

Remarks:

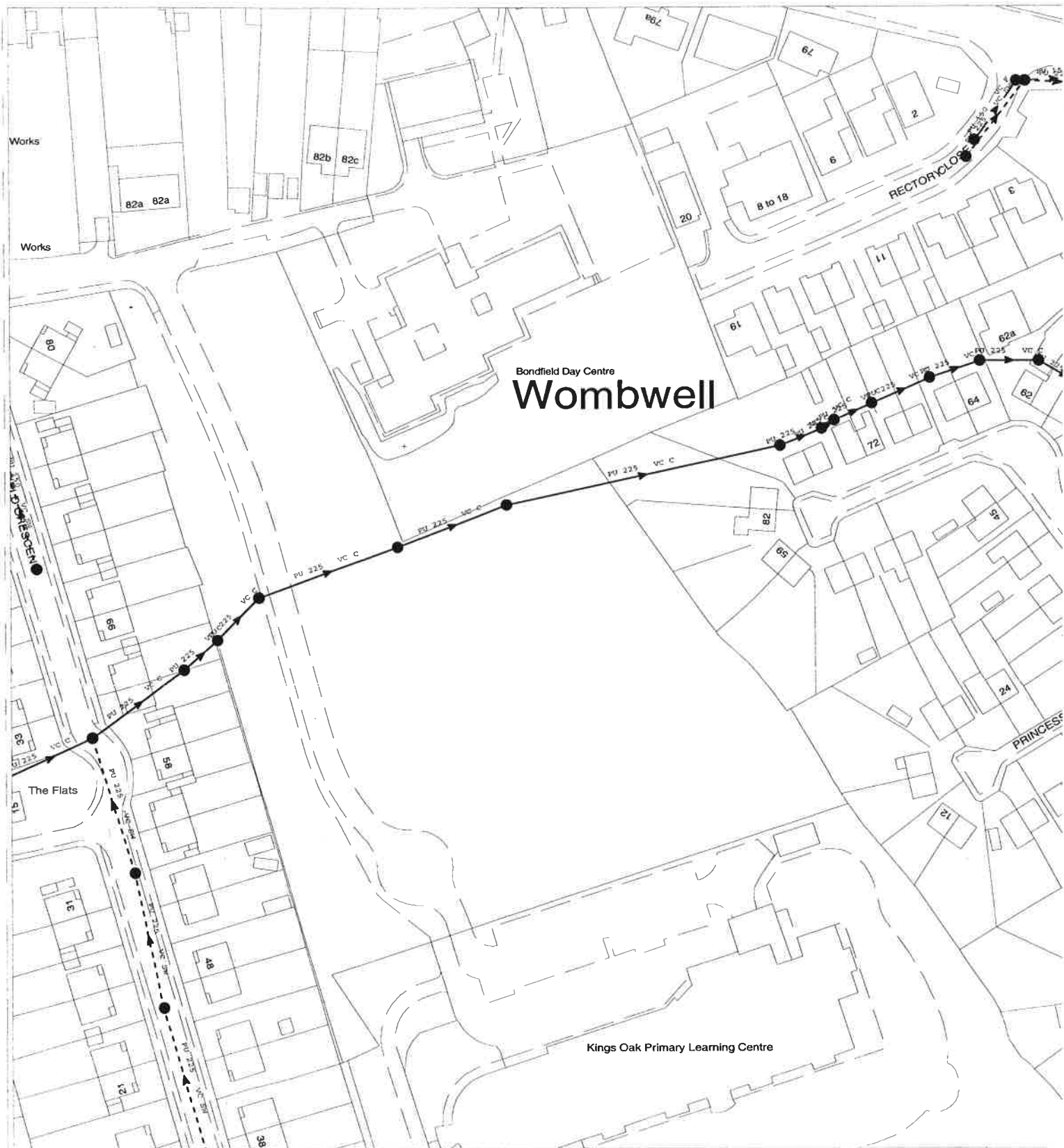
CoDa Structures

Consulting Civil & Structural Engineers
No. 2 Harewood Yard,
Harewood, Leeds
LS17 9LF

**PHASE 1 & 2 ENGINEERING & ENVIRONMENTAL
ASSESSMENT
FORMER GABLES SCHOOL
BONDFIELD CRESCENT WOMBWELL**

APPENDIX L

**EXTRACTS FROM STATUTORY SERVICES RECORDS
AND
YORKSHIRE WATER LETTER DATED 26 MARCH 2007 REF: H002849**



439205 : 402657

Map Name : SE3902NW



YorkshireWater

Yorkshire Water,
 PO Box 500,
 Halifax Road,
 Bradford BD6 2LZ
 Contact Name :
 Joe Nicholas
 Contact Tel :

(Ord) Based upon Ordnance Survey map data with the permission of the Controller of Her Majesty's Stationery Office, (c) Crown Copyright. Licence No. WU298581.

Title

Notes

Partial Key

- Foul Sewer = F
- Combined Sewer = C
- Surface Water Sewer = SW
- Trade Sewer = TD
- Partially Separate = PS

This plan is furnished as a general guide only and no warranty is given or implied. This plan must not be used in the event of excavations or other works made in the vicinity of public sewers. No house or property connections shown.

Date Req : 09/03/2007, 10:28:06

Date Gen : 09/03/2007, 10:28:19

Source : Sewer Network Enquiry



439205 : 402657

Map Name : SE3902NW

Title

Notes

Partial Key

Water mains up to 4" in diameter

Water mains over 4" in diameter

Raw water mains

Private water mains

The position and depths of apparatus shown on this plan are approximate only. The exact positions and depths should be obtained by excavation trial holes

Scale : 1:1250

Drg No :

Date Req : 09/03/2007, 10:27:27

Source : Water Network Enquiry

Maris No :

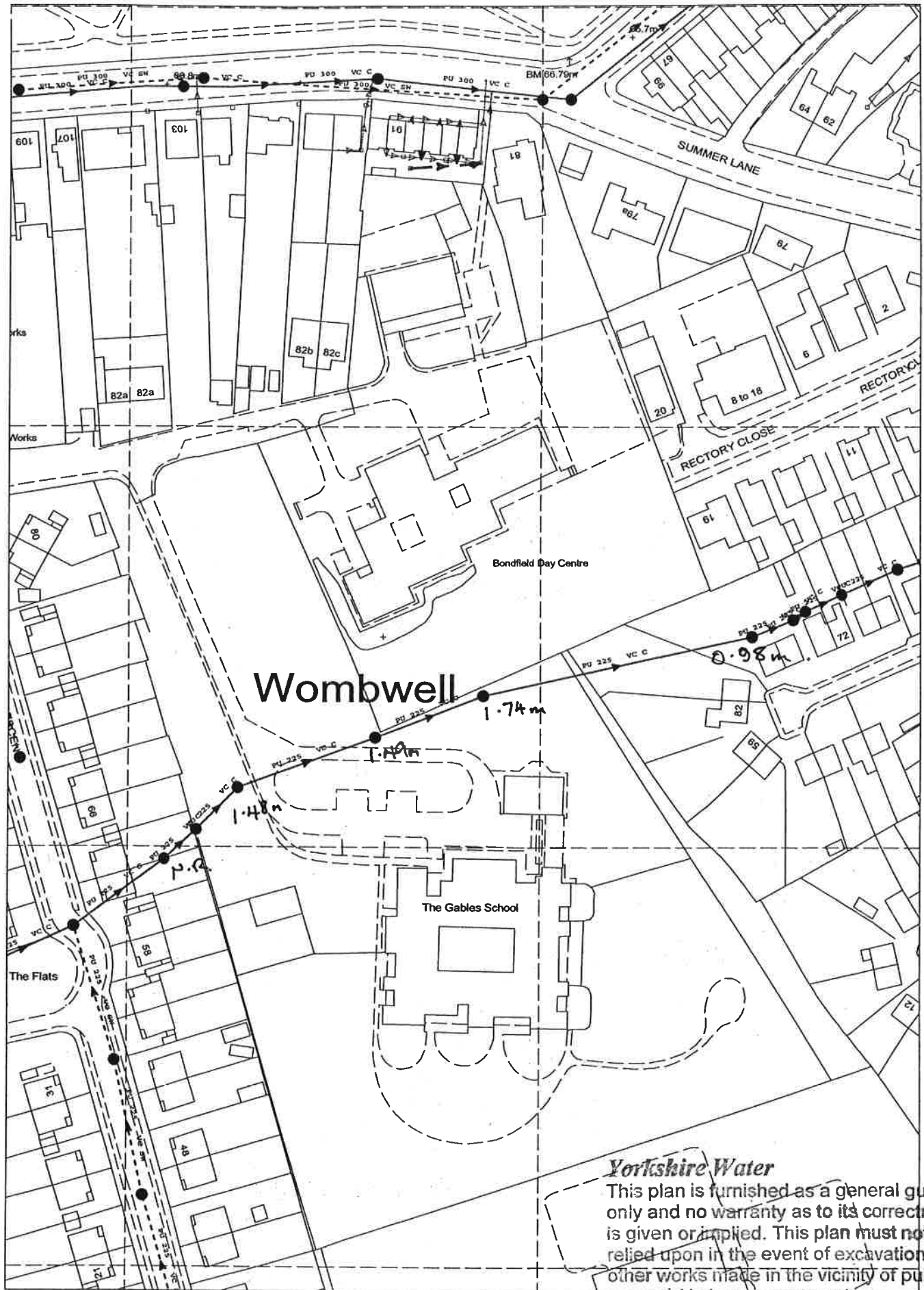
Date Gen : 09/03/2007, 10:27:41



YorkshireWater

Yorkshire Water,
PO Box 500,
Halifax Road,
Bradford BD6 2LZ
Contact Name :
Joe Nicholas
Contact Tel :

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Wombwell

Yorkshire Water

This plan is furnished as a general guide only and no warranty as to its correctness is given or implied. This plan must not be relied upon in the event of excavations or other works made in the vicinity of public sewers. No house or property connections are shown.

Extract from Statutory Sewer Map

Location: *Wombwell*

Scale: 1/500 1/1000 1/1250 1/2500

YWS Ref: *4002843/PE4*

Sheet: *1* of *1*

20 MAR 2007

(Only) Based upon Ordnance Survey map data with the permission of the Controller of Her Majesty's Stationery Office, (c) Crown Copyright. Licence No. WU268581.

NR - No recorded depth

UPN:
Originator:



YORKSHIRE ELECTRICITY GROUP plc.

The position of our equipment is shown on this plan as accurately as possible. However, it may have changed since the plan was produced. Therefore, the position of our equipment and those of service cables which may not be shown should be established on site. Electricity cables not owned by Yorkshire Electricity may be laid in this area and may not be shown on this plan. Where private cables are shown, the information should not be regarded as accurate and should be used for guidance purposes only. In all cases, accurate information should be obtained from the owner of such cables prior to the commencement of work on the site.

Former Gables School



Safe Digging Map

439439,402718

KD

14-03-2007

1:1000



SCALE: 1 : 1250

USER ID: jeremy.clough

DATE: 20/03/2007

NRSWA RESPONSE

GRID REFERENCE :
439577, 402913, SE3902

LP MAINS

MP MAINS

IP MAINS

LHP MAINS

NHP MAINS

0m 50m
Approximate scale 1 : 1250 printed
on A3 Colour Portrait

Valve

Depth of
Cover

Syphon

Diameter
Change

Material
Change

This plan shows those pipes owned by Transco plc or the relevant Gas Distribution Network in their roles as Licensed Gas Transporters (GT). Gas pipes owned by other GTs, or otherwise privately owned, may be present in this area. Information with regard to such pipes should be obtained from the relevant owners. The information shown on this plan is given without warranty, the accuracy thereof cannot be guaranteed. Service pipes, valves, syphons, stub connections, etc. are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Transco plc, the relevant Gas Distribution Network, or their agents, servants or contractors for any error or omission. Safe digging practices, in accordance with HS(G47), must be used to verify and establish the actual position of mains, pipes, services and other apparatus on site before any mechanical plant is used. It is your responsibility to ensure that this information is provided to all persons (either direct labour or contractors) working for you on or near gas apparatus. The information included on this plan should not be referred to beyond a period of 28 days from the date of issue.

Desktop MAPS Version 4.3.0

East Area

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CoDa Structures
No 2 Harewood Yard
Harewood
LEEDS
LS17 9LF

FAO Jon Lawrence

JOB No.	/
RECEIVED 27 MAR 2007	
REPLIED	
COPY TO	DATE

Yorkshire Water
Waste Water - Sewerage
New Development Team
Knostrop WWTW
Knowsthorpe Lane
LEEDS
LS9 0PJ

Tel: (0113) 235 4148
Fax: (01274) 372 834

Email:
Planning.Sewerage@yorkshirewater.co.uk

Your Ref: 6062/1.04/JL
Our Ref: H002849 /sew/ndt/peh

For telephone enquiries ring:

Philip Hoffmann on (0113) 235 4148

26th March 2007

Dear Sir,

Land at former Gables School, Bondfield Crescent, Wombwell, Barnsley - Pre-Planning Sewerage Enquiry-Residential Development

Thank you for your letter of 7th March 2007 and remittance. Please find enclosed our official VAT receipt number 007428 together with a complimentary extract from the Statutory Sewer Map. This indicates the recorded position of the public sewers. The following comments reflect our view, with regard to the public sewer network only, based on a 'desk top' study of the site:

There is a 225mm diameter public combined sewer recorded crossing the site. No buildings are to be erected within 3 (three) metres, nor trees planted within 5 (five) metres of this public sewer. It may not be acceptable to raise or lower ground levels over the sewer, nor to restrict access to the manholes on the sewer. If you wish to have this sewer diverted under Section 185 of the Water Industry Act 1991 an application should be made in writing. To discuss this matter, please telephone 0845 124 24 29.

Development of the site should take place with separate systems for foul and surface water drainage. The separate system should preferably extend to the public sewer.

Foul water may discharge to the 225mm diameter public combined water sewer recorded within the site.

The developer's attention is drawn to Requirement H3 of the Building Regulations 2000. This establishes a preferred hierarchy for surface water disposal. Consideration should firstly be given to discharge to soakaway, infiltration system and watercourse in that priority order.

Sustainable Drainage Systems (SUDS), for example the use of soakaways and/or permeable hardstanding etc., may be a suitable solution for surface water disposal appropriate in this situation. You are advised to seek comments on the suitability of SUDS in this instance from the appropriate authorities.

Where appropriate, soakaways, swales and infiltration trenches (SUDS) may be adopted as part of the public sewer network. For general conditions for the adoption of SUDS please see the attached sheet. Further information may be seen in the DEFRA publication 'Interim Code of

Practice for Sustainable Drainage Systems' (ISBN 0-86017-904-4). If the developer is considering adoption of SUDS he should contact our New Development Team at Sheffield on 0845 124 24 29.

The local public sewer network does not have capacity to accept any additional surface water discharge from this development. In the first instance, therefore, I would advise you to contact the local Land Drainage Authority with a view to establishing a suitable watercourse for discharge.

To prevent overloading of the existing public sewers, a storage tank - or some other means of flow attenuation - will be required to control the rate of discharge of surface water. Surface water discharges to public sewer will be restricted to the level of run-off - i.e. same rate of discharge - to that from the existing/previous use of the site. To maintain the "status quo" in the public sewer network, any discharge of surface water from the site should take place with similar rates of flow and/or measured areas discharging to similar points of connection to that of the existing/previous use of the site. You will need to demonstrate positive drainage to the public sewer to Yorkshire Water by means of investigation and calculation carried out at your expense. To do this, Yorkshire Water requires to see previous drainage layouts with pipe sizes, gradients and connection points, proposed drainage layouts with pipe sizes, gradients and connection points, measured impermeable areas of the previous use of site and the proposed use of site, along with the calculations that show the previous discharge rate from the site to the public sewer and the proposed discharge rate from the site to the public sewer.

Prospectively adoptable sewers must be designed and constructed in accordance with the WRc publication "Sewers for Adoption - a design and construction guide for developers" 6th Edition as supplemented by Yorkshire Water's requirements, pursuant to an agreement under Section 104 of the Water Industry Act 1991. An application to enter into a Section 104 agreement must be made in writing prior to any works commencing on site. Please contact our New Development Team at Sheffield (telephone 0845 124 24 29) for further information.

The public sewer network is for domestic sewage purposes. This generally means foul water for domestic purposes and, where a suitable surface water or combined sewer is available, surface water from the roofs of buildings together with surface water from paved areas of land appurtenant to those buildings. Land and highway drainage have no right of connection to the public sewer network. Land drainage will not be allowed into a public sewer. Highway drainage, however, may be accepted under certain circumstances; for instance, if SUDS are not a viable option and there is no highway drain available and if capacity is available within the public sewer network. In this event, the developer will be required to enter into a formal agreement with Yorkshire Water Services under Section 115 Water Industry Act 1991 to discharge non-domestic flows into the public sewer network.

Any new connection to an existing public sewer will require the approval of Yorkshire Water. You may obtain an application form by telephoning 0845 124 24 29.

The above comments are based upon the information and records available at the present time. The information contained in this letter together with that shown on any extract from the Statutory Sewer Map that may be enclosed is believed to be correct and is supplied in good faith. Please note that capacity in the public sewer network is not reserved for specific future development. It is used up on a 'first come, first served' basis. You should visit the site and establish the line and level of any public sewers affecting your proposals before the commencement of any design work.

Yours faithfully,



New Development Team

**PHASE 1 & 2 ENGINEERING & ENVIRONMENTAL
ASSESSMENT**

**FORMER GABLES SCHOOL
BONDFIELD CRESCENT WOMBWELL**

[Subject to Completion of Gas Monitoring]

VOLUME 1

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1.0 INTRODUCTION

- 1.01 Following instructions from Ackroyd & Abbott Ltd during February 2007, CoDA Structures have undertaken an appraisal of a potential residential development site adjacent Bondfield Crescent, Wombwell. The appraisal assesses environmental and geotechnical ground conditions and associated highways and drainage issues.
- 1.02 The site is currently undeveloped, but was formerly The Gables School.
- 1.03 It is proposed to develop the site with housing.
- 1.04 Sections 2.0 – 7.0 of this report undertake a desk based assessment to determine the environmental quality of the land at the site and to identify the potential for any environmental risks as follows:-
- to establish the likely extent of any potential contamination at the site as a result of its current and previous use;
 - to establish the sensitivity of the site in relation to the site's geology, hydrogeology and hydrology;
 - to assess the significance of any potential contamination at the site with respect to possible harm to the surrounding environment and site end users;
 - to provide recommendations for further works as appropriate.
- 1.05 The interpretation provided in this report is based upon information gathered from public data sources.
- 1.06 A trial pit ground investigation was undertaken on 8 March 2007.
- 1.07 A window sampling borehole investigation, including the installation of gas/groundwater monitoring wells was undertaken on 12 March 2007.
- 1.08 The site can be accessed from Bondfield Crescent.
- 1.09 The Ordnance Survey co-ordinates for the centre of the site are 439570 mE, 402900 mN.
- 1.10 The site is approximately 1.71 hectares in area.
- 1.11 The local authority is Barnsley Metropolitan Borough Council (BMBC).

2.0 LOCATION, TOPOGRAPHY & CURRENT CONDITION

2.01 The site is located to the east of Bondfield Crescent and is approximately 4 miles to the south east of Barnsley town centre.

2.02 The boundaries of the site are defined as follows:-

- Northern boundary : back of footway to Bondfield Crescent;
- Southern boundary : steel mesh fence to school beyond;
- Western Boundary : trees, hedging and either chain link or steel palisade fencing to residential properties on Bondfield Crescent;
- Eastern boundary : chain link fence to adjacent Day Centre, allotments and residential properties on Kingsway and Princess Gardens.

2.03 A site walk-over was undertaken on 14 March 2007 and the following noted:-

- the new road to the school to the south is complete except for the wearing course to the footway;
- a small amount of fly tipping;
- the majority of topsoil has been stripped off the site;
- two distinct soil mounds in the south eastern sector;
- a tarmac footpath in the south eastern sector;
- trees in the south eastern sector;
- no obvious signs of contamination.

2.04 The site is currently undeveloped, and the former school buildings have been demolished.

2.05 A site location plan (Fig. 1) is attached in Volume 2, Appendix B.

2.06 A site plan (Fig.2) is attached in Volume 2, Appendix C.

2.07 Site photographs are attached in Volume 2, Appendix D.

3.0 HISTORIC SITE USAGE

3.01 Extracts from Ordnance Survey Sheets dating back to 1854 have been examined and the following constitutes a brief history of the entire site and the surrounding land:-

Map/Date & Scale	On-site Feature	Features within 250m of site	Features within 1000m of site
1854/55 sheets 1:10,000	- the site appears to be farmland;	- the surrounding area is undeveloped; - an old quarry to the north east;	- the surrounding area is predominantly undeveloped; - the village of Wombwell to the east; - a railway line to the north east; - a canal to the north east.
1892/92 sheets 1:2,500	- little change noted;	- a cemetery to the north; - residential development to the north east;	- Not Applicable (N/A)
1893-94 sheets 1:10,000	- little change noted;	- little change noted;	- expansion of Wombwell to the north and east; - a glass bottle works and gas works to the north east; - a brickyard to the west; - a colliery to the south; - development to the north.
1903-06 sheets 1:10,000	- little change noted;	- residential development to the north west and south west;	- N/A
1905-07 sheets 1:10,000	- little change noted;	- little change noted;	- further expansion of Wombwell to the north east; - an old quarry to the west.
1930-31 sheets 1:2,500	- allotments in the northern sector; - part of a football ground in the southern sector;	- residential development to the surrounding area; - remainder of the football ground to the south;	- N/A
1938 1:10,000	- little change noted;	- little change noted;	- residential development to the surrounding area; - a railway line to the south west; - a foundry to the south west; - a brickworks to the east.
1956 1:10,000	- little change noted	- residential development adjacent the western boundary;	- further residential development to the west.
1962 1:2,500	- part of a Greyhound Stadium in the southern sector;	- remainder of Greyhound Stadium to the south;	- N/A
1966-67 sheets 1:10,000	- little change noted;	- little change noted;	- further residential development to the north west and south west; - works to the east and south west;

1976 1:2,500	- little change noted;	- little change noted;	- N/A
1980 1:10,000	- the Greyhound Stadium is no longer present;	- a School adjacent the southern boundary;	- little change noted.
1982 1:2,500	- site occupied by The Gables School;	- little change noted;	- N/A
1989 1:10,000	- little change noted;	- little change noted;	- a factory to the north east.
1993 1:2,500	- little change noted;	- little change noted	- N/A
2000 1:10,000	- little change noted;	- little change noted;	- further commercial development to the north east.
2004 1:10,000	- little change noted;	- little change noted;	- little change noted.

3.02 Historic Ordnance Survey plans are attached in Volume 2, Appendix E.

4.0 GEOLOGY AND HYDROGEOLOGY

4.01 GEOLOGY:

1:625,000 Solid Geology indicates that the site is underlain by Oaks Rock over Middle Coal Measures, shales and mudstones. No faults or abnormal features are indicated. Drift deposits are unlikely to be present at the surface.

4.02 MINING:

A mining report has been prepared by David Bellis Consulting Surveyors, and is summarised as follows:-

- The following seams have been worked and the site may be within the zone of influence:

Seam	Depth (m)	Section (m)	Date	Comments
Abdy	126	0.78	1956	Subjacent
Low Beanshaw	155	0.63	1939	Subjacent
Barnsley	259	1.80	1900	Subjacent
Swallow Wood	312	0.80	1967	Subjacent
Fenton	491	1.80	1970	Subjacent
Parkgate	507	1.14	1939	Subjacent
Silkstone	592	0.91	1977	Subjacent

- There is coal in reserve, but no workings are currently planned.
- There are no recorded mine entries on or within 20m of the site.
- There is no evidence of coal mining related subsidence claims in relation to the site during the past ten years.

- Settlement from deep old workings is likely to be complete.

The mining search is attached in Volume 2, Appendix F.

4.03 HYDROGEOLOGY

No watercourses are believed to run through the site. However, a watercourse is located approximately 469m to the north east of the site.

The site does not appear to lie within a 1:100 year fluvial indicative river flood plain, and is not believed to be prone to flooding.

The site is underlain by a minor aquifer within geological formations of variable permeability. Although not producing large quantities of water for abstraction the aquifer is important for local supplies and for supplying base flow to rivers.

The overlying soils are classified as having a high leaching potential unless proved otherwise.

There are 2 no. discharge consents within 1000m of the site, but neither of these are within 500m of the site.

There have been 2 no. pollution incidents within 1000m of the site. Of these 1 no. was within 500m of the site and details are summarised as follows:-

1 no. Category 2 significant incident involving:

- unknown 489m to the east

There are no water abstraction licenses held within 1000m of the site.

The site does not lie in a Source Protection Zone.

5.0 POLLUTION CONTROLS & WASTE

5.01 Pollution Controls:

There are 6 no. Local Authority Pollution Prevention or Control Permits held within 1000m of the site.

There are no integrated pollution controls held within 1000m of the site.

There are no integrated pollution prevention or control permits held within 1000m of the site.

There are no registered radio active substance licences held within 1000m of the site.

5.02 Waste:

There are 4 no. registered landfill sites within 1000m of the site. Of these 2 no. are within 500m of the site and details are summarised as follows:-

Location:	Station Road, Wombwell 496m to the north east
Category:	Landfill; for waste produced/controlled by Licence holder
Status:	Licence lapsed/cancelled/defunct/not applicable/surrendered
Authorised Waste:	Clean excavation spoil.

Location:	Wombwell Canal and Aldham Embankment, Wombwell 496m to the north east
Category:	Landfill; no restriction on source of waste
Status:	Licence lapsed/cancelled/defunct/not applicable/surrendered
Authorised Waste:	Clean excavated spoil.

There are no British Geological Survey recorded landfill sites within 1000m of the site.

There are 4 no. local authority recorded landfill sites within 1000m of the site. Of these 1 no. is within 500m of the site and details are summarised as follows:-

Location:	Not supplied 444m to the north east;
Status:	Unknown
Types of Waste:	Unknown.

There are no waste treatment/disposal sites within 1000m of the site.

There is 1 no. waste management facility within 1000m of the site.

There are no waste transfer sites within 1000m of the site.

6.0 IDENTIFIED POSSIBLE SOURCES OF CONTAMINATION

The past history of the site would indicate several possible sources of contamination as follows:-

6.01 Soil Contamination:

Whilst the site does not appear to have been filled or artificially raised in level any fill that has been imported onto the site may have elevated levels of contamination, depending upon the source and nature of the material used.

The site has been used for the following activities:-

- Allotments (approximately 1930 – 1982)
- Football Ground (approximately 1930 - 1962)
- Greyhound Stadium (approximately 1962 - 1980)
- School (approximately 1982 – 2004).

These are considered to be low risk contaminative activities, and it is unlikely that the site has been affected by uncontrolled tipping of waste products, residues or chemicals. There is also no evidence that the site may be affected by hydrocarbon contamination.

Potentially contaminative activities in the immediate vicinity of the site have included the following:-

- quarries.

Potentially contaminative activities in the surrounding area to the site have included the following: -

- | | | |
|------------|----------------------|--------------|
| - mining | - 'works' | - gas works |
| - quarries | - glass bottle works | - foundry |
| - railway | - factory | - brickworks |

Contemporary Trade Directory entries for the vicinity of the site (within 500m) are as follows:-

- | | |
|---|------------------------|
| - Garage Services (inactive) | 149m to the north east |
| - Commercial vehicle servicing (active) | 289m to the north east |
| - Wall coverings (inactive) | 302m to the north east |
| - Disability equipment (inactive) | 312m to the north east |
| - Hardware (active) | 327m to the east |

- Upholstery Cleaners (active)	354m to the north east
- Dry Cleaners (active)	371m to the east
- MOT Test Centre (active)	373m to the north
- Steam cleaning services (active)	376m to the north
- Garage Services	388m to the north
- Garage Services (inactive)	392m to the north
- Car Dealership (inactive)	393 to the north
- New haulage services (active)	393m to the north
- Fork Lift Trucks (active)	396m to the south west
- Domestic appliance servicing & repairs (inactive)	407m to the south east
- Garden Machinery (active)	412m to the north
- Garage Services (active)	415m to the north
- Garage Services (active)	415m to the north
- Printing (active)	448m to the east
- Garage Services (active)	450m to the north east
- Garage Services (active)	453m to the north east
- Car Body Repairs (inactive)	453m to the north east
- Garage Services (inactive)	457m to the north east
- Radio Communications Equipment (active)	458m to the east
- Car Dealership (active)	479m to the north
- Vehicle Body Repairs (active)	487m to the north east
- Refrigeration Equipment (inactive)	491m to the east.

There are no fuel station entries in the vicinity of the site (within 500m).

6.02 **Pollution of Controlled Waters:**

The possibility of leachate contamination, particularly within any uncontrolled filling or tipping that has occurred on the site, may need to be investigated to assess the potential for pollution to the underlying minor aquifer.

6.03 **Gas Contamination:**

The site should not be at risk from landfill gas migration from landfill sites as those in the vicinity are more than 250m from the site.

Former quarries in the vicinity of the site are considered to be of a sufficient distance and of such an age not to pose a risk to the development, even if any backfill materials were potential sources of landfill gas generation.

As the site is within a mining area the development may be at risk from mine gases. Therefore, gas monitoring is being undertaken within the ground investigation works.

Database information indicates that the site is in an area where Radon protection measures are required.

7.0 RISK ASSESSMENT

- 7.01 Environmental considerations at the site are addressed in this section by a site-specific assessment.
- 7.02 Risk assessment is the process of collating known information on a hazard or set of hazards in order to estimate actual or potential risks to receptors. The receptor may be human health, a water resource, a sensitive local eco-system or even construction materials. Receptors can be connected with the hazard under consideration via one or several exposure pathways (e.g. the pathway of direct contact). Risks are generally managed by isolating or removing the hazard, isolating the receptor, or by intercepting the exposure pathway. Without the three essential components of a source (hazard), pathway and receptor there can be no risk. Thus, the mere presence of a hazard at a site does not mean that there will necessarily be attendant risks. The following risk assessment thus focuses on the parts of the site where hazards have been identified and is not always general to the whole site.
- 7.03 By considering the source, pathway and receptor an assessment is made as to whether the source contamination can reach a target or receptor. The degree and significance of any resulting risk is then determined. The exposure risks are considered for present site conditions.
- 7.04 The results of this assessment for the site are presented in a table at the end of this section. The designation of risk is based upon a consideration of both:
- the likelihood or probability of an event. [This takes into account both the presence of the hazard and receptor and the integrity of the pathway.]
 - The severity of the potential consequence. [This takes into account both the potential severity of the hazard and the sensitivity of the receptor.]
- 7.05 The following categorisation of risk has been adopted:-

Term	Description
Very high risk	There is a high probability that severe harm could arise to a designated receptor from a identified hazard at the site without appropriate remedial action.
High risk	Harm is likely to arise to a designated receptor from an identified hazard at the site without appropriate remedial action.
Moderate risk	It is possible that without appropriate remedial action harm could arise to a designated receptor, but it is relatively unlikely that any such harm would be severe, and if any harm were to occur it is more likely that such harm would be relatively mild.

CoDa Structures

Consulting Civil & Structural Engineers
 No. 2 Harewood Yard,
 Harewood, Leeds
 LS17 9LF

**PHASE 1 & 2 ENGINEERING & ENVIRONMENTAL
 ASSESSMENT
 FORMER GABLES SCHOOL
 BONDFIELD CRESCENT WOMBWELL**

Low risk It is possible that harm could arise to a designated receptor from an identified receptor, but it is likely that at worst this harm if realised would normally be mild.

Negligible risk The presence of an identified hazard does not give rise to the potential to cause significant harm to a designated receptor.

Summary of Environmental Risks

Source Area	Potential Pollutant	Potential Receptors	Potential Pathways to Receptors	Associated Hazard [severity]	Likelihood of Occurrence	Risk
Site-wide due to imported fill	Typically heavy metals & arsenic	Controlled Waters	Migration through permeable soils	Contamination of groundwater and watercourse (medium)	Possible	Low/ Moderate
Site-wide due to imported fill	Typically heavy metals & arsenic	Users	Direct contact, Indirect contact, inhalation, ingestion	Health risk (medium)	Possible	Low/ Moderate
Coal Seams	Methane and/or Carbon Dioxide	Users	Migration through permeable ground	Asphyxiation (Methane and Carbon Dioxide). Explosion (Methane)	Moderate	Low / Moderate
Geology	Radon	Users	Migration through permeable ground	Health risk (Medium)	Moderate / High	Moderate/ High

8.0 REDEVELOPMENT PROPOSALS - DISCUSSION**8.01 Fieldwork:**

9 no. Trial Pits (TP1, TP3 – TP12) were excavated with a mechanical excavator to depths of between 1.2 and 3.7m on 8 March 2007. The purpose of the trial pits was to allow an insitu visual inspection of the superficial soils, recover samples for laboratory testing and undertake soakaway tests in 3 no. of the trial pits.

6 No. window sampling boreholes were sunk to depths of between 1.2 and 3.5m on 12 March 2007. The purpose of the boreholes was to allow an insitu visual inspection of the superficial soils, recover samples for laboratory testing and install 4 no. gas/groundwater monitoring wells

The locations of the trial pits, window sampling boreholes, soakaway tests and gas/groundwater monitoring wells are indicated on the Site Topographical Survey (Fig. 2) attached in Volume 2, Appendix C.

8.02 Laboratory Testing:

To provide an assessment of soil contamination with respect to the proposed residential development soil samples from the topsoil, made ground and natural ground encountered on the site were screened for a range of potential contaminants.

The screening included the following:-

Arsenic	Mercury	Zinc	PAH 16EPA
Cadmium	Selenium	Boron (ws)	
Chromium	Copper	Sulphate (ws)	
Lead	Nickel	pH	

In view of the ground conditions encountered no geotechnical testing was undertaken.

8.03 Ground Conditions:

The following typical ground profile was encountered on the site:-

Topsoil	0.20 – 0.80m	(where present)
Made ground	0.25 – 3.30m	
Sand	0.90 – 1.80m	
Highly weathered sandstone	0.45 – 1.80m	
Sandstone		

Topsoil was encountered in TP1, TP6, TP9, TP10, WS1, WS2, WS3 and WS6.

Made ground was encountered in all the investigation locations, except in TP1, TP10 and WS2, which comprised silty clay, ash, sand, gravel, brick fragments, clinker and occasional cobbles, plastic, concrete fragments, macadam fragments and stone chippings.

The deeper areas of made ground (in excess of 1.0m) were encountered in the south eastern sector. In relation to TP8 it is associated with a mound of material.

A band of silty clay between 0.10 – 0.20m was encountered below the made ground in TP8, WS1 and WS5. Traces of this strata (less than 0.10m thick) were also encountered in both TP1 and TP7.

A band of sand was encountered in TP3, TP5, TP7, TP8, TP10 and WS6, whereas highly weathered sandstone was encountered in TP1, TP4, TP6, WS1, WS2, WS3, WS4 and WS5.

Sandstone was proved at the following depths below ground level:-

TP1	-	2.2m	WS1	-	2.2m
TP3	-	1.7m	WS2	-	2.2m
TP4	-	1.0m	WS3	-	3.5m
TP5	-	1.6m	WS4	-	1.2m
TP6	-	2.3m	WS5	-	1.9m
TP7	-	2.1m			
TP10	-	2.2m			

Sandstone was not proved in TP8, TP9 or WS6.

Trial Pit logs are attached in Volume 2, Appendix G.

Window Sampling Borehole Logs are attached in Volume 2, Appendix H.

8.04 **Groundwater:**

Groundwater was encountered during the trial pit investigation as follows:-

TP6	slight seepage at 1.85m rising to 1.80m begl after 20 minutes
TP7	slight seepage at 0.30m begl
TP9	moderate ingress at 1.20m begl rising to 1.10 begl after 20 minutes

The water ingress in TP9 may have been due to an old land drain or to springwater.

No groundwater was encountered during the window sampling borehole investigation.

Groundwater monitoring in the 4 no. boreholes with installations is recorded in the following table:

Boreholes	28.03.07	(Date)	(Date)	(Date)	(Date)	(Date)
WS1	Dry					
WS2	Dry					
WS3	Dry					
WS6	Dry					

8.05 Excavations:

Excavation progress was reasonable until competent sandstone was encountered. Excavations were generally stable in natural ground for the period that the trial pits were left open. Excavations were generally unstable in made ground greater than 1.0m thick.

8.06 Laboratory Testing:

Soils

The results of the chemical analyses on the soil samples are summarised below. Test result certificates are attached in Volume 2, Appendix J.

Samples taken from Topsoil:

Contaminant	Concentration in soils mg/kg*	Number of samples tested
pH	7.1 – 8.0	4
Sulphate (ws)	0.007 – 0.018g/l	4
Arsenic	10.4 – 30.2	4
Boron (ws)	<0.5	4
Cadmium	<0.2 – 0.4	4
Chromium	12.3 – 20.8	4
Copper	16.9 – 68.4	4
Mercury	<0.1 – 0.2	4
Nickel	14.3 – 21.8	4
Lead	37.3 – 373.6	4
Selenium	1.0 – 1.8	4
Zinc	74.9 – 485.3	4
PAH	7.6 – 28.4	4

* unless stated otherwise.

Samples taken from made ground:

Contaminant	Concentration in soils mg/kg*	Number of samples tested
pH	6.3 – 11.4	11
Sulphate (ws)	0.008 – 0.282g/l	11
Arsenic	2.7 – 66.0	11
Boron (ws)	<0.5 – 1.8	11
Cadmium	<0.2 – 0.7	11
Chromium	10.1 – 30.4	11
Copper	5.1 – 152.5	11
Mercury	<0.1 – 0.5	11
Nickel	11.4 – 41.1	11
Lead	9.2 – 254.4	11
Selenium	<1.0 – 11.6	11
Zinc	36.7 – 305.2	11
PAH	<0.1 – 1153.1	11

* unless stated otherwise.

Samples taken from natural ground:

Contaminant	Concentration in soils mg/kg*	Number of samples tested
pH	4.6 – 7.4	4
Sulphate (ws)	0.009 – 0.115g/l	4
Arsenic	4.3 – 13.7	4
Boron (ws)	<0.5	4
Cadmium	<0.2	4
Chromium	10.3 – 12.7	4
Copper	11.1 – 20.0	4
Mercury	<0.1	4
Nickel	11.5 – 15.6	4
Lead	22.0 – 42.4	4
Selenium	1.2 – 1.5	4
Zinc	49.7 – 140.8	4
PAH	<0.1 – 1.7	4

* unless stated otherwise.

The results of sulphate and pH determination indicate sulphate content expressed as 2:1 aqueous extract between :

- 0.007 and 0.115 g/l SO₄ with pH values between 4.6 and 8.0 in made ground/topsoil;
- 4.6 and 11.4 g/l SO₄ with pH values between 0.010 and 0.282 in natural horizons.

8.07 Insitu Testing:

SPT results undertaken in the window sampling boreholes are summarised as follows:-

Strata	Depth (m)	SPT
Made ground	1.0 – 2.0	13 and 15
Sand	1.0 and 2.0	26 and 50
Weathered sandstone	1.0 – 3.0	20-50

Detailed SPT results are attached in Volume 2, Appendix K.

8.08 Gas Monitoring:

Gas monitoring results to date are summarised in the following tables:-

Date 28 March 2007			Atmospheric Pressure 1000 mb		
Borehole	Water Level (m)	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Flow Rate l/hr
WS1	Dry	0.0	1.1	19.7	
WS2	Dry	0.0	0.4	19.9	
WS3	Dry	0.0	0.0	20.9	
WS6	Dry	0.0	0.0	21.0	

Date 2007			Atmospheric Pressure () mb		
Borehole	Water Level (m)	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Flow Rate l/hr
WS1					
WS2					
WS3					
WS6					

Date 2007			Atmospheric Pressure () mb		
Borehole	Water Level (m)	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Flow Rate l/hr
WS1					
WS2					
WS3					
WS6					

Date			Atmospheric Pressure		
2007			() mb		
Borehole	Water Level (m)	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Flow Rate l/hr
WS1					
WS2					
WS3					
WS6					

Date			Atmospheric Pressure		
2007			() mb		
Borehole	Water Level (m)	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Flow Rate l/hr
WS1					
WS2					
WS3					
WS6					

Date			Atmospheric Pressure		
2007			() mb		
Borehole	Water Level (m)	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Flow Rate l/hr
WS1					
WS2					
WS3					
WS6					

9.0 CONTAMINATION – DESIGN OBJECTIVES & PHILOSOPHY

9.1 Identification of Potential Hazards

In March 2002 DEFRA and the Environment Agency published a series of technical research papers introducing a new approach to the assessment of risk to human health from land contamination. This research includes the development of the new CLEA model and Soil Guideline Values (SGVs). However, these guidelines at present only address a few contaminants and development of the model and SGVs is ongoing. The soil guidelines are based on assumptions on soil conditions, the existence of exposure pathways behaviour and type of contaminants. The apparent exceedence of the quoted SGV is taken as indicating that further detailed assessment is required or that remedial actions should be taken.

9.02 Sensitivity of Development

The presence of elevated concentrations of particular analytes may present hazards in terms of personal health, damage to plant life and other environmental issues. The CLEA model and SGVs classified particular end uses on a scale of sensitivity.

Residential with plant uptake
Residential without plant uptake
Allotments
Commercial/Industrial.

9.03 Design Life

It is important to recognise when considering a particular problem that the solution has finite life, a concept with which those in the construction industry are familiar.

The design life is influenced by the materials used in construction, the environment and the degree of maintenance carried out to extend the design life.

Monitoring is required to determine whether a design is functioning correctly, commensurate with the prevailing environmental conditions. It is essential that future users are aware of today's solutions since historically most buildings and infrastructure works continue in service. The effect of an increased design life should not be allowed to prejudice the original design principles.

9.04 Legislation

The principle legislation relating to a potential pollution and contamination problems addressed in the Environmental Protection Act 1990 and Environmental Act 1995.

For 'contaminated' land to exist a significant 'pollution linkage' must be present, that is, there should be a source of contamination, a pathway by which the contamination can migrate, to an identified 'receptor' where it could cause 'significant harm'.

Should any link within this chain be severed then the land may not strictly be regarded as 'contaminated land' under the Environmental Protection Act 1990.

9.05 Investigation

Due to the historic site usage it was anticipated that there may be contamination from the former site use.

A ground investigation was commissioned to investigate soils and the chemical constituents of these soils, especially any made ground. The site was not expected to be severally contaminated and therefore a comprehensive testing regime based on the current industry standard BS 10175 : 2001 was not considered necessary. However, a contamination survey was undertaken with a provision that return visits would have to be made if contamination was exposed at a sufficient concentration to justify more extensive investigations.

.06 Design Objectives

i) The objective of reclamation works is to improve any marginal land into ground suitable for its use for residential use with plant uptake. The standard of work would be to that normally considered acceptable for residential development with plant uptake, but not forming part of the food production system. The standards would be in accordance with the parameters established by DEFRA and the Environment Agency. These guidelines are incomplete and a set of Tier One 'Intervention Values' are proposed in Appendix I to provide a more complete set of initial screening values. These Intervention Values are generally based upon a SOM of 2.5%. If considered appropriate, a further quantitative risk assessment will be undertaken using calculated site specific target values.

ii) Risk Assessment

A qualitative risk assessment of any contaminants identified on the site will be undertaken. This will consider the significance of the contaminants identified in terms of a source, pathway, receptor (i.e. pollution linkage).

10.0 REDEVELOPMENT PROPOSALS - DISCUSSION

10.01 Soils

The investigation has revealed made ground on the site. The Desk Study sections of this report have also indicated little potential for contamination at the site and the regime of chemical analyses adopted reflects this.

The results have been assessed using the Tier One 'Intervention Values' proposed in Appendix I. With regard to the assessment of this site, the appropriate intervention values are considered to be those for residential use with plant uptake.

The test results are compared in the following table:-

Samples taken from Topsoil:

Contaminant	Concentration in soils mg/kg*	Number of samples tested	Intervention Value mg/kg	No. of samples exceeding Intervention Value
pH	7.1 – 8.0	4	<5	0
Sulphate (WS)	0.007 – 0.018g/l	4	-	-
Arsenic	10.4 – 30.2	4	20	2
Boron (WS)	<0.5	4	3	0
Cadmium	<0.2 – 0.4	4	1	0
Chromium	12.3 – 20.8	4	130	0
Copper	16.9 – 68.4	4	111	0
Mercury	<0.1 – 0.2	4	8	0
Nickel	14.3 – 21.8	4	50	0
Lead	37.3 – 373.6	4	450	0
Selenium	1.0 – 1.8	4	35	0
Zinc	74.9 – 485.3	4	330	1
PAH	7.6 – 28.4	4	#	#

* unless stated otherwise

see later discussion

When compared with the proposed intervention values in relation to residential use with plant uptake the determinants with elevated concentrations in topsoil were:

Arsenic	2 No.	WS1 TP1	0.10m 0.20m	28.2 mg/kg 30.2 mg/kg
Zinc	1 No.	TP1	0.20m	485.3 mg/kg

The upper bound values (US₉₅) for elevated contamination levels in topsoil encountered on the site have been calculated as follows:-

arsenic 32.5 mg/kg > SGV of 20 mg/kg
 zinc 456.6 mg/kg > IV of 330 mg/kg

The acidic conditions in coal measures geology is likely to be naturally occurring.

The US₉₅ value for arsenic is significantly above its SGV of 20 mg/kg, but this is not unusual in coal measures geology where naturally occurring background levels tend to be high.

The US₉₅ value for zinc is above its SGV of 330 mg/kg, and a significant pollution linkage may exist on the site in relation to end users. However, only one elevated level has been encountered.

Samples taken from made ground:

Contaminant	Concentration in soils mg/kg*	Number of samples tested	Intervention Value (SGV*) mg/kg	No. of samples exceeding Intervention Value
pH	6.3 – 11.4	11	<5	1
Sulphate (ws)	0.008 – 0.282g/l	11	-	-
Arsenic	2.7 – 66.0	11	20	3
Boron (ws)	<0.5 – 1.8	11	3	0
Cadmium	<0.2 – 0.7	11	1	0
Chromium	10.1 – 30.4	11	130	0
Copper	5.1 – 152.5	11	111	1
Mercury	<0.1 – 0.5	11	8	0
Nickel	11.4 – 41.1	11	50	0
Lead	9.2 – 254.4	11	450	0
Selenium	<1.0 – 11.6	11	35	0
Zinc	36.7 – 305.2	11	330	0
PAH	<0.1 – 1153.1	11	#	#

* unless stated otherwise

see later discussion.

When compared with the proposed intervention values in relation to residential use with plant uptake the determinants with elevated concentrations in made ground were:

Arsenic	2 No.	TP3 TP6	0.20m 0.80m	66.0 mg/kg 63.5 mg/kg
Copper	1 No.	TP6	0.80m	152.5 mg/kg

The values for elevated contamination levels in the made ground encountered on the site have been calculated as follows:-

arsenic 37.2 mg/kg > SGV of 20 mg/kg
 zinc 67.3 mg/kg > IV of 111 mg/kg

The US₉₅ value for copper is below the proposed intervention level, therefore no further assessment is required.

The US₉₅ value for arsenic is above its SGV of 20 mg/kg and therefore a significant pollution linkage may exist on the site in relation to end users.

Samples taken from natural ground:

Contaminant	Concentration in soils mg/kg*	Number of samples tested	Intervention Value (SGV*) mg/kg	No. of samples exceeding Intervention Value
pH	4.6 – 7.4	4	<5	0
Sulphate (ws)	0.009 – 0.115g/l	4	-	-
Arsenic	4.3 – 13.7	4	20	0
Boron (ws)	<0.5	4	-	-
Cadmium	<0.2	4	1	0
Chromium	10.3 – 12.7	4	130	0
Copper	11.1 – 20.0	4	110	0
Mercury	<0.1	4	8	0
Nickel	11.5 – 15.6	4	50	0
Lead	22.0 – 42.4	4	450	0
Selenium	1.2 – 1.5	4	35	0
Zinc	49.7 – 140.8	4	330	0
PAH	<0.1 – 1.7	4	#	#

* unless stated otherwise

see later discussion

When compared with the proposed intervention values in relation to residential use with plant uptake no determinants with elevated concentrations were encountered.

Therefore natural ground directly below the made ground encountered on the site does not appear to have been significantly affected by elevated levels encountered in the overlying soils. Excavated natural ground is therefore considered suitable for reuse as inert capping.

Speciated analysis of samples are summarised in the following table:-

PAH 16 EPA	Concentrations in soils mg/kg	No. of Samples tested	Intervention Value mg/kg	No. of Samples exceeding Intervention Value
Acenaphthene	<0.1 – 19.6	19	45	0
Acenaphthylene	<0.1 – 3.4	19	5	0
Anthracene	<0.1 – 46.7	19	140	0
Benzo (a) Anthracene	<0.1 – 93.4	19	3.4	3
Benzo (a) Pyrene	<0.1 – 89.6	19	1.1	6
Benzo (b) Fluoranthene	<0.1 – 95.9	19	1.3	6
Benzo (k) Fluoranthene	<0.1 – 38.4	19	4	2
Benzo (g,h,i) Perylene	<0.1 – 53.0	19	340	0
Chrysene	<0.1 – 84.3	19	23	2
Di-benzo (a,h) Anthracene	<0.1 – 11.6	19	1.1	2
Indeno (1,2,3-cd) Pyrene	<0.1 – 56.5	19	3.6	2
Fluoranthene	<0.1 – 215.3	19	21	2
Fluorene	<0.1 – 14.6	19	184	0
Napthalene	<0.1 – 13.1	19	3.4	4
Phenanthrene	<0.1 – 139.5	19	110	1
Pyrene	<0.1 – 184.6	19	160	1
Total	<0.1 – 1153.1	19	-	-

When compared with the proposed intervention values in relation to residential use with plant uptake the PAH compounds with elevated concentrations were:-

Napthalene	4 No.	WS6	0.5m	7.1 mg/kg
		TP3	0.2m	5.9 mg/kg
		TP6	0.8m	5.3 mg/kg
		TP8	2.4m	13.1 mg/kg
Benzo (a) Anthracene	3 No.	WS6	0.5m	93.4 mg/kg
		TP3	0.2m	43.3 mg/kg
		TP6	0.8m	4.2 mg/kg
Benzo (a) Pyrene	6 No.	WS1	0.1m	1.5 mg/kg
		WS6	0.5m	89.6 mg/kg
		TP1	0.2m	36.1 mg/kg
		TP3	0.1m	1.9 mg/kg
		TP6	0.2m	3.0 mg/kg
		TP6	0.8m	3.9 mg/kg
Benzo (b) Fluoranthene	6 No.	WS1	0.1m	1.5 mg/kg
		WS6	0.5m	95.9 mg/kg
		TP1	0.2m	3.0 mg/kg
		TP3	0.2m	50.2 mg/kg
		TP6	0.1m	2.1 mg/kg
		TP6	0.8m	4.9 mg/kg
Benzo (k) Fluoranthene	2 No.	WS6	0.5m	38.4 mg/kg
		TP3	0.2m	17.3 mg/kg
Chrysene	2 No.	WS6	0.5m	84.3 mg/kg
		TP3	0.2m	37.5 mg/kg
Di-benzo (a,h) Anthracene	2 No.	WS6	0.5m	11.6 mg/kg
		TP3	5.6m	
Indeno (1,2,3-cd) Pyrene	2 No.	WS6	0.5m	56.5 mg/kg
		TP3	0.2	19.2 mg/kg

Fluorene	2 No.	WS6 TP3	0.5m 0.2m	215.3 mg/kg 62.6 mg/kg
Phenanthrene	1 No.	WS6	0.5m	139.5 mg/kg
Pyrene	1 No.	WS6	0.5m	184.6 mg/kg

The majority of the elevated PAH determinants are associated with ash or ash and clinker in the made ground in TP3, TP6, TP8 and WS6.

It is evident without further statistical analysis that elevated levels of PAH compounds in the made ground constitute a risk to human health and a significant pollution linkage is present on the site in relation to end users.

Elevated levels of Benzo (a) Pyrene and Benzo (b) Fluoranthene were encountered in the topsoil in WS1, TP1 and TP6. The values for these compounds have been calculated as follows:-

Benzo (a) Pyrene	2.9 mg/kg	>	IV 1.1. mg/kg
Benzo (b) Fluoranthene	2.9 mg/kg	>	IV 1.3 mg/kg

As the US₉₅ values for Benzo (a) Pyrene and Benzo (b) Fluoranthene are above their respective intervention values, and therefore a significant pollution linkage is present on the site in relation to end users.

In view of the above the following remediation measures are proposed for the site:-

- excavate topsoil and remove from site to a suitably licensed tip;
- excavate the made ground in the vicinity of TP3 and place under external hardcover areas (drives or car parking courts);
- the mound in the south western corner of the site should be excavated and placed under hardcover areas (drives or car parking courts);
- in the area of TP6, TP8 and WS6 the made ground in private garden areas should be capped with 600mm of inert soil, incorporating 150mm of topsoil;
- all service trenches should be backfilled with clean inert material;

A 600mm capping is considered appropriate to prevent site end users coming into contact with potentially contaminated ground.

A contamination risk assessment is undertaken in Section 11.0.

10.02 Controlled Waters

The levels of contamination encountered in the made ground on the site, do not appear to pose a significant risk to controlled waters.

10.03 Mining:

Settlement from deep mining below the site is likely to be complete. The site does not appear to be at risk from mine entries.

10.04 Gas

The site appears not to be at risk from landfill gas. Speciated PAH testing has indicated that the volatilisation of hydrocarbons is unlikely to impact on the internal air quality of dwellings.

Gas monitoring to date has indicated the following:-

- no elevated concentrations of methane;
- slightly elevated concentrations of carbon dioxide (between 0.4 – 1.1% by volume), but not above the intervention value of 1.5%;
- slightly depleted oxygen levels.

Subject to the completion of the monitoring no gas protection measures are required on the site in relation to either landfill or mine gases.

Basic Radon protection measures are required on the development.

10.05 Foundations

Traditional strip footings can be adopted on this area of the site, designed to a safe working bearing pressure of 150 kN/m², bearing on the sands or weathered sandstone, and at a minimum of 0.6m below existing ground level. Trench foundations will be required in some areas of the site where made ground is present or natural strata has been disturbed by the removal of historic foundations and drainage.

10.06 Ground Floor Construction:

Ground bearing slabs can be adopted on the development where sub-base thickness is less than 600mm. Where made ground is present on the site, suspended ground floors should be adopted on the development.

10.07 Sulphate attack on Buried Concrete

The results of the sulphate analysis compared to BRE Special Digest No. 1: 'Concrete in Aggressive Ground' indicate:

- Class DS-1 conditions in made ground
- Class DS-1 conditions in natural ground
- ACEC site classification AC-1s.

10.08 Pavements

The site access road has already been constructed as part of the adjacent new school development.

CBR values on natural ground (sands and weathered sandstone) should be reasonable and a design value of 5% can be adopted following proof rolling.

CBR values on made ground are likely to be variable and the following is recommended:-

- under the adopted road excavate made ground and replace with excavated sand or weathered sandstone from other areas of the site;
- under private areas excavate made ground up to a maximum of 600mm, screen and recompact selected material to an engineered specification.

10.09 Drainage

Yorkshire Water have advised the following:-

i) **Foul Water:**

Foul water can be discharged into the 225mm diameter sewer that traverses the site. It appears that a gravity system can be adopted on the development.

ii) **Surface Water**

There is no capacity for additional surface water to be discharged into the 225mm diameter combined sewer that traverses the site. However, the discharge rate from the new development can be balanced against the existing discharge rate from the site (to be verified by survey). It is likely that there will be an increase in hardcover area and stormwater storage would be required. Depending upon any storage requirements, it appears that a gravity system can be adopted on the development.

It should be noted that the new access road on the site is drained with unattenuated flow to the 225mm diameter combined sewer. It is therefore considered unlikely that Yorkshire Water will permit any additional discharge of surface water into this sewer.

The Yorkshire Water desk top report and extracts from the public sewer record are attached in Appendix L.

Falling head permeability tests have indicated the following soil permeabilities:-
TP1 1.23×10^{-4} m/s; TP5 1.78×10^{-5} m/s; TP6 6.12×10^{-5} m/s

Whilst further tests will be required the use of soakaways appears to be feasible.
Soakaways should be sited at least 5.0m away from building foundations.

The falling head permeability tests are attached in Volume 2, Appendix K.

Consideration can be given to the use of porous paving for car park courts, but such paving should not be used within 3.0m of building foundations.

Conventional drainage bedding will be required in natural ground, however, an 'enhanced' bedding detail (concrete bed or geotextile reinforced granular bed) may be required in any untreated made ground horizons.

10.10 Development Access

The site access road has already been constructed as part of the adjacent new school development.

10.11 Excavations

Excavation progress should be reasonable until competent sandstone is encountered. Trench shoring should be provided in accordance with current Health and Safety guidance. Groundwater seepages should be expected in made ground horizons. It should be noted that the ground water table level is likely to vary seasonally.

10.12 Land Drainage

Any land drains encountered within the works should be reinstated. If land drains are diverted this will require consent from the Environment Agency.

10.14 Services

Gas:

A 63mm main is located in the southern footway of Bondfield Crescent adjacent the northern site boundary.

Electricity:

A cable is shown adjacent the western boundary in the southern sector of the site. However, this cable may not now be in place as it served the old school, now demolished.

A cable is also shown in the south eastern sector of the site which appears to feed the new school to the south.

Water:

A spur is indicated in the northern end of the new footway that serves the new school.

Sewers:

A 150mm diameter highway drain is present in the new road on the site.

A 225mm diameter adopted sewer traverses the centre of the site in an east – west direction.

A 225mm diameter private sewer which serves the new school to the south of the site runs parallel to the eastern site boundary.

It is understood that services are located in both the footway and carriageway of the new road on the site that serves the new school to the south. However the Statutory records do not yet appear to have been updated.

Extracts from Statutory Services plans are attached in Volume 2 Appendix L.

11.00 CONTAMINATION ASSESSMENT

11.01 General

In order to evaluate the environmental risks identified during the investigation, a simple source-pathway-target model has been developed and is summarised at the end of this section in table form. The model has been used to determine significant pollutant linkages and identify suitable risk management proposals on which the remediation design is based.

11.02 Sources

Chemical analyses of samples have indicated elevated levels of arsenic, zinc and PAH compounds in topsoil, and arsenic, copper and PAH compounds in the made ground on the site.

11.03 Pathways

Potential pathways for metals and most PAHs are by direct ingestion such as dust inhalation, or indirect ingestion via skin absorption. However, pathways for some PAHs are by volatilisation and migration through permeable soils.

Root uptake is a possible pathway to provide a pollutant linkage between any contamination and end users by indirect ingestion.

Groundwater migration is a further potential pathway for contamination.

11.04 Targets

The likely targets for the contaminants that have been identified are:

- the future occupiers, i.e., the end users of the development;
- the construction works during the works;
- plants;
- controlled waters.

Assessed Risks – Topsoil

SOURCES	PATHWAYS	TARGETS	LIKELIHOOD OF OCCURRENCE	SEVERITY OF CONSEQUENCE	RISK RATING	RISK MANAGEMENT ACTION TAKEN
Arsenic Zinc PAH compounds	Direct Ingestion/ Inhalation or Contact	End Users	Possible	Moderate	Moderate	Topsoil to be removed from site to a suitably licensed tip.
	Direct Ingestion/ Inhalation or Contact	Construction workers	Possible	Moderate	Low	Induction, high standard of personal hygiene. Topsoil to be removed from site to a suitably licensed tip.
	Indirect Ingestion	Construction workers	Possible	Moderate	Low	Induction, high standard of personal hygiene. Topsoil to be removed from site to a suitably licensed tip.
	Indirect Ingestion	End Users	Possible	Moderate	Low/ Moderate	Topsoil to be removed from site to a suitably licensed tip.
	Root Uptake	Plants	Possible	Moderate	Moderate	Topsoil to be removed from site to a suitably licensed tip.
	Vertical/ lateral migration to controlled waters.	Aquifer/ Watercourse	Possible	Moderate	Low	Topsoil to be removed from site to a suitably licensed tip. Site underlain by a minor aquifer. No groundwater abstraction within 1000m of the site. No watercourse within 470m of the site. No groundwater encountered in the investigation.

Assessed Risks – Made Ground –South Eastern Corner:

SOURCES	PATHWAYS	TARGETS	LIKELIHOOD OF OCCURRENCE	SEVERITY OF CONSEQUENCE	RISK RATING	RISK MANAGEMENT ACTION TAKEN
Arsenic PAH compounds	Direct Ingestion/ Inhalation or Contact	End Users	Possible	Moderate	Moderate	Place made ground in the vicinity of TP3 under hardcover areas. Provide 600mm of inert soils to private gardens in south eastern sector.
	Direct Ingestion/ Inhalation or Contact	Construction workers	Possible	Moderate	Low/ Moderate	Induction, high standard of personal hygiene. All service trenches to be backfilled with clean inert materials.
	Indirect Ingestion	Construction workers	Possible	Moderate	Low	Induction, high standard of personal hygiene.
	Indirect Ingestion	End Users	Possible	Moderate	Moderate	Place made ground in the vicinity of TP3 under hardcover areas. Provide 600mm of inert soils to private gardens in south eastern sector.
	Root Uptake	Plants	Possible	Moderate	Moderate	Place made ground in the vicinity of TP3 under hardcover areas. Provide 600mm of inert soils to private gardens in south eastern sector.
	Vertical/lateral migration to controlled waters	Aquifer	Possible	Moderate	Low	Contamination levels relatively low. Site underlain by a minor aquifer. Place made ground in the vicinity of TP3 under hardcover areas. Provide 600mm of inert soils to private gardens. No groundwater encountered in the investigation.

12.0 RECLAMATION PROPOSALS

12.01 The proposed works shall include the following, although this does not necessarily indicate the order or full extent of the works.

- Identify/disconnect and/or divert any live services on the site.
- Grub out vegetation and remove from site. Any trees or hedges that are to be retained should be protected from the works.
- Inspect the site for hazardous materials, remove from site together with all fly tipping and rubbish to a suitably licensed tip, using approved methods and a suitably licensed contractor.
- Undertake general site strip. All topsoil is to be removed from site to a suitably licensed tip.
- After the initial site strip the formation is to be inspected. Any areas of deleterious material or contamination not identified in the ground investigation identified by visual or olfactory evidence and subsequent chemical testing is to be remediated if necessary following risk assessment.
- Excavate made ground from the area of TP3 and place under hardcover areas.
- Made ground in the south eastern sector, if not placed under hardcover areas, should be capped with 600mm of inert soils incorporating 150mm of topsoil.
- All service trenches should be backfilled with clean, inert material.
- Clean inert excavated natural soils from the site may be used as capping, following chemical testing.
- Excavate made ground from below adopted highways and replace with natural sand or weathered sandstone excavated from other areas of the site.
- Remodel site levels as required by the development.
- Any imported engineering fill material should be compacted in accordance with the Dpt. Highways Specification.
- Guidance should be sought from the local Waste Management Regulation office regarding the disposal of soils from the site.

13.0 ADDITIONAL INVESTIGATION WORKS REQUIRED**13.01 Ground Investigation:**

- Additional falling head permeability tests are recommended to verify initially established soil permeability.

13.02 Drainage

A survey should be made of the existing drainage system on the site to assess which services are live or redundant.

CoDa Structures Consulting Civil & Structural Engineers No. 2 Harewood Yard, Harewood, Leeds LS17 9LF	PHASE 1 & 2 ENGINEERING & ENVIRONMENTAL ASSESSMENT FORMER GABLES SCHOOL BONDFIELD CRESCENT WOMBWELL
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14.0 SUMMARY

Site Name & Location	The former Gables School, Bondfield Crescent Wombwell.																																																									
Proposal	54 houses																																																									
Local Authority	Barnsley Metropolitan Borough Council.																																																									
Site History	<p>The site remained undeveloped until 1930, since when allotments were present in the northern sector and part of a football ground in the southern sector. The football ground became a Greyhound Stadium in approximately 1962, before the site was developed with The Gables School in approximately 1982. The school was recently demolished.</p> <p>The surrounding area to the site was undeveloped until approximately 1982, since when residential development has occurred. Potentially contaminative activities in the immediate vicinity of the site have included quarries. Potentially contaminative activities in the surrounding area have included mining, quarries, railway lines, 'works', glass bottle works, a factory, gas works, foundry and brickworks.</p>																																																									
Hydrogeology	The site is in a relatively low sensitivity hydrogeological area, being underlain by a minor aquifer, is not within 250m of a watercourse and is not within a Source Protection Zone.																																																									
Flooding	The site does not appear to be prone to flooding.																																																									
Gas Precautions	<p>The site appears not to be at risk from landfill gas. Speciated PAH testing has indicated that the volatilisation of hydrocarbons is unlikely to impact on the internal air quality of dwellings. Gas monitoring to date has indicated the following:-</p> <ul style="list-style-type: none"> - no elevated concentrations of methane; - slightly elevated concentrations of carbon dioxide (between 0.4 – 1.1% by volume), but not above the intervention value of 1.5%; - slightly depleted oxygen levels. <p>Subject to the completion of the monitoring no gas protection measures are required on the site in relation to either landfill or mine gases.</p> <p>Basic Radon protection measures are required on the development.</p>																																																									
Coal Mining	The site does not appear to be at risk from shallow mine workings or mine entries. Any ground settlement from deep mining should have ceased long ago.																																																									
Ground Conditions	<p>The following typical ground profile was encountered on the site:-</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 40%;">Topsoil</td> <td style="width: 30%;">0.20 – 0.80m</td> <td style="width: 30%; text-align: right;">(where present)</td> </tr> <tr> <td>Made ground</td> <td>0.25 – 3.30m</td> <td></td> </tr> <tr> <td>Sand</td> <td>0.90 – 1.80m</td> <td></td> </tr> <tr> <td>Highly weathered sandstone</td> <td>0.45 – 1.80m</td> <td></td> </tr> <tr> <td>Sandstone</td> <td></td> <td></td> </tr> </table> <p>Topsoil was encountered in TP1, TP6, TP9, TP10, WS1, WS2, WS3 and WS6.</p> <p>Made ground was encountered in all the investigation locations, except in TP1, TP10 and WS2, which comprised silty clay, ash, sand, gravel, brick fragments, clinker and occasional cobbles, plastic, concrete fragments, macadam fragments and stone chippings.</p> <p>The deeper areas of made ground (in excess of 1.0m) were encountered in the south eastern sector. In relation to TP8 it is associated with a mound of material.</p> <p>A band of silty clay between 0.10 – 0.20m was encountered below the made ground in TP8, WS1 and WS5. Traces of this strata (less than 0.10m thick) were also encountered in both TP1 and TP7.</p> <p>A band of sand was encountered in TP3, TP5, TP7, TP8, TP10 and WS6, whereas highly weathered sandstone was encountered in TP1, TP4, TP6, WS1, WS2, WS3, WS4 and WS5.</p> <p>Sandstone was proved at the following depths below ground level:-</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%;">TP1</td> <td style="width: 10%;">-</td> <td style="width: 20%;">2.2m</td> <td style="width: 10%;">WS1</td> <td style="width: 10%;">-</td> <td style="width: 20%;">2.2m</td> </tr> <tr> <td>TP3</td> <td>-</td> <td>1.7m</td> <td>WS2</td> <td>-</td> <td>2.2m</td> </tr> <tr> <td>TP4</td> <td>-</td> <td>1.0m</td> <td>WS3</td> <td>-</td> <td>3.5m</td> </tr> <tr> <td>TP5</td> <td>-</td> <td>1.6m</td> <td>WS4</td> <td>-</td> <td>1.2m</td> </tr> <tr> <td>TP6</td> <td>-</td> <td>2.3m</td> <td>WS5</td> <td>-</td> <td>1.9m</td> </tr> <tr> <td>TP7</td> <td>-</td> <td>2.1m</td> <td></td> <td></td> <td></td> </tr> <tr> <td>TP10</td> <td>-</td> <td>2.2m</td> <td></td> <td></td> <td></td> </tr> </table> <p>Sandstone was not proved in TP8, TP9 or WS6.</p>	Topsoil	0.20 – 0.80m	(where present)	Made ground	0.25 – 3.30m		Sand	0.90 – 1.80m		Highly weathered sandstone	0.45 – 1.80m		Sandstone			TP1	-	2.2m	WS1	-	2.2m	TP3	-	1.7m	WS2	-	2.2m	TP4	-	1.0m	WS3	-	3.5m	TP5	-	1.6m	WS4	-	1.2m	TP6	-	2.3m	WS5	-	1.9m	TP7	-	2.1m				TP10	-	2.2m			
Topsoil	0.20 – 0.80m	(where present)																																																								
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TP5	-	1.6m	WS4	-	1.2m																																																					
TP6	-	2.3m	WS5	-	1.9m																																																					
TP7	-	2.1m																																																								
TP10	-	2.2m																																																								

Client: ACKROYD & ABBOTT HOMES LTD.
 Project No: 6062
 Date: 29 March 2007 Revision A

Foundations	Traditional strip footings can be adopted on this area of the site, designed to a safe working bearing pressure of 150 kN/m ² , bearing on the sands or weathered sandstone, and at a minimum of 0.6m below existing ground level. Trench foundations will be required in some areas of the site where made ground is present or natural strata has been disturbed by the removal of historic foundations and drainage.																														
Ground Floor Slab	Ground bearing slabs can be adopted on the development where sub-base thickness is less than 600mm. Where made ground is present on the site, suspended ground floors should be adopted on the development.																														
Building Near Trees	Not applicable.																														
Pavements	CBR values on natural ground (sands and weathered sandstone) should be reasonable and a design value of 5% can be adopted following proof rolling. CBR values on made ground are likely to be variable and the following is recommended:- - under the adopted road excavate made ground and replace with excavated sand or weathered sandstone from other areas of the site; - under private areas excavate made ground up to a maximum of 600mm, screen and recompact selected material to an engineered specification.																														
Access	The site access road has already been constructed as part of the adjacent new school development.																														
Dewatering	Not envisaged, but groundwater seepages should be expected in made ground horizons. It should be noted that the ground water table level is likely to vary seasonally.																														
Excavations	Excavation progress should be reasonable until competent sandstone is encountered. Trench shoring should be provided in accordance with current Health and Safety guidance.																														
Sulphate Classification	The results of the sulphate analysis compared to BRE Special Digest No. 1: 'Concrete in Aggressive Ground' indicate: - Class DS-1 conditions in made ground - Class DS-1 conditions in natural ground - ACEC site classification AC-1s.																														
Radon	Basic Radon protection measures are required on the development.																														
Contamination Assessment	<p>When compared with the proposed intervention values in relation to residential use with plant uptake the determinants with elevated concentrations in topsoil were:</p> <table border="1"> <tr> <td>Arsenic</td> <td>2 No.</td> <td>WS1</td> <td>0.10m</td> <td>28.2 mg/kg</td> </tr> <tr> <td></td> <td></td> <td>TP1</td> <td>0.20m</td> <td>30.2 mg/kg</td> </tr> <tr> <td>Zinc</td> <td>1 No.</td> <td>TP1</td> <td>0.20m</td> <td>485.3 mg/kg</td> </tr> </table> <p>The upper bound values (US₉₅) for elevated contamination levels in topsoil encountered on the site have been calculated as follows:- arsenic 32.5 mg/kg > SGV of 20 mg/kg zinc 456.6 mg/kg > IV of 330 mg/kg</p> <p>The acidic conditions in coal measures geology is likely to be naturally occurring. The US₉₅ value for arsenic is significantly above its SGV of 20 mg/kg, but this is not unusual in coal measures geology where naturally occurring background levels tend to be high. The US₉₅ value for zinc is above its SGV of 330 mg/kg, and a significant pollution linkage may exist on the site in relation to end users. However, only one elevated level has been encountered.</p> <p>When compared with the proposed intervention values in relation to residential use with plant uptake the determinants with elevated concentrations in made ground were:</p> <table border="1"> <tr> <td>Arsenic</td> <td>2 No.</td> <td>TP3</td> <td>0.20m</td> <td>66.0 mg/kg</td> </tr> <tr> <td></td> <td></td> <td>TP6</td> <td>0.80m</td> <td>63.5 mg/kg</td> </tr> <tr> <td>Copper</td> <td>1 No.</td> <td>TP6</td> <td>0.80m</td> <td>152.5 mg/kg</td> </tr> </table> <p>The values for elevated contamination levels in the made ground encountered on the site have been calculated as follows:- arsenic 37.2 mg/kg > SGV of 20 mg/kg zinc 67.3 mg/kg > IV of 111 mg/kg</p> <p>The US₉₅ value for copper is below the proposed intervention level, therefore no further assessment is required.</p>	Arsenic	2 No.	WS1	0.10m	28.2 mg/kg			TP1	0.20m	30.2 mg/kg	Zinc	1 No.	TP1	0.20m	485.3 mg/kg	Arsenic	2 No.	TP3	0.20m	66.0 mg/kg			TP6	0.80m	63.5 mg/kg	Copper	1 No.	TP6	0.80m	152.5 mg/kg
Arsenic	2 No.	WS1	0.10m	28.2 mg/kg																											
		TP1	0.20m	30.2 mg/kg																											
Zinc	1 No.	TP1	0.20m	485.3 mg/kg																											
Arsenic	2 No.	TP3	0.20m	66.0 mg/kg																											
		TP6	0.80m	63.5 mg/kg																											
Copper	1 No.	TP6	0.80m	152.5 mg/kg																											

The US₉₅ value for arsenic is above its SGV of 20 mg/kg and therefore a significant pollution linkage may exist on the site in relation to end users.

When compared with the proposed intervention values in relation to residential use with plant uptake no determinants with elevated concentrations were encountered.

Therefore natural ground directly below the made ground encountered on the site does not appear to have been significantly affected by elevated levels encountered in the overlying soils. Excavated natural ground is therefore considered suitable for reuse as inert capping.

When compared with the proposed intervention values in relation to residential use with plant uptake the PAH compounds with elevated concentrations were:-

Naphthalene	4 No.	WS6	0.5m	7.1 mg/kg
		TP3	0.2m	5.9 mg/kg
		TP6	0.8m	5.3 mg/kg
		TP8	2.4m	13.1 mg/kg
Benzo (a) Anthracene	3 No.	WS6	0.5m	93.4 mg/kg
		TP3	0.2m	43.3 mg/kg
		TP6	0.8m	4.2 mg/kg
Benzo (a) Pyrene	6 No.	WS1	0.1m	1.5 mg/kg
		WS6	0.5m	89.6 mg/kg
		TP1	0.2m	36.1 mg/kg
		TP3	0.1m	1.9 mg/kg
		TP6	0.2m	3.0 mg/kg
		TP6	0.8m	3.9 mg/kg
Benzo (b) Fluoranthene	6 No.	WS1	0.1m	1.5 mg/kg
		WS6	0.5m	95.9 mg/kg
		TP1	0.2m	3.0 mg/kg
		TP3	0.2m	50.2 mg/kg
		TP6	0.1m	2.1 mg/kg
		TP6	0.8m	4.9 mg/kg
Benzo (k) Fluoranthene	2 No.	WS6	0.5m	38.4 mg/kg
		TP3	0.2m	17.3 mg/kg
Chrysene	2 No.	WS6	0.5m	84.3 mg/kg
		TP3	0.2m	37.5 mg/kg
Di-benzo (a,h) Anthracene	2 No.	WS6	0.5m	11.6 mg/kg
		TP3	5.6m	
Indeno (1,2,3-cd) Pyrene	2 No.	WS6	0.5m	56.5 mg/kg
		TP3	0.2	19.2 mg/kg
Fluorene	2 No.	WS6	0.5m	215.3 mg/kg
		TP3	0.2m	62.6 mg/kg
Phenanthrene	1 No.	WS6	0.5m	139.5 mg/kg
Pyrene	1 No.	WS6	0.5m	184.6 mg/kg

The majority of the elevated PAH determinants are associated with ash or ash and clinker in the made ground in TP3, TP6, TP8 and WS6.

It is evident without further statistical analysis that elevated levels of PAH compounds in the made ground constitute a risk to human health and a significant pollution linkage is present on the site in relation to end users.

Elevated levels of Benzo (a) Pyrene and Benzo (b) Fluoranthene were encountered in the topsoil in WS1, TP1 and TP6. The values for these compounds have been calculated as follows:-

Benzo (a) Pyrene 2.9 mg/kg > IV 1.1 mg/kg

Benzo (b) Fluoranthene 2.9 mg/kg > IV 1.3 mg/kg

As the US₉₅ values for Benzo (a) Pyrene and Benzo (b) Fluoranthene are above their respective intervention values, and therefore a significant pollution linkage is present on the site in relation to end users.

Remediation Proposals	<p>the following remediation measures are proposed for the site:-</p> <ul style="list-style-type: none"> - excavate topsoil and remove from site to a suitably licensed tip; - excavate the made ground in the vicinity of TP3 and place under external hardcover areas (drives or car parking courts); - the mound in the south western corner of the site should be excavated and placed under hardcover areas (drives or car parking courts); - in the area of TP6, TP8 and WS6 the made ground in private garden areas should be capped with 600mm of inert soil, incorporating 150mm of topsoil; - all service trenches should be backfilled with clean inert material; <p>A 600mm capping is considered appropriate to prevent site end users coming into contact with potentially contaminated ground.</p>
Remediation Method Statement	Required.
Foul Water Drainage	<p>Yorkshire Water have advised the following:-</p> <p>Foul water can be discharged into the 225mm diameter sewer that traverses the site. It is appears that a gravity system can be adopted on the development.</p> <p>Conventional drainage bedding will be required in natural ground, however, an 'enhanced' bedding detail (concrete bed or geotextile reinforced granular bed) may be required in any untreated made ground horizons.</p>
Surface Water Drainage	<p>Yorkshire Water have advised the following:-</p> <p>There is no capacity for additional surface water to be discharged into the 225mm diameter combined sewer that traverses the site. However, the discharge rate from the new development can be balanced against the existing discharge rate from the site (to be verified by survey). It is likely that there will be an increase in hardcover area and stormwater storage would be required. Depending upon any storage requirements, it appears that a gravity system can be adopted on the development.</p> <p>It should be noted that the new access road on the site is drained with unattenuated flow to the 225mm diameter combined sewer. It is therefore considered unlikely that Yorkshire Water will permit any additional discharge of surface water into this sewer.</p> <p>Falling head permeability tests have indicated the following soil permeabilities:- TP1 1.23×10^{-4} m/s; TP5 1.78×10^{-5} m/s; TP6 6.12×10^{-5} m/s</p> <p>Whilst further tests will be required the use of soakaways appears to be feasible. Soakaways should be sited at least 5.0m away from building foundations.</p> <p>Consideration can be given to the use of porous paving for car park courts, but such paving should not be used within 3.0m of building foundations.</p> <p>Conventional drainage bedding will be required in natural ground, however, an 'enhanced' bedding detail (concrete bed or geotextile reinforced granular bed) may be required in any untreated made ground horizons.</p>
Unforeseen Circumstances	Should any areas of previously unidentified potentially contaminated soil be encountered during site construction works we would recommend consultation with CoDA Structures to ensure that the recommendations continue to apply.
Construction Works	It is recommended that construction personnel with direct contact with the soils at the site use appropriate PPE equipment (i.e. gloves and overalls) together with welfare facilities in accordance with general health and safety guidelines.
Utilities	We would recommend that a copy of the ground investigation report when available, is supplied to Utility Companies, and that their recommendations relating to appropriate supply pipes are adhered to.
Statutory Consultation	We would recommend that a copy of the ground investigation report once prepared is issued to the Local Authority for comment and approval prior to the development of the site.
Further Investigation Work	<p>Ground Investigation:</p> <ul style="list-style-type: none"> - Additional falling head permeability tests are recommended to verify initially established soil permeability. <p>Drainage</p> <ul style="list-style-type: none"> - A survey should be made of the existing drainage system on the site to assess which services are live or redundant.

Comment

It would appear that the site can be redeveloped using normal construction, remediation and earthworks techniques.
The redevelopment of the site should not have any adverse environmental impact.

15.0 CAVEATS

- 15.01 The comments given in this report and recommendations made are based on the information that could be obtained from reasonably accessible sources. Discussions have not yet been held with statutory bodies and the local authority.
- 15.02 The comments and recommendations made in this report are based on the ground conditions encountered during the site work, and on the results of laboratory testing on a selected number of samples taken in the field. There may be conditions prevailing at the site with respect to ground conditions and contamination that have not been encountered during the investigations, and which have therefore not been taken into account in this report.
- 15.03 This report has been prepared for the sole use of Ackroyd & Abbott Ltd. and their development funders, unless agreed otherwise in writing by CoDA Structures.

Signed:


.....
J Lawrence B Eng C Eng M I Struct E



The Coal
Authority

Resolving the **impacts** of mining

CON29M Non-Residential Mining Report

9 BONDFIELD CRESCENT
WOMBWELL
BARNESLEY
SOUTH YORKSHIRE

Date of enquiry: 12 October 2016
Date enquiry received: 12 October 2016
Issue date: 12 October 2016

Our reference: 51001267578001
Your reference: 100629760_1 |



CON29M Non-Residential Mining Report

This report is based on, and limited to, the records held by the Coal Authority and the Cheshire Brine Subsidence Compensation Board's records, at the time we answer the search.

Client name

LANDMARK INFORMATION GROUP LIMITED

Enquiry address

9 BONDFIELD CRESCENT, WOMBWELL, BARNSELY,
SOUTH YORKSHIRE


How to contact us


0345 762 6848 (UK)
+44 (0)1623 637 000 (International)

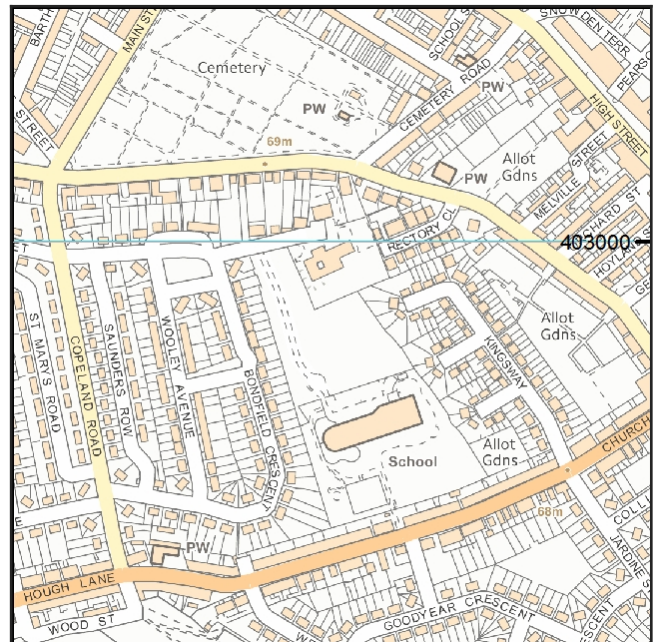
200 Lichfield Lane
Mansfield
Nottinghamshire
NG18 4RG

www.groundstability.com

 /company/the-coal-authority

 /thecoalauthority

 /coalauthority



Approximate position of property



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Summary

Has the search report highlighted evidence or potential of		
1	Past underground coal mining	Yes
2	Present underground coal mining	No
3	Future underground coal mining	Yes
4	Mine entries	No
5	Coal mining geology	No
6	Past opencast coal mining	No
7	Present opencast coal mining	No
8	Future opencast coal mining	No
9	Coal mining subsidence	No
10	Mine gas	No
11	Hazards related to coal mining	No
12	Withdrawal of support	Yes
13	Working facilities order	No
14	Payments to owners of former copyhold land	No
15	Information from the Cheshire Brine Subsidence Compensation Board	No

For detailed findings, please go to page 4.

Detailed findings

1. Past underground coal mining

The property is in a surface area that could be affected by underground mining in 8 seams of coal at 120m to 600m depth, and last worked in 1978.

Any movement in the ground due to coal mining activity should have stopped.

2. Present underground coal mining

The property is not within a surface area that could be affected by present underground mining.

3. Future underground coal mining

The property is not in an area where the Coal Authority has plans to grant a licence to remove coal using underground methods.

The property is not in an area where a licence has been granted to remove or otherwise work coal using underground methods.

The property is not in an area likely to be affected from any planned future underground coal mining.

However, reserves of coal exist in the local area which could be worked at some time in the future.

No notices have been given, under section 46 of the Coal Mining Subsidence Act 1991, stating that the land is at risk of subsidence.

4. Mine entries

There are no known coal mine entries within, or within 20 metres of, the boundary of the property.

5. Coal mining geology

The Coal Authority is not aware of any damage due to geological faults or other lines of weakness that have been affected by coal mining.

6. Past opencast coal mining

The property is not within the boundary of an opencast site from which coal has been removed by opencast methods.

7. Present opencast coal mining

The property does not lie within 200 metres of the boundary of an opencast site from which coal is being removed by opencast methods.

8. Future opencast coal mining

There are no licence requests outstanding to remove coal by opencast methods within 800 metres of the boundary.

The property is not within 800 metres of the boundary of an opencast site for which a licence to remove coal by opencast methods has been granted.

9. Coal mining subsidence

The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres, since 31 October 1994.

There is no current Stop Notice delaying the start of remedial works or repairs to the property.

The Coal Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.

10. Mine gas

The Coal Authority has no record of a mine gas emission requiring action.

11. Hazards related to coal mining

The property has not been subject to remedial works, by or on behalf of the Authority, under its Emergency Surface Hazard Call Out procedures.

12. Withdrawal of support

The property is in an area where a notice to withdraw support was given in 1983.

The property is not in an area where a notice has been given under section 41 of the Coal Industry Act 1994, cancelling the entitlement to withdraw support.

13. Working facilities order

The property is not in an area where an order has been made, under the provisions of the Mines (Working Facilities and Support) Acts 1923 and 1966 or any statutory modification or amendment thereof.

14. Payments to owners of former copyhold land

The property is not in an area where a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

15. Information from the Cheshire Brine Subsidence Compensation Board

The property lies outside the Cheshire Brine Compensation District.

Additional remarks

Information provided by the Coal Authority in this report is compiled in response to the Law Society's Con29M Coal Mining and Brine Subsidence Claim enquiries. The said enquiries are protected by copyright owned by the Law Society of 113 Chancery Lane, London WC2A 1PL. Please note that Brine Subsidence Claim enquiries are only relevant for England and Wales. This report is prepared in accordance with the Law Society's Guidance Notes 2006, the User Guide 2006 and the Coal Authority and Cheshire Brine Board's Terms and Conditions applicable at the time the report was produced.

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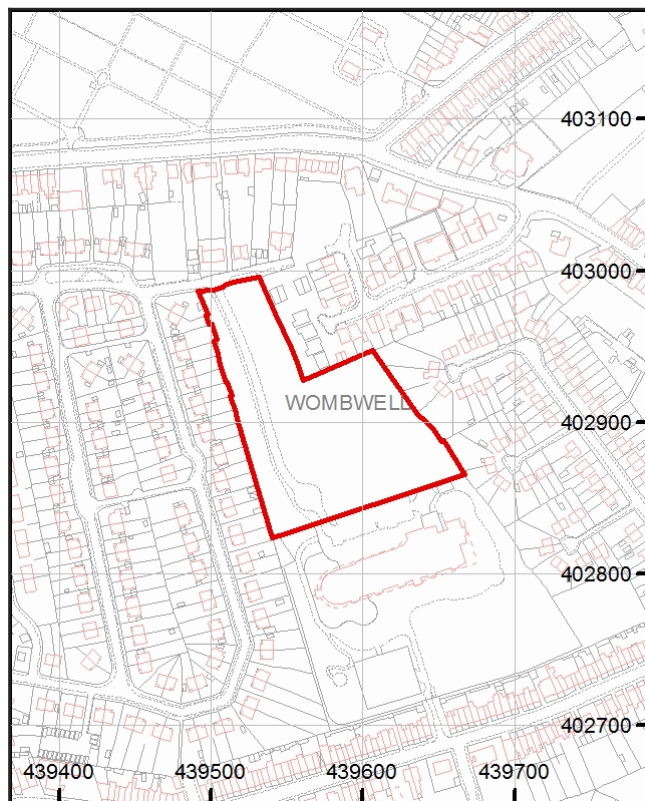
Alternative formats

If you would like this report in an alternative format, please contact our communications team.

Enquiry boundary

Key

Approximate position of enquiry boundary shown




How to contact us


0345 762 6848 (UK)
+44 (0)1623 637 000 (International)

200 Lichfield Lane
Mansfield
Nottinghamshire
NG18 4RG

www.groundstability.com

 /company/the-coal-authority

 /thecoalauthority

 /coalauthority



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Appendix 3

Trial Pit Logs, TP1 to TP3, TP5 to TP17, Bund

Project Name
 Bondfield Crescent

Project No.
 40547

Co-ords: -
 Level: -

Date
 19/10/2016

Location: Wombwell

Dimensions: -

Scale
 1:25

Client: Gleeson Developments Ltd

Depth
 2.00m



Logged By
 SRI





Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description		
Depth (m)	Type	Results						
0.30	D		0.45			Scrubland over MADE GROUND/TOPSOIL: Dark brown gravelly SAND. Gravel is fine to coarse, angular of brick, glass, ceramics, clinker and coal fragments.		
0.50	D					MADE GROUND: Grey/brown slightly clayey slightly gravelly sand. Gravel is fine to coarse, angular of brick, sandstone and coal fragments.		
0.85	D					0.80		Orange/brown slightly clayey slightly gravelly SAND with low cobble content. Gravel and cobbles are angular of moderately strong coarse grained sandstone.
						1.00		Orange/brown gravelly SAND with medium becoming high cobble content. Gravel and cobbles are angular of moderately strong coarse grained sandstone. (weathered sandstone)
			2.00			Trialpit Complete at 2.00 m		

Remarks:

Groundwater: None encountered



Project Name Bondfield Crescent	Project No. 40547	Co-ords: - Level: -	Date 19/10/2016
Location: Wombwell		Dimensions: - Depth 1.40m	Scale 1:25
Client: Gleeson Developments Ltd			Logged By SRI

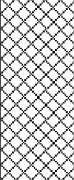


Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.30	D		0.30			Scrubland over MADE GROUND/TOPSOIL: Dark brown gravelly SAND. Gravel is coarse, angular of brick wall, macadam, sandstone, clinker and coal fragments.
			0.50			MADE GROUND: Macadam
0.60	D					Orange/brown gravelly SAND with medium cobble content. Gravel and cobbles are angular of moderately strong coarse grained sandstone (weathered sandstone)
			1.35			Yellow moderately strong SANDSTONE recovered as angular coarse grained gravel and cobbles.
			1.40			Trialpit Complete at 1.40 m

Remarks:

Groundwater: None encountered



Project Name Bondfield Crescent	Project No. 40547	Co-ords: - Level: -	Date 19/10/2016
Location: Wombwell		Dimensions: - Depth 2.35m	Scale 1:25
Client: Gleeson Developments Ltd			Logged By SRI

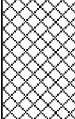
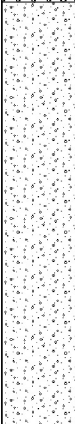
Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.10	D		0.60			Scrubland over MADE GROUND/TOPSOIL: Dark brown slightly gravelly slightly clayey SAND. Gravel is fine to coarse, angular of brick, sandstone and occasional plastic.
0.70	D					Orange/brown gravelly SAND with medium cobble content. Gravel and cobbles are angular, moderately strong, coarse grained sandstone (weathered sandstone)
			2.20			Yellow moderately strong SANDSTONE recovered as angular coarse grained gravel and cobbles.
			2.35			Trialpit Complete at 2.35 m

Remarks:

Groundwater: None encountered



Project Name Bondfield Crescent	Project No. 40547	Co-ords: - Level: -	Date 19/10/2016
Location: Wombwell		Dimensions: - Depth 1.80m	Scale 1:25
Client: Gleeson Developments Ltd			Logged By SRI






Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.10	D		0.40			Scrubland over MADE GROUND/TOPSOIL: Dark brown slightly clayey slightly gravelly SAND. Gravel is fine to coarse, angular of sandstone and brick
						Orange/brown sandy gravel with medium cobble content. Gravel and cobbles are angular, moderately strong, coarse grained sandstone. (weathered sandstone).
			1.80			Trialpit Complete at 1.80 m

Remarks:

Groundwater: None encountered



Project Name Bondfield Crescent	Project No. 40547	Co-ords: - Level: -	Date 19/10/2016
Location: Wombwell		Dimensions: - Depth 1.50m	Scale 1:25
Client: Gleeson Developments Ltd			Logged By SRI



Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.30	D		0.10 0.20		 Scrubland over MADE GROUND/TOPSOIL: Dark brown slightly gravelly SAND. Gravel is fine to coarse, angular of sandstone  MADE GROUND: Yellow sandy gravel. Gravel is fine to coarse, angular of sandstone.  MADE GROUND: Dark grey sandy CLAY with fragments of coal and sandstone.	
0.60	D		0.50 0.70		 Orange/brown gravelly SAND with medium cobble content. Gravel and cobbles are angular, moderately strong, coarse grained sandstone (weathered sandstone)  Yellow moderately strong SANDSTONE recovered as angular coarse grained gravel and cobbles.	
			1.50		Trialpit Complete at 1.50 m	

Remarks:

Groundwater: None encountered



Project Name Bondfield Crescent	Project No. 40547	Co-ords: - Level: -	Date 19/10/2016
Location: Wombwell		Dimensions: - Depth 1.80m	Scale 1:25
Client: Gleeson Developments Ltd			Logged By SRI

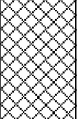

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.20	D		0.70			Scrubland over MADE GROUND/TOPSOIL: Dark brown gravelly slightly clayey SAND. Gravel is fine to coarse, angular of brick, glass, sandstone and rare polystyrene, ceramics and plastic.
0.80	D					MADE GROUND: Pink/White slightly sandy GRAVEL. Gravel is medium-coarse of limestone (sub-base?)
			1.70			Yellow moderately strong SANDSTONE recovered as angular coarse grained gravel and cobbles.
			1.80			Trialpit Complete at 1.80 m

Remarks:

Groundwater: None encountered



Project Name Bondfield Crescent	Project No. 40547	Co-ords: - Level: -	Date 19/10/2016
Location: Wombwell		Dimensions: - Depth 1.65m	Scale 1:25
Client: Gleeson Developments Ltd			Logged By SRI

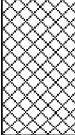
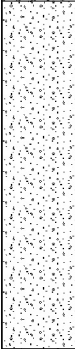

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.20	D		0.40			Scrubland over MADE GROUND/TOPSOIL: Dark brown slightly clayey slightly gravelly SAND. Gravel is fine to coarse, angular of sandstone and brick
						Orange/brown gravelly SAND with medium cobble content. Gravel and cobbles are angular, moderately strong, coarse grained sandstone (weathered sandstone).
			1.65			Trialpit Complete at 1.65 m

Remarks: Too hard to progress

Groundwater: Slight groundwater ingress at base



Project Name Bondfield Crescent	Project No. 40547	Co-ords: - Level: -	Date 19/10/2016
Location: Wombwell		Dimensions: -	Scale 1:25
Client: Gleeson Developments Ltd		Depth 1.80m	Logged By SRI





Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.10	D		0.45			Scrubland over MADE GROUND/TOPSOIL: Dark brown slightly clayey slightly gravelly SAND. Gravel is fine to coarse, angular of sandstone and brick
0.60	D					Orange/brown gravelly SAND with medium cobble content. Gravel and cobbles are angular, moderately strong, coarse grained sandstone (weathered sandstone).
			1.60			Yellow moderately strong SANDSTONE recovered as angular, coarse grained gravel and cobbles.
			1.80			Trialpit Complete at 1.80 m

Remarks: Slow progression at base

Groundwater: None encountered



Project Name Bondfield Crescent	Project No. 40547	Co-ords: - Level: -	Date 19/10/2016
Location: Wombwell		Dimensions: -	Scale 1:25
Client: Gleeson Developments Ltd		Depth 1.55m	Logged By SRI


Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.20	D		0.10			Scrubland over MADE GROUND/TOPSOIL: Dark brown slightly gravelly SAND. Gravel is fine to coarse, angular of sandstone.
			0.30			MADE GROUND: Yellow/brown gravelly SAND. Gravel is fine to coarse, angular of limestone (sub-base)
0.60	D		0.75			Orange/brown gravelly SAND with medium cobble content. Gravel and cobbles are angular, moderately strong, coarse grained sandstone (weathered sandstone).
			1.55			Yellow moderately strong SANDSTONE recovered as angular coarse grained gravel and cobbles.
Trialpit Complete at 1.55 m						

Remarks: Clay pipe hit at 0.4 m bgl.

Groundwater: None encountered



Project Name Bondfield Crescent	Project No. 40547	Co-ords: - Level: -	Date 19/10/2016
Location: Wombwell		Dimensions: - Depth 1.90m	Scale 1:25
Client: Gleeson Developments Ltd			Logged By SRI




Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.10	D		0.10			Scrubland over MADE GROUND/TOPSOIL: Dark brown slightly gravelly SAND. Gravel is fine to coarse, angular of sandstone, brick and coal fragments
1.00	D					MADE GROUND: Brown gravelly SAND with rootlets. Gravel is fine to coarse, angular of concrete, brick, metal, ceramics, coal, sandstone, cement bound asbestos, rubber.
			1.85 1.90			Yellow moderately strong SANDSTONE recovered as angular coarse grained gravel and cobbles.
Trialpit Complete at 1.90 m						

Remarks:

Groundwater: None encountered



Project Name Bondfield Crescent	Project No. 40547	Co-ords: - Level: -	Date 19/10/2016
Location: Wombwell		Dimensions: -	Scale 1:25
Client: Gleeson Developments Ltd		Depth 2.40m	Logged By SRI

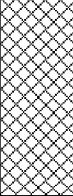



Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
Depth (m)	Type	Results					
0.10	D		0.05			Scrubland over MADE GROUND/TOPSOIL: Dark brown slightly clayey slightly gravelly SAND. Gravel is fine to coarse, angular of brick, sandstone and rare glass and concrete fragments. MADE GROUND: Dark brown slightly clayey gravelly SAND. Gravel is fine to coarse, angular of brick, sandstone, reinforced concrete post, metal and glass.	
0.95	D		0.90			Possible MADE GROUND? Orange/brown clayey slightly gravelly SAND with medium cobble content. Gravel and cobbles are angular of moderately strong coarse grained sandstone. Some clay lumps recovered. (built up embankment off road side)	1
1.50	D		2.00			Yellow moderately strong SANDSTONE recovered as angular coarse grained gravel and cobbles.	2
			2.40			Trialpit Complete at 2.40 m	3
							4

Remarks:

Groundwater: None encountered



Project Name Bondfield Crescent	Project No. 40547	Co-ords: - Level: -	Date 19/10/2016
Location: Wombwell		Dimensions: - Depth 1.75m	Scale 1:25
Client: Gleeson Developments Ltd			Logged By SRI






Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
Depth (m)	Type	Results					
0.20	D					Scrubland over MADE GROUND/TOPSOIL: Dark brown slightly clayey slightly gravelly SAND. Gravel is fine to coarse, angular of brick, sandstone and rare coal fragments.	
0.85	D		0.65 0.80			MADE GROUND: Pink/white sandy GRAVEL. Gravel is fine coarse, angular of limestone (sub-base?)	
						Orange/brown gravelly SAND with medium cobble content. Gravel and cobbles are angular, moderately strong, coarse grained sandstone (weathered sandstone).	1
			1.60 1.75			Yellow moderately strong SANDSTONE recovered as angular coarse grained gravel and cobbles.	
Trialpit Complete at 1.75 m							2
							3
							4

Remarks:

Groundwater: None encountered



Project Name Bondfield Crescent	Project No. 40547	Co-ords: - Level: -	Date 19/10/2016
Location: Wombwell		Dimensions: - Depth 2.00m	Scale 1:25
Client: Gleeson Developments Ltd			Logged By SRI

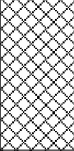




Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.05			0.05			Scrubland over MADE GROUND/TOPSOIL: Dark brown slightly clayey slightly gravelly SAND. Gravel is fine to coarse, angular of sandstone.
0.50	D		0.40			MADE GROUND: Pink/white slightly sandy gravel. Gravel is fine to coarse, angular of limestone (sub-base)
0.80	D		0.70			MADE GROUND: Grey/brown sandy clay with occasional coal fragments
			1.50			Firm yellow/brown sandy gravelly CLAY. Gravel is fine to coarse, angular of sandstone
			2.00			Orange/brown gravelly slightly clayey SAND with medium cobble content. Gravel and cobbles are angular, moderately strong, coarse grained sandstone (weathered sandstone).
Trialpit Complete at 2.00 m						

Remarks: Clay pipe hit at 0.3 m bgl.

Groundwater: None encountered



Project Name Bondfield Crescent	Project No. 40547	Co-ords: - Level: -	Date 19/10/2016
Location: Wombwell		Dimensions: - Depth 2.50m	Scale 1:25
Client: Gleeson Developments Ltd			Logged By SRI


Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
Depth (m)	Type	Results					
0.10	D					Scrubland over MADE GROUND/TOPSOIL: Dark brown gravelly slightly clayey SAND. Gravel is fine to coarse, angular of brick, sandstone and rare ceramics.	
0.60	D		0.50			MADE GROUND: Orange/brown slightly gravelly clayey SAND. Gravel is fine to coarse, angular of sandstone and brick	
0.90	D		0.80			MADE GROUND: Black ashy clayey GRAVEL. Gravel is fine to coarse, angular of mixed lithologies including: coal, ceramic, metal, brick, glass bottles and jars, rare batteries.	1
1.60	D		1.50			MADE GROUND: Grey silty clay with occasional gravel of coal and sandstone	
1.95	D		1.90 2.00			Orange/brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse, angular of sandstone. Orange/brown gravelly SAND with medium cobble content. Gravel and cobbles are angular, moderately strong, coarse grained sandstone (weathered sandstone)	2
			2.50			Trialpit Complete at 2.50 m	3 4

Remarks:

Groundwater: None encountered



Project Name Bondfield Crescent	Project No. 40547	Co-ords: - Level: -	Date 19/10/2016
Location: Wombwell		Dimensions: -	Scale 1:25
Client: Gleeson Developments Ltd		Depth 0.55m	Logged By SRI

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.10	D		0.50 0.55			Scrubland over MADE GROUND/TOPSOIL: Dark brown gravelly slightly clayey SAND. Gravel is fine to coarse, angular of brick, pebbles, sandstone and glass.

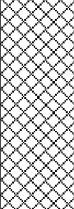


Remarks: No further progression due to encountering a concrete slab.

Groundwater: None encountered



POLEBASE 3.1 (BG 426.46) Standard Trialpit Log '02 dated 27th Nov '03

Project Name Bondfield Crescent	Project No. 40547	Co-ords: - Level: -	Date 19/10/2016
Location: Wombwell		Dimensions: - Depth 1.80m	Scale 1:25
Client: Gleeson Developments Ltd			Logged By SRI

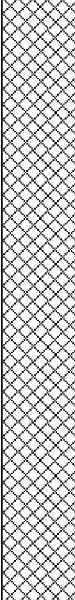
Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
Depth (m)	Type	Results					
1.00	D		0.70			Scrubland over MADE GROUND/TOPSOIL: Dark brown slightly gravelly slightly clayey SAND. Gravel is fine to coarse, angular of sandstone and coal fragments	1
			1.30			Orange/brown gravelly SAND with medium cobble content. Gravel and cobbles are angular, moderately strong, coarse grained sandstone (weathered sandstone).	
			1.80			Yellow moderately strong SANDSTONE recovered as angular coarse grained gravel and cobbles.	
						Trialpit Complete at 1.80 m	2
							3
							4

Remarks:

Groundwater: None encountered



Project Name Bondfield Crescent	Project No. 40547	Co-ords: - Level: -	Date 19/10/2016
Location: Wombwell		Dimensions: - Depth 2.00m	Scale 1:25
Client: Gleeson Developments Ltd			Logged By SRI

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	Results				
0.30	D					MADE GROUND: Dark brown gravelly slightly clayey SAND. Gravel is fine to coarse, angular of brick, glass, sandstone and concrete fragments. 2 x concrete boulders recovered at 0.5 m depth.
1.70	D					
			2.00			Trialpit Complete at 2.00 m

Remarks: Trial pit excavated through bund.

Groundwater:



Appendix 4

Soakaway Test Results

PROJECT:	Bondfield Crescent, Wombwell	Job No. 40547	Date 21.10.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared SRI	Checked KE

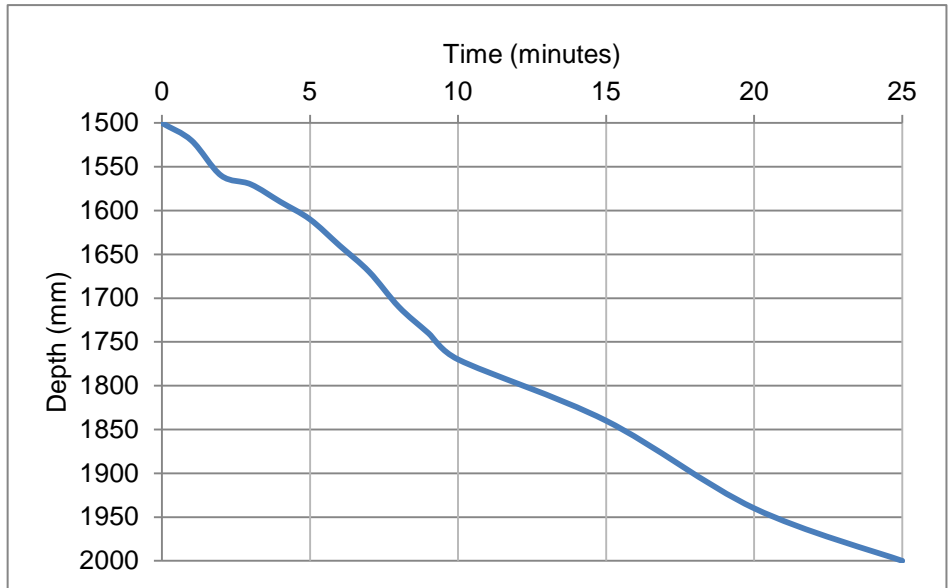
Test No. TP1/SA1 test 1

Test Pit Dimensions

Length = **1500 mm** Plan area = **1.05 m²**
 Width = **700 mm**
 Depth = **2000 mm** (Total depth)

Approximate time to discharge water into the hole: **60 Seconds**
 Depth to water after completion of pumping: **1500 mm**

Time (min)	Depth (mm)
0	1500
1	1520
2	1560
3	1570
4	1590
5	1610
6	1640
7	1670
8	1710
9	1740
10	1770
15	1840
20	1940
25	2000



Test Pit Log

Depth (m)	Description
0.0-0.45	MADE GROUND/TOPSOIL: Brown gravelly sand. Gravel of brick, glass, sandstone
0.45-0.8	MADE GROUND: Grey/brown slightly clayey slightly gravelly sand
0.8-1.0	Orange/brown slightly clayey slightly gravelly sand. Gravel of sandstone
1.0-2.0	Orange/brown gravelly sand with high cobble content. (weathered sandstone)

PROJECT:	Bondfield Crescent, Wombwell	Job No. 40547	Date 21.10.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared SRI	Checked KE

Test No. TP1/SA1 test 1

Soil Infiltration Rate in Accordance with BR365

$$f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

Where:

- V_{p75-25} is the effective storage volume of water in the trial pit between 75% and 25% effective depth;
- a_{p50} is the internal surface area of the trial pit up to 50% effective depth and including the base area
- t_{p75-25} is the time for the water level to fall from 75% to 25% effective depth

Initial parameters

Depth to water = **1500 mm** Average water depth: **250 mm**
 Start time = **0 min**

Change in water depth: **500 mm**

Final parameters

Depth to water = **2000 mm** Time interval: **25 min**
 End time = **25 min**

Effective Storage Volume of Water in the Trial Pit = **0.525 m³**
 75% Effective Depth = **1625 mm** from ground level
 25% Effective Depth = **1875 mm** from ground level
 Time at 75% Effective Depth = **6 minutes**
 Time at 25% Effective Depth = **17 minutes**

V_{p75-25} = **0.26 m³**

a_{p50} = **2.15 m²**

t_{p75-25} = **660 sec**

f = **1.8E-04 m/sec**

Average Soakaway Rate = **3.5E-04 m³/sec**
 Average soakaway area = **2.15 m²** (sides + base)

BR365 Soil Infiltration Rate = 1.8E-04 m/sec
Average Infiltration Rate = 1.6E-04 m/sec

PROJECT:	Bondfield Crescent, Wombwell	Job No. 40547	Date 21.10.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared SRI	Checked KE

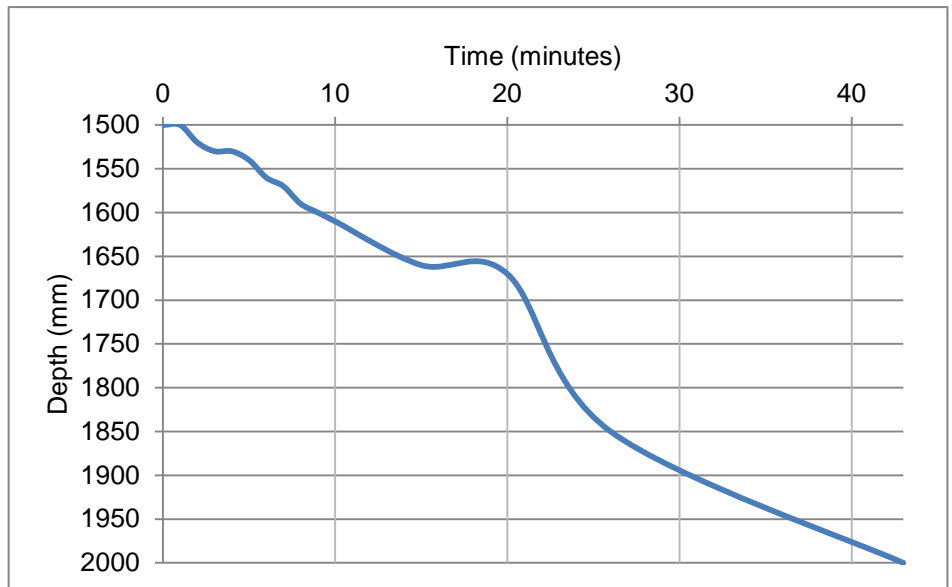
Test No. TP1/SA1 test 2

Test Pit Dimensions

Length = **1500 mm** Plan area = **1.05 m²**
 Width = **700 mm**
 Depth = **2000 mm (Total depth)**

Approximate time to discharge water into the hole: **60 Seconds**
 Depth to water after completion of pumping: **1500 mm**

Time (min)	Depth (mm)
0	1500
1	1500
2	1520
3	1530
4	1530
5	1540
6	1560
7	1570
8	1590
9	1600
10	1610
15	1660
20	1670
26	1850
43	2000



Test Pit Log

Depth (m)	Description
0.0-0.45	MADE GROUND/TOPSOIL: Brown gravelly sand. Gravel of brick, glass, sandstone
0.45-0.8	MADE GROUND: Grey/brown slightly clayey slightly gravelly sand
0.8-1.0	Orange/brown slightly clayey slightly gravelly sand. Gravel of sandstone
1.0-2.0	Orange/brown gravelly sand with high cobble content. (weathered sandstone)

PROJECT:	Bondfield Crescent, Wombwell	Job No. 40547	Date 21.10.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared SRI	Checked KE

Test No. TP1/SA1 test 2

Soil Infiltration Rate in Accordance with BR365

$$f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

Where:

- V_{p75-25} is the effective storage volume of water in the trial pit between 75% and 25% effective depth;
- a_{p50} is the internal surface area of the trial pit up to 50% effective depth and including the base area
- t_{p75-25} is the time for the water level to fall from 75% to 25% effective depth

Initial parameters

Depth to water = **1500 mm** Average water depth: **250 mm**
 Start time = **1 min**

Change in water depth: **500 mm**

Final parameters

Depth to water = **2000 mm** Time interval: **42 min**
 End time = **43 min**

Effective Storage Volume of Water in the Trial Pit = **0.525 m³**
 75% Effective Depth = **1625 mm** from ground level
 25% Effective Depth = **1875 mm** from ground level
 Time at 75% Effective Depth = **11 minutes**
 Time at 25% Effective Depth = **28 minutes**

V_{p75-25} = **0.26 m³**

a_{p50} = **2.15 m²**

t_{p75-25} = **1020 sec**

f = **1.2E-04 m/sec**

Average Soakaway Rate = **2.1E-04 m³/sec**
 Average soakaway area = **2.15 m²** (sides + base)

BR365 Soil Infiltration Rate = 1.2E-04 m/sec
Average Infiltration Rate = 9.7E-05 m/sec

PROJECT:	Bondfield Crescent, Wombwell	Job No. 40547	Date 21.10.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared SRI	Checked KE

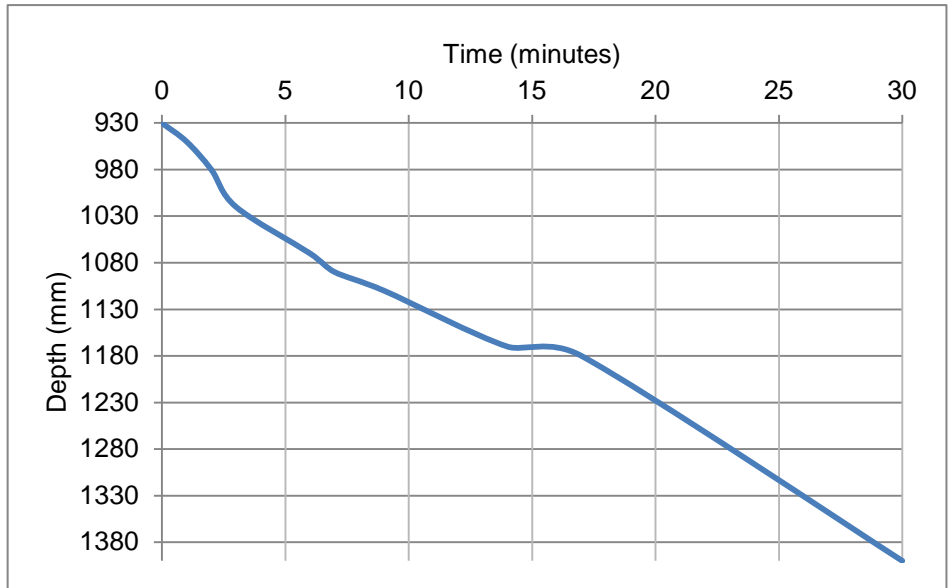
Test No. TP2/SA2 test 1

Test Pit Dimensions

Length = 1800 mm Plan area = 1.35 m²
 Width = 750 mm
 Depth = 1400 mm (Total depth)

Approximate time to discharge water into the hole: 60 Seconds
 Depth to water after completion of pumping: 930 mm

Time (min)	Depth (mm)
0	930
1	950
2	980
3	1020
6	1070
7	1090
9	1110
14	1170
17	1180
30	1400



Test Pit Log

Depth (m)	Description
0.0-0.3	MADE GROUND/TOPSOIL: Brown gravelly sand. Gravel of sandstone, brick, coal
0.3-0.5	MADE GROUND: Macadam
0.5-1.35	Orange/brown gravelly SAND. Gravel and cobbles of sandstone
1.35-1.4	SANDSTONE

PROJECT:	Bondfield Crescent, Wombwell	Job No. 40547	Date 21.10.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared SRI	Checked KE

Test No. TP2/SA2 test 1

Soil Infiltration Rate in Accordance with BR365

$$f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

Where:

- V_{p75-25} is the effective storage volume of water in the trial pit between 75% and 25% effective depth;
- a_{p50} is the internal surface area of the trial pit up to 50% effective depth and including the base area
- t_{p75-25} is the time for the water level to fall from 75% to 25% effective depth

Initial parameters

Depth to water = **930 mm** Average water depth: **235 mm**
 Start time = **0 min**

Change in water depth: **470 mm**

Final parameters

Depth to water = **1400 mm** Time interval: **30 min**
 End time = **30 min**

Effective Storage Volume of Water in the Trial Pit = **0.6345 m³**
 75% Effective Depth = **1048 mm** from ground level
 25% Effective Depth = **1283 mm** from ground level
 Time at 75% Effective Depth = **4 minutes**
 Time at 25% Effective Depth = **23 minutes**

V_{p75-25} = **0.32 m³**

a_{p50} = **2.55 m²**

t_{p75-25} = **1140 sec**

f = **1.1E-04 m/sec**

Average Soakaway Rate = **3.5E-04 m³/sec**
 Average soakaway area = **2.55 m²** (sides + base)

BR365 Soil Infiltration Rate = 1.1E-04 m/sec
Average Infiltration Rate = 1.4E-04 m/sec

PROJECT:	Bondfield Crescent, Wombwell	Job No. 40547	Date 26.10.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared ET	Checked KE

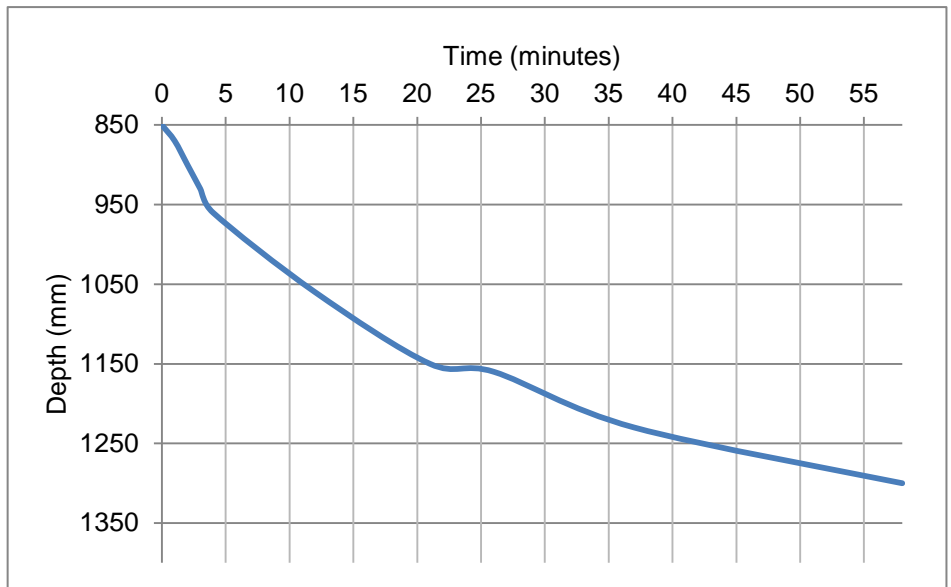
Test No. TP2/SA2 test 2

Test Pit Dimensions

Length = **1800 mm** Plan area = **1.35 m²**
 Width = **750 mm**
 Depth = **1300 mm** (Total depth)

Approximate time to discharge water into the hole: **60 Seconds**
 Depth to water after completion of pumping: **850 mm**

Time (min)	Depth (mm)
0	850
1	870
2	900
3	930
4	960
12	1060
21	1150
26	1160
37	1230
58	1300



Test Pit Log

Depth (m)	Description
0.0-0.3	MADE GROUND/TOPSOIL: Brown gravelly sand. Gravel of sandstone, brick, coal
0.3-0.5	MADE GROUND: Macadam
0.5-1.35	Orange/brown gravelly SAND. Gravel and cobbles of sandstone
1.35-1.4	SANDSTONE

PROJECT:	Bondfield Crescent, Wombwell	Job No. 40547	Date 26.10.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared ET	Checked KE

Test No. TP2/SA2 test 2

Soil Infiltration Rate in Accordance with BR365

$$f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

Where:

- V_{p75-25} is the effective storage volume of water in the trial pit between 75% and 25% effective depth;
- a_{p50} is the internal surface area of the trial pit up to 50% effective depth and including the base area
- t_{p75-25} is the time for the water level to fall from 75% to 25% effective depth

Initial parameters

Depth to water = **960 mm** Average water depth: **170 mm**
 Start time = **4 min**

Change in water depth: **340 mm**

Final parameters

Depth to water = **1300 mm** Time interval: **54 min**
 End time = **58 min**

Effective Storage Volume of Water in the Trial Pit = **0.6075 m³**
 75% Effective Depth = **963 mm** from ground level
 25% Effective Depth = **1188 mm** from ground level
 Time at 75% Effective Depth = **4 minutes**
 Time at 25% Effective Depth = **28 minutes**

V_{p75-25} = **0.30 m³**

a_{p50} = **2.50 m²**

t_{p75-25} = **1426 sec**

f = **8.5E-05 m/sec**

Average Soakaway Rate = **1.4E-04 m³/sec**
 Average soakaway area = **2.22 m² (sides + base)**

BR365 Soil Infiltration Rate = 8.5E-05 m/sec
Average Infiltration Rate = 6.4E-05 m/sec

PROJECT:	Bondfield Crescent, Wombwell	Job No. 40547	Date 26.10.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared ET	Checked KE

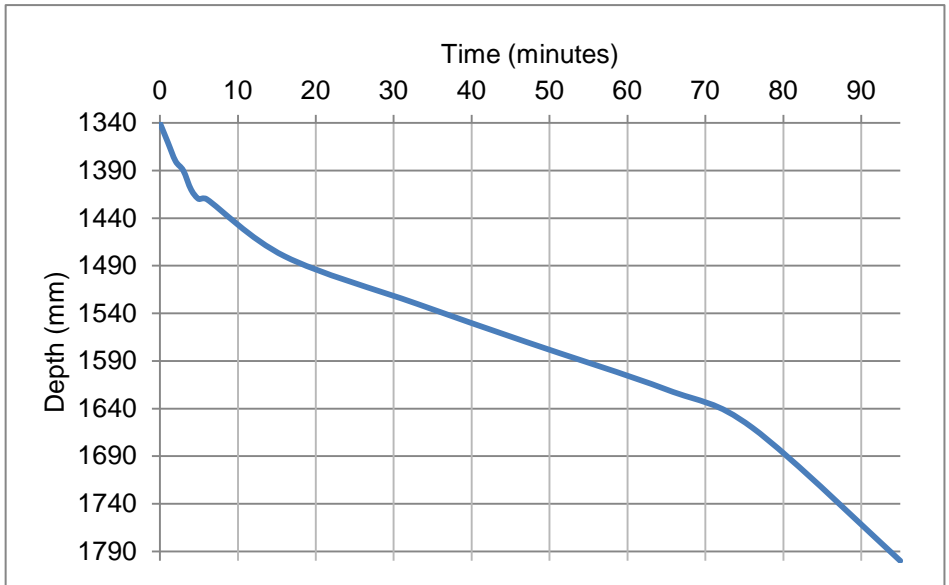
Test No. TP7/SA3 test 1

Test Pit Dimensions

Length = 1700 mm Plan area = 1.275 m²
 Width = 750 mm
 Depth = 1800 mm (Total depth)

Approximate time to discharge water into the hole: 60 Seconds
 Depth to water after completion of pumping: 1340 mm

Time (min)	Depth (mm)
0	1340
1	1360
2	1380
3	1390
4	1410
5	1420
6	1420
16	1480
33	1530
47	1570
65	1620
76	1660
95	1800



Test Pit Log

Depth (m)	Description
0.0-0.7	Scrubland over MADE GROUND/TOPSOIL: Dark brown gravelly slightly clayey SAND
0.7-1.7	MADE GROUND: Pink/White slightly sandy GRAVEL. Gravel is medium-coarse of limestone
1.7-1.8	SANDSTONE recovered as angular, strong, coarse grained gravel and cobbles.

PROJECT:	Bondfield Crescent, Wombwell	Job No. 40547	Date 26.10.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared ET	Checked KE

Test No. TP7/SA3 test 1

Soil Infiltration Rate in Accordance with BR365

$$f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

Where:

- V_{p75-25} is the effective storage volume of water in the trial pit between 75% and 25% effective depth;
- a_{p50} is the internal surface area of the trial pit up to 50% effective depth and including the base area
- t_{p75-25} is the time for the water level to fall from 75% to 25% effective depth

Initial parameters

Depth to water = **1420 mm** Average water depth: **190 mm**
 Start time = **6 min**

Change in water depth: **380 mm**

Final parameters

Depth to water = **1800 mm** Time interval: **89 min**
 End time = **95 min**

Effective Storage Volume of Water in the Trial Pit = **0.5865 m³**
 75% Effective Depth = **1455 mm** from ground level
 25% Effective Depth = **1685 mm** from ground level
 Time at 75% Effective Depth = **12 minutes**
 Time at 25% Effective Depth = **79 minutes**

V_{p75-25} = **0.29 m³**

a_{p50} = **2.40 m²**

t_{p75-25} = **4020 sec**

f = **3.0E-05 m/sec**

Average Soakaway Rate = **9.1E-05 m³/sec**
 Average soakaway area = **2.21 m²** (sides + base)

BR365 Soil Infiltration Rate = 3.0E-05 m/sec
Average Infiltration Rate = 4.1E-05 m/sec

PROJECT:	Bondfield Crescent, Wombwell	Job No. 40547	Date 21.10.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared SRI	Checked KE

Test No. TP12/SA4 test 1

Test Pit Dimensions

Length = 1700 mm Plan area = 1.19 m²

Width = 700 mm

Depth = 2400 mm (Total depth)

Approximate time to discharge water into the hole:

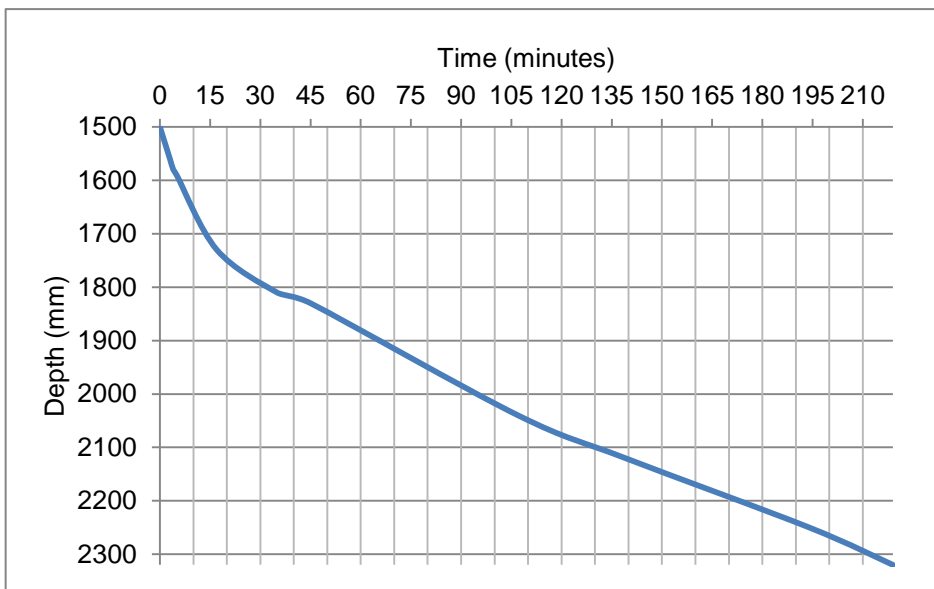
30 Seconds

Depth to water after completion of pumping:

1500 mm

Time (min) Depth (mm)

0	1500
1	1520
2	1540
3	1560
4	1580
5	1590
17	1730
35	1810
45	1830
107	2040
139	2120
194	2250
219	2320



Test Pit Log

Depth (m)

Description

0.0-0.05	Scrubland over MADE GROUND/TOPSOIL: Dark brown slightly clayey slightly gravelly SAND.
0.05-0.9	MADE GROUND: Dark brown slightly clayey gravelly SAND
0.9-2.0	MADE GROUND? Orange/brown clayey slightly gravelly SAND with medium cobble content.
2.0-2.4	SANDSTONE recovered as angular, strong, coarse grained gravel and cobbles

PROJECT:	Bondfield Crescent, Wombwell	Job No. 40547	Date 21.10.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared ET	Checked KE

Test No. TP12/SA4 test 1

Soil Infiltration Rate in Accordance with BR365

$$f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

Where:

- V_{p75-25} is the effective storage volume of water in the trial pit between 75% and 25% effective depth;
- a_{p50} is the internal surface area of the trial pit up to 50% effective depth and including the base area
- t_{p75-25} is the time for the water level to fall from 75% to 25% effective depth

Initial parameters

Depth to water = **1730 mm** Average water depth: **375 mm**
 Start time = **17 min**

Change in water depth: **590 mm**

Final parameters

Depth to water = **2320 mm** Time interval: **202 min**
 End time = **219 min**

Effective Storage Volume of Water in the Trial Pit = **1.071 m³**
 75% Effective Depth = **1725 mm** from ground level
 25% Effective Depth = **2175 mm** from ground level
 Time at 75% Effective Depth = **15 minutes**
 Time at 25% Effective Depth = **160 minutes**

V_{p75-25} = **0.54 m³**

a_{p50} = **3.35 m²**

t_{p75-25} = **8700 sec**

f = **1.8E-05 m/sec**

Average Soakaway Rate = **5.8E-05 m³/sec**
 Average soakaway area = **2.99 m²** (sides + base)

BR365 Soil Infiltration Rate = 1.8E-05 m/sec
Average Infiltration Rate = 1.9E-05 m/sec

PROJECT:	Bondfield Crescent, Wombwell	Job No. 40547	Date 26.10.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared ET	Checked KE

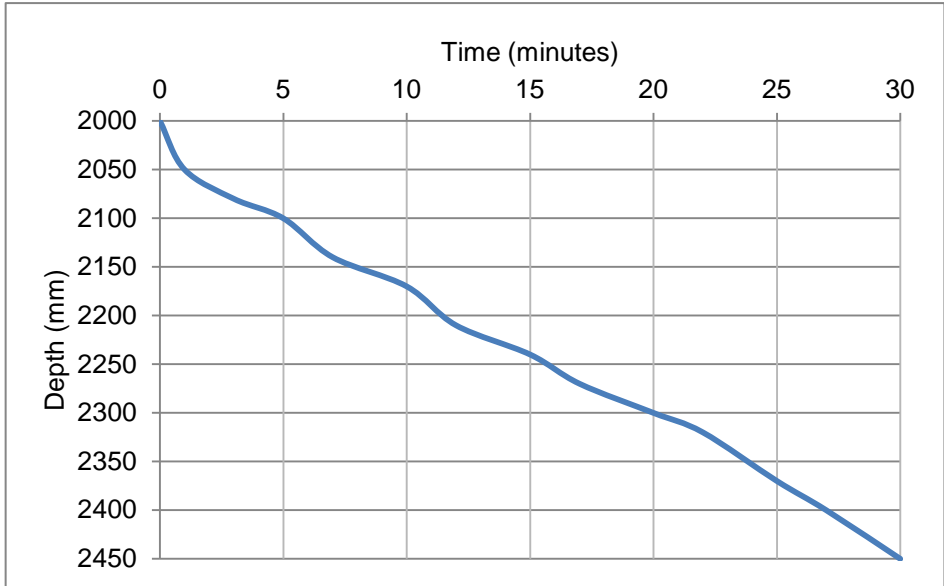
Test No. TP15/SA5 test 1

Test Pit Dimensions

Length = **600 mm** Plan area = **1.02 m²**
 Width = **1700 mm**
 Depth = **2500 mm (Total depth)**

Approximate time to discharge water into the hole: **120 Seconds**
 Depth to water after completion of pumping: **2000 mm**

Time (min)	Depth (mm)
0	2000
1	2050
3	2080
5	2100
7	2140
10	2170
12	2210
15	2240
17	2270
20	2300
22	2320
25	2370
27	2400
30	2450



***Pit silted up slightly during monitoring**

Test Pit Log

Depth (m)	Description
0.0-0.5	Scrubland over MADE GROUND/TOPSOIL: Dark brown gravelly slightly clayey SAND
0.5-0.8	MADE GROUND: Orange/brown slightly gravelly clayey SAND
0.8-1.5	MADE GROUND: Black ashy clayey GRAVEL
1.5-1.9	MADE GROUND: Grey silty clay with occasional gravel of coal and sandstone
1.9-2.0	Orange/brown slightly sandy slightly gravelly CLAY.
2.0-2.5	Orange/brown gravelly SAND with medium cobble content

PROJECT:	Bondfield Crescent, Wombwell	Job No. 40547	Date 26.10.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared ET	Checked KE

Test No. TP15/SA5 test 1

Soil Infiltration Rate in Accordance with BR365

$$f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

Where:

- V_{p75-25} is the effective storage volume of water in the trial pit between 75% and 25% effective depth;
- a_{p50} is the internal surface area of the trial pit up to 50% effective depth and including the base area
- t_{p75-25} is the time for the water level to fall from 75% to 25% effective depth

Initial parameters

Depth to water = **2050 mm** Average water depth: **250 mm**
 Start time = **1 min**

Change in water depth: **400 mm**

Final parameters

Depth to water = **2450 mm** Time interval: **29 min**
 End time = **30 min**

Effective Storage Volume of Water in the Trial Pit = **0.51 m³**
 75% Effective Depth = **2125 mm** from ground level
 25% Effective Depth = **2375 mm** from ground level
 Time at 75% Effective Depth = **6 minutes**
 Time at 25% Effective Depth = **25 minutes**

V_{p75-25} = **0.26 m³**

a_{p50} = **2.17 m²**

t_{p75-25} = **1140 sec**

f = **1.0E-04 m/sec**

Average Soakaway Rate = **2.3E-04 m³/sec**
 Average soakaway area = **2.17 m²** (sides + base)

BR365 Soil Infiltration Rate = 1.0E-04 m/sec
Average Infiltration Rate = 1.1E-04 m/sec

PROJECT:	Bondfield Crescent, Wombwell	Job No. 40547	Date 26.10.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared ET	Checked KE

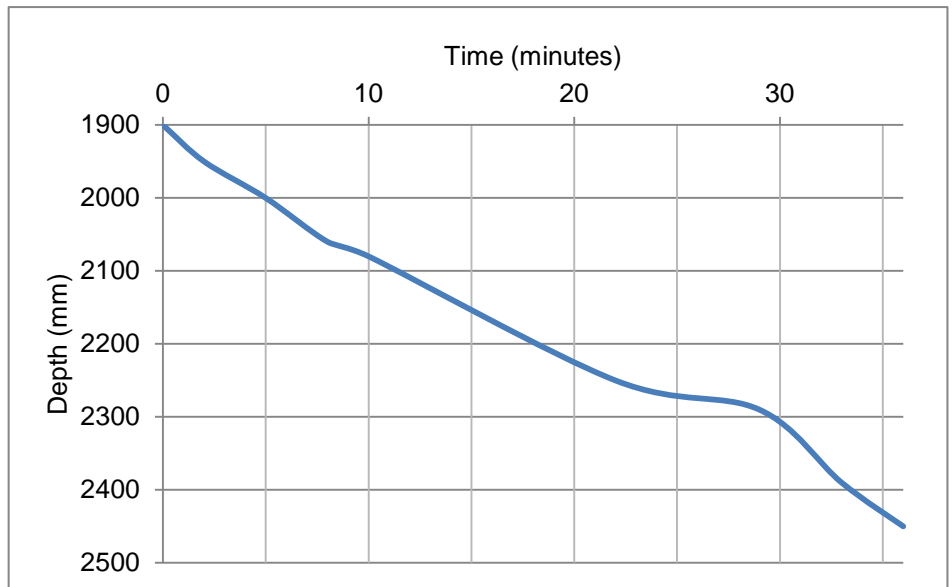
Test No. TP15/SA5 test 2

Test Pit Dimensions

Length = **600 mm** Plan area = **1.02 m²**
 Width = **1700 mm**
 Depth = **2450 mm (Total depth)**

Approximate time to discharge water into the hole: **180 Seconds**
 Depth to water after completion of pumping: **1900 mm**

Time (min)	Depth (mm)
0	1900
2	1950
5	2000
8	2060
10	2080
22	2250
29	2290
33	2390
36	2450



Test Pit Log

Depth (m)	Description
0.0-0.5	Scrubland over MADE GROUND/TOPSOIL: Dark brown gravelly slightly clayey SAND
0.5-0.8	MADE GROUND: Orange/brown slightly gravelly clayey SAND
0.8-1.5	MADE GROUND: Black ashy clayey GRAVEL
1.5-1.9	MADE GROUND: Grey silty clay with occasional gravel of coal and sandstone
1.9-2.0	Orange/brown slightly sandy slightly gravelly CLAY.
2.0-2.5	Orange/brown gravelly SAND with medium cobble content

PROJECT:	Bondfield Crescent, Wombwell	Job No. 40547	Date 26.10.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared ET	Checked KE

Test No. TP15/SA5 test 2

Soil Infiltration Rate in Accordance with BR365

$$f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

Where: V_{p75-25} is the effective storage volume of water in the trial pit between 75% and 25% effective depth;

a_{p50} is the internal surface area of the trial pit up to 50% effective depth and including the base area

t_{p75-25} is the time for the water level to fall from 75% to 25% effective depth

Initial parameters

Depth to water = **1900 mm** Average water depth: **275 mm**
 Start time = **0 min**

Change in water depth: **550 mm**

Final parameters

Depth to water = **2450 mm** Time interval: **36 min**
 End time = **36 min**

Effective Storage Volume of Water in the Trial Pit = **0.561 m³**
 75% Effective Depth = **2038 mm** from ground level
 25% Effective Depth = **2313 mm** from ground level
 Time at 75% Effective Depth = **7 minutes**
 Time at 25% Effective Depth = **31 minutes**

V_{p75-25} = **0.28 m³**

a_{p50} = **2.29 m²**

t_{p75-25} = **1440 sec**

f = **8.5E-05 m/sec**

Average Soakaway Rate = **2.6E-04 m³/sec**
 Average soakaway area = **2.29 m²** (sides + base)

BR365 Soil Infiltration Rate = 8.5E-05 m/sec
Average Infiltration Rate = 1.1E-04 m/sec

PROJECT:	Bondfield Crescent, Wombwell	Job No. 40547	Date 26.10.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared ET	Checked KE

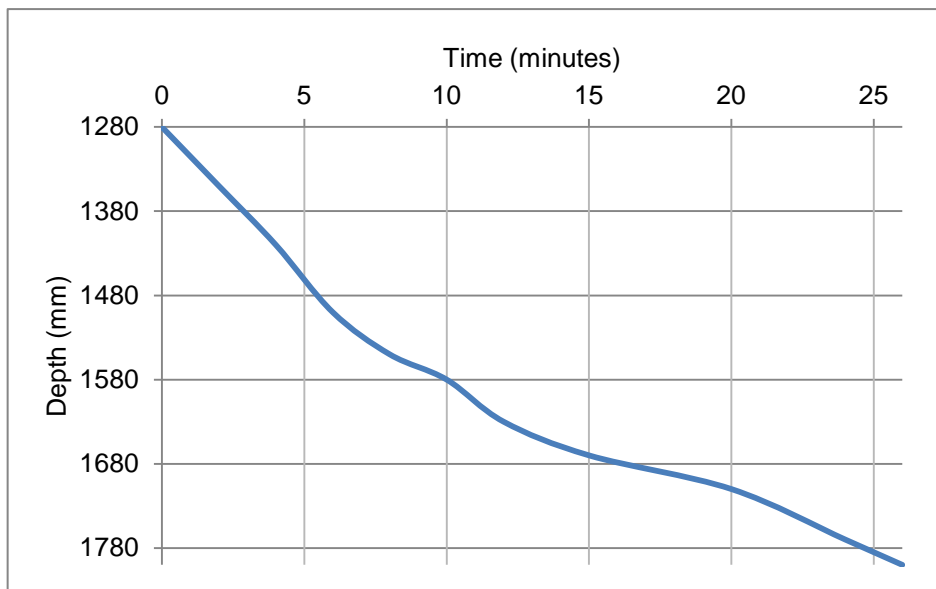
Test No. TP17/SA6 test 1

Test Pit Dimensions

Length = 1500 mm Plan area = 1.05 m²
Width = 700 mm
Depth = 1800 mm (Total depth)

Approximate time to discharge water into the hole: **90 Seconds**
Depth to water after completion of pumping: **1280 mm**

Time (min)	Depth (mm)
0	1280
2	1350
4	1420
6	1500
8	1550
10	1580
12	1630
15	1670
20	1710
24	1770
26	1800



Test Pit Log

Depth (m)	Description
0.0-0.7	MADE GROUND/TOPSOIL: Dark brown slightly gravelly slightly clayey SAND
0.7-1.3	Orange/brown gravelly SAND with medium cobble content.
1.3-1.8	SANDSTONE recovered as angular, strong, coarse grained gravel and cobbles.

PROJECT:	Bondfield Crescent, Wombwell	Job No. 40547	Date 26.10.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared ET	Checked KE

Test No. TP17/SA6 test 1

Soil Infiltration Rate in Accordance with BR365

$$f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

Where:

- V_{p75-25} is the effective storage volume of water in the trial pit between 75% and 25% effective depth;
- a_{p50} is the internal surface area of the trial pit up to 50% effective depth and including the base area
- t_{p75-25} is the time for the water level to fall from 75% to 25% effective depth

Initial parameters

Depth to water = **1280 mm** Average water depth: **260 mm**
 Start time = **0 min**

Change in water depth: **520 mm**

Final parameters

Depth to water = **1800 mm** Time interval: **26 min**
 End time = **26 min**

Effective Storage Volume of Water in the Trial Pit = **0.546 m³**
 75% Effective Depth = **1410 mm** from ground level
 25% Effective Depth = **1670 mm** from ground level
 Time at 75% Effective Depth = **4 minutes**
 Time at 25% Effective Depth = **15 minutes**

V_{p75-25} = **0.27 m³**

a_{p50} = **2.19 m²**

t_{p75-25} = **660 sec**

f = **1.9E-04 m/sec**

Average Soakaway Rate = **3.5E-04 m³/sec**
 Average soakaway area = **2.19 m²** (sides + base)

BR365 Soil Infiltration Rate = 1.9E-04 m/sec
Average Infiltration Rate = 1.6E-04 m/sec

PROJECT:	Bondfield Crescent, Wombwell	Job No. 40547	Date 26.10.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared ET	Checked KE

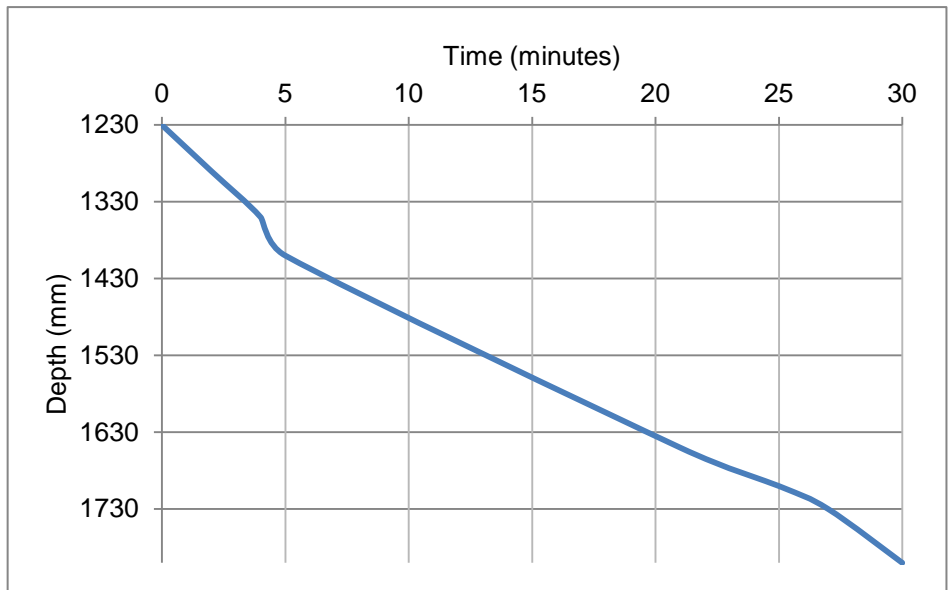
Test No. TP17/SA6 test 2

Test Pit Dimensions

Length = **1500** mm Plan area = **1.05** m²
Width = **700** mm
Depth = **1800** mm (Total depth)

Approximate time to discharge water into the hole: **60** Seconds
Depth to water after completion of pumping: **1230** mm

Time (min)	Depth (mm)
0	1230
2	1290
4	1350
5	1400
21	1650
25	1700
27	1730
30	1800



Test Pit Log

Depth (m)	Description
0.0-0.7	MADE GROUND/TOPSOIL: Dark brown slightly gravelly slightly clayey SAND
0.7-1.3	Orange/brown gravelly SAND with medium cobble content.
1.3-1.8	SANDSTONE recovered as angular, strong, coarse grained gravel and cobbles.

PROJECT:	Bondfield Crescent, Wombwell	Job No. 40547	Date 26.10.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared ET	Checked KE

Test No. TP17/SA6 test 2

Soil Infiltration Rate in Accordance with BR365

$$f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

Where:

- V_{p75-25} is the effective storage volume of water in the trial pit between 75% and 25% effective depth;
- a_{p50} is the internal surface area of the trial pit up to 50% effective depth and including the base area
- t_{p75-25} is the time for the water level to fall from 75% to 25% effective depth

Initial parameters

Depth to water = **1230 mm** Average water depth: **285 mm**
 Start time = **0 min**

Change in water depth: **570 mm**

Final parameters

Depth to water = **1800 mm** Time interval: **30 min**
 End time = **30 min**

Effective Storage Volume of Water in the Trial Pit = **0.5985 m³**
 75% Effective Depth = **1373 mm** from ground level
 25% Effective Depth = **1658 mm** from ground level
 Time at 75% Effective Depth = **4 minutes**
 Time at 25% Effective Depth = **22 minutes**

V_{p75-25} = **0.30 m³**

a_{p50} = **2.30 m²**

t_{p75-25} = **1080 sec**

f = **1.2E-04 m/sec**

Average Soakaway Rate = **3.3E-04 m³/sec**
 Average soakaway area = **2.30 m² (sides + base)**

BR365 Soil Infiltration Rate = 1.2E-04 m/sec
Average Infiltration Rate = 1.4E-04 m/sec

PROJECT:	Bondfield Crescent, Wombwell	Job No. 40547	Date 26.10.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared ET	Checked KE

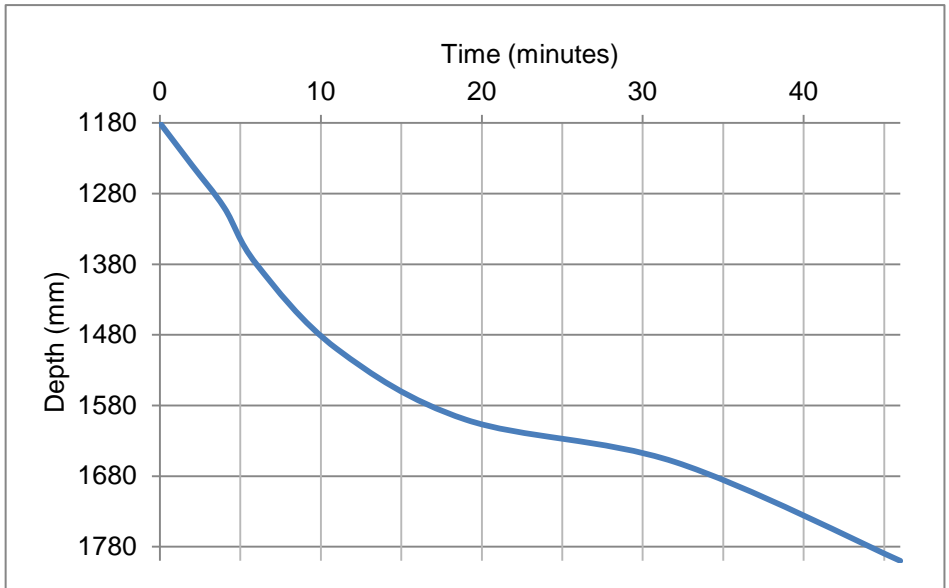
Test No. TP17/SA6 test 3

Test Pit Dimensions

Length = **1500** mm Plan area = **1.05** m²
 Width = **700** mm
 Depth = **1800** mm (Total depth)

Approximate time to discharge water into the hole: **60** Seconds
 Depth to water after completion of pumping: **1180** mm

Time (min)	Depth (mm)
0	1180
2	1240
4	1300
6	1380
11	1500
19	1600
32	1660
46	1800



Test Pit Log

Depth (m)	Description
0.0-0.7	MADE GROUND/TOPSOIL: Dark brown slightly gravelly slightly clayey SAND
0.7-1.3	Orange/brown gravelly SAND with medium cobble content.
1.3-1.8	SANDSTONE recovered as angular, strong, coarse grained gravel and cobbles.

PROJECT:	Bondfield Crescent, Wombwell	Job No. 40547	Date 26.10.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared ET	Checked KE

Test No. TP17/SA6 test 3

Soil Infiltration Rate in Accordance with BR365

$$f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

Where: V_{p75-25} is the effective storage volume of water in the trial pit between 75% and 25% effective depth;

a_{p50} is the internal surface area of the trial pit up to 50% effective depth and including the base area

t_{p75-25} is the time for the water level to fall from 75% to 25% effective depth

Initial parameters

Depth to water = **1380 mm** Average water depth: **210 mm**
 Start time = **6 min**

Change in water depth: **420 mm**

Final parameters

Depth to water = **1800 mm** Time interval: **40 min**
 End time = **46 min**

Effective Storage Volume of Water in the Trial Pit = **0.651 m³**
 75% Effective Depth = **1335 mm** from ground level
 25% Effective Depth = **1645 mm** from ground level
 Time at 75% Effective Depth = **5 minutes**
 Time at 25% Effective Depth = **25 minutes**

V_{p75-25} = **0.33 m³**

a_{p50} = **2.41 m²**

t_{p75-25} = **1200 sec**

f = **1.1E-04 m/sec**

Average Soakaway Rate = **1.8E-04 m³/sec**
 Average soakaway area = **1.97 m²** (sides + base)

BR365 Soil Infiltration Rate = 1.1E-04 m/sec
Average Infiltration Rate = 9.3E-05 m/sec

PROJECT:	Bondfield Crescent, Wombwell	Job No. 40547	Date 26.10.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared ET	Checked KE

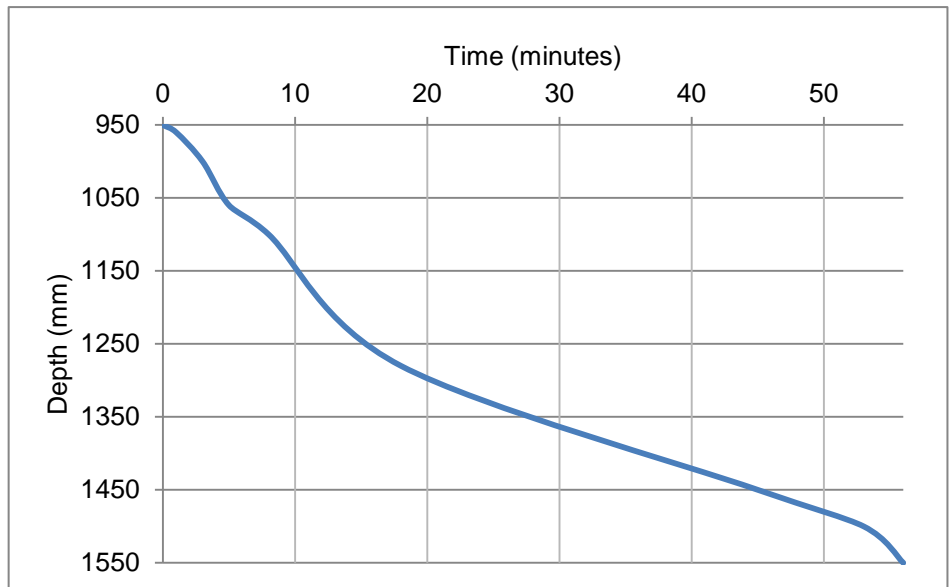
Test No. TP10/SA7 test 1

Test Pit Dimensions

Length = 1500 mm Plan area = 1.05 m²
 Width = 700 mm
 Depth = 1550 mm (Total depth)

Approximate time to discharge water into the hole: 45 Seconds
 Depth to water after completion of pumping: 1550 mm

Time (min)	Depth (mm)
0	950
1	960
3	1000
5	1060
8	1100
18	1280
45	1450
53	1500
56	1550



Test Pit Log

Depth (m)	Description
0.0-0.1	Scrubland over MADE GROUND/TOPSOIL: Dark brown slightly gravelly SAND.
0.1-0.3	MADE GROUND: Yellow/brown gravelly SAND
0.3-0.75	Orange/brown gravelly SAND with medium cobble content
0.75-1.55	SANDSTONE recovered as angular, strong, coarse grained gravel and cobbles

PROJECT:	Bondfield Crescent, Wombwell	Job No. 40547	Date 26.10.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared ET	Checked KE

Test No. TP10/SA7 test 1

Soil Infiltration Rate in Accordance with BR365

$$f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

Where:

- V_{p75-25} is the effective storage volume of water in the trial pit between 75% and 25% effective depth;
- a_{p50} is the internal surface area of the trial pit up to 50% effective depth and including the base area
- t_{p75-25} is the time for the water level to fall from 75% to 25% effective depth

Initial parameters

Depth to water = **950 mm** Average water depth: **300 mm**
 Start time = **0 min**

Change in water depth: **600 mm**

Final parameters

Depth to water = **1550 mm** Time interval: **56 min**
 End time = **56 min**

Effective Storage Volume of Water in the Trial Pit = **0.63 m³**
 75% Effective Depth = **1100 mm** from ground level
 25% Effective Depth = **1400 mm** from ground level
 Time at 75% Effective Depth = **8 minutes**
 Time at 25% Effective Depth = **34 minutes**

V_{p75-25} = **0.32 m³**

a_{p50} = **2.37 m²**

t_{p75-25} = **1560 sec**

f = **8.5E-05 m/sec**

Average Soakaway Rate = **1.9E-04 m³/sec**
 Average soakaway area = **2.37 m²** (sides + base)

BR365 Soil Infiltration Rate = 8.5E-05 m/sec
Average Infiltration Rate = 7.9E-05 m/sec

PROJECT:	Bondfield Crescent, Wombwell	Job No. 40547	Date 26.10.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared ET	Checked KE

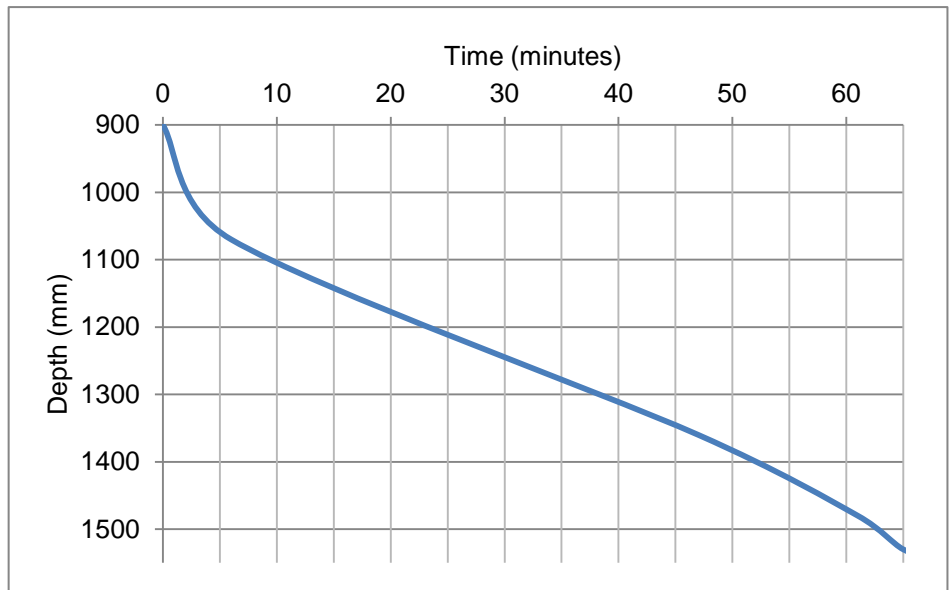
Test No. TP10/SA7 test 2

Test Pit Dimensions

Length = **1500** mm Plan area = **1.05** m²
 Width = **700** mm
 Depth = **1550** mm (Total depth)

Approximate time to discharge water into the hole: **45** Seconds
 Depth to water after completion of pumping: **900** mm

Time (min)	Depth (mm)
0	900
6	1070
47	1360
61	1480
65	1530
69	1550



Test Pit Log

Depth (m)	Description
0.0-0.1	Scrubland over MADE GROUND/TOPSOIL: Dark brown slightly gravelly SAND.
0.1-0.3	MADE GROUND: Yellow/brown gravelly SAND
0.3-0.75	Orange/brown gravelly SAND with medium cobble content
0.75-1.55	SANDSTONE recovered as angular, strong, coarse grained gravel and cobbles

PROJECT:	Bondfield Crescent, Wombwell	Job No. 40547	Date 26.10.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared ET	Checked KE

Test No. TP10/SA7 test 2

Soil Infiltration Rate in Accordance with BR365

$$f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

Where:

- V_{p75-25} is the effective storage volume of water in the trial pit between 75% and 25% effective depth;
- a_{p50} is the internal surface area of the trial pit up to 50% effective depth and including the base area
- t_{p75-25} is the time for the water level to fall from 75% to 25% effective depth

Initial parameters

Depth to water = **1070 mm** Average water depth: **240 mm**
 Start time = **6 min**

Change in water depth: **480 mm**

Final parameters

Depth to water = **1550 mm** Time interval: **63 min**
 End time = **69 min**

Effective Storage Volume of Water in the Trial Pit = **0.6825 m³**
 75% Effective Depth = **1063 mm** from ground level
 25% Effective Depth = **1388 mm** from ground level
 Time at 75% Effective Depth = **6 minutes**
 Time at 25% Effective Depth = **51 minutes**

V_{p75-25} = **0.34 m³**

a_{p50} = **2.48 m²**

t_{p75-25} = **2700 sec**

f = **5.1E-05 m/sec**

Average Soakaway Rate = **1.3E-04 m³/sec**
 Average soakaway area = **2.11 m²** (sides + base)

BR365 Soil Infiltration Rate = 5.1E-05 m/sec
Average Infiltration Rate = 6.3E-05 m/sec

PROJECT:	Bondfield Crescent, Wombwell	Job No. 40547	Date 26.10.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared ET	Checked KE

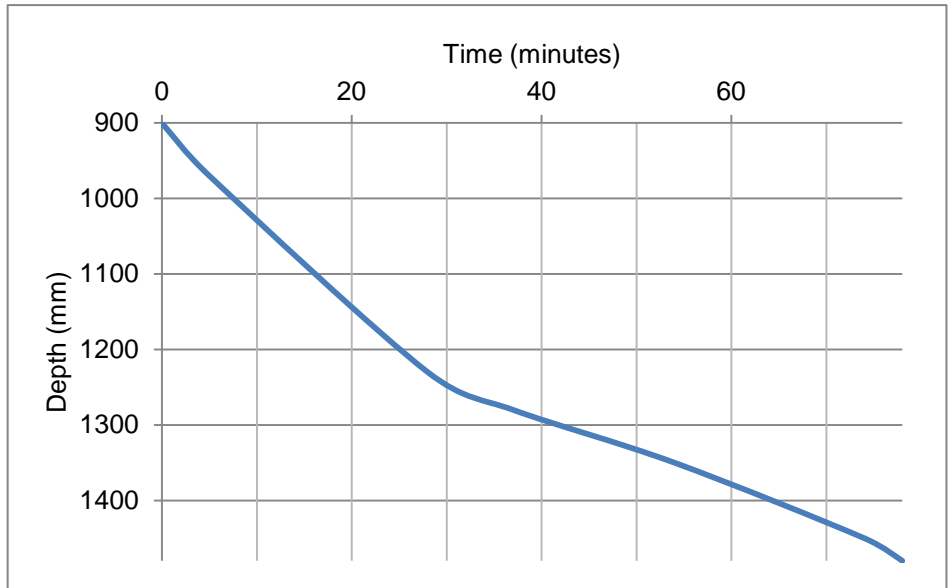
Test No. TP10/SA7 test 3

Test Pit Dimensions

Length = 1500 mm Plan area = 1.05 m²
 Width = 700 mm
 Depth = 1500 mm (Total depth)

Approximate time to discharge water into the hole: 60 Seconds
 Depth to water after completion of pumping: 900 mm

Time (min)	Depth (mm)
0	900
5	970
28	1230
37	1280
54	1350
74	1450
78	1480



*Pit silted up slightly during monitoring

Test Pit Log

Depth (m)	Description
0.0-0.1	Scrubland over MADE GROUND/TOPSOIL: Dark brown slightly gravelly SAND.
0.1-0.3	MADE GROUND: Yellow/brown gravelly SAND
0.3-0.75	Orange/brown gravelly SAND with medium cobble content
0.75-1.55	SANDSTONE recovered as angular, strong, coarse grained gravel and cobbles

PROJECT:	Bondfield Crescent, Wombwell	Job No. 40547	Date 26.10.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared ET	Checked KE

Test No. TP10/SA7 test 3

Soil Infiltration Rate in Accordance with BR365

$$f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

Where:

- V_{p75-25} is the effective storage volume of water in the trial pit between 75% and 25% effective depth;
- a_{p50} is the internal surface area of the trial pit up to 50% effective depth and including the base area
- t_{p75-25} is the time for the water level to fall from 75% to 25% effective depth

Initial parameters

Depth to water = **900 mm** Average water depth: **310 mm**
 Start time = **0 min**

Change in water depth: **580 mm**

Final parameters

Depth to water = **1480 mm** Time interval: **78 min**
 End time = **78 min**

Effective Storage Volume of Water in the Trial Pit = **0.63 m³**
 75% Effective Depth = **1050 mm** from ground level
 25% Effective Depth = **1350 mm** from ground level
 Time at 75% Effective Depth = **13 minutes**
 Time at 25% Effective Depth = **54 minutes**

V_{p75-25} = **0.32 m³**

a_{p50} = **2.37 m²**

t_{p75-25} = **2460 sec**

f = **5.4E-05 m/sec**

Average Soakaway Rate = **1.3E-04 m³/sec**
 Average soakaway area = **2.41 m²** (sides + base)

BR365 Soil Infiltration Rate = 5.4E-05 m/sec
Average Infiltration Rate = 5.4E-05 m/sec

PROJECT:	Bondfield Crescent, Wombwell	Job No. 40547	Date 26.10.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared ET	Checked KE

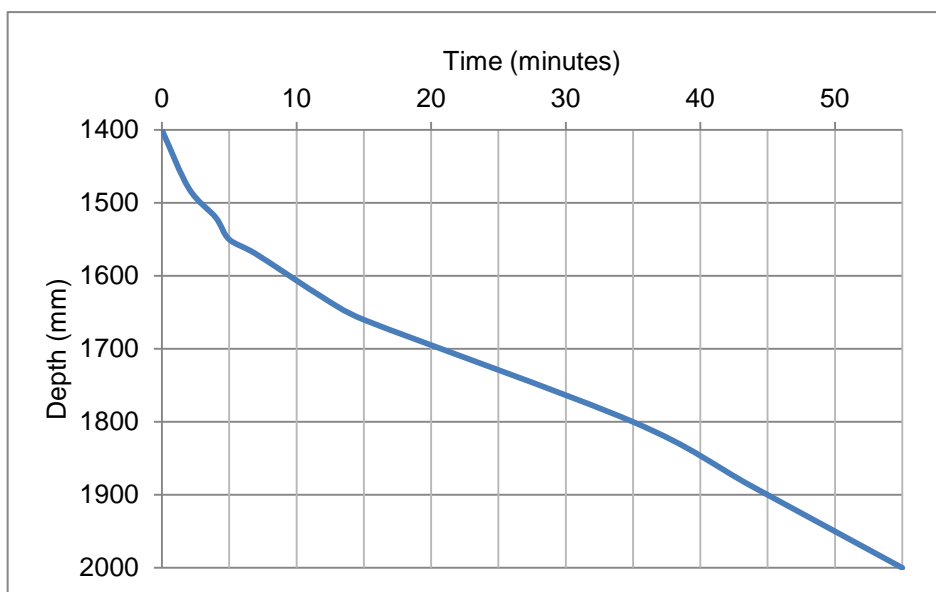
Test No. TP14/SA8 test 1

Test Pit Dimensions

Length = 1300 mm Plan area = 0.845 m²
 Width = 650 mm
 Depth = 2000 mm (Total depth)

Approximate time to discharge water into the hole: 60 Seconds
 Depth to water after completion of pumping: 1400 mm

Time (min)	Depth (mm)
0	1400
2	1480
4	1520
5	1550
7	1570
12	1630
15	1660
35	1800
44	1890
55	2000



Test Pit Log

Depth (m)	Description
0.0-0.05	MADE GROUND/TOPSOIL: Dark brown slightly clayey slightly gravelly SAND
0.05-0.4	MADE GROUND: Pink/white slightly sandy gravel.
0.4-0.7	MADE GROUND: Grey/brown sandy clay with occasional coal fragments
0.7-1.5	Yellow/brown sandy gravelly clay. Gravel is fine to coarse, angular of sandstone
1.5-2.0	Orange/brown gravelly slightly clayey SAND with medium cobble content

PROJECT:	Bondfield Crescent, Wombwell	Job No. 40547	Date 26.10.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared ET	Checked KE

Test No. TP14/SA8 test 1

Soil Infiltration Rate in Accordance with BR365

$$f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

Where:

- V_{p75-25} is the effective storage volume of water in the trial pit between 75% and 25% effective depth;
- a_{p50} is the internal surface area of the trial pit up to 50% effective depth and including the base area
- t_{p75-25} is the time for the water level to fall from 75% to 25% effective depth

Initial parameters

Depth to water = **1550 mm** Average water depth: **225 mm**
 Start time = **5 min**

Change in water depth: **450 mm**

Final parameters

Depth to water = **2000 mm** Time interval: **50 min**
 End time = **55 min**

Effective Storage Volume of Water in the Trial Pit = **0.507 m³**
 75% Effective Depth = **1550 mm** from ground level
 25% Effective Depth = **1850 mm** from ground level
 Time at 75% Effective Depth = **5 minutes**
 Time at 25% Effective Depth = **40 minutes**

V_{p75-25} = **0.25 m³**

a_{p50} = **2.02 m²**

t_{p75-25} = **2100 sec**

f = **6.0E-05 m/sec**

Average Soakaway Rate = **1.3E-04 m³/sec**
 Average soakaway area = **1.72 m²** (sides + base)

BR365 Soil Infiltration Rate = 6.0E-05 m/sec
Average Infiltration Rate = 7.4E-05 m/sec

PROJECT:	Bondfield Crescent, Wombwell	Job No. 40547	Date 26.10.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared ET	Checked

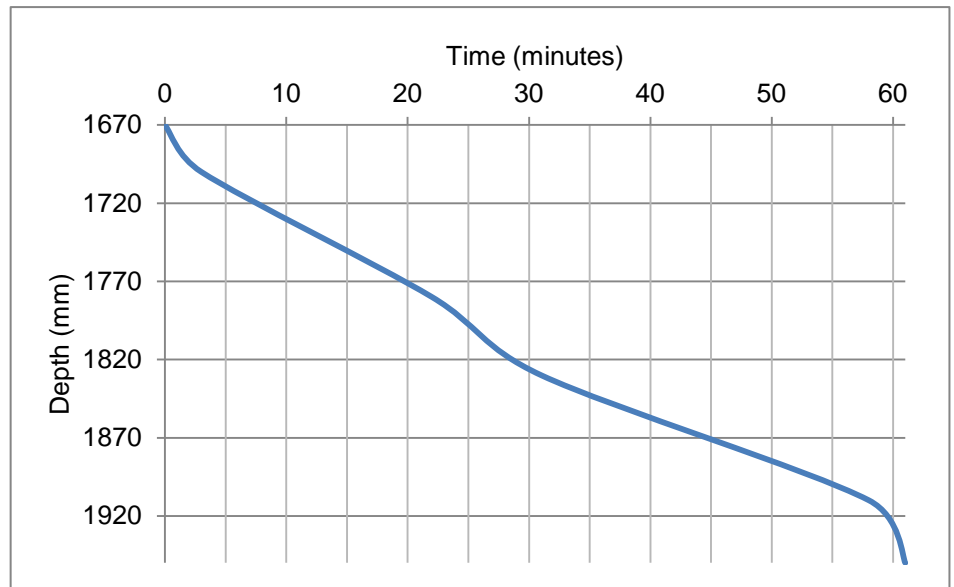
Test No. TP14/SA8 test 2

Test Pit Dimensions

Length = **1300** mm Plan area = **0.845** m²
 Width = **650** mm
 Depth = **1950** mm (Total depth)

Approximate time to discharge water into the hole: **120** Seconds
 Depth to water after completion of pumping: **1670** mm

Time (min)	Depth (mm)
0	1670
3	1700
22	1780
31	1830
58	1910
61	1950



Test Pit Log

Depth (m)	Description
0.0-0.05	MADE GROUND/TOPSOIL: Dark brown slightly clayey slightly gravelly SAND
0.05-0.4	MADE GROUND: Pink/white slightly sandy gravel.
0.4-0.7	MADE GROUND: Grey/brown sandy clay with occsional coal fragments
0.7-1.5	Yellow/brown sandy gravelly clay. Gravel is fine to coarse, angular of sandstone
1.5-2.0	Orange/brown gravelly slightly clayey SAND with medium cobble content

PROJECT:	Bondfield Crescent, Wombwell	Job No. 40547	Date 26.10.16
SUBJECT:	Infiltration Test Results and Calculation of Infiltration Rates	Prepared ET	Checked

Test No. TP14/SA8 test 2

Soil Infiltration Rate in Accordance with BR365

$$f = \frac{V_{p75-25}}{a_{p50} \times t_{p75-25}}$$

Where: V_{p75-25} is the effective storage volume of water in the trial pit between 75% and 25% effective depth;

a_{p50} is the internal surface area of the trial pit up to 50% effective depth and including the base area

t_{p75-25} is the time for the water level to fall from 75% to 25% effective depth

Initial parameters

Depth to water = **1700 mm** Average water depth: **125 mm**
 Start time = **3 min**

Change in water depth: **250 mm**

Final parameters

Depth to water = **1950 mm** Time interval: **58 min**
 End time = **61 min**

Effective Storage Volume of Water in the Trial Pit = **0.2366 m³**
 75% Effective Depth = **1740 mm** from ground level
 25% Effective Depth = **1880 mm** from ground level
 Time at 75% Effective Depth = **10 minutes**
 Time at 25% Effective Depth = **46 minutes**

V_{p75-25} = **0.12 m³**

a_{p50} = **1.39 m²**

t_{p75-25} = **2160 sec**

f = **3.9E-05 m/sec**

Average Soakaway Rate = **6.1E-05 m³/sec**
 Average soakaway area = **1.33 m²** (sides + base)

BR365 Soil Infiltration Rate = 3.9E-05 m/sec
Average Infiltration Rate = 4.6E-05 m/sec

Appendix 5

Chemical Test Results, Chemtest Report No. 16-25691

Modified/Corrected Mean Calculations

Table of Assessment Values (Residential with Home-grown Produce)



Final Report

Report No.: 16-25691-1

Initial Date of Issue: 31-Oct-2016

Client: Eastwood & Partners

Client Address: St. Andrews House
23 Kingfield Road
Sheffield
South Yorkshire
S11 9AS

Contact(s): Geo
Sarah Illingworth

Project: 40547 Bondfield Crescent, Wombwell


Quotation No.: **Date Received:** 24-Oct-2016

Order No.: KE/SRI/40547 **Date Instructed:** 24-Oct-2016

No. of Samples: 19

Turnaround (Wkdays): 5 **Results Due:** 28-Oct-2016

Date Approved: 31-Oct-2016

Approved By:


Details: Keith Jones, Technical Manager

Results - Soil

Client: Eastwood & Partners	Chemtest Job No.:		16-25691	16-25691	16-25691	16-25691	16-25691	16-25691	16-25691	16-25691	16-25691	16-25691
Quotation No.:	Chemtest Sample ID.:		368885	368886	368887	368888	368889	368890	368891	368892	368893	368893
Order No.: KE/SRI/40547	Client Sample Ref.:		TP1	TP1	TP2	TP5	TP6	TP7	TP8	TP9	TP11	TP11
	Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):		0.3	0.85	0.3	0.1	0.6	0.2	0.2	0.1	1.0	1.0
	Date Sampled:		19-Oct-2016	19-Oct-2016	19-Oct-2016	20-Oct-2016	19-Oct-2016	19-Oct-2016	20-Oct-2016	20-Oct-2016	20-Oct-2016	19-Oct-2016
	Asbestos Lab:		COVENTRY		COVENTRY	COVENTRY		COVENTRY	COVENTRY	COVENTRY	COVENTRY	COVENTRY
Determinand	Accred.	SOP	Units	LOD								
ACM Type	U	2192		N/A	-		-	-		-	-	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected		No Asbestos Detected	No Asbestos Detected		No Asbestos Detected	No Asbestos Detected	No Asbestos Detected
Moisture	N	2030	%	0.020	20	10	6.8	8.0	8.2	8.8	10	8.9
Soil Colour	N	2040		N/A	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones	Stones	Stones	Stones	Stones	Stones	Stones	Stones
Soil Texture	N	2040		N/A	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand
pH	M	2010		N/A	7.8	8.0	8.1	7.4	8.2	7.4	7.8	7.9
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.017	< 0.010	< 0.010	0.014	< 0.010	0.013	< 0.010	< 0.010
Total Sulphur	M	2175	%	0.010	0.18	0.010	0.030	0.070	0.010	0.070	0.040	0.050
Sulphate (Acid Soluble)	M	2430	%	0.010	0.10	0.012	0.017	0.060	< 0.010	0.074	0.029	0.043
Arsenic	M	2450	mg/kg	1.0	81	3.4	8.9	19	6.5	18	9.6	14
Cadmium	M	2450	mg/kg	0.10	0.51	< 0.10	0.15	0.28	0.14	0.23	0.22	0.36
Chromium	M	2450	mg/kg	1.0	25	7.3	20	14	10	15	13	21
Copper	M	2450	mg/kg	0.50	150	7.4	19	29	8.4	30	20	28
Mercury	M	2450	mg/kg	0.10	0.33	< 0.10	0.10	0.13	< 0.10	0.13	0.10	0.13
Nickel	M	2450	mg/kg	0.50	44	11	19	20	24	19	19	21
Lead	M	2450	mg/kg	0.50	300	12	42	87	19	78	39	60
Selenium	M	2450	mg/kg	0.20	0.83	< 0.20	< 0.20	0.47	< 0.20	0.54	0.32	0.42
Zinc	M	2450	mg/kg	0.50	410	41	82	120	59	99	87	120
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Naphthalene	M	2800	mg/kg	0.10	2.2	< 0.10	< 0.10	1.4	< 0.10	1.1	0.79	1.3
Acenaphthylene	N	2800	mg/kg	0.10	0.99	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.14
Acenaphthene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	M	2800	mg/kg	0.10	0.19	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	M	2800	mg/kg	0.10	6.2	< 0.10	0.28	1.2	< 0.10	0.97	0.49	3.5
Anthracene	M	2800	mg/kg	0.10	1.3	< 0.10	< 0.10	0.11	< 0.10	< 0.10	< 0.10	0.61
Fluoranthene	M	2800	mg/kg	0.10	11	< 0.10	1.1	2.9	< 0.10	1.5	0.78	7.1
Pyrene	M	2800	mg/kg	0.10	8.5	< 0.10	0.82	2.3	< 0.10	1.2	0.69	5.9
Benzo[a]anthracene	M	2800	mg/kg	0.10	4.5	< 0.10	0.21	0.80	< 0.10	0.23	0.19	2.1
Chrysene	M	2800	mg/kg	0.10	5.3	< 0.10	0.22	0.86	< 0.10	0.24	0.13	2.3
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	5.4	< 0.10	0.26	1.1	< 0.10	0.27	0.18	2.8
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	1.8	< 0.10	< 0.10	0.25	< 0.10	< 0.10	< 0.10	0.84
Benzo[a]pyrene	M	2800	mg/kg	0.10	4.4	< 0.10	0.27	0.83	< 0.10	0.16	0.13	2.4
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	2.0	< 0.10	< 0.10	0.52	< 0.10	< 0.10	< 0.10	1.2
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	0.21	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	2.4	< 0.10	< 0.10	0.44	< 0.10	< 0.10	0.10	1.3
Total Of 16 PAH's	N	2800	mg/kg	2.0	56	< 2.0	3.2	13	< 2.0	5.7	3.5	32

Results - Soil

Client: Eastwood & Partners	Chemtest Job No.:		16-25691	16-25691	16-25691	16-25691	16-25691	16-25691	16-25691	16-25691	16-25691	16-25691	
Quotation No.:	Chemtest Sample ID.:		368894	368895	368896	368898	368899	368900	368901	368902	368903		
Order No.: KE/SRI/40547	Client Sample Ref.:		TP12	TP12	TP12	TP15	TP15	TP15	TP15	TP15	TP15	Bund	
	Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	
	Top Depth (m):		0.1	0.95	1.5	0.1	0.6	0.9	1.6	1.95	0.3		
	Date Sampled:		19-Oct-2016	19-Oct-2016	19-Oct-2016	19-Oct-2016	19-Oct-2016	19-Oct-2016	19-Oct-2016	19-Oct-2016	20-Oct-2016		
	Asbestos Lab:			COVENTRY		COVENTRY	COVENTRY						
Determinand	Accred.	SOP	Units	LOD									
ACM Type	U	2192		N/A	-	-	-	-	-	-	-	-	
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	
Moisture	N	2030	%	0.020	7.8	6.6	8.0	19	11	19	16	15	9.8
Soil Colour	N	2040		N/A	Brown	Brown	Brown	Brown	Brown	Black	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones	Stones	Stones	Stones, Roots	Stones	Stones	Stones	Stones	Stones
Soil Texture	N	2040		N/A	Sand	Sand	Sand	Sand	Sand	Clay	Clay	Clay	Sand
pH	M	2010		N/A	7.1	6.4	7.6	7.8	7.8	5.2	7.1	6.1	7.8
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	< 0.010	< 0.010	< 0.010	0.022	< 0.010	0.024	< 0.010	< 0.010	0.020
Total Sulphur	M	2175	%	0.010	0.030	0.030	< 0.010	0.19	0.070	0.24	0.080	0.040	0.11
Sulphate (Acid Soluble)	M	2430	%	0.010	0.038	0.038	< 0.010	0.11	0.022	0.27	0.037	< 0.010	0.053
Arsenic	M	2450	mg/kg	1.0	15	9.2	2.7	22	5.7	48	13	2.3	24
Cadmium	M	2450	mg/kg	0.10	0.26	0.22	< 0.10	0.34	0.15	0.11	0.17	0.12	0.20
Chromium	M	2450	mg/kg	1.0	14	11	18	18	10	14	12	30	24
Copper	M	2450	mg/kg	0.50	25	17	13	49	10	51	21	21	27
Mercury	M	2450	mg/kg	0.10	0.12	0.12	< 0.10	0.25	< 0.10	0.22	0.14	< 0.10	0.12
Nickel	M	2450	mg/kg	0.50	20	16	25	23	14	18	16	46	28
Lead	M	2450	mg/kg	0.50	63	40	8.6	87	24	73	42	11	65
Selenium	M	2450	mg/kg	0.20	0.46	0.32	< 0.20	0.74	0.22	1.8	0.38	< 0.20	0.28
Zinc	M	2450	mg/kg	0.50	98	64	33	130	61	50	59	49	98
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Naphthalene	M	2800	mg/kg	0.10	1.3	1.1	< 0.10	1.0	< 0.10	< 0.10	< 0.10	< 0.10	1.1
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.36
Acenaphthene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.10	< 0.10	< 0.10	0.22
Phenanthrene	M	2800	mg/kg	0.10	1.4	0.96	< 0.10	1.9	0.30	4.2	0.22	< 0.10	6.1
Anthracene	M	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	0.38	< 0.10	< 0.10	< 0.10	< 0.10	1.9
Fluoranthene	M	2800	mg/kg	0.10	2.3	1.8	< 0.10	4.8	0.60	0.98	0.17	< 0.10	13
Pyrene	M	2800	mg/kg	0.10	1.8	1.3	< 0.10	4.0	0.50	0.75	0.18	< 0.10	11
Benzo[a]anthracene	M	2800	mg/kg	0.10	0.47	0.30	< 0.10	1.3	< 0.10	< 0.10	< 0.10	< 0.10	4.7
Chrysene	M	2800	mg/kg	0.10	0.51	0.46	< 0.10	1.4	< 0.10	0.10	< 0.10	< 0.10	5.6
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	0.55	0.50	< 0.10	1.5	< 0.10	< 0.10	< 0.10	< 0.10	6.4
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	0.15	0.10	< 0.10	0.37	< 0.10	< 0.10	< 0.10	< 0.10	2.2
Benzo[a]pyrene	M	2800	mg/kg	0.10	0.33	0.24	< 0.10	1.3	< 0.10	< 0.10	< 0.10	< 0.10	5.4
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	0.21	0.16	< 0.10	0.53	< 0.10	< 0.10	< 0.10	< 0.10	2.8
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.16
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	0.28	0.19	< 0.10	0.61	< 0.10	< 0.10	< 0.10	< 0.10	2.8
Total Of 16 PAH's	N	2800	mg/kg	2.0	9.3	7.1	< 2.0	19	< 2.0	6.1	< 2.0	< 2.0	64

Client: Eastwood & Partners		Chemtest Job No.:		16-25691	
Quotation No.:		Chemtest Sample ID.:		368904	
Order No.: KE/SRI/40547		Client Sample Ref.:		Bund	
		Sample Type:		SOIL	
		Top Depth (m):		1.7	
		Date Sampled:		20-Oct-2016	
		Asbestos Lab:		COVENTRY	
Determinand	Accred.	SOP	Units	LOD	
ACM Type	U	2192		N/A	-
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected
Moisture	N	2030	%	0.020	11
Soil Colour	N	2040		N/A	Brown
Other Material	N	2040		N/A	Stones
Soil Texture	N	2040		N/A	Sand
pH	M	2010		N/A	7.9
Sulphate (2:1 Water Soluble) as SO ₄	M	2120	g/l	0.010	< 0.010
Total Sulphur	M	2175	%	0.010	0.10
Sulphate (Acid Soluble)	M	2430	%	0.010	0.032
Arsenic	M	2450	mg/kg	1.0	14
Cadmium	M	2450	mg/kg	0.10	0.20
Chromium	M	2450	mg/kg	1.0	14
Copper	M	2450	mg/kg	0.50	24
Mercury	M	2450	mg/kg	0.10	0.13
Nickel	M	2450	mg/kg	0.50	20
Lead	M	2450	mg/kg	0.50	52
Selenium	M	2450	mg/kg	0.20	0.30
Zinc	M	2450	mg/kg	0.50	95
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50
Naphthalene	M	2800	mg/kg	0.10	0.88
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10
Acenaphthene	M	2800	mg/kg	0.10	< 0.10
Fluorene	M	2800	mg/kg	0.10	< 0.10
Phenanthrene	M	2800	mg/kg	0.10	2.7
Anthracene	M	2800	mg/kg	0.10	0.45
Fluoranthene	M	2800	mg/kg	0.10	3.9
Pyrene	M	2800	mg/kg	0.10	3.4
Benzo[a]anthracene	M	2800	mg/kg	0.10	1.0
Chrysene	M	2800	mg/kg	0.10	1.1
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	0.94
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	0.25
Benzo[a]pyrene	M	2800	mg/kg	0.10	0.85
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	0.35
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	< 0.10
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	0.40
Total Of 16 PAH's	N	2800	mg/kg	2.0	16

SOP	Title	Accreditation	Parameters included	Method summary
2010	pH Value of Soils	UKAS accredited MCERTS accredited	pH	pH Meter
2030	Moisture and Stone Content of Soils (Requirement of MCERTS)		Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description (Requirement of MCERTS)		Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	UKAS accredited MCERTS accredited	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2175	Total Sulphur in Soils	UKAS accredited MCERTS accredited	Total Sulphur	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2192	Asbestos	UKAS Accredited	Asbestos	Polarised light microscopy / Gravimetry
2430	Total Sulphate in soils	UKAS accredited MCERTS accredited*	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2450	Acid Soluble Metals in Soils	UKAS accredited MCERTS accredited	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils		Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	UKAS accredited MCERTS accredited*	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS

Report Information

Key

- U UKAS accredited
- M MCERTS and UKAS accredited
- N Unaccredited
- S This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
- SN This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
- T This analysis has been subcontracted to an unaccredited laboratory
- I/S Insufficient Sample
- U/S Unsuitable Sample
- N/E not evaluated
- < "less than"
- > "greater than"

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

customerservices@chemtest.co.uk

SITE: Bondfield Crescent, Wombwell	Job No. 40547	Date 10.11.16
SUBJECT: Mean and Maximum Value Test for Arsenic Made Ground/Topsoil	Prepared SRI	Checked KLG/KE

Results	Sample	Log x = y	
77.40	(TP1 0.3)	1.889	Number of results : n = 12
8.90	(TP2 0.3)	0.949	Mean : X = 22.23
19.00	(TP5 0.1)	1.279	Standard deviation : s = 18.67
18.00	(TP7 0.2)	1.255	T value : t = 1.796
9.60	(TP8 0.2)	0.982	
14.00	(TP9 0.1)	1.146	
15.00	(TP12 0.1)	1.176	<u>Corrected mean (95% confidence)</u>
22.00	(TP15 0.1)	1.342	<u>= X + t * s / n^0.5 = 31.91</u>
30.20	TP1 0.2	1.480	
28.20	WS1 0.1	1.450	
10.40	TP9 0.1	1.017	
14.10	TP10 0.3	1.149	Max value = 77.40
			log xm = ym = 1.889
			Number of results : N = 12
			Mean y = 1.260
			Standard deviation of 0.261
			T = (ym-ya) / S = 2.406
			Tcrit (fom table A1.3) = 2.13
			Result probably an outlier

SITE: Bondfield Crescent, Wombwell	Job No. 40547	Date 10.11.16
SUBJECT: Mean and Maximum Value Test for Benzo(b)fluoranthene Made Ground/Topsoil	Prepared SRI	Checked KLG/KE

Results	Sample	Log x = y		
5.40	(TP1 0.3)	0.732	Number of results : n	12
0.26	(TP2 0.3)	-0.585	Mean : X =	1.54
1.10	(TP5 0.1)	0.041	Standard deviation : s	1.53
0.27	(TP7 0.2)	-0.569	T value : t =	1.796
0.18	(TP8 0.2)	-0.745		
2.80	(TP9 0.1)	0.447		
0.55	(TP12 0.1)	-0.260		
1.50	(TP15 0.1)	0.176		
3.00	TP1 0.2	0.477		
1.50	WS1 0.1	0.176		
0.80	TP9 0.1	-0.097		
1.10	TP10 0.3	0.041		

Corrected mean (95% confidence)

= X + t * s / n^0.5 = 2.33

Max value = 5.40

log xm = ym = 0.732

Number of results : N 12

Mean y = -0.014

Standard deviation of 0.460

T = (ym-ya) / S = 1.623

Tcrit (fom table A1.3) 2.13

Result probably not an outlier

SITE: Bondfield Crescent, Wombwell	Job No. 40547	Date 10.11.16
SUBJECT: Mean and Maximum Value Test for Benzo(a)pyrene Made Ground/Topsoil	Prepared SRI	Checked KLG/KE

Results	Sample	Log x = y		
4.40	(TP1 0.3)	0.643	Number of results : n	12
0.27	(TP2 0.3)	-0.569	Mean : X =	1.31
0.83	(TP5 0.1)	-0.081	Standard deviation : s	1.33
0.16	(TP7 0.2)	-0.796	T value : t =	1.796
0.13	(TP8 0.2)	-0.886		
2.40	(TP9 0.1)	0.380		
0.33	(TP12 0.1)	-0.481		
1.30	(TP15 0.1)	0.114		
3.00	TP1 0.2	0.477		
1.50	WS1 0.1	0.176		
0.60	TP9 0.1	-0.222		
0.80	TP10 0.3	-0.097		

Corrected mean (95% confidence)

= X + t * s / n^0.5 = 2.00

Max value = 4.40

log xm = ym = 0.643

Number of results : N 12

Mean y = -0.112

Standard deviation of 0.497

T = (ym-ya) / S = 1.519

Tcrit (fom table A1.3) 2.13

Result probably not an outlier

SITE: Bondfield Crescent, Wombwell	Job No. 40547	Date 10.11.16
SUBJECT: Mean Value Test for Lead - Made Ground/Topsoil	Prepared SRI	Checked KLG/KE

The method uses the geometric mean rather than the arithmetic mean which is used for other contaminants.

Results mg/kg	Sample	Log Results
308.00	(TP1 0.3)	2.489
42.00	(TP2 0.3)	1.623
87.00	(TP5 0.1)	1.940
78.00	(TP7 0.2)	1.892
39.00	(TP8 0.2)	1.591
60.00	(TP9 0.1)	1.778
63.00	(TP12 0.1)	1.799
87.00	(TP15 0.1)	1.94
324.30	TP1 0.2	2.511
373.60	WS1 0.1	2.572
37.30	TP9 0.1	1.572
67.80	TP10 0.3	1.831

Calculations based on log results

Number of results : n = 12
 Mean : X = 1.961
 Standard deviation : s = 0.362
 T value : t = 1.796
 Corrected mean (95% confidence) =
 = $X + t * s / n^{0.5}$ = 2.149

Final results

Mean : X = 92 mg/kg


Corrected mean (95% confidence) = 141 mg/kg

Inorganic Compounds	Human Health - Residential with Homegrown Produce (mg/kg)
Arsenic	37
Cadmium	11
Chromium (III)	910
Chromium (VI)	6
Lead	200
Mercury	1.2
Nickel	180
Selenium	250
Copper	2400
Zinc	3700

Organic Compounds	Human Health - Residential with Homegrown Produce (mg/kg)		
	1% SOM	2.5% SOM	6% SOM
Naphthalene	2.3	5.6	13
Acenaphthene	210	510	1100
Acenaphthylene	170	420	920
Fluorene	170	400	860
Phenanthrene	95	220	440
Anthracene	2400	5400	11000
Fluoranthene	280	560	890
Pyrene	620	1200	2000
Benzo(a)anthracene	7.2	11	13
Chrysene	15	22	27
Benzo(b)fluoranthene	2.6	3.3	3.7
Benzo(k)fluoranthene	77	93	100
Benzo(a)pyrene	2.2	2.7	3.0
Dibenz(a,h)anthracene	0.24	0.28	0.3
Indeno(1,2,3-cd)pyrene	27	36	41
Benzo(g,h,i)perylene	320	340	350
Benzene	0.087	0.17	0.37
Toluene	130	290	660
Ethylbenzene	47	110	260
o-Xylene	60	140	330
m-Xylene	59	140	320
p-Xylene	56	130	310

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Prepared	KDL	Checked	CAT	Date	18/11/16	Job No	40547
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 Eastwood & Partners <small>CONSULTING ENGINEERS</small> St Andrew's House 23 Kingfield Road Sheffield S11 9AS Tel: (0114) 255 4554 Fax: (0114) 255 4330	GLEESON DEVELOPMENTS LTD BONDFIELD CRESCENT, WOMBWELL ASSESSMENT CRITERIA – RESIDENTIAL WITH HOMEGROWN PRODUCE
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Contaminant	Phytotoxicity			
	pH 5.0 to 5.5	pH 5.5 to 6.0	pH 6.0 to 6.5	pH >7.0
Arsenic	50			
Cadmium	3			
Chromium	400			
Lead	300			
Mercury	1			
Nickel	50	60	75	110
Copper	80	100	135	200
Zinc	200	200	200	300


The assessment concentration for lead is the Category 4 Screening Level produced by Contaminated Land: Applications in Real Environments (CL:AIRE) and outlined in Appendix H of their report SP1010. The others have been taken from Nathanail, C. P., McCaffrey, C., Gillett, A., Ogden, R., and Nathanail, J., 2015, *'The LQM/CIEH S4ULs for Human Health Risk Assessment'*, Land Quality Press, Nottingham. The metals/metalloids are based on a sandy loam soil and 6% soil organic matter. The assessment values are not intended to be applied to individual sample results where materials are similar, as the levels of contaminants will have a natural variability across the site. Instead, the modified mean value should be compared with the assessment concentration.

The assessment values for phytotoxicity are the levels at which plant growth is thought to be affected. They are taken from the maximum permissible and advisable concentrations in soil after application of soil sludge given in the *'The Code of Good Agricultural Practice for the Protection of Soil'*, MAFF, 1998.

The assessment of sulphate, water soluble sulphate, elemental sulphur and sulphide is to determine the aggressive nature of the ground with respect to concrete and consequently the results are compared with BRE Special Digest 1:2005 *'Concrete in Aggressive Ground'*.

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