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Suncroft House & Garden Station Road, Warkworth Environmental Study

Prepared by Alistair MacDonald (*BSc, MSc, LL.M, CGeol, FGS*)
Intersoil Ltd.

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Soil Gas Results

Draft 13 June 2013

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Date: 13 June 2013
Ref: Issue 12023/amd2

Ms. Forsyth
Suncroft
Station Road
Warkworth

Suncroft House & Garden Station Road, Warkworth Environmental Study

1. COMMISSION, PURPOSE & SCOPE

Intersoil was commissioned to undertake an environmental study within the grounds of Suncroft, Station Road, Warkworth. The purpose of the study was to provide an environmental and historical context and background information on the site and its surroundings, supplemented by a general and up to date overview of ground conditions across the Site (house and garden) from exploratory boring and shallow hand dug pits.

The purpose of this report was to establish the history and ground conditions of land occupied by a house (Suncroft) and gardens. Specifically, the objective was to establish if refuse or ashy waste was present in the garden area. The scope was prepared following discussions at a site visit in April 2013. This report has been prepared solely for Ms. Forsyth of Suncroft. This report is valid for 12 months from date of issue by Intersoil.

2. SEARCHES

2.1 Site Description

The study area and location are presented in the Appendix. The site is centred on O.S. Grid Reference 424780E, 606370N and has an approximate area of 1800m². Access is off Station Road. The site rises from Station Road along the southern boundary. It is occupied by a private house and garden with hedge and associated outbuildings. There was no visual evidence of land contamination, poor house-keeping, distressed vegetation or significant ground irregularity (depressions or mounds) on Site at the time of the site visit. A tank thought to contain heating oil was noted.

The land to the south, east and west are similarly residential with open gardens. The land to the north comprises open scrub, ashy gravel and woodland with a small workshop.

2.2 Historical Maps

A number of maps previously issued by the Ordnance Survey were acquired and selected large scale maps are presented in the Appendix. Table 1 shows the main features:

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Date	Onsite	Offsite	Comments
1855	Open ground	Quarry and woodland immediately north east Well 100m south west Cemetery 50m south east	Open ground
1897	No change	Quarry boundary retracted 20m north Housing south of site	
1923	Small outbuilding in north of plot	Quarry shown occupying its original boundary	Small outbuilding in north of site
1959	No change	Housing extending to west	
1981	House and outbuildings on site	Housing extending west, next door.	House and outbuildings on site
1989	Little change	Little change	
2012	Little change	Little change	

TABLE 1: SUMMARY OF HISTORICAL LAND USE

Information provided by the Client indicates that the property was acquired in the late 1950's. Correspondence suggests that the quarry immediately north of the Site was, around that time, operated as a tip by the Council.

2.3. Environmental Database Search

An Homecheck report¹ was acquired as part of the study and the following aspects of environmental information are summarised as follows:

Description	Onsite (Y/N)	Close to site (Y/N)	Comments
Landfill Site	N	Y	Old Council Tip north east of the Site Ref PA15 Northumberland County Council Closed 1970
Waste Transfer and treatment	N	N	-
Integrated Pollution Control licensing	N	N	-
Radioactive Licencing	N	N	-
Hazardous substances licencing	N	N	-
Dangerous Substances	N	N	-
Control of Major Accident Hazards	N	N	-
Emissions to air	N	N	-
Contraventions of groundwater or pollution	N	N	-
Contaminated land Register	N	N	-

¹ Envirocheck Report Ref 45677749-1 dated 23 April 2013 . Envirocheck reports are copyright.

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Past Land uses	Y	Y	Quarry and landfilling immediately or within 20m north of the site Factory/Works 145m north east Cemetery 50m south east Possible tanks 240 south east
Contemporary Land uses	N	Y	-
Flooding	Y	Y	Pluvial & surface water risk possible
Other	Y	Y	See geology and hydrogeology sections

TABLE 2: ENVIRONMENTAL DATA

3.3 Mining & Geology

The site is shown to overlie Devensian Till of the Quaternary. The underlying geology is shown to be the Stainmore Formation of the Carboniferous, comprising sandstones, limestone and mudstones. No previous soil investigation data has been identified for the Site. Information from the British Geological Survey (BGS) shows two boreholes were sunk in the wider area. One is located along Station Road and the second on the Birling Road beyond the east of the site. The BGS database suggests, however, that the boreholes were relatively shallow and did not exceed 2m depth. The Envirocheck report suggests a possible risk of coal seams at shallow depth in the area.

3.4 Hydrogeology & Hydrology

The site is located on thin Devensian till (clay) overlying sandstone. There may be perched water within any made ground above the clays. The sandstones and potentially limestones within the Stainmore formation have aquifer properties. The nearest discharge consent is 116m south east of the site and licenced to Northumbrian Water. A second discharge consent applies to Birling Farm 170m north of the site. The nearest major surface water feature is the River Coquet. This flows eastward and is 50m south of the site.

3.5 Radon

Reference to an environmental database report confirms that radon is not an issue in the area and between 1 and 3% of properties are thought to be affected in the wider area.

3.6 Character Summary

Based on an assessment of the historical maps and environmental information provided, the site has been exposed to the following:

Potential Major Contaminative use Onsite	None
Potential Minor Contaminative use Onsite	Above ground tank
Offsite Potential Contaminative use (immediate vicinity)	Old quarry and landfill Builders compound
Offsite Potential Contaminative use (wider area)	Works to north

TABLE 3: SUMMARY OF CONTAMINATIVE EXPOSURE

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3.7 Risk Assessment

The data collated from site has been assessed and the following possible receptors have been considered within a '*conceptual model*'. This is a summarised assessment which outlines the potential issues within or near the site that may impact the proposed development.

Potential Sources

In general, potential sources of contamination relate to determinants within the made ground which may contain toxic or phytotoxic substances which may be viewed as a potential hazard. Historical maps supplemented by other search data have not revealed any potentially contaminating land use on the Site.

Given the proximity of the old quarry which has been partly backfilled, there is some risk of elevated soil gas in the area. However, there was no obvious clay capping or other cover across the ground.

Potential Pathways

These are the means by which sources of contamination may reach sensitive receptors. This may comprise:

- Dermal contact
- Ingestion
- Inhalation
- Migration in dust
- Migration in vapours
- Groundwater
- Surfacewater

Potential Receptors

There are a number of potential receptors to be considered when re-development is planned. These may comprise:

- Construction Workers
- Future End Users
- The Public and users of adjoining land
- Property (concrete and utilities)
- Vegetation
- Animals
- Surface Water

For a potential hazard to be present there must be a relationship between the source and the receptors (or those at risk from contamination). This is termed the *source-pathway-receptor* relationship. Assuming all 3 elements are present, there are various combinations which may appear to be relevant to this site, albeit remote. A number of these are or may be perceived to be either likely (in terms of occurrence) or unlikely and a risk rating (in terms of potential effects or impact) has been assigned accordingly.

Receptor	Pathway	Effects	Potential	Risk Rating
Shallow Groundwater from offsite source	Percolation through made ground	Contamination of perched water and drainage	LOW	LOW
Groundwater in Bedrock	Percolation from perched water	Contamination of groundwater	LOW	LOW
Construction Workers. Site Operatives	Dermal Contact Ingestion Inhalation	Health Effects	LOW	LOW
Public & Neighbours	Inhalation & Ingestion to Public	Health Effects	LOW	LOW
Site users	Inhalation, dermal contact and ingestion	Contamination from previous development and soil gas migration	LOW	LOW
Surface Water	Migration via perched water	Contamination from drainage and perched water migration	LOW	LOW
Property	Direct Contact	Aggressive Ground Conditions. Possible elevated soil gas	LOW-MED	LOW-MED
Wildlife (Burrowing mammals or foragers)	Dermal Contact Ingestion Inhalation	Health Effects	LOW	LOW

TABLE 4: CONCEPTUAL MODEL & PRELIMINARY RISK ASSESSMENT

The Conceptual Model provides information on relevant relationships that are thought possible or likely based on the sites current use. This investigation has identified a 'low' risk category for most of the elements related to soil contamination. A soil investigation was commissioned to provide up to date information on the ground conditions and establish soil gas conditions. Exploratory work was also undertaken within the old tip. This is reported elsewhere.

4. EXPLORATORY FIELDWORK

Fieldwork was undertaken on the 25th April 2013. Two boreholes and a shallow augered pit was excavated in the garden between the house and the old quarry. A light percussion rig was used to sink the boreholes. A series of small disturbed samples were taken as the borehole progressed. Any suspect samples of made ground were stored in smoked glass bottles and vials. Three hand dug pits were also excavated to 0.6m depth along the boundary.

5. MONITORING STANDPIPES

Monitoring standpipes were installed in selected boreholes as follows:

- BH1- 3m (50mm dia.)
- BH2- 1m (50mm dia.) hand augured hole
- BH3- 3m (50mm dia.)

The standpipes were slotted 50mm in diameter with plain pipe in the top 0.5m and completed with a steel tap and rubber bung and plastic cover. Below the ground the pipe annulus was surrounded by 10mm pea gravel and the top 300mm sealed by bentonite pellets.

6. GROUND CONDITIONS

6.1 Made Ground – crushed rubble and debris

A dark grey brown and brown clayey topsoil type made ground was encountered in all three boreholes and was found to be from 0.2, 0.4 and 0.5m in thickness.

6.2 Natural Superficial Deposits

The topsoil type cover was underlain by firm or firm to stiff dark brown clay with sandstone gravels. This extended to 3m depth in two of the boreholes and to the base of the shallow augered pit (1m). Hand dug pits encountered thin topsoil type soils over brown clay.

6.3 Solid Geology

None of the boreholes proved rock-head.

7. MALODOURS

No malodours were reported.

8. OBSTRUCTIONS

None of the boreholes were terminated early.

9. STABILITY

No trial pits were excavated and no comment is made of excavation stability.

10. IN-SITU TESTING

10.1 Shear Vanes in clay

Seven shear vanes were undertaken in the clay. Results ranged from 54kPa (firm) to 119kPa.

10.2 Probing

No dynamic probing was undertaken.

11. GROUNDWATER

Ground water was not encountered during boring. Groundwater monitoring from shallow standpipes was undertaken from the three standpipes as follows:

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BOREHOLE	27 April	17 May	23 May	24 May	4 June	13 June
1(3m)	Dry	Dry	Dry	Nm	Dry	Dry
2 (1m)	Dry	Dry	Dry	Nm	Dry	Dry
3 (3m)	0.73	0.73	0.72	Nm	0.78	0.94

TABLE 5: Groundwater Monitoring

Nm =not measured. Metres below surface.

12. SOIL GAS

Soil gas monitoring was undertaken on 6 occasions. Gas monitoring was undertaken using a Gas data LMS portable gas analyser. No methane was detected. Carbon dioxide was low where detected and did not exceed 0.9%. Oxygen levels remained above 18%. No positive and maintained flow was recorded although there were minor fluctuations noted periodically. One of the six surveys was undertaken at low atmospheric pressure.

13. ASSESSMENT & CONCLUSION

The purpose of this report was to establish the history and ground conditions of land occupied by a house (Suncroft) and gardens. Specifically, the objective was to establish if refuse or ashy waste was present in the garden area. The presence of the backfilled quarry is highlighted in environmental database searches acquired as part of property searches routinely undertaken as part of land transactions.

This study shows that the plot forming the existing house and garden forming Suncroft was acquired in the late 1950's. Historical maps indicate that the plot was located just south of a quarry which was subsequently backfilled with waste until 1970. There is no evidence to suggest that the plot was exposed to, or formed part of, the old tip.

In order to provide additional certainty, three boreholes were sunk between the house and the edge of the former quarry. The boreholes did not encounter any refuse or ashy fill evident on the surface of the nearby tip. Clayey topsoil type soils were found to overlie firm brown clays which extended to at least 3m depth from surface. Three hand dug pits along the boundary with the wall, fence and hedge extended to 0.6m and did not encounter ash or refuse.

Soil gas monitoring has not detected any elevated concentrations of soil gas of concern.

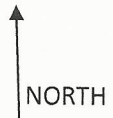
Groundwater was detected in only one of the 3 exploratory holes. It is considered to be perched, accumulating from ingress from the surface and rainwater and perched within the clay.

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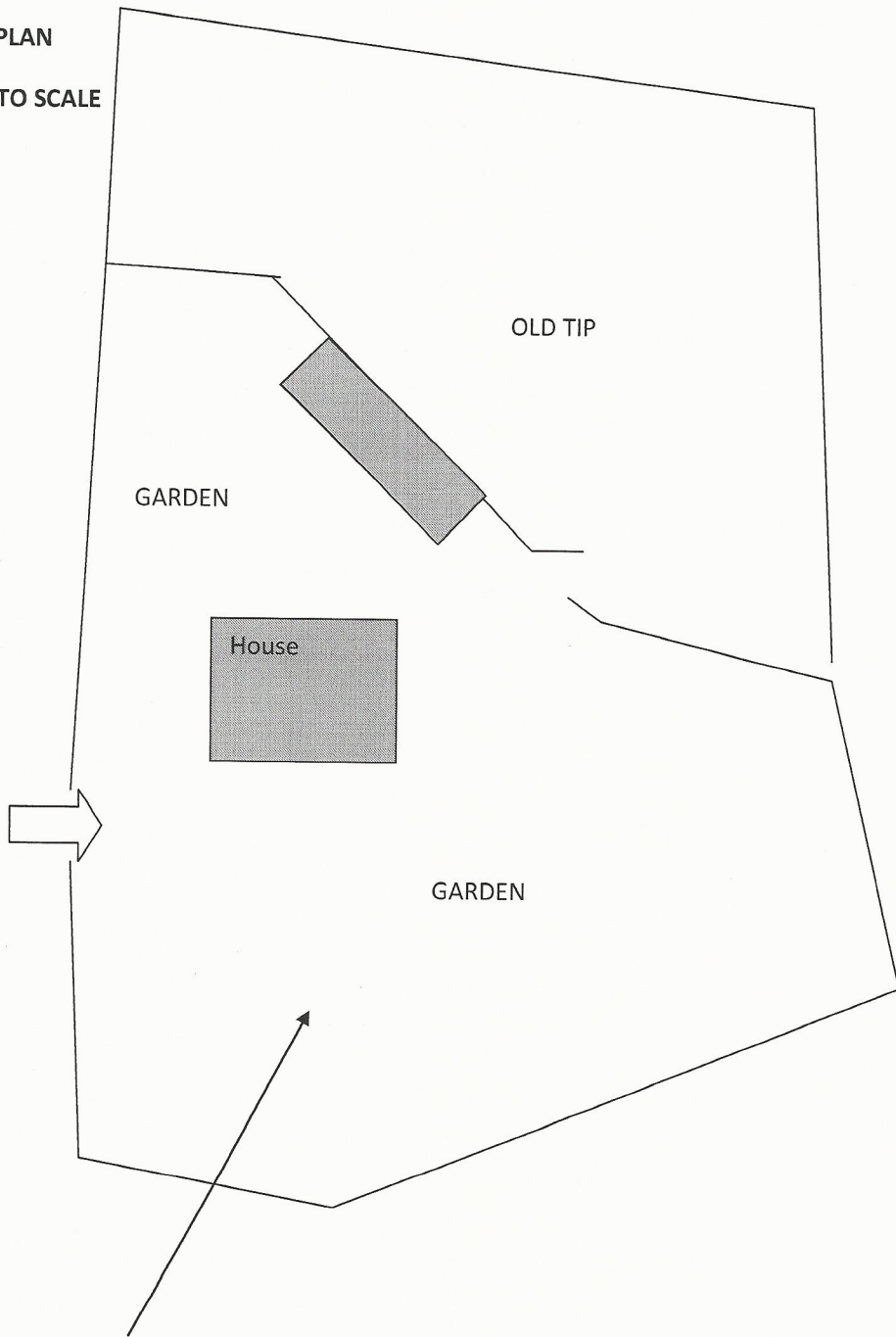
APPENDICES

Site Plan
Historical Maps
Exploratory Location plan
Exploratory Logs
Soil Gas Results



SITE PLAN

NOT TO SCALE



SUNCROFT HOUSE & GARDEN

SITE PLAN

JUNE 2013



Site Details:

BUILDERS YARD 18M FROM
SUNCROFT STATION ROAD,
55M FROM STATION ROAD,
NE65 0XP

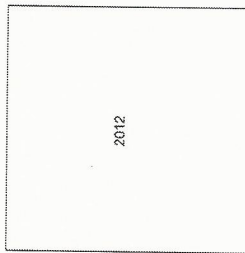
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Map date: 2012

Scale: 1:1,250

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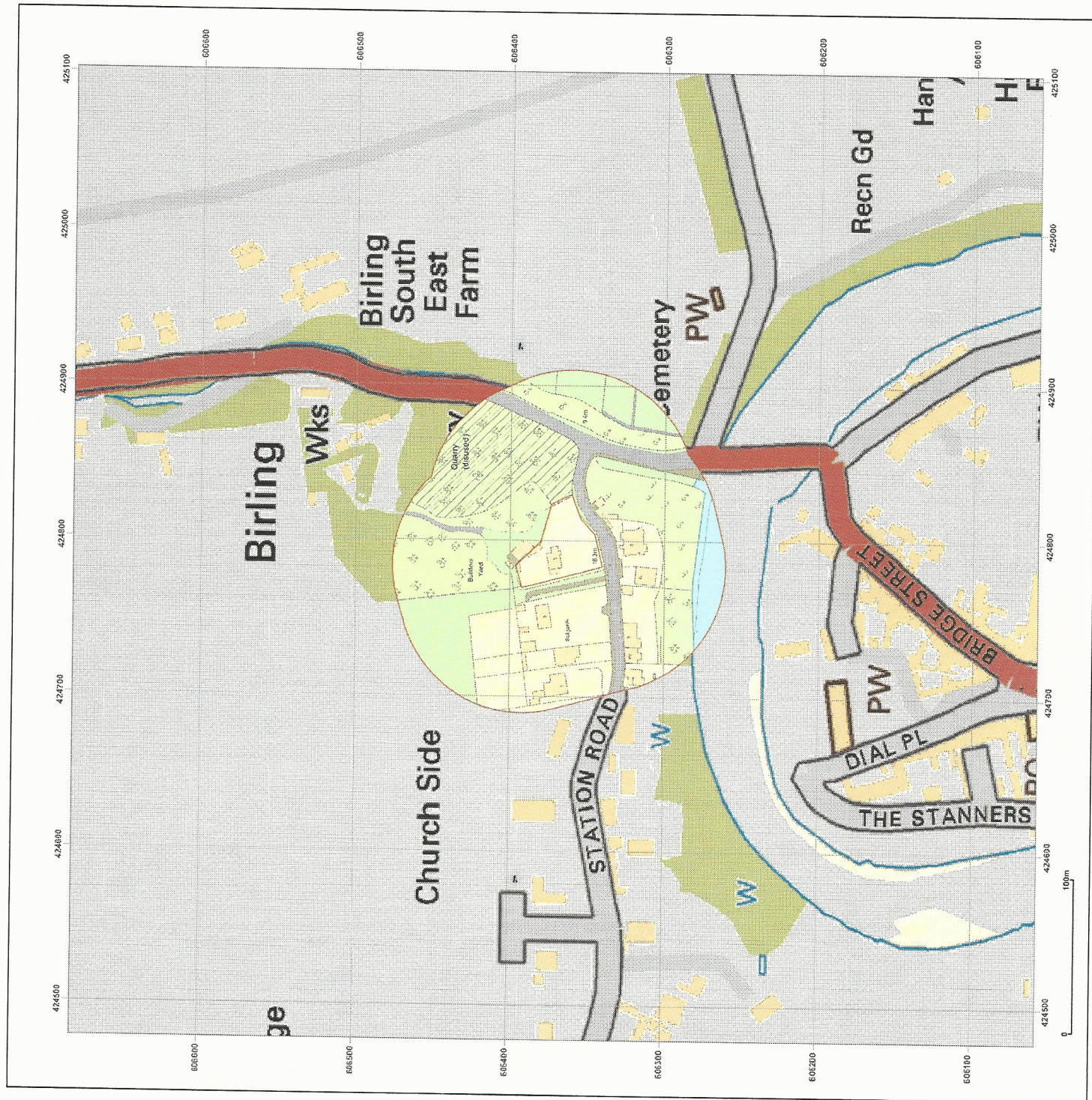


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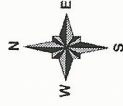
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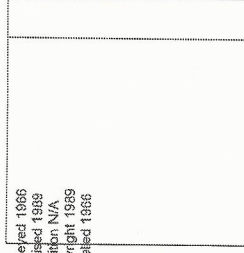
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SUNCROFT STATION ROAD,
55M FROM STATION ROAD,
NE65 0XP

Client Ref: 13026
Report Ref: SG-BAR-748877
Grid Ref: 424790, 606370

Map Name: National Grid
Map date: 1984-1989
Scale: 1:2,500
Printed at: 1:2,500



Surveyed 1966
Revised 1989
Edition N/A
Copyright 1989
Levelled 1966

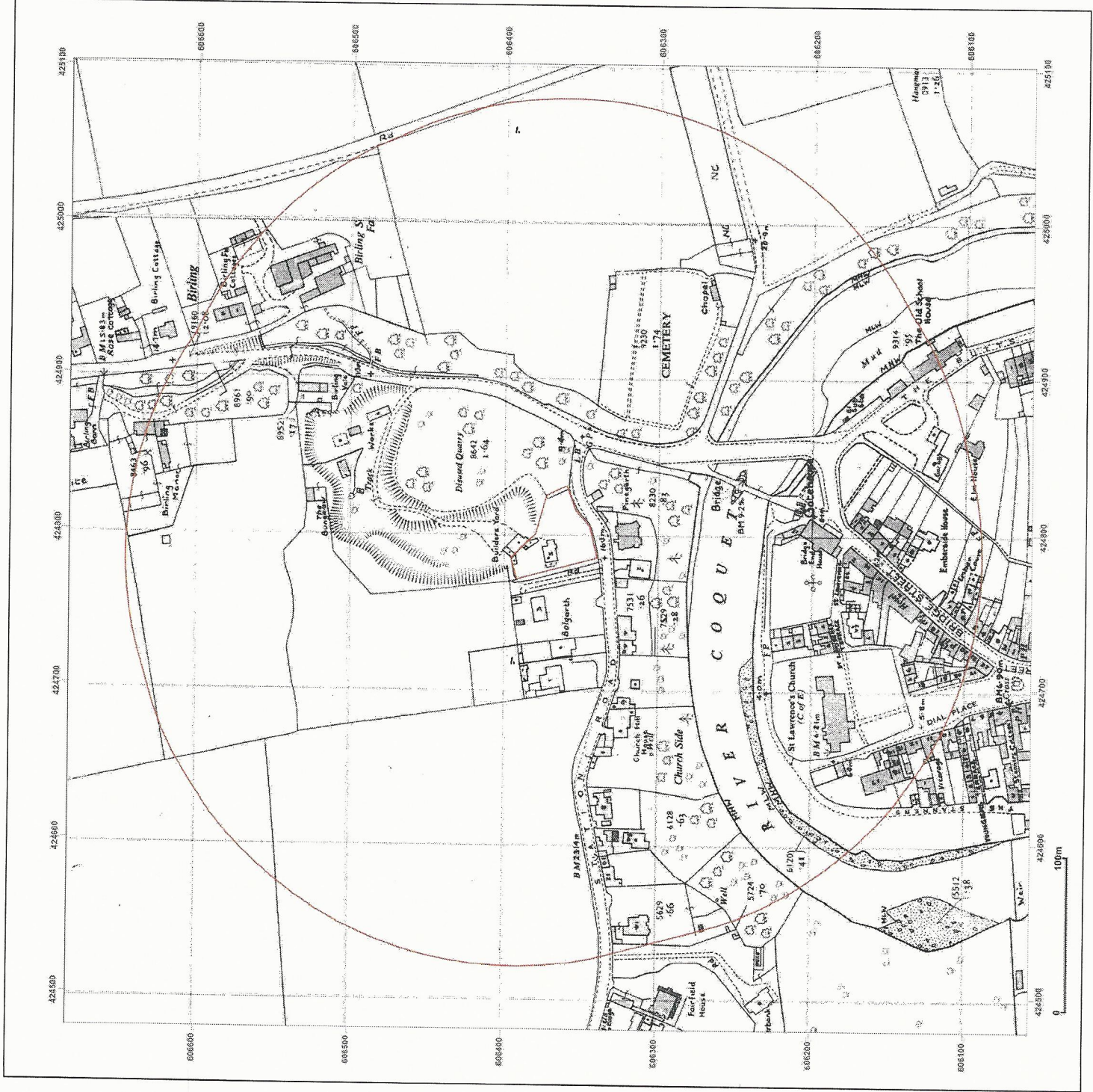


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Site Details:
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 SUNCROFT STATION ROAD,
 55M FROM STATION ROAD,
 NE65 0XP

Client Ref: 13026
Report Ref: SG-BAR-748877
Grid Ref: 424790, 606370

Map Name: National Grid
Map date: 1981
Scale: 1:2,500
Printed at: 1:2,500



Surveyed 1948
 Revised 1981
 Edition N/A
 Copyright 1981
 Levelled 1948

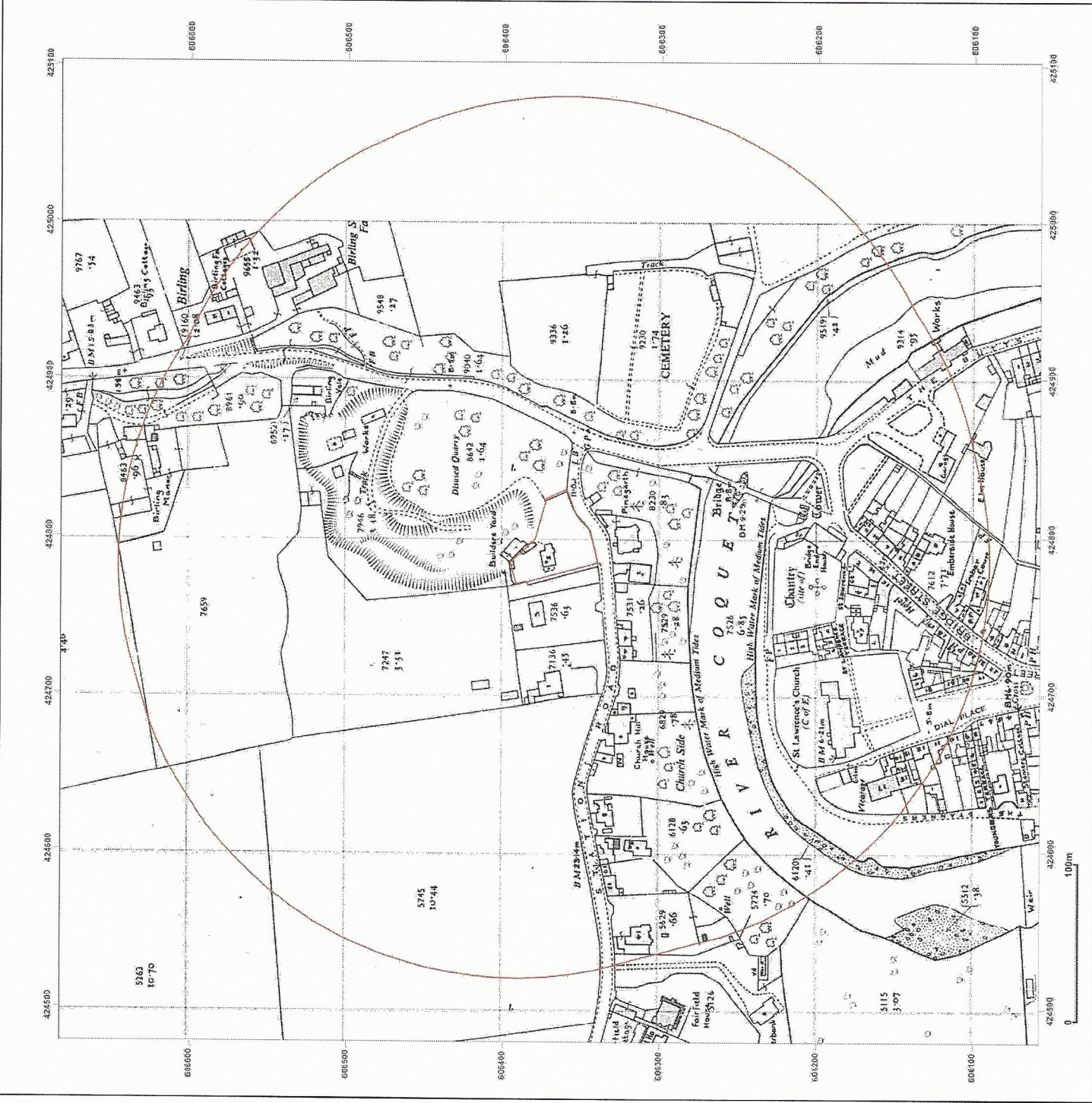
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55M FROM STATION ROAD,
NE65 0XP

Client Ref: 13026
Report Ref: SG-BAR-748877
Grid Ref: 424790, 606370

Map Name: National Grid

Map date: 1959

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1959
Revised 1959
Edition N/A
Copyright 1960
Levelled 1948

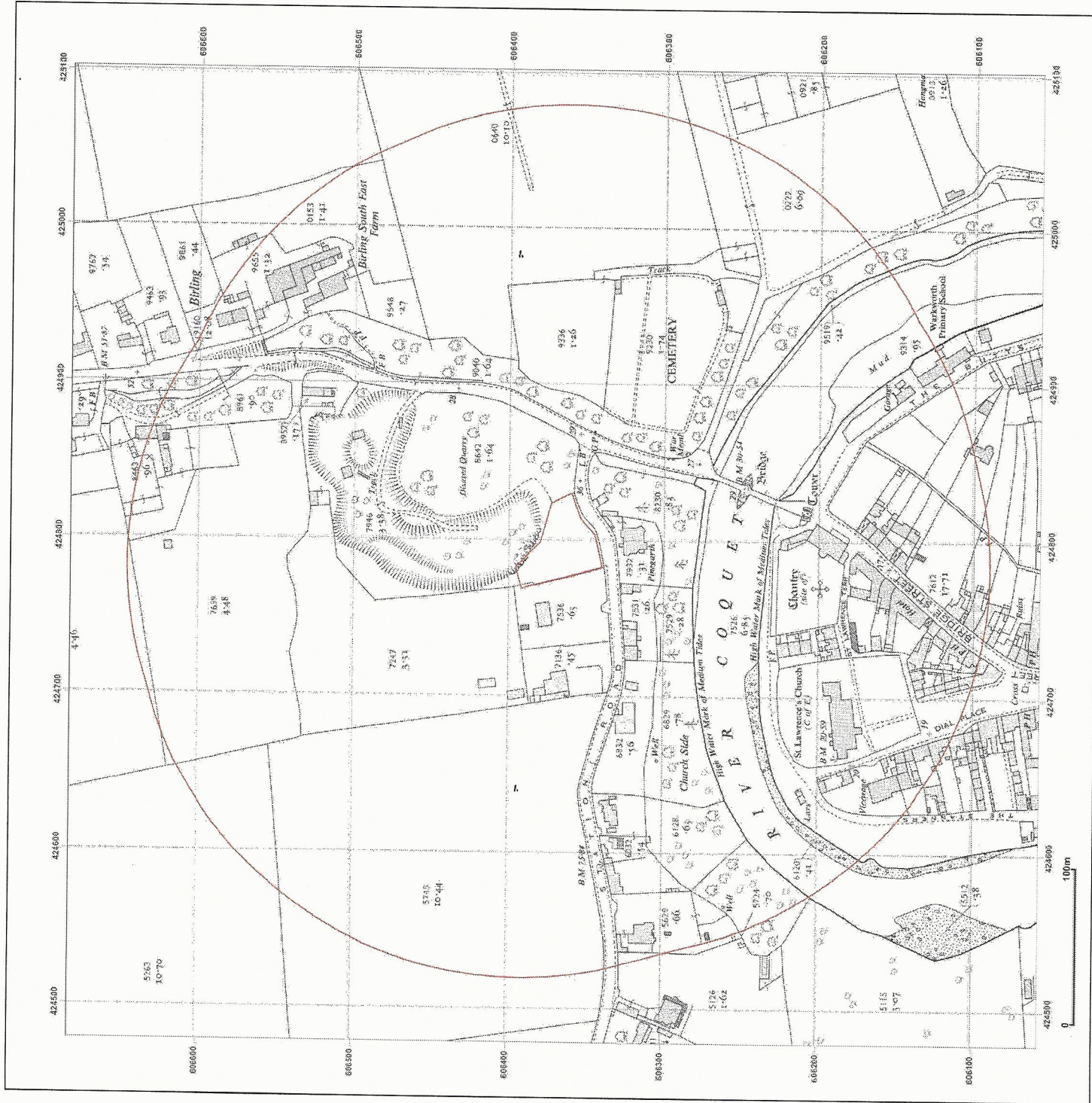


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55M FROM STATION ROAD,
NE65 DXP

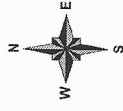
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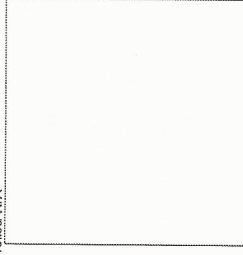
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Surveyed 1923
Revised 1923
Edition N/A
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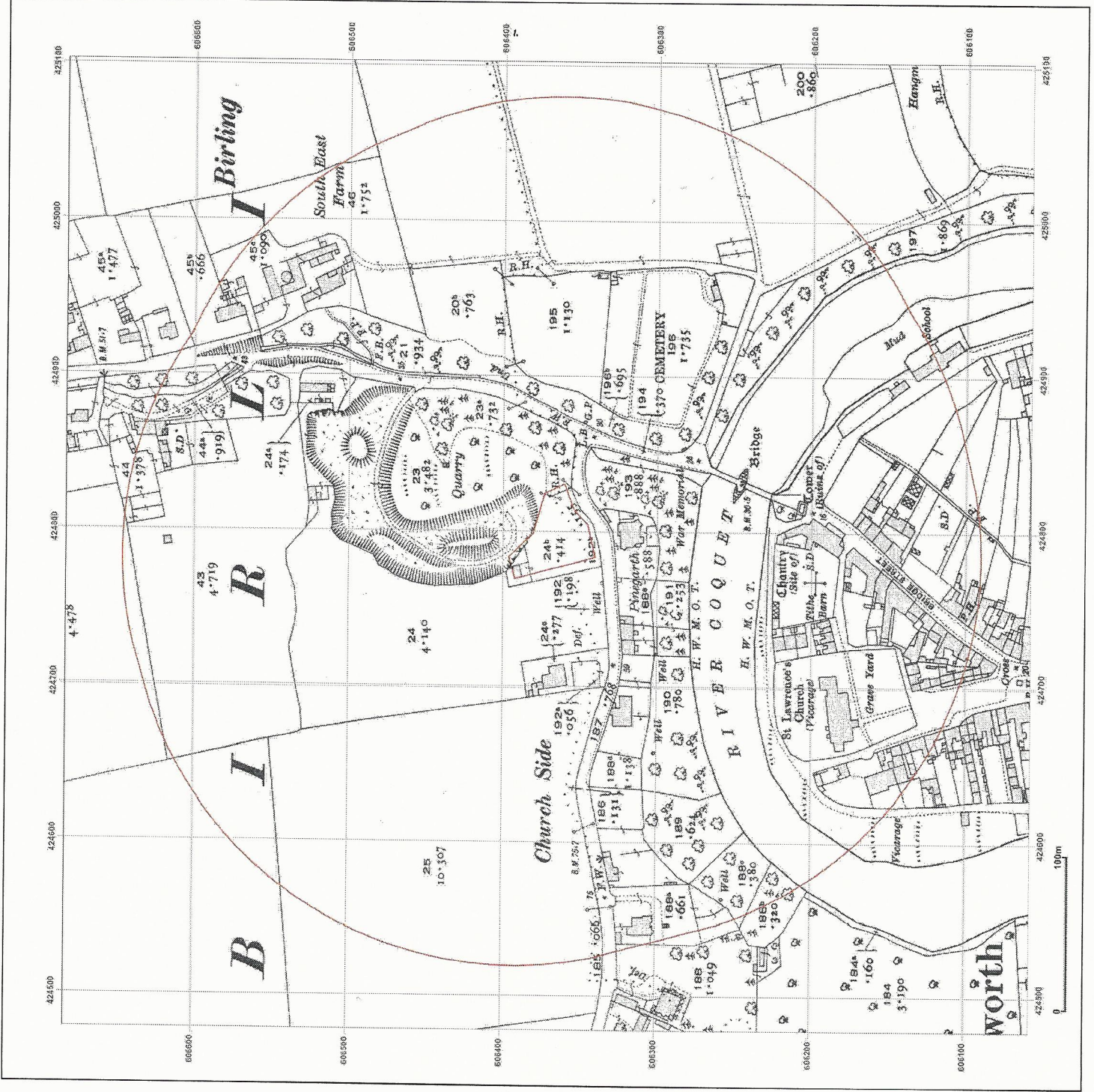


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Site Details:

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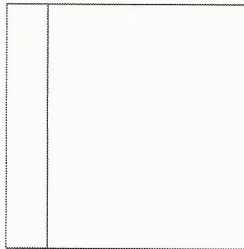
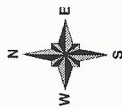
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Map Name: County Series

Map date: 1897

Scale: 1:2,500

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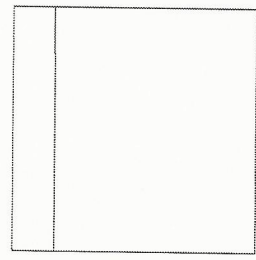
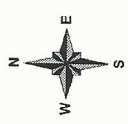
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Map Name: County Series

Map date: 1855

Scale: 1:2,500

Printed at: 1:2,500



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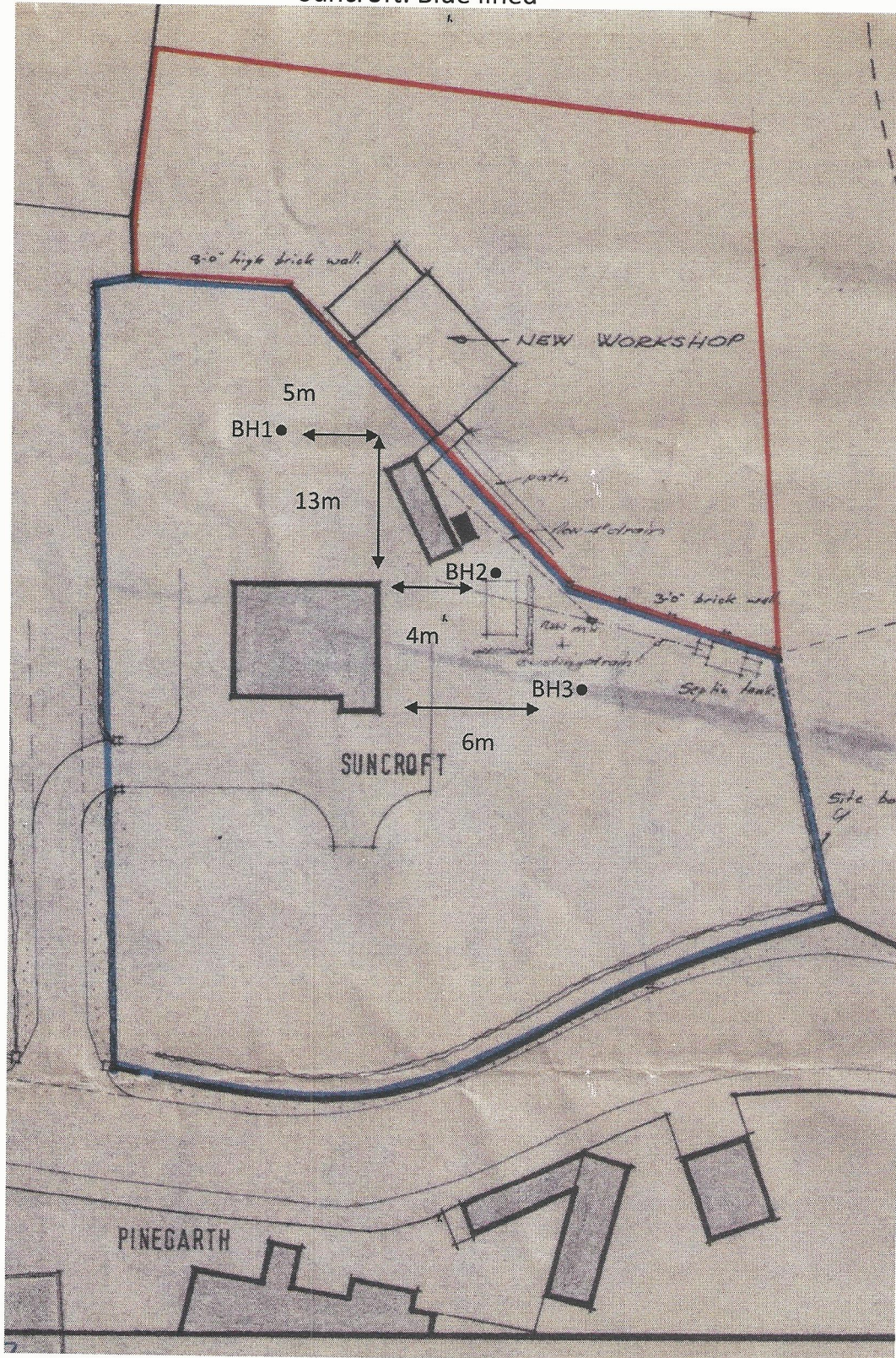
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Suncroft: Blue lined



BOREHOLE LOCATIONS

(BH2 - Hand Augured)

BOREHOLE LOG

Project suncroft warkworth				BOREHOLE No BH1	
Job No 13032	Date 24-04-13	Ground Level (m)	Co-Ordinates ()		
Contractor INTERSOIL				Sheet 1 of 1	

SAMPLES & TESTS			STRATA					Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
						(0.40)	Topsoil type (MADE GROUND)		
						(0.70)	Firm dark brown CLAY		
						(1.90)	Firm to stiff dark brown sandy CLAY with little gravel		
						3.00			

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											PIPE TO 3M DRY

All dimensions in metres Scale 1:34.375	Client Forsyth	Method/ Plant Used	Logged By AM
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AGS3 UK BH WARKWORTH SUNCROFT.GPJ ACS 3 1.GDT 14/6/13

BOREHOLE LOG

Project suncroft warkworth				BOREHOLE No BH2	
Job No 13032	Date 24-04-13	Ground Level (m)	Co-Ordinates ()		
Contractor INTERSOIL				Sheet 1 of 1	

SAMPLES & TESTS			STRATA					Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
						(0.50) 0.50	Topsoil type (MADE GROUND)		
						(0.50) 1.00	Firm dark brown CLAY with little gravel		

AGS3 UK BH WARKWORTH SUNCROFT.GPJ AGS 3 1.GDT 14/6/13

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											PIPE TO 1M DRY
All dimensions in metres Scale 1:34.375			Client Forsyth			Method/ Plant Used			Logged By AM		

BOREHOLE LOG

Project suncroft warkworth				BOREHOLE No BH3	
Job No 13032	Date 24-04-13	Ground Level (m)	Co-Ordinates ()		
Contractor INTERSOIL				Sheet 1 of 1	

SAMPLES & TESTS			STRATA					Geology	Instrument/ Backfill
Depth	Type No	Test Result	Water	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
					[Pattern]	0.20	Topsoil type (MADE GROUND)		
					[Pattern]	(0.90)	Firm dark brown CLAY		
					[Pattern]	1.10	Firm to stiff dark brown sandy CLAY with little gravel		
					[Pattern]	(1.90)			
					[Pattern]	3.00			

AGS3 UK BH WARKWORTH-SUNCROFT.GPJ AGS 3 1.GDT 14/6/13

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											PIPE TO 3M DRY

All dimensions in metres Scale 1:34.375	Client Forsyth	Method/ Plant Used	Logged By AM
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Suncroft Garden

Operation

Date

Start Atmos. Press.

End Atmos Press.

Conditions

1

SOIL GAS SURVEY

27-Apr-13

1015 MILLIBARS

1015 MILLIBARS

cool dry

NOTES

- 1) nmf=no maintained flow
 - 2) positive flow rate fluctuated during readings
 - 3) Gasdata LM1 used: Next calibration due May 2013
- NM = not measured

Readings are % volume

LOCATION	CH4 - %LEL	CH4-%VOL	CO2	O2	Flow(l/hr)	Water (mbgl)	comments
BH1	0	0	0.3	21.6	nmf	dry to 3m base	
BH2	0	0	0.3	21.3	nmf	dry to 0.73m base	
BH3	0	0	0	21.7	nmf	NM	

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Suncroft Garden

Operation

Date

Start Atmos. Press.

End Atmos Press.

Conditions

2

SOIL GAS SURVEY

17-May-13

1005 MILLIBARS

1005 MILLIBARS

cool dry

NOTES

- 1) nmf=no maintained flow
 - 2) positive flow rate fluctuated during readings
 - 3) Gasdata LM1 used: Next calibration due May 2014
- NM = not measured

Readings are % volume

LOCATION	CH4 - %LEL	CH4-%VOL	CO2	O2	Flow(l/hr)	Water (mbgl)	comments
BH1	0	0	0.2	20.2	nmf	dry to 3m base	
BH2	0	0	0.2	20.3	nmf	dry to 0.73m base	
BH3	0	0	0	20.8	nmf	0.73m	

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Suncroft Garden

Operation

Date

Start Atmos. Press.

End Atmos Press.

Conditions

3

SOIL GAS SURVEY

23-May-13

1009 MILLIBARS

1009 MILLIBARS

sun breezy

NOTES

- 1) nmf=no maintained flow
 - 2) positive flow rate fluctuated during readings
 - 3) Gasdata LM1 used: Next calibration due May 2014
- NM = not measured

Readings are % volume

LOCATION	CH4 - %LEL	CH4-%VOL	CO2	O2	Flow(l/hr)	Water (mbgl)	comments
BH1	0	0	0.1	20.2	nmf	dry to 3m base	
BH2	0	0	0.2	20.3	nmf	dry to 0.73m base	
BH3	0	0	0.2	20.5	nmf	0.72m	

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Suncroft Garden

Operation

Date

Start Atmos. Press.

End Atmos Press.

Conditions

4

SOIL GAS SURVEY

24-May-13

1011 MILLIBARS

1011 MILLIBARS

Cool dry

NOTES

- 1) nmf=no maintained flow
 - 2) positive flow rate fluctuated during readings
 - 3) Gasdata LM1 used: Next calibration due May 2014
- NM = not measured

Readings are % volume

LOCATION	CH4 - %LEL	CH4-%VOL	CO2	O2	Flow(l/hr)	Water (mbgl)	comments
BH1	0	0	0.1	20.5	nmf	NM	
BH2	0	0	0.2	20.8	nmf	NM	
BH3	0	0	0.2	21.1	nmf	NM	

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Suncroft Garden

Operation

Date

Start Atmos. Press.

End Atmos Press.

Conditions

5

SOIL GAS SURVEY

04-Jun-13

1030 MILLIBARS

1030 MILLIBARS

dry

NOTES

- 1) nmf=no maintained flow
 - 2) positive flow rate fluctuated during readings
 - 3) Gasdata LM1 used: Next calibration due May 2014
- NM = not measured

Readings are % volume

LOCATION	CH4 - %LEL	CH4-%VOL	CO2	O2	Flow(l/hr)	Water (mbgl)	comments
BH1	0	0	0.4	20.1	nmf	dry	
BH2	0	0	0.7	19.8	nmf	dry	
BH3	0	0	0.1	20.5	nmf	0.78m	

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Suncroft Garden

Operation

Date

Start Atmos. Press.

End Atmos Press.

Conditions

6

SOIL GAS SURVEY

13-Jun-13

998 MILLIBARS

998 MILLIBARS

dry. Mild

NOTES

- 1) nmf=no maintained flow
 - 2) positive flow rate fluctuated during readings
 - 3) Gasdata LM1 used: Next calibration due May 2014
- NM = not measured

Readings are % volume

LOCATION	CH4 - %LEL	CH4-%VOL	CO2	O2	Flow(l/hr)	Water (mbgl)	comments
BH1	0	0	0.8	20	nmf	dry	
BH2	0	0	0.9	19.2	nmf	dry	
BH3	0	0	0.1	20.4	nmf	0.94m	