

South Yorkshire Passenger Transport
Executive

Wakefield Road Corridor, Phase 2

Geotechnical and geo-environmental
desk study

A61-ARUP-XX-XX-RP-CG-0001

P01 | 10 December 2021

This report takes into account the particular
instructions and requirements of our client.

It is not intended for and should not be relied
upon by any third party and no responsibility
is undertaken to any third party.

Job number 253511-00

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ARUP

Contents

	Page
1 Introduction	1
1.1 Sources of Information	1
1.2 Report Structure	1
1.3 Disclaimer	1
2 The site	2
2.1 Site description	2
2.2 Site history	3
2.3 Geology	6
2.4 Hydrogeology	7
2.5 Hydrology	7
2.6 Landfills	7
2.7 Proposed development	7
3 Mining	8
3.1 Mining history	8
3.2 Mining risk assessment	9
3.3 Summary	11
3.4 Mitigation measures	12
4 Geotechnical considerations	14
4.1 Made ground	14
4.2 Retaining structures	14
5 Geoenvironmental risk assessment	15
5.1 Introduction	15
5.2 Source	15
5.3 Receptors	15
5.4 Pathways	16
6 Summary and recommendations	18
6.1 Summary	18
6.2 Recommendations	18

Figures

Figure 1 1:50,000 British Geological Survey Extract

Appendices

Appendix A

Proposed scheme general arrangement

Appendix B

Historical maps

Appendix C

South Yorkshire Mining Advisory Service mining report

1 Introduction

Ove Arup and Partners Limited (Arup) have been commissioned by South Yorkshire Passenger Transport Executive (SYLTE) (“the Client”) to provide a geotechnical and geo-environmental desk study for the Phase 2 of the A61 Wakefield Road Corridor.

The scheme involves the widening of the A61 to the north of Barnsley and reconfiguring of the existing highway, with associated works on adjacent highways.

1.1 Sources of Information

The following sources of information have been reviewed:

- Historical mapping obtained through Groundsure;
- British Geological Survey, 1:10K geological mapping, Sheets SE30NE and SE30NW;
- British Geological Survey, 1:50K geological mapping;
- British Geological Survey, 1989, Geology of the country around Barnsley (Geological Memoir).
- South Yorkshire Mining Advisory Service, 2021, A61 Corridor – proposed junction improvements, Smithies Lane and Carlton Lane;

1.2 Report Structure

This report has the following structure:

- Section 2 provides a summary of the site, site history and environmental setting;
- Section 3 details the mining information for the site;
- Section 4 assesses the geotechnical constraints affecting the site;
- Section 5 provides a conceptual site model for the proposed development and an initial contamination risk assessment; and
- Section 6 provides conclusions and recommendations for the proposed development.

1.3 Disclaimer

This report takes into account the particular instruction and requirements of the Client. It is not intended for, and should not be relied upon by any third parties, and no responsibility is undertaken to any third party. This report does not replace the need to carry out ground investigation works.

2 The site

2.1 Site description

The site is located to the north of Barnsley town centre along the A61, Wakefield Road and extends from approximately the northern extent of residential properties in the south to Carlton Road in the north. The site location is shown in Image 1 below. The general arrangement drawing is shown in Appendix A.



Image 1: Site location shown in red

The site is approximately 400m long in a north-south alignment and includes approximately 100m of Smithy Lane. The site includes the A61 and existing areas of verge, pavement and extends to areas of car parking, residential garden and verges on adjacent premises.

In this location the A61 carries single lane traffic in each direction. Site uses are predominantly large warehouse stores, fast food outlets and car show rooms with large areas of car parking. Residential properties are present in the northeastern corner along Carlton Road and Old Road. Wakefield Road is bisected by Smithies Lane and Quarry Street in the north.

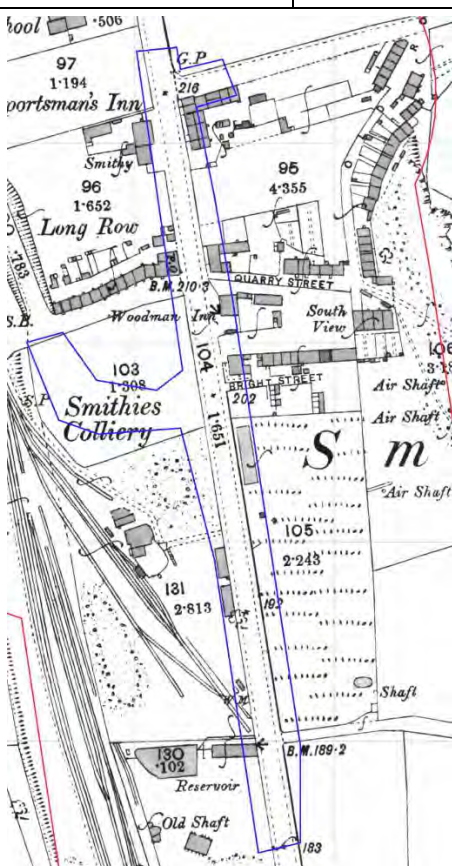
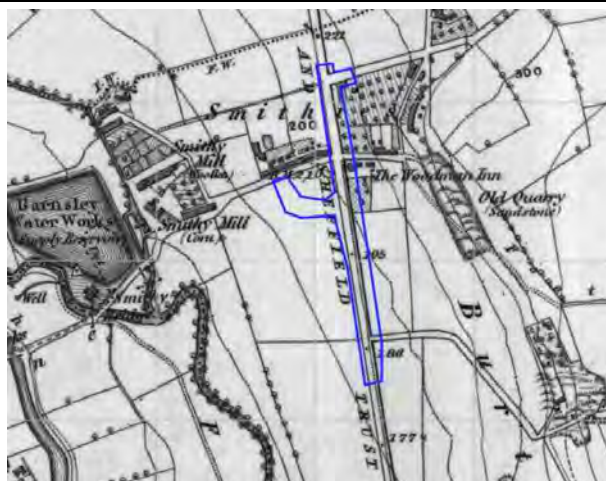
The A61 rises gradually to the north within the site area, with the surrounding ground rising steeply to the east.

2.2 Site history

The history of the site has been reviewed and is summarised in Table 1. See Appendix B for the full set of historical plans.

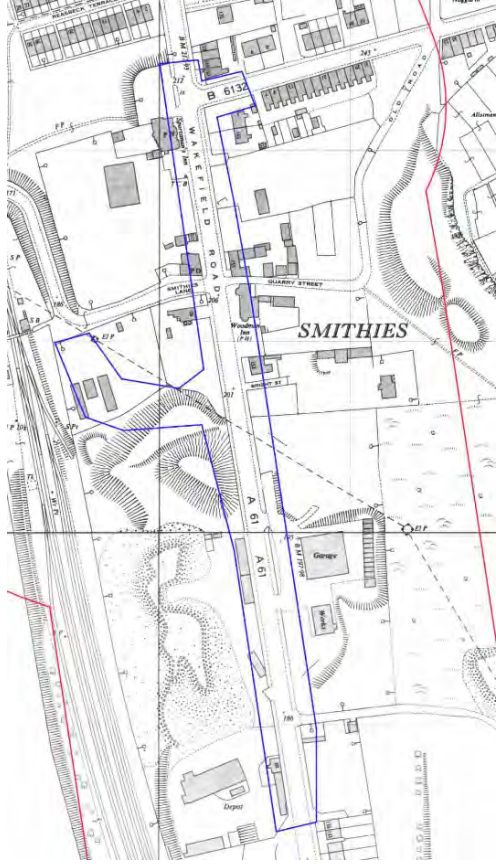
Table 1 - Summary of site history

Features shown	Extract date	Original scale
Wakefield Road and Carlton Road are shown in their current alignment. Part of Smithies Lane appears to be present which is partially occupied. A wool and corn mill (Smithy Mill) are shown approximately 90m west of the site. These are not labelled in later maps. Beyond the mills is Barnsley Water Works supply reservoir. An old and an existing quarry are shown to the east, the nearest is approximately 80m east of the site. The River Dearne is in a similar alignment to the existing alignment.	1850	1:10,560
Development has begun along much of Wakefield Road. Most uses are not labelled but a smithy is shown at the north of the site. Smithies Colliery is shown on the western side of Wakefield Road. The railway is shown to the west of the site and Smithies Lane is shown crossing beneath it. Sidings from the railway are shown to extend all the way to Wakefield Road. A reservoir is shown between Wakefield Road and the railway. A quarry is shown to the north of the old quarry on the previous mapping, approximately 80m to the east of the site. There are numerous air shafts and old shafts shown around the site	1892-1893	1:2,500

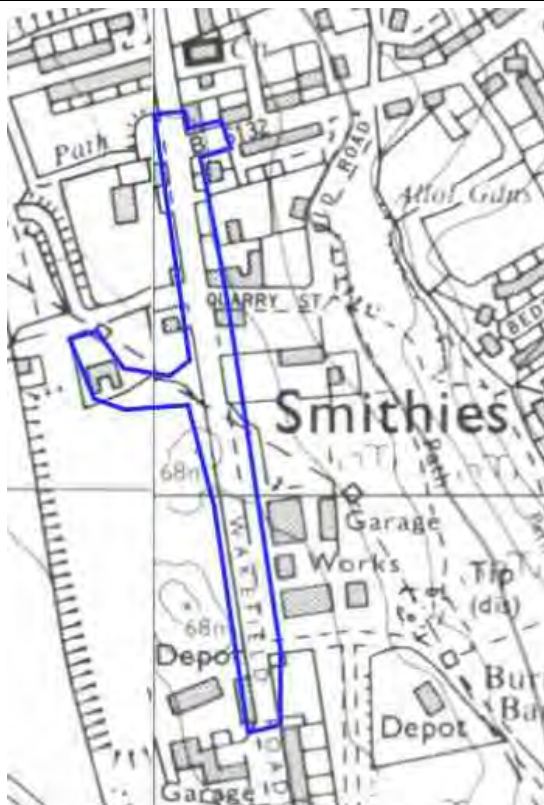


There is little change within the site boundary. The reservoir by the south of the site is no longer shown. A colliery is labelled (Wallsend Main Colliery) and appears to relate to workings on both sides of Wakefield Road. Smithies Colliery is no longer labelled and may be part of Wallsend Main Colliery. Mine 'levels' are marked on the east side of Wakefield Road. These correlate with the position of adits recorded by the Coal Authority.	1906	1:2,500
The railway sidings to the west of the site have been removed and it appears that the spoil tip from the colliery has expanded. Residential properties are now shown to the south of the site. Wallsend Main Colliery is no longer shown.	1929	1:10,560
	1960-61	1:2,500



Development has continued on Wakefield Road and two of the uses are shown to be a garage and works, the smithy in the north of the site is now shown as a public house. A depot is shown by the southwest of the site. The quarry to the east appears to have been infilled. The spoil mounds on the east side of Wakefield Road appear to have been remodelled.		
The colliery is labelled as a tip (disused). The railway is shown to be dismantled to the north of the site but appears to still be present along and to the south of the site	1973-1974	1:10,000 

The remainder of the railway has been dismantled. A tip (disused) is shown to the east of the site. The boundary of the tip is not clear but does not appear to extend to the site.	1982	1:10,000
There is little noticeable change on the mapping until 2010 when Smithies Lane is shown to be present in its current alignment.	2010	1:10,000



2.3 Geology

The SE30NE and SE30NW 1:10,000 geological mapping was reviewed as well as the 1:50,000 geological mapping.

Figure 1 shows an extract of the 1:50,000 geological mapping overlain with the site boundary.

2.3.1 Superficial geology

An area of artificial ground is shown relating to the former colliery and tip to the west of Wakefield Road. No other superficial deposits or made ground are mapped along the scheme, but local deposits of made ground are likely to be associated with previous and current developments.

2.3.2 Solid geology

The site is primarily underlain by undifferentiated Pennine Middle Coal Measures of mudstone, siltstone, sandstone and coal. The Wooley Edge Rock is shown outcropping to the east and the Kent's Rock to the west, both are named sandstone units within the Pennine Middle Coal Measures. The bedrock is shown dipping shallowly to the east, into the slope.

Three faults are shown in the north of the site. One trending in a southwest-northeast alignment and two in a northwest-southeast alignment. Four coal seams are shown outcropping beneath and around the site typically in a north south orientation, acute to the road.

Coal seams outcropping beneath the site are the Top Beamshaw (Kilnhurst) and the Winter (Abdy) Coal. See Section 3 for further information on mining.

2.4 Hydrogeology

There are no source protection zones within 1km of the site. The underlying Pennine Middle Coal Measures are classed as a Secondary A aquifer.

2.5 Hydrology

The River Dearne flows approximately north to south along the southern half of the site and at its closest is approximately 170m to the west of the site. Further north the river flows further west from the site.

2.6 Landfills

Wakefield Road landfill is a recorded historical landfill approximately 55m west of the proposed development. The landfill was active from 1981 to 1988 and accepted industrial and commercial waste.

2.7 Proposed development

The proposed development will involve widening the road which will take some land from the surrounding uses and will increase to a maximum of four lane traffic and an additional turning lane. Earthworks will be required to excavate to a suitable formation level for the required highway build-up. Retaining structures may be required in some locations to make up level differences with the existing uses.

3 Mining

A review of coal mining along the scheme has been carried out by South Yorkshire Mining Advisory Service (SYMAS) and is included in Appendix C. A summary is included below with additional information on non-coal mining and quarrying.

3.1 Mining history

3.1.1 Recorded quarries

Three quarries were noted around the site from the historical mapping, one of which was described as an old quarry by 1850. None were recorded beneath the site or within the immediate area.

3.1.2 Recorded and unrecorded coal mineworkings

There are two coal seams that appear to outcrop beneath the site, however, there are four seams that are recorded outcropping within the area. Due to faulting in the area, these seams underlie and outcrop in various parts of the scheme. These coal seams, in stratigraphical order, are:

Table 2: Coal seam summary

Coal seam	Approximate thickness (m)	Details
Two Foot	0.9	Outcropping to the northeast and south east of the site. Unlikely to underlie the site but may be present in the northeastern and southeastern corners of the site at outcrop.
Winter (Abdy)	1.0	Shown to outcrop in the north of the site. Likely to be at shallow depth in the south of the site.
Top Beamshaw	1.2	Shown to outcrop at an acute angle to Wakefield Road in the centre of the site. Will underlie the site at shallow depth in the south of the site and between the fault lines in the north.
Low Beamshaw	0.6	Over 20m deep beneath south of the site. Will be at shallow depth along the centre of the centre of the site and in the north. It may outcrop beneath the northwestern extent of the site.

No shallow coal mining is recorded beneath the scheme itself, but the Coal Authority records probable shallow coal mine workings across the site. There is

potential for shallow workings prior to 1872 before record keeping of workings was required.

Deep workings associated with the Top Haigh Moor Coal and Lidgett Coal are recorded at substantial depth beneath the site.

3.1.3 Recorded mine entries

There are four mine entries shown within 20m of the site, all located south of Smithies Lane but there are significantly more shown further east and three shown south of the site.

The mine entries around the site are summarised below:

Table 3: Mine entry summary

CA Reference	Shaft or adit	Likely direction of adit	Treated	Departure (m)	Shaft diameter
435407-012	Shaft	N/A	Yes	0	2.3
435408-026	Adit	Beneath highway	No	8	2.5 (assumed)
435408-006	Adit	Away from highway	No	5	2.5 (assumed)
435407-013	Adit	Beneath highway	No	13	2.5 (assumed)

The locations were taken from mine abandonment plans and the actual entrance location may vary, indicated with the departure.

3.2 Mining risk assessment

3.2.1 Former surface workings

If unrecorded quarries or surface workings are present within the site these are likely to be before the available mapping and any infill will have consolidated under self-weight. The proposed highway works will impose limited additional surcharge load and backfill of this age is unlikely to result in significant settlement of the highway. However, fill materials may be locally of low strength and this could have local impact, particularly for foundations of street furniture.

3.2.2 Shallow mineworkings

The Coal Authority have records of shallow mineworkings (likely in the Winter Coal seam) immediately to the east of Wakefield Road just to the south of the junction with Smithies Lane. There are also many recorded mine entries that suggest the extent of shallow mineworkings beneath the site are much greater than the Coal Authority have detailed records for, including in coal seams other than the Winter Coal.

The SYMAS report did not record any remedial treatment of mineworkings having been previously carried out in the immediate area.

There is the potential for workings in the shallow seams, particularly the Winter Coal, Top Beamshaw and Low Beamshaw. Some of these workings may be particularly shallow beneath the highway and hence the risk from these workings would be moderate to high.

3.2.3 Deep mineworkings

Deep workings underlie the site but are of such age that all significant settlement will have already occurred. The risk from deep mineworkings is therefore considered to be very low.

3.2.4 Historical mines entries

There are three recorded mine entries on, or very close to the site, and one within 20m of the site. Two of these are adits that are expected to dip beneath the site.

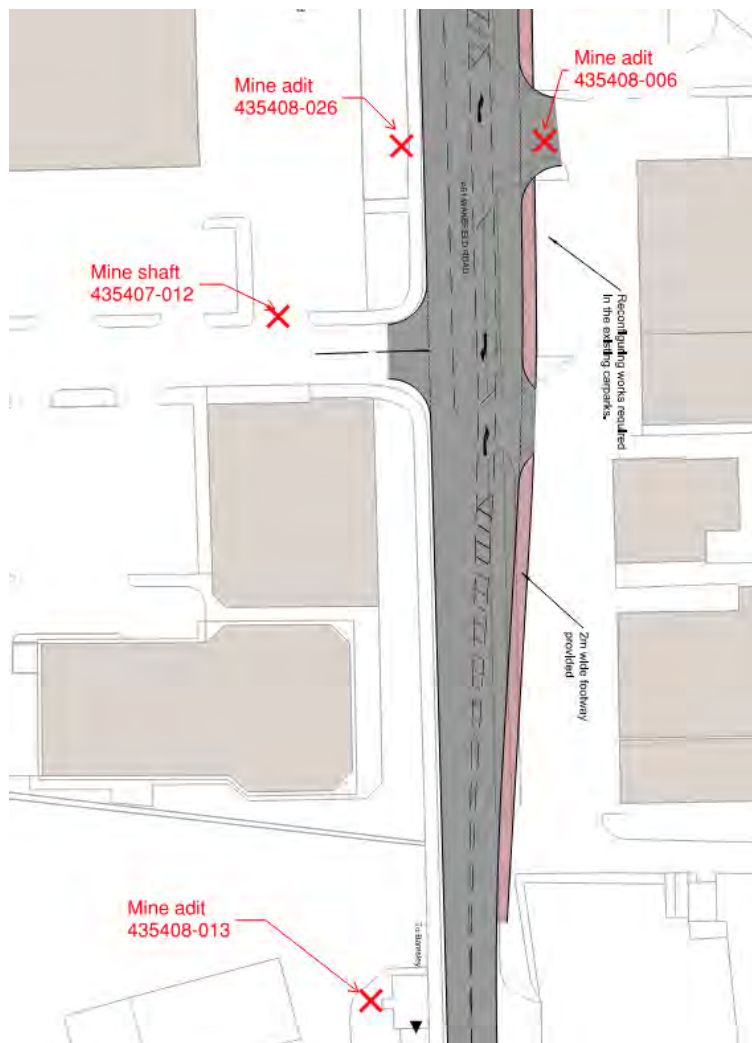


Image 2: Approximate mine entry location overlain on the general arrangement

Image 2 shows the mine entry locations overlain on the general arrangement plan. Mine adits 435408-006 is within the proposed development area. Mine adit 435408-026 is shown to the west of the scheme and no development is proposed here but if untreated may still provide a risk to the existing highway. Mine adit 435408-013 is in the south of the site, beyond any proposed changes to the existing highway.

Mineshaft 435407-012 is recorded as being treated, probably during development of the car showroom. However, details of the treatment have not been obtained. The other mine entries are not recorded as having been treated.

There is also the potential for unrecorded mine entries. The risk from recorded and unrecorded mine entries is considered to be high.

3.2.5 Ground gas

The proposed development will have no confined spaces and the risk from hazardous ground gas to end users is therefore considered to be negligible. However, the risk from potential hazardous ground gas will need to be controlled during intrusive ground investigation and any excavations during the construction phase.

3.2.6 Coal combustion

At least two coal seams outcrop beneath the site and hence coal may be exposed during construction. There is potential for combustion to occur when coal is exposed to air.

3.3 Summary

Source	Location	Hazard	Risk
Infilled surface workings	Noted west of Wakefield Road. Potentially elsewhere in the scheme but not shown on historical mapping.	Settlement of poorly backfilled material.	Low The depth of surface workings is not likely to be more than 2m-3m. Any infill is likely to be reasonably compact, but may have local potential for settlement.
Shallow underground workings	Site wide	Collapse of workings leading to subsidence	High
Deep underground mine workings	Site wide	General subsidence	Very low

Recorded and unrecorded mine entries	Site wide	Local collapse subsidence from adits and mine entries.	High
Hazardous ground gas emissions	Potentially anywhere above coal deposits and mineworkings	Accumulation in confined spaces to toxic or explosive concentrations.	Negligible to end users Moderate during investigation and construction
Coal combustion	At outcrop locations	Exposure of coal may cause combustion during construction	High

3.4 Mitigation measures

3.4.1 Shallow underground workings

Due to the length of the scheme and the probability that any workings would be sporadic a typical intrusive ground investigation is unlikely to identify any or all potential workings along the site if present.

Surface geophysical survey could potentially identify areas of voided ground, and it is recommended that surveys are carried out in advance of either intrusive investigation or construction.

During excavations a watching brief could be maintained to identify areas of ground disturbance that may indicate the presence of mineworking subsidence. However, this would only apply if in-situ rock was encountered within the excavation and this may be below the proposed depth of pavement build-up.

If evidence of mineworking voids is found, the need for treatment will depend on their extent and depth. Treatment could potentially include drilling and grouting works. An alternative may be to reinforce the highway foundation with layers of geogrid, which would act to prevent a potential crowhole from causing abrupt subsidence.

3.4.2 Recorded and unrecorded mine entries

There are two recorded mine adits that may pass beneath the highway and another adit that may underlie the site, however there is uncertainty in their exact positions.

It is recommended that surface geophysical survey is carried out to attempt to determine the location of the mine entries in advance of intrusive investigation. Depending on the depth of feature identified, intrusive investigation may be via trial trenching or borehole drilling.

The required treatment of mine entries will depend on their position and depth and could include drilling and grouting or excavation and recompaction.

3.4.3 Coal combustion

Where exposed during the investigation or construction, coal should be removed or immediately blinded with concrete or compacted clay to minimise the risk of spontaneous combustion. Similarly, air-flush drilling should be avoided.

4 Geotechnical considerations

4.1 Made ground

Made ground is likely to be present across the site, particularly in the west of the site beneath the former colliery and tip. The proposed development predominantly extends to the east and there is little proposed above the former colliery.

If coal was excavated at outcrop there may be pockets of poorly compacted material at the surface.

The made ground in the east is unlikely to be of significant thickness.

During construction, testing should be in place to identify and remediate any localised soft spots within the made ground, which is likely to be variable over short distances.

4.2 Retaining structures

Due to the rise in levels to the east, widening the road may require additional retaining structures to reduce the need for extensive earthworks. Retained heights are likely to be small.

A retaining structure may be required on west side of Smithies Lane. It should be noted that this will be founded behind and above an existing retaining structure and this will need to be taken into consideration in design.

5 Geoenvironmental risk assessment

5.1 Introduction

This section reviews the potential sources of contamination across the site and the surrounding area based on available information.

The potential risks to human health and the environment have been considered in the context of a conceptual source-pathway-receptor (SPR) model of the site, identifying:

- The principal pollutant hazards within the site (the sources);
- The principal receptors at risk from the hazards; and
- The existence, or absence, of plausible pathways which may exist between the identified hazards and receptor.

For risks to be present at the site, all three elements (source-pathway-receptor) of a plausible pollutant linkage must be present. Potential linkages are described below, based on the proposed site end uses.

5.2 Source

The following sources of contamination are present on and off site.

Potential source	Potentially contaminative material	On site or off site
Made ground – possible infilled surface workings, colliery spoil, general fill	Asbestos, heavy metals, TPHs, PAHs	On and off site
Smithy	Heavy metals, TPH, PAH, inorganic compounds	On site
Garage and workshop (if drainage system defective)	Heavy metals, TPH, PAH, inorganic compounds	Off site
Underlying geology	Sulphate, pyrite, ground gas	On and off site

5.3 Receptors

Receptors during the construction and operation phase of development include:

- Construction and maintenance workers;
- Future site users, neighbours and pedestrians;
- Secondary A aquifer; and

- Structural concrete.

5.4 Pathways

Potential pathways that may be present during development and operation include:

- Human health – ingestion of soils or dust;
- Human health – inhalation of dust or vapour;
- Human health – dermal contact with soils and surface water;
- Controlled waters – migration of dissolved and free phase contamination within groundwater; and
- Controlled waters – transport to groundwater through site drainage and runoff.

5.4.1 Preliminary conceptual site model

Table 4 shows the preliminary conceptual site model for the proposed development.

Table 4: Preliminary conceptual site model

Source	Pathway	Receptor	Plausible pollutant linkage
Construction phase			
Contaminated made ground	Inhalation of dust or vapours	Construction worker	Yes
		Site neighbours	Yes
	Dermal contact with soil	Construction workers	Yes
	Ingestion of soils and dust		
Leachable contaminants in the made ground and dissolved contaminants in groundwater	Dermal contact with groundwater	Construction workers	Yes
	Ingestion of groundwater		
	Groundwater ingress through runoff or pore water	Secondary A aquifer	Yes
Hazardous ground gas	Accumulation in confined spaces and excavations	Construction workers	Possible in excavations or confined spaces
Post construction			
Contaminated made ground	Inhalation of dust or vapours	Site users	No – hardstanding over made ground
		Maintenance workers	Yes
	Dermal contact with soils	Site users	No, hardstanding over made ground

	Ingestion of soils and dust	Maintenance workers	Yes
		Site users	No, hardstanding over made ground
		Maintenance workers	Yes
Leachable contaminants in the made ground and dissolved contaminants in groundwater	Via surface infiltration	Secondary A Aquifer	No, hardstanding over made ground
Concrete aggressivity	Chemical attack by groundwater and soil	Buried concrete structures	Yes
Hazardous ground gas	Accumulation in confined spaces and excavations	Site users	No, no enclosed spaces
		Maintenance workers	Possible if there are confined spaces associated with drainage.

There is a risk to construction workers and site neighbours during construction that can be managed with construction best practice and appropriate controls and/or PPE.

During the operational phase, there is negligible risk to pedestrians, site users and site neighbours due to the presence of hardstanding. The overall impact on the Secondary A aquifer is reduced from the existing condition by reducing infiltration. There is a risk to maintenance workers who may come into contact with the made ground, but this can be mitigated with best practice and appropriate PPE.

6 Summary and recommendations

6.1 Summary

The following key points have been identified in this report:

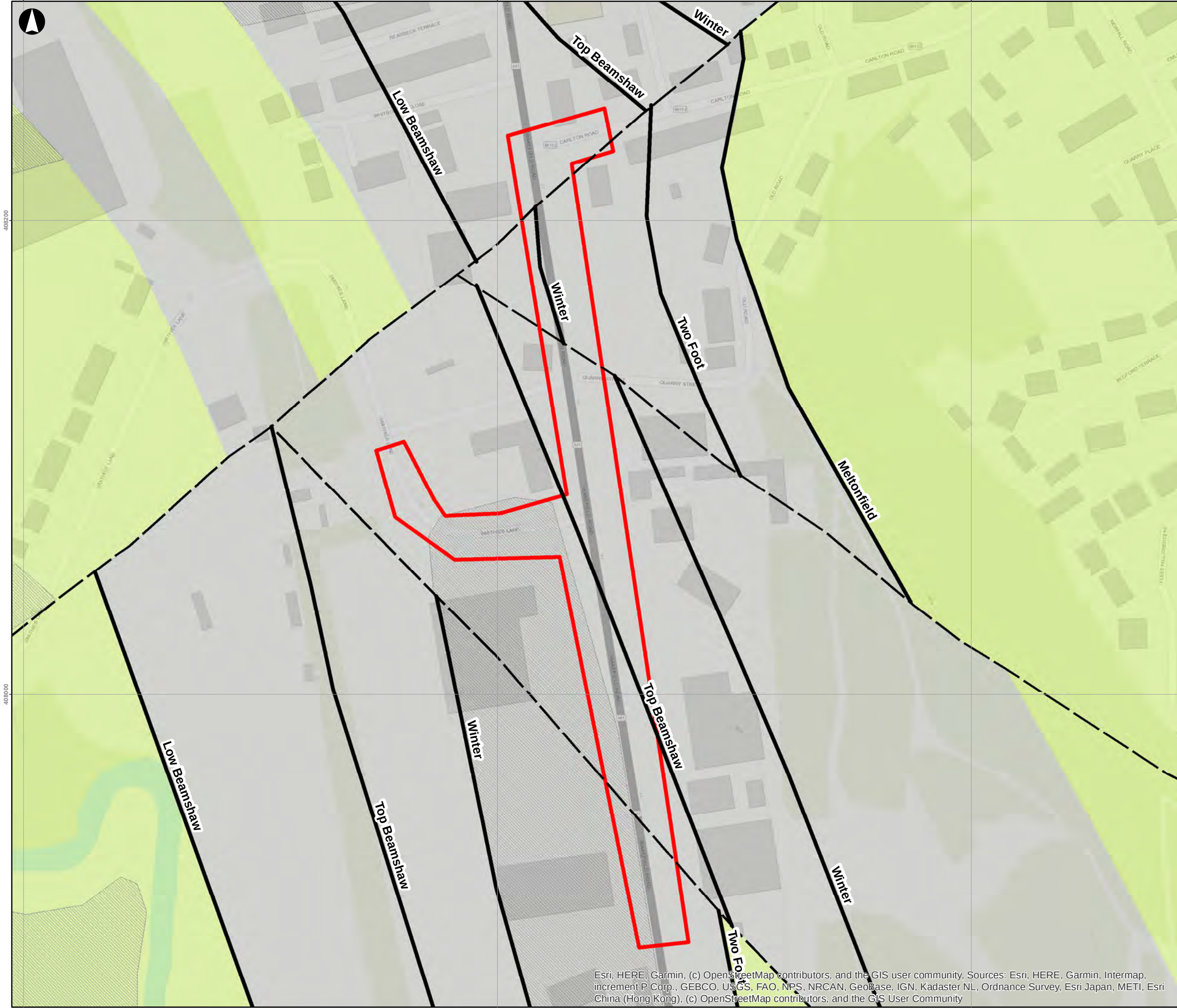
- The site is in an area of known shallow and deep mineworkings and historical quarries.
- Infilled quarries near to the site may contain landfill material.
- There are at least three mine adits and a mine shaft within 20m of the site. Two of these adits are expected to extend beneath the highway.
- There are likely to be shallow mineworkings beneath the site .
- Both the mine entries and shallow mineworkings present a risk of subsidence that may affect the proposed highway development.

6.2 Recommendations

The following actions are recommended:

- The locations of the adits and shaft should be investigated, firstly with surface geophysics and then intrusive investigation. Depending on their position and conditions, they may require treatment to minimise risk to the highway.
- Potential shallow mineworkings should be investigated in a similar manner. Mitigation of risk from shallow mineworkings may be via either treatment works or reinforcement of pavement foundations.
- Due to the likely variability of the made ground, testing should be in place during construction to identify and remediate any localised soft spots. Sampling and testing during ground investigation should be carried out to assess ground contamination and how this may affect earthworks and spoil disposal.

Figures



Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community, Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

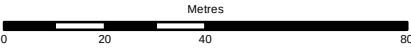
Legend

- Faults
- Coal outcrops
- Site Boundary
- Made Ground
- Undifferentiated Middle Coal Measures
- Sandstone

Contains British Geological Survey materials © UKRI 2021

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Issue	Date	By	Chkd	Appd
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Client
**South Yorkshire Passenger
Transport Executive (SYPTE)**

Job Title
A61 Wakefield Road Corridor, Phase 2

**1:50,000 British Geological Survey
Extract**

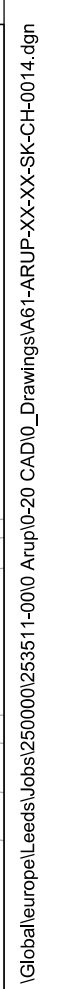
Scale at A3
1:1,500

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Drawing No Figure 1	Issue P01
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Appendix A

Proposed scheme general
arrangement



 Proposed carriageway
 Proposed bus stop
 Proposed footway

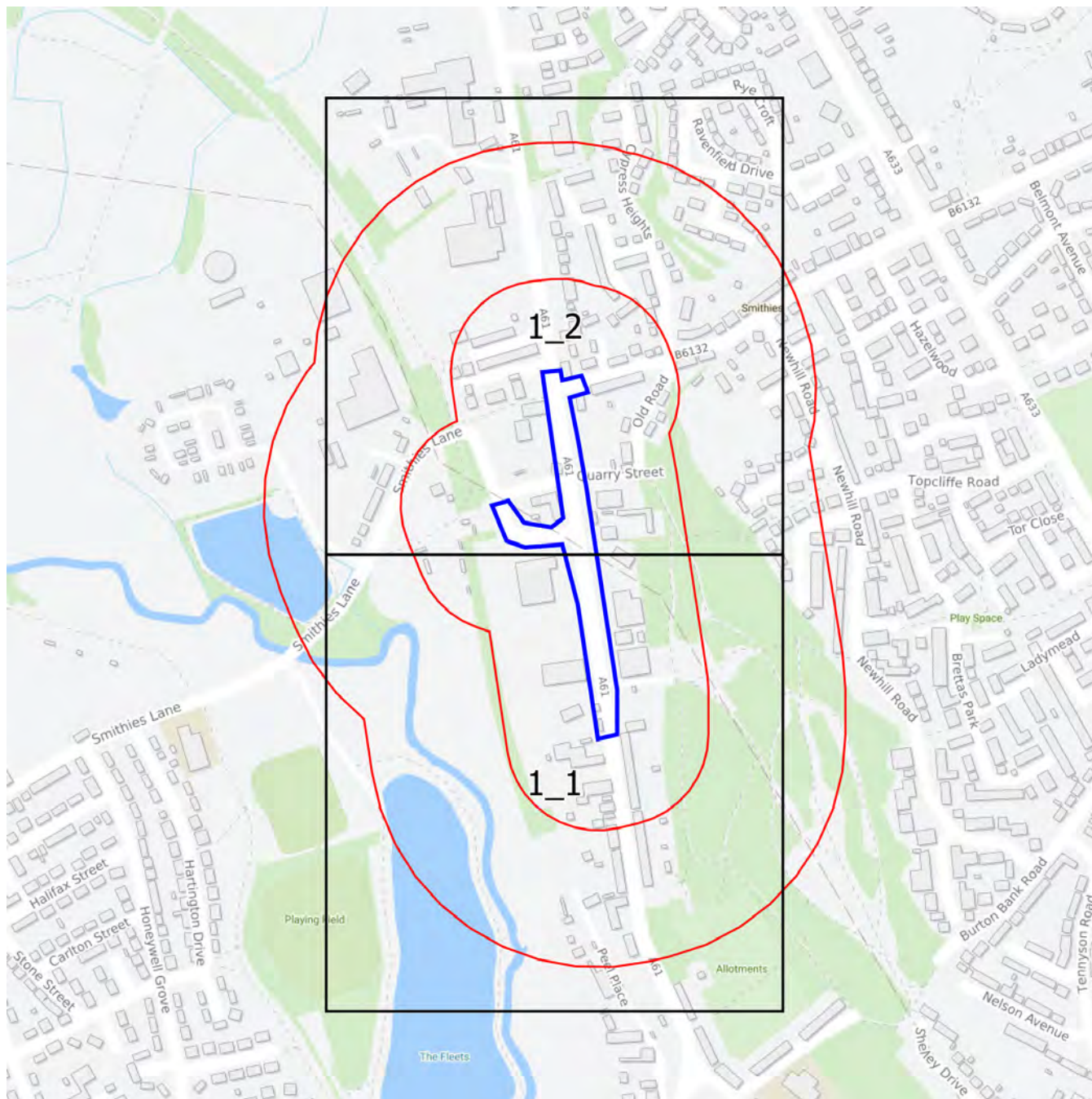
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For Information				
P01	07/05/21	SM	HJ	CW
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Scale at A1	1:500
Role	Highways
Suitability	- S2 - Fit for information
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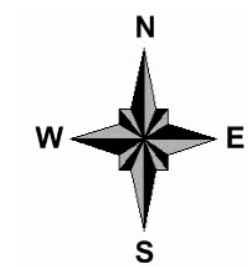
Appendix B

Historical maps



Groundsure
INSIGHTS

1:1,250 Scale Grid Index



Site Details:

POST BOX 8M FROM B M & C
FUNERAL DIRECTORS,
WAKEFIELD ROAD 6M FROM
A61, WAKEFIELD ROAD,
SMITHIES, BARNSELY, S71
1NN

Client Ref: 253511
Report Ref: GS-8267487_1250_1_1
Grid Ref: 435014, 407795

Map Name: National Grid

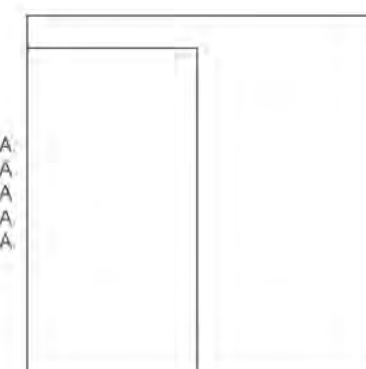
Map date: 1960

Scale: 1:1,250

Printed at: 1:2,000



Surveyed N/A
Revised N/A
Edition N/A
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Map legend available at:
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Site Details:

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A61, WAKEFIELD ROAD,
SMITHIES, BARNSELY, S71
1NN

Client Ref: 253511
Report Ref: GS-8267487_1250_1_1
Grid Ref: 435014, 407795

Map Name: National Grid

Map date: 1959-1962

Scale: 1:1,250

Printed at: 1:2,000



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Revised 1961
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Site Details:

POST BOX 8M FROM B M & C
FUNERAL DIRECTORS,
WAKEFIELD ROAD 6M FROM
A61, WAKEFIELD ROAD,
SMITHIES, BARNSELY, S71
1NN

Client Ref: 253511
Report Ref: GS-8267487_1250_1_1
Grid Ref: 435014, 407795

Map Name: National Grid

Map date: 1970-1975

Scale: 1:1,250

Printed at: 1:2,000



Surveyed 1958
Revised 1970
Edition N/A
Copyright 1970
Levelled 1963

Surveyed 1959
Revised 1970
Edition N/A
Copyright 1970
Levelled 1963

Surveyed N/A
Revised N/A
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SMITHIES, BARNSELY, S71
1NN

Client Ref: 253511
Report Ref: GS-8267487_1250_1_1
Grid Ref: 435014, 407795

Map Name: National Grid

Map date: 1973-1977

Scale: 1:1,250

Printed at: 1:2,000



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

Surveyed 1960
Revised 1976
Edition N/A
Copyright 1977
Levelled 1963

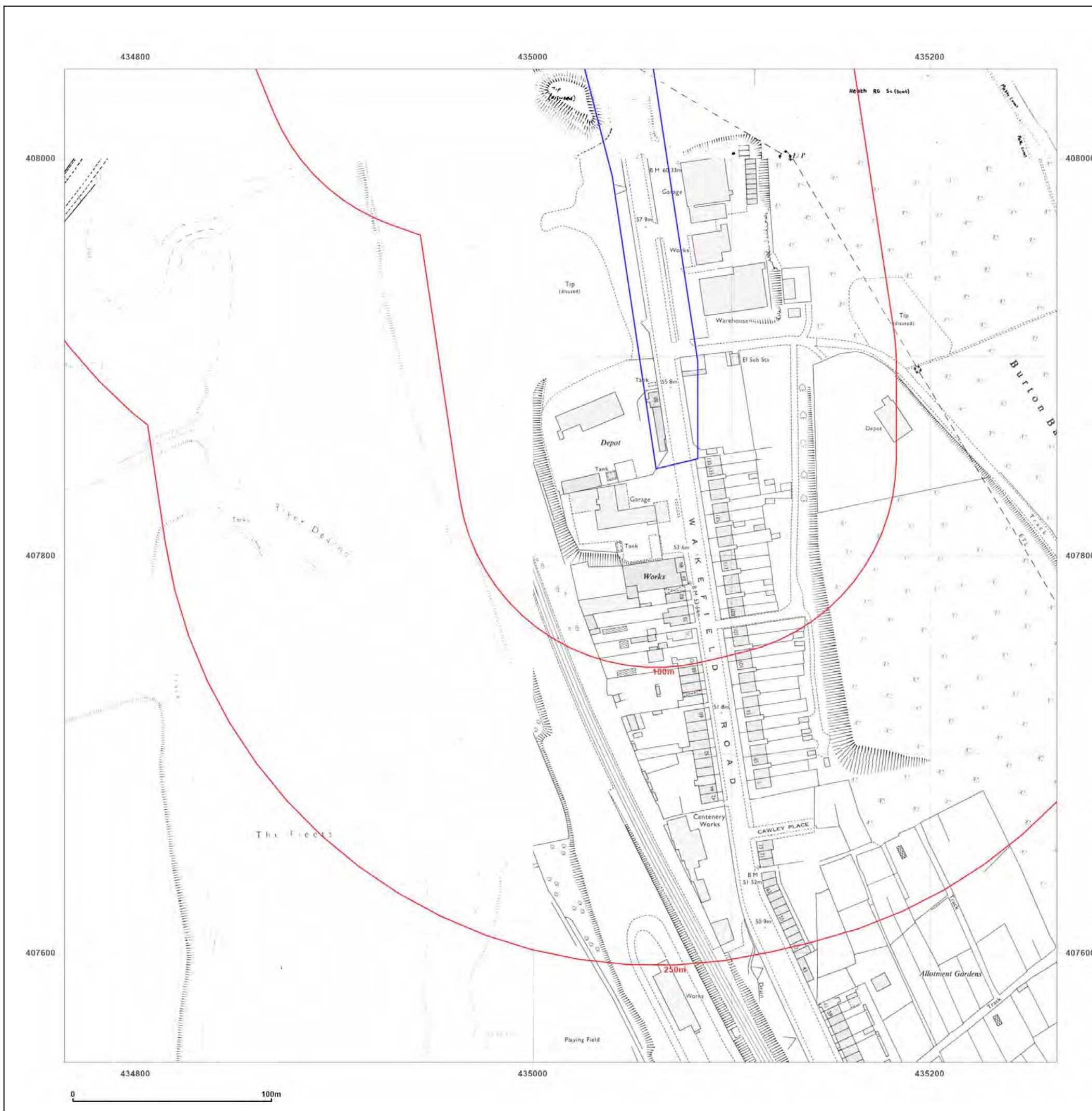


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Client Ref: 253511
Report Ref: GS-8267487_1250_1_1
Grid Ref: 435014, 407795

Map Name: National Grid

Map date: 1990-1992

Scale: 1:1,250

Printed at: 1:2,000



Surveyed 1963
Revised 1991
Edition N/A
Copyright 1991
Levelled 1963

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

Surveyed 1963
Revised 1990
Edition N/A
Copyright 1990
Levelled 1963

Surveyed 1963
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1NN

Client Ref: 253511
Report Ref: GS-8267487_1250_1_1
Grid Ref: 435014, 407795

Map Name: National Grid

Map date: 1993

Scale: 1:1,250

Printed at: 1:2,000



Surveyed N/A
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Edition N/A
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Surveyed N/A
Revised N/A
Edition N/A
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1NN

Client Ref: 253511
Report Ref: GS-8267487_1250_1_2
Grid Ref: 435014, 408295

Map Name: National Grid

Map date: 1959-1961

Scale: 1:1,250

Printed at: 1:2,000



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Levelled 1930

Surveyed 1961
Revised 1961
Edition N/A
Copyright 1961
Levelled 1959

Surveyed 1958
Revised 1958
Edition N/A
Copyright 1959
Levelled 1930

Surveyed 1961
Revised 1961
Edition N/A
Copyright 1961
Levelled 1959

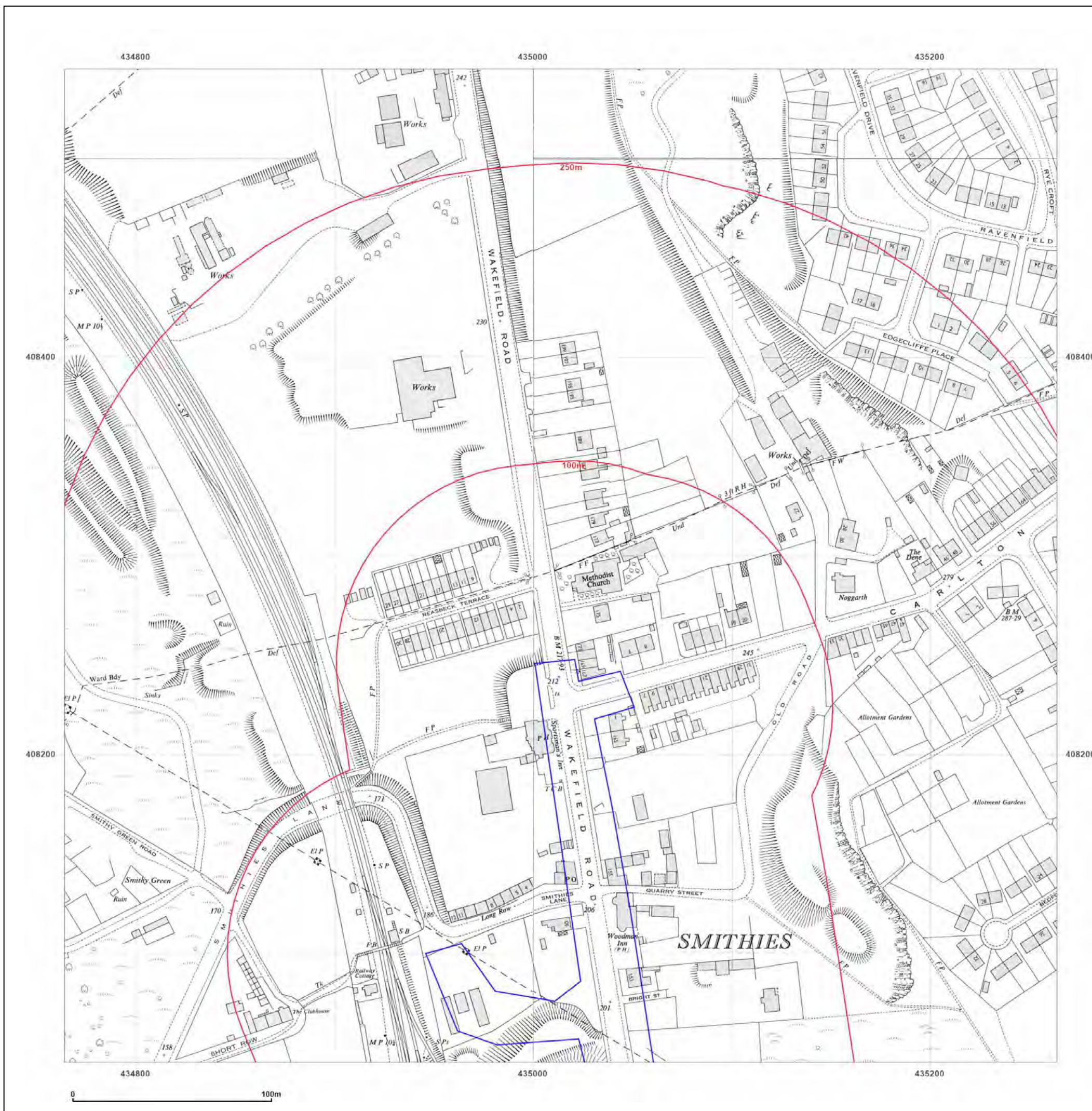


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Client Ref: 253511
Report Ref: GS-8267487_1250_1_2
Grid Ref: 435014, 408295

Map Name: National Grid

Map date: 1970-1975

Scale: 1:1,250

Printed at: 1:2,000



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Client Ref: 253511
Report Ref: GS-8267487_1250_1_2
Grid Ref: 435014, 408295

Map Name: National Grid

Map date: 1976-1981

Scale: 1:1,250

Printed at: 1:2,000



Surveyed 1958
Revised 1976
Edition N/A
Copyright 1977
Levelled 1963

Surveyed 1961
Revised 1975
Edition N/A
Copyright 1976
Levelled 1963

Surveyed N/A
Revised N/A
Edition N/A
Copyright 1981
Levelled 1963

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

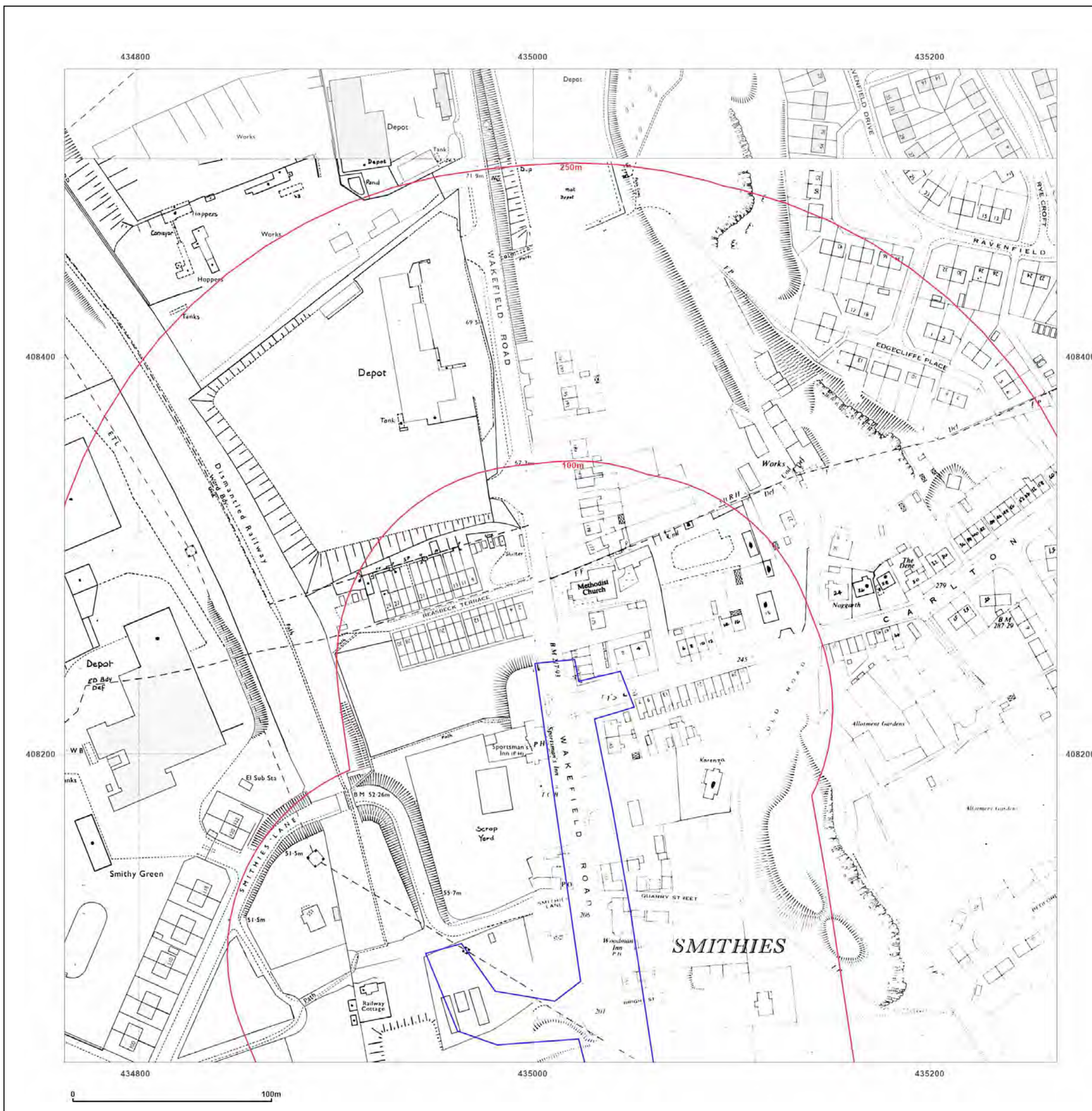


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1NN

Client Ref: 253511
Report Ref: GS-8267487_1250_1_2
Grid Ref: 435014, 408295

Map Name: National Grid

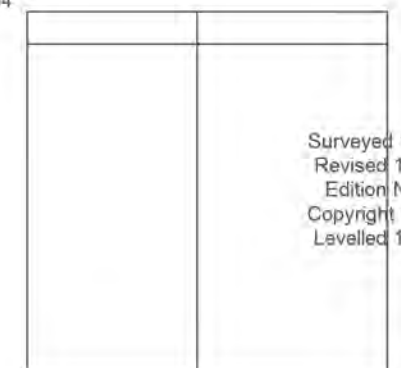
Map date: 1978-1982

Scale: 1:1,250

Printed at: 1:2,000



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Edition N/A
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Levelled 1964



Surveyed 1961
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1NN

Client Ref: 253511
Report Ref: GS-8267487_1250_1_2
Grid Ref: 435014, 408295

Map Name: National Grid

Map date: 1983

Scale: 1:1,250

Printed at: 1:2,000



Surveyed N/A
Revised N/A
Edition N/A
Copyright 1983
Levelled 1963

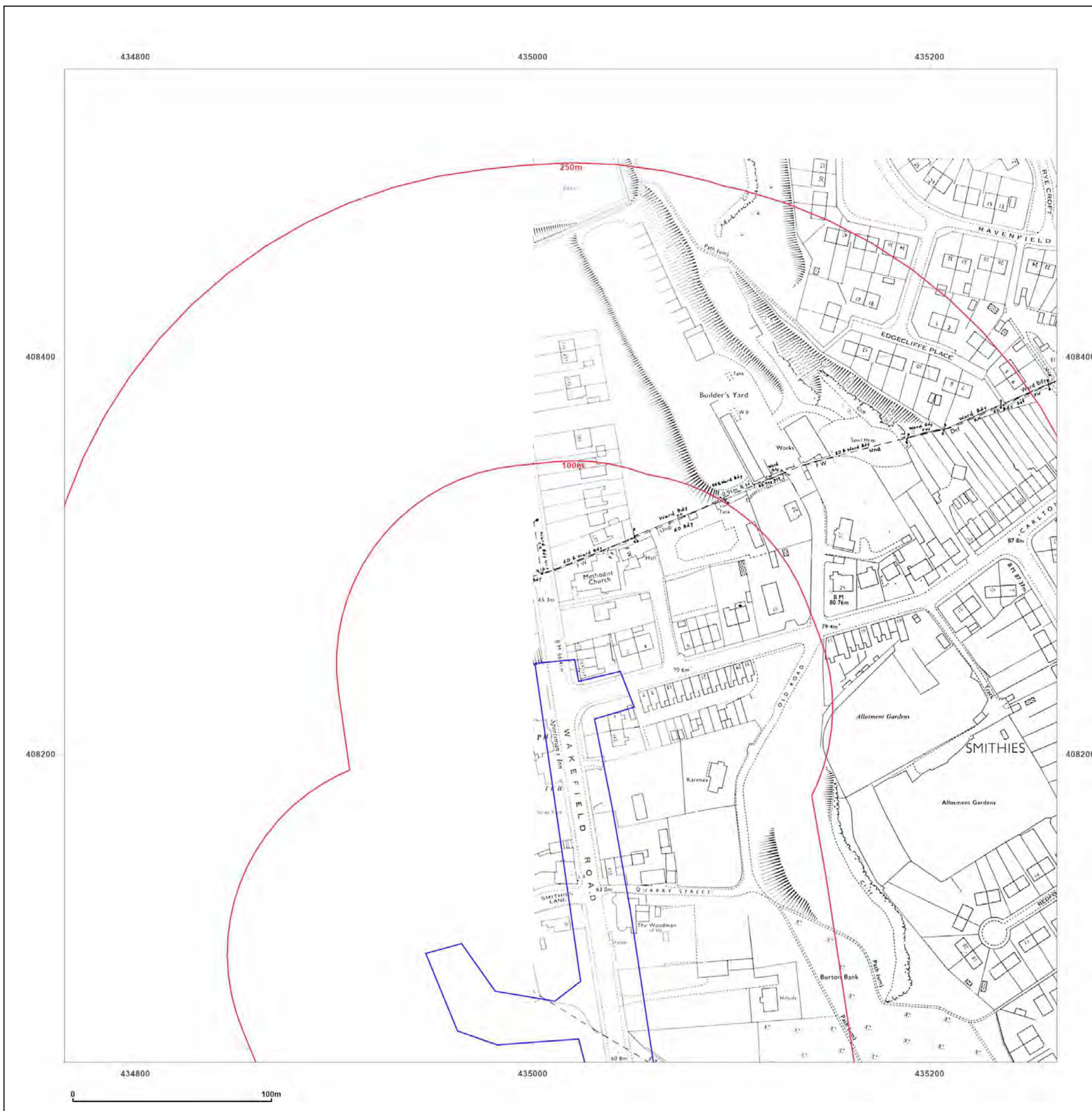


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Client Ref: 253511
Report Ref: GS-8267487_1250_1_2
Grid Ref: 435014, 408295

Map Name: National Grid

Map date: 1991-1993

Scale: 1:1,250

Printed at: 1:2,000



Surveyed 1964
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Edition N/A
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Levelled 1964

Surveyed 1993
Revised 1993
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1963
Revised 1991
Edition N/A
Copyright 1991
Levelled 1963

Surveyed N/A
Revised N/A
Edition N/A
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Levelled N/A

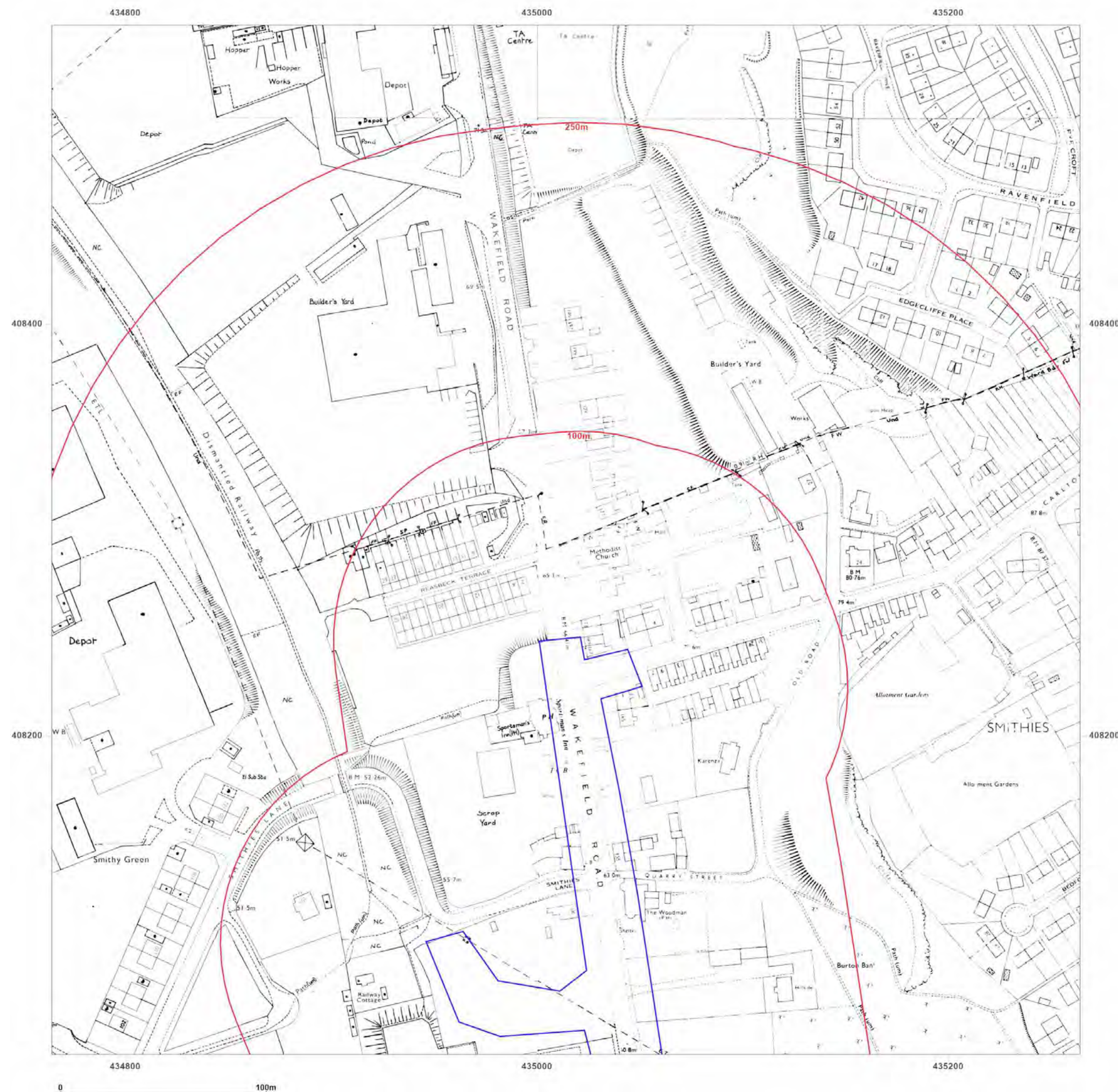


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Client Ref: 253511
Report Ref: GS-8267487_1250_1_2
Grid Ref: 435014, 408295

Map Name: National Grid

Map date: 1993

Scale: 1:1,250

Printed at: 1:2,000



Surveyed N/A
Revised N/A
Edition N/A
Copyright 1993
Levelled N/A

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Revised N/A
Edition N/A
Copyright 1993
Levelled N/A

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Edition N/A
Copyright 1993
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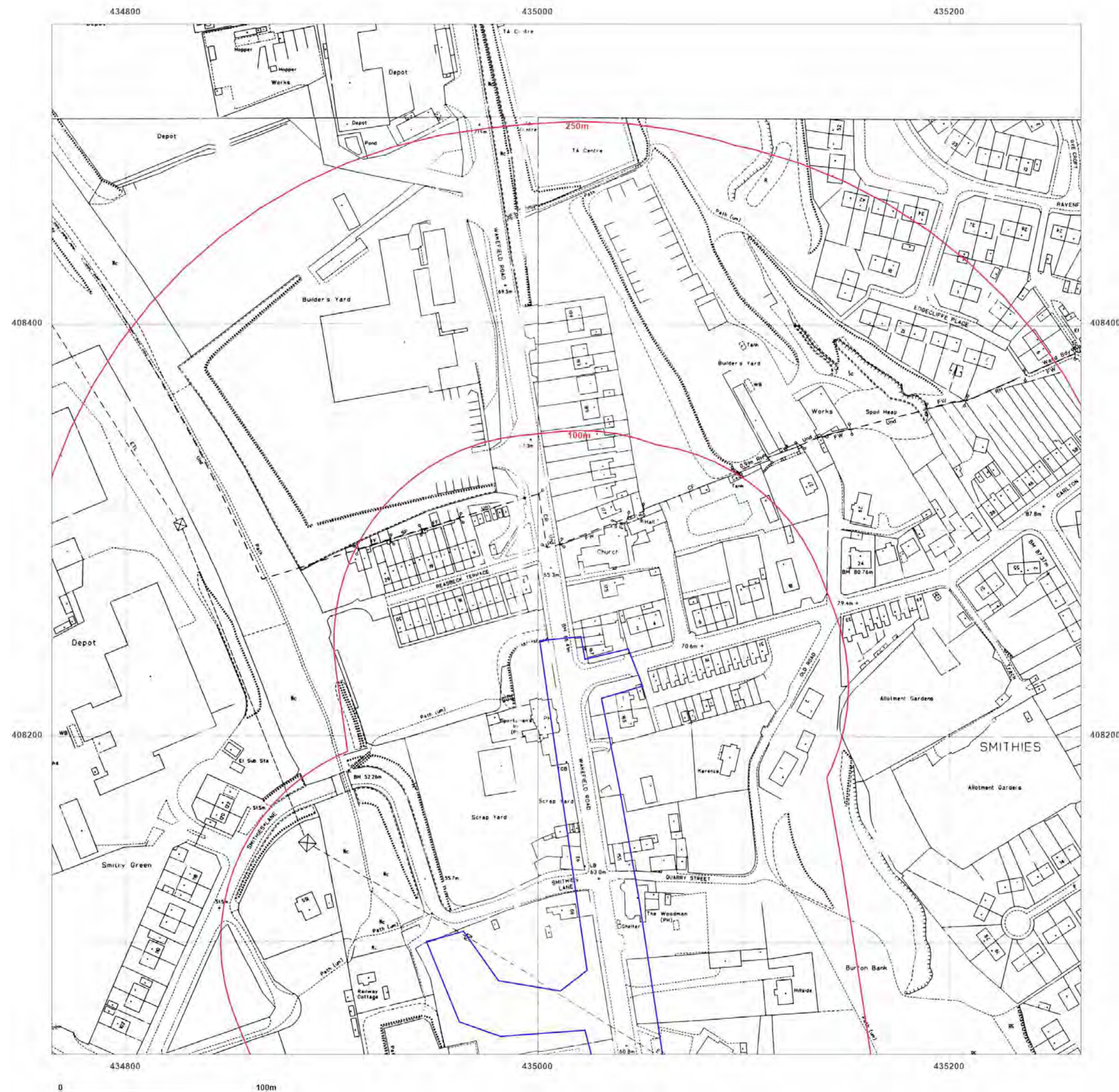


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Client Ref: 253511
Report Ref: GS-8267487_1250_1_2
Grid Ref: 435014, 408295

Map Name: National Grid

Map date: 1993

Scale: 1:1,250

Printed at: 1:2,000



Surveyed N/A
Revised N/A
Edition N/A
Copyright 1993
Levelled N/A

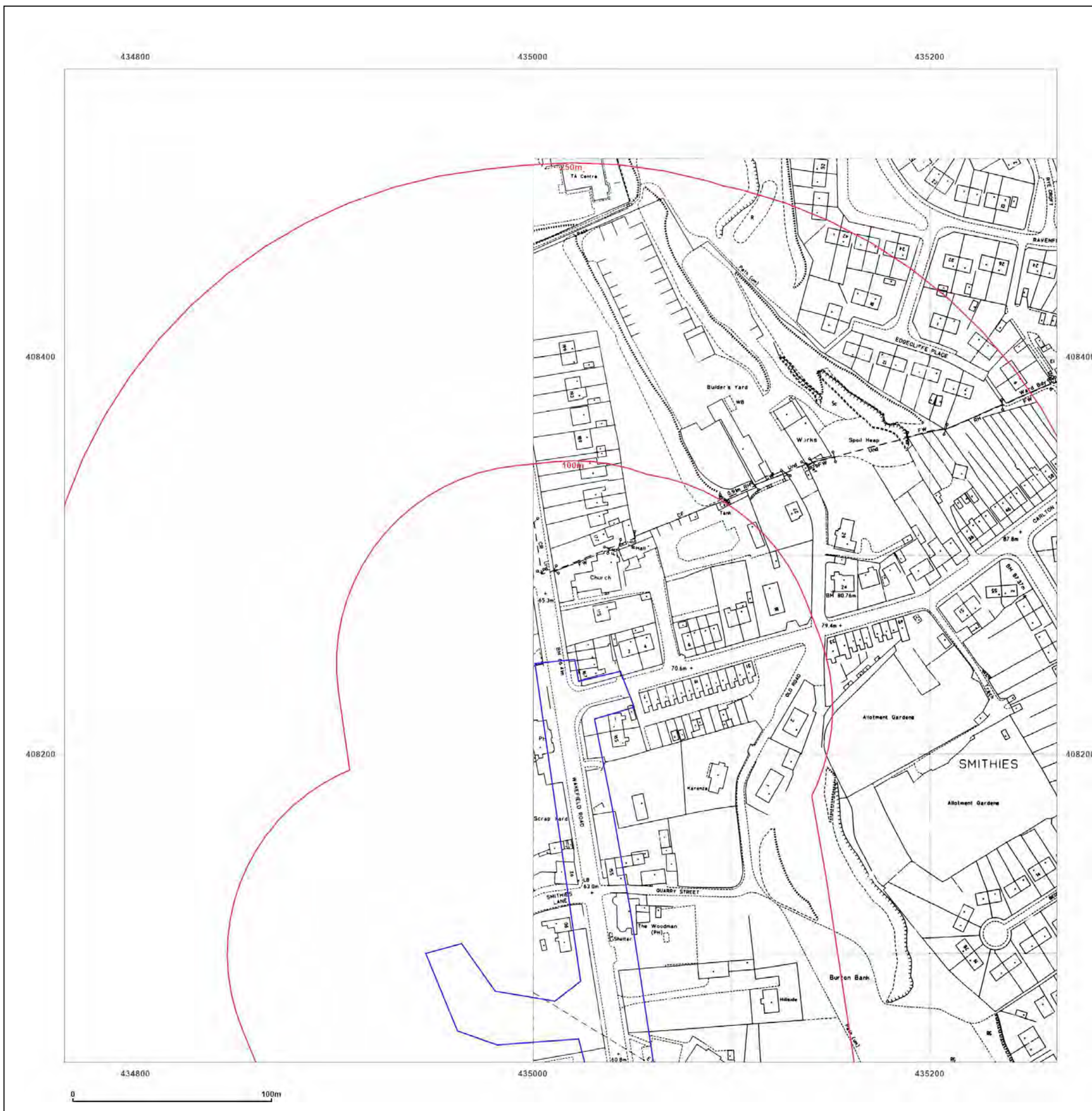


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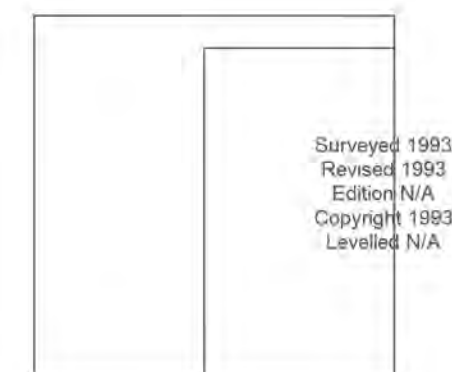
Client Ref: 253511
Report Ref: GS-8267487_1250_1_2
Grid Ref: 435014, 408295

Map Name: National Grid

Map date: 1993

Scale: 1:1,250

Printed at: 1:2,000

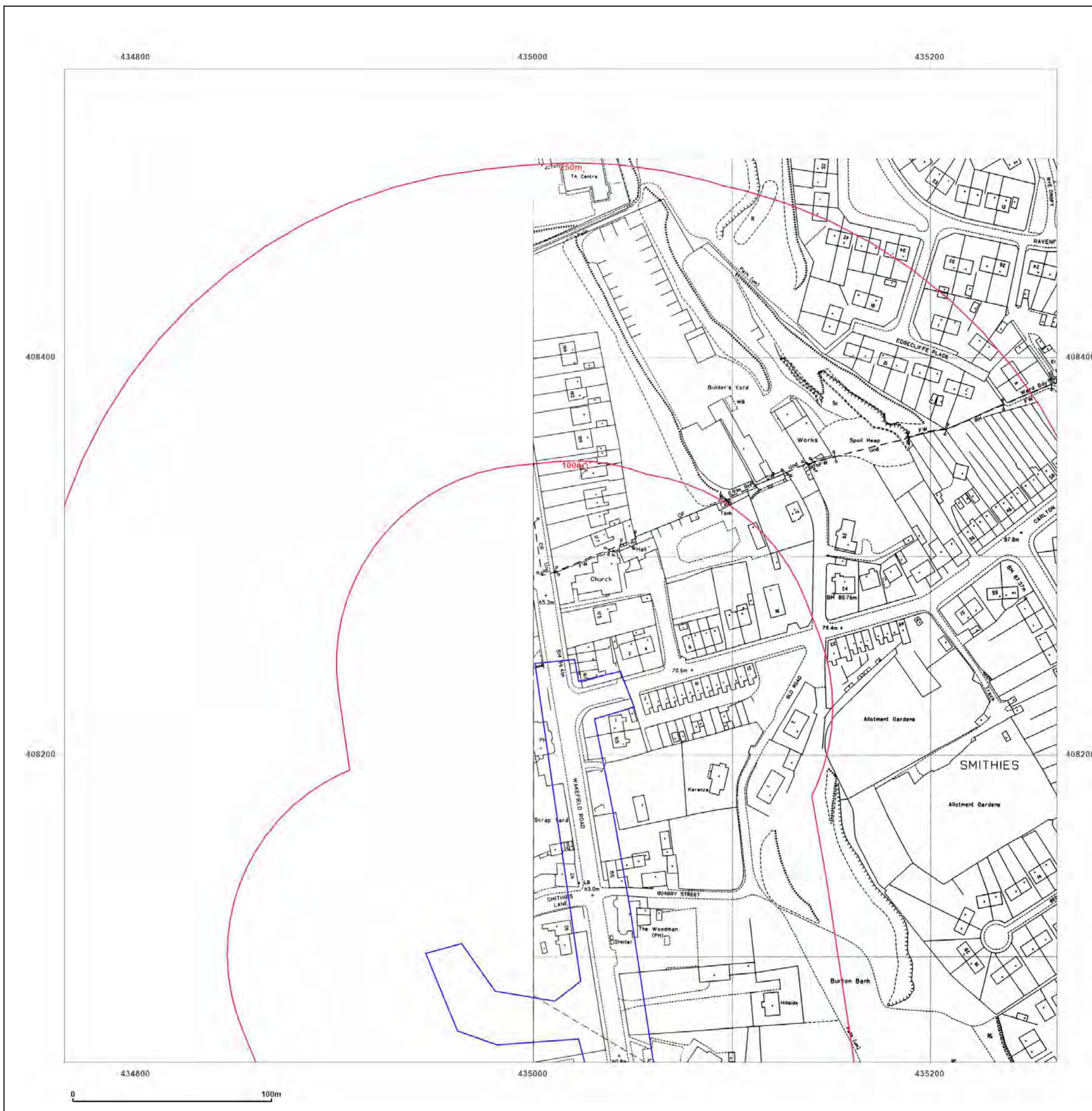


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1NN

Client Ref: 253511
Report Ref: GS-8267487_2500
Grid Ref: 435014, 408045

Map Name: County Series

Map date: 1892-1893

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1892
Revised N/A
Edition 1892
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Surveyed 1893
Revised 1893
Edition N/A
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1NN

Client Ref: 253511
Report Ref: GS-8267487_2500
Grid Ref: 435014, 408045

Map Name: County Series

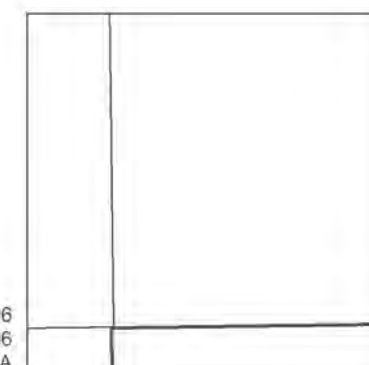
Map date: 1906

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1890
Revised 1904
Edition N/A
Copyright N/A
Levelled N/A



Surveyed 1906
Revised 1906
Edition N/A
Copyright N/A
Levelled N/A

Surveyed 1890
Revised 1904
Edition N/A
Copyright N/A
Levelled N/A

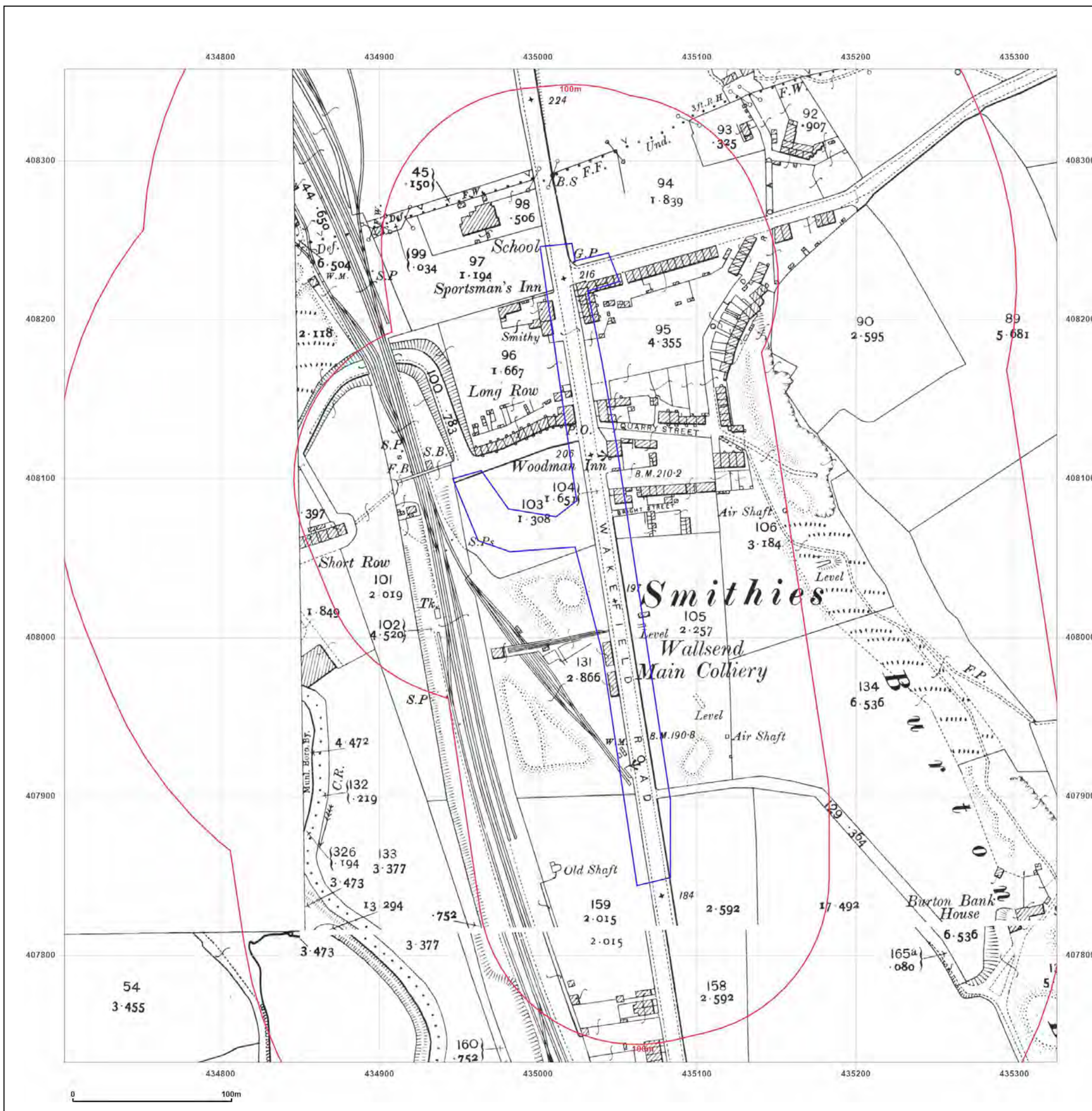


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Client Ref: 253511
Report Ref: GS-8267487_2500
Grid Ref: 435014, 408045

Map Name: National Grid

Map date: 1960-1961

Scale: 1:2,500

Printed at: 1:2,500



Surveyed 1961
Revised 1961
Edition 1962
Copyright 1962
Levelled 1959

Surveyed 1960
Revised 1960
Edition 1962
Copyright 1962
Levelled 1960



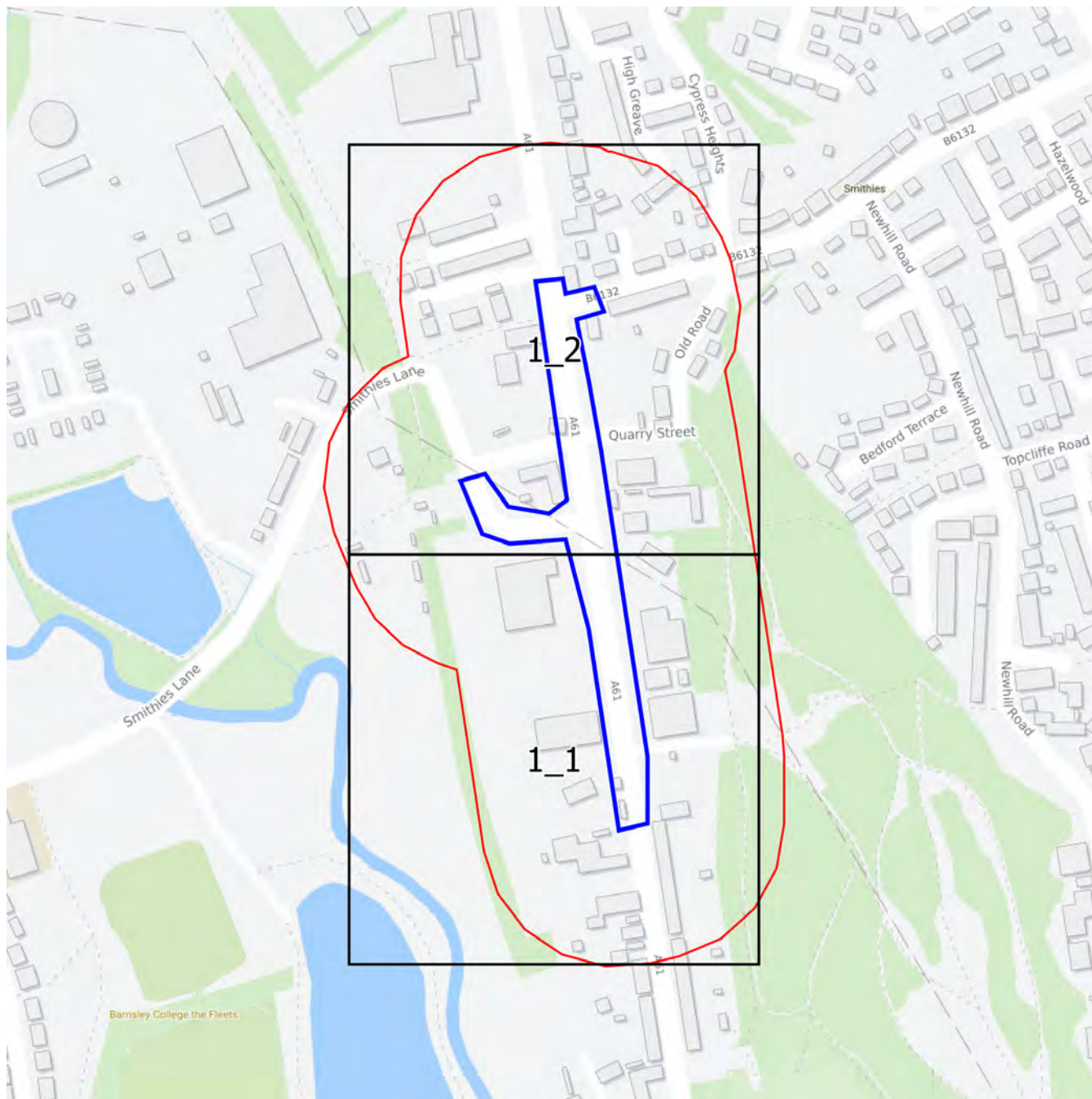
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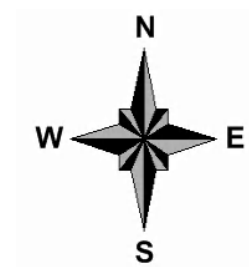
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Landline Scale Grid Index



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Client Ref: 253511
Report Ref: GS-8267487_Landline_1_1
Grid Ref: 435014, 407896

Map Name: LandLine

Map date: 2003

Scale: 1:1,250

Printed at: 1:1,250



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1NN

Client Ref: 253511
Report Ref: GS-8267487_Landline_1_2
Grid Ref: 435014, 408196

Map Name: LandLine

Map date: 2003

Scale: 1:1,250

Printed at: 1:1,250



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1NN

Client Ref: 253511
Report Ref: GS-8267487
Grid Ref: 435014, 408046

Map Name: County Series

Map date: 1850

Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1851
Revised N/A
Edition 1850
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Client Ref: 253511
Report Ref: GS-8267487
Grid Ref: 435014, 408046

Map Name: County Series

Map date: 1890

Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1890
Revised 1890
Edition 1890
Copyright N/A
Levelled N/A

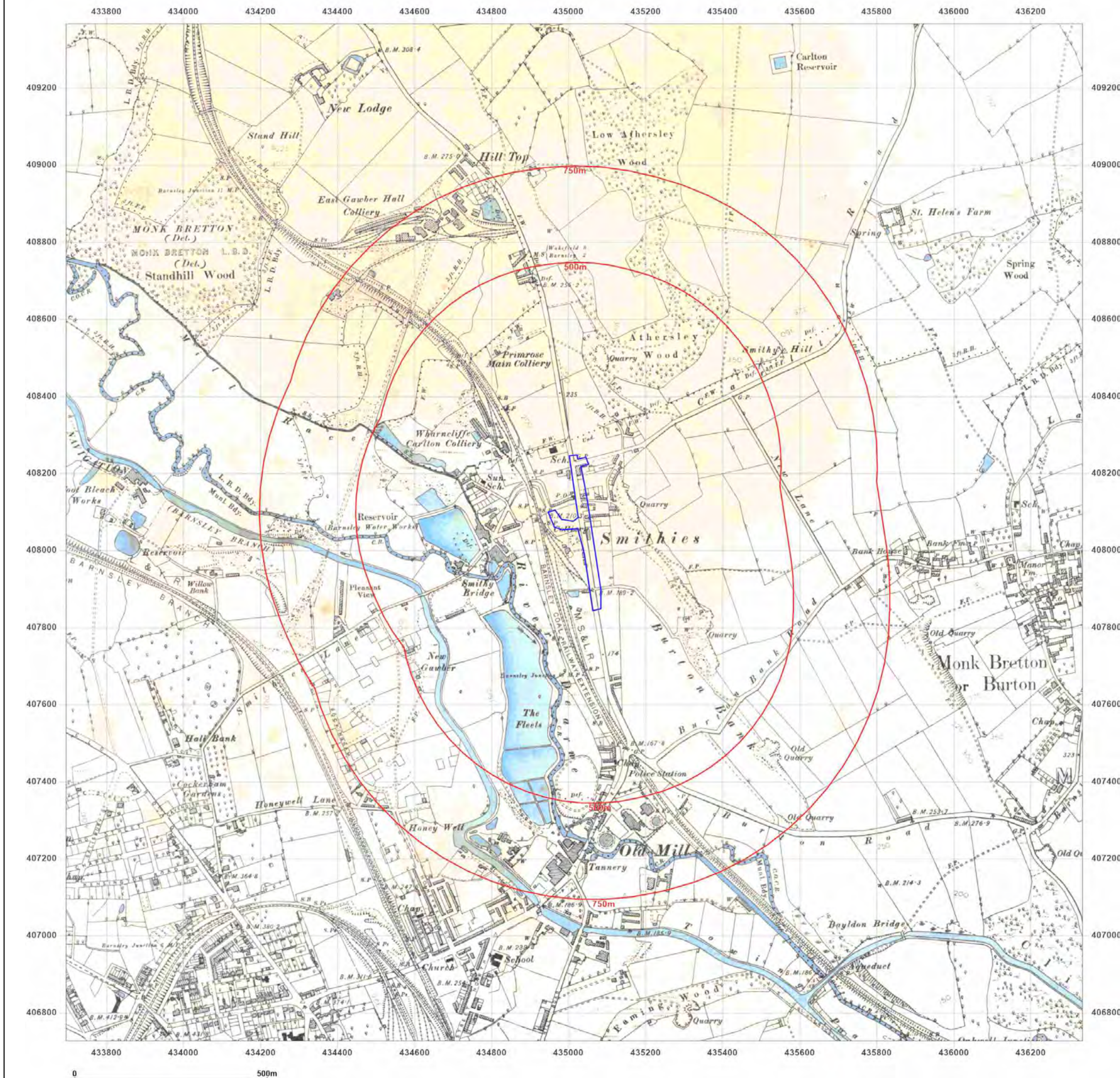


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Client Ref: 253511
Report Ref: GS-8267487
Grid Ref: 435014, 408046

Map Name: County Series

Map date: 1904

Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1891
Revised 1904
Edition 1904
Copyright N/A
Levelled N/A

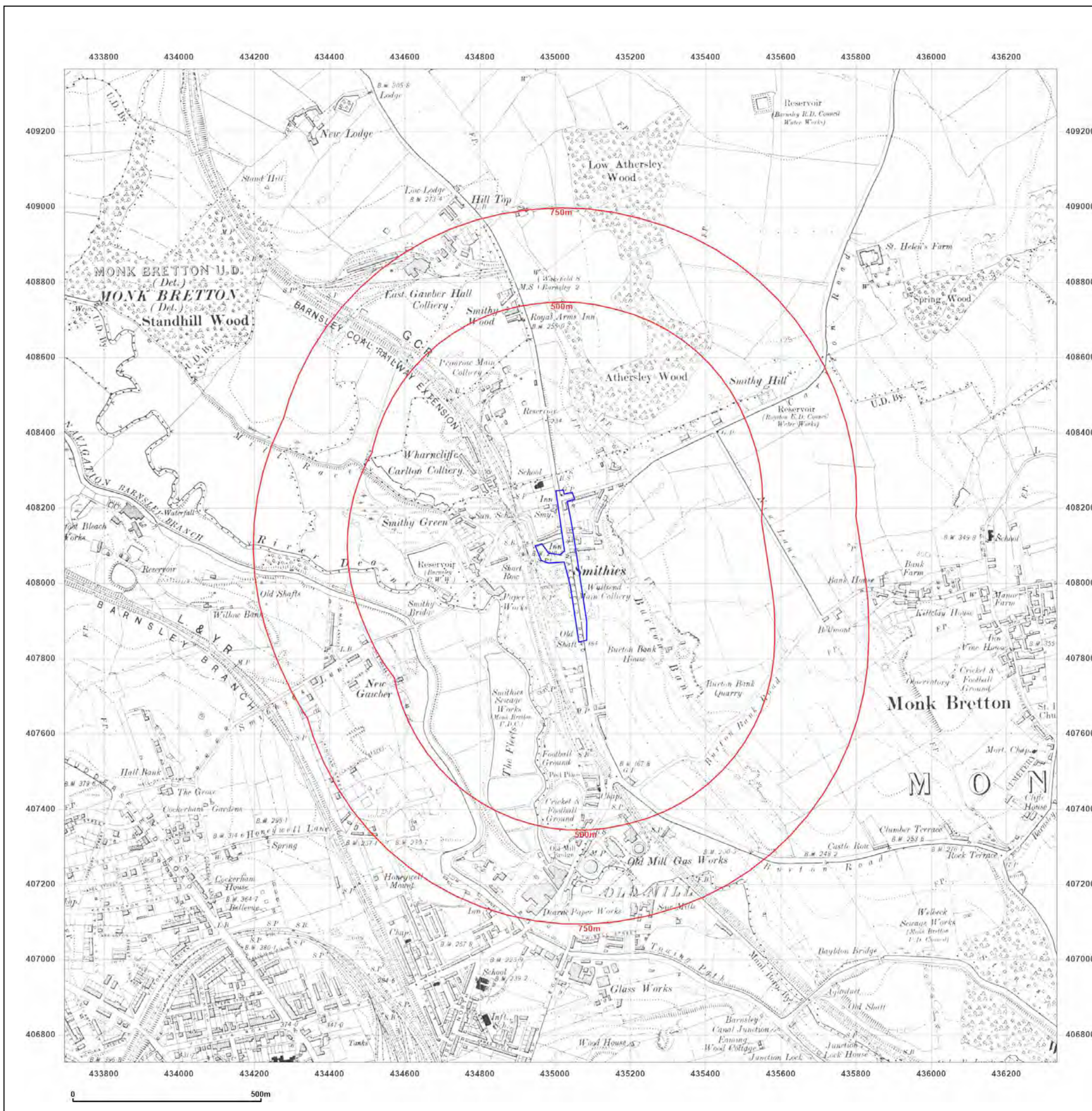


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1NN

Client Ref: 253511
Report Ref: GS-8267487
Grid Ref: 435014, 408046

Map Name: County Series

Map date: 1929

Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1851
Revised 1929
Edition 1929
Copyright N/A
Levelled 1915

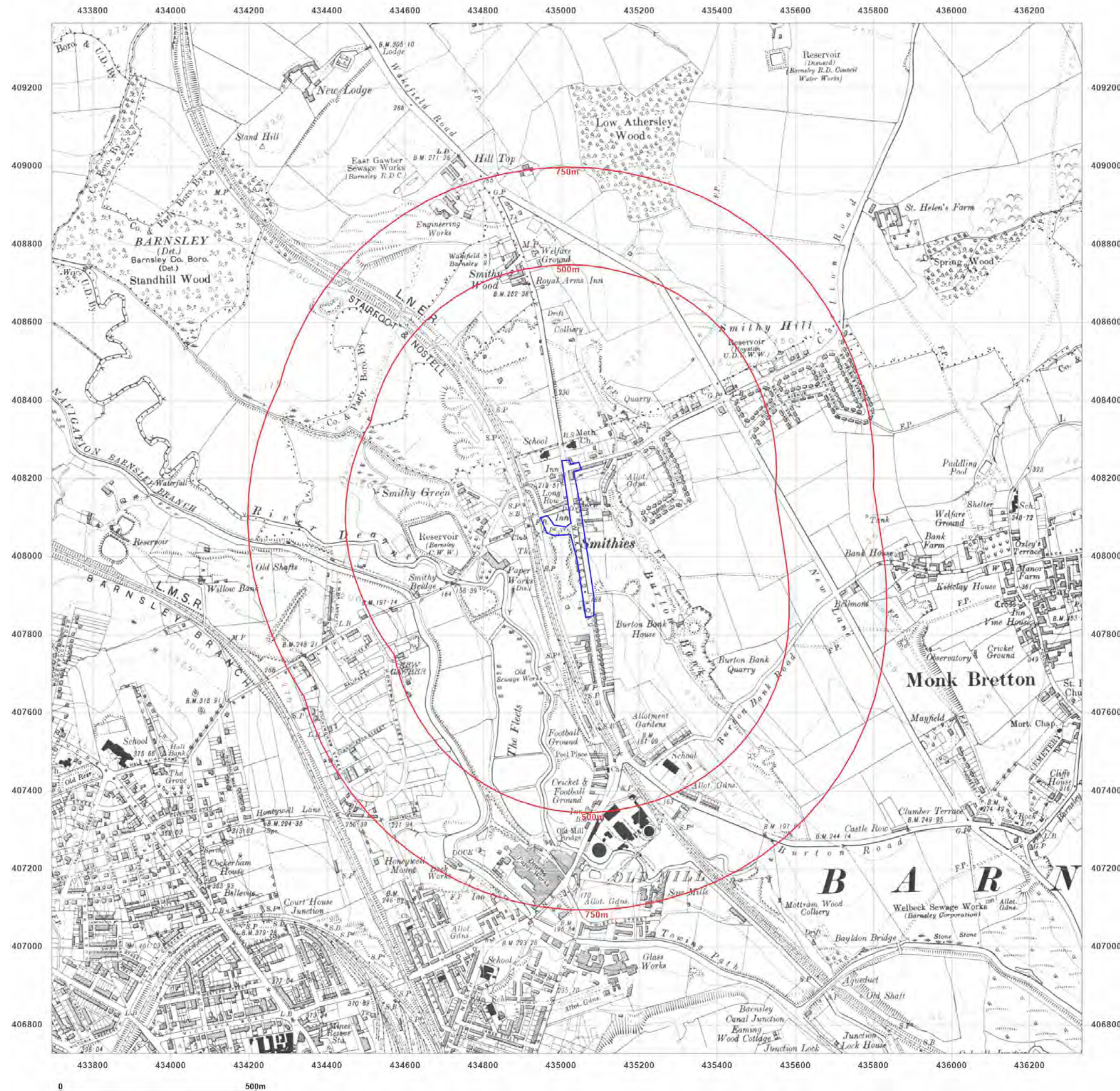


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1NN

Client Ref: 253511
Report Ref: GS-8267487
Grid Ref: 435014, 408046

Map Name: County Series

Map date: 1938

Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1851
Revised 1938
Edition 1938
Copyright N/A
Levelled 1929

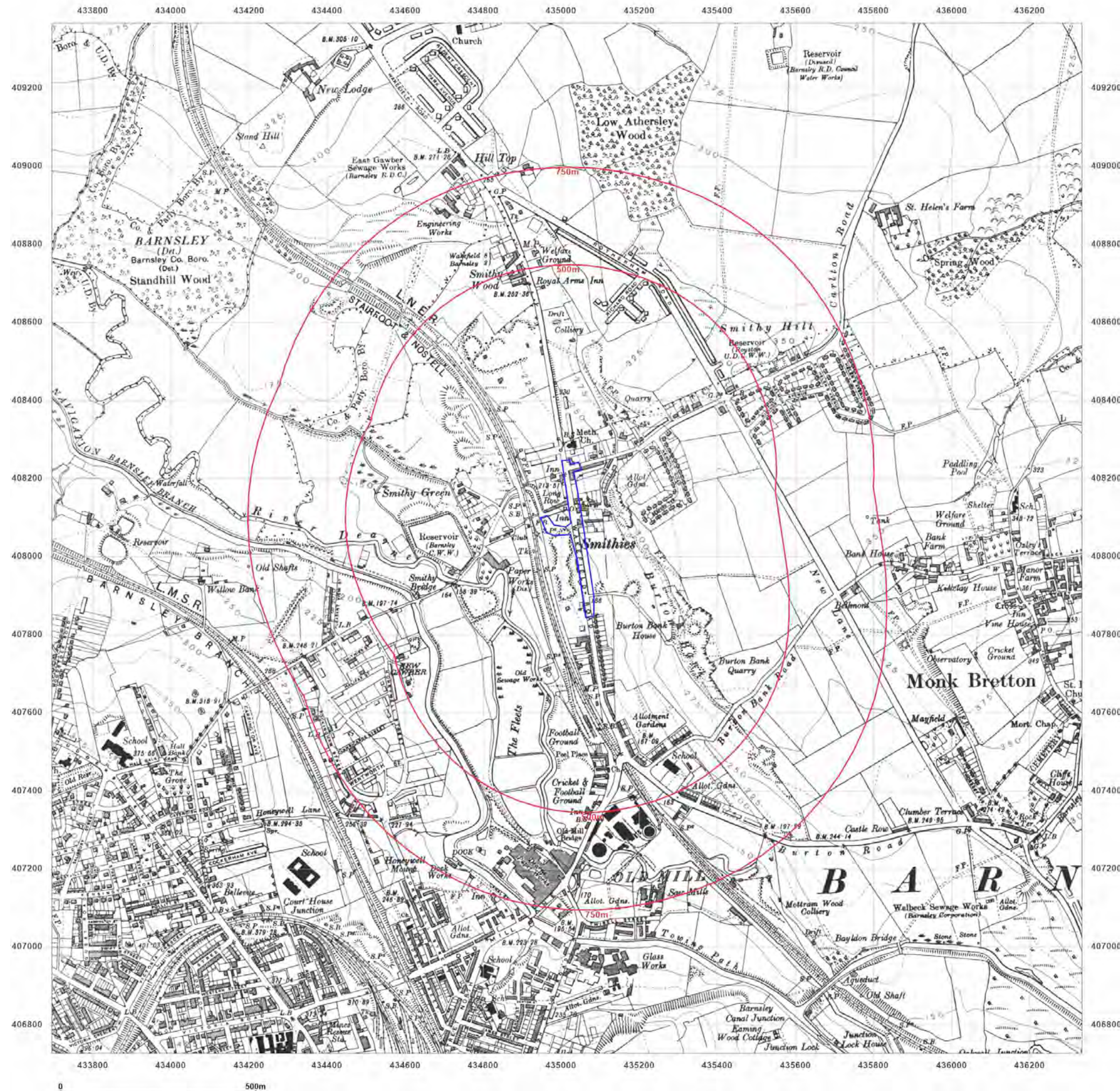


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SMITHIES, BARNSELY, S71
1NN

Client Ref: 253511
Report Ref: GS-8267487
Grid Ref: 435014, 408046

Map Name: County Series

Map date: 1948

Scale: 1:10,560

Printed at: 1:10,560



Surveyed 1851
Revised 1948
Edition 1948
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1NN

Client Ref: 253511
Report Ref: GS-8267487
Grid Ref: 435014, 408046

Map Name: Provisional

Map date: 1955-1956

Scale: 1:10,560

Printed at: 1:10,560



Surveyed N/A
Revised 1955
Edition N/A
Copyright 1956
Levelled N/A

Surveyed N/A
Revised 1955
Edition N/A
Copyright 1956
Levelled N/A

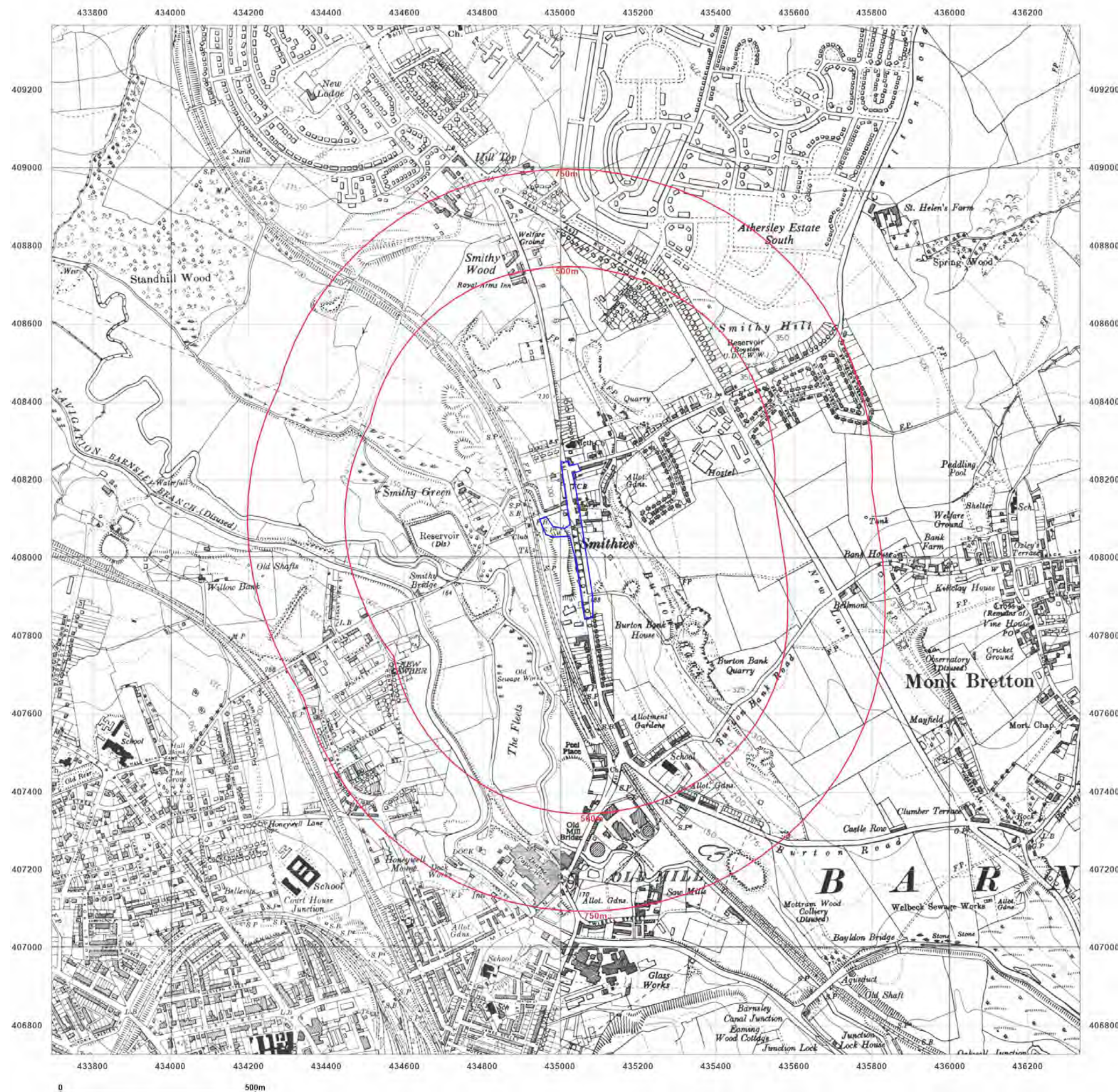


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Site Details:

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WAKEFIELD ROAD 6M FROM
A61, WAKEFIELD ROAD,
SMITHIES, BARNSELY, S71
1NN

Client Ref: 253511
Report Ref: GS-8267487
Grid Ref: 435014, 408046

Map Name: Provisional

Map date: 1966

Scale: 1:10,560

Printed at: 1:10,560



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

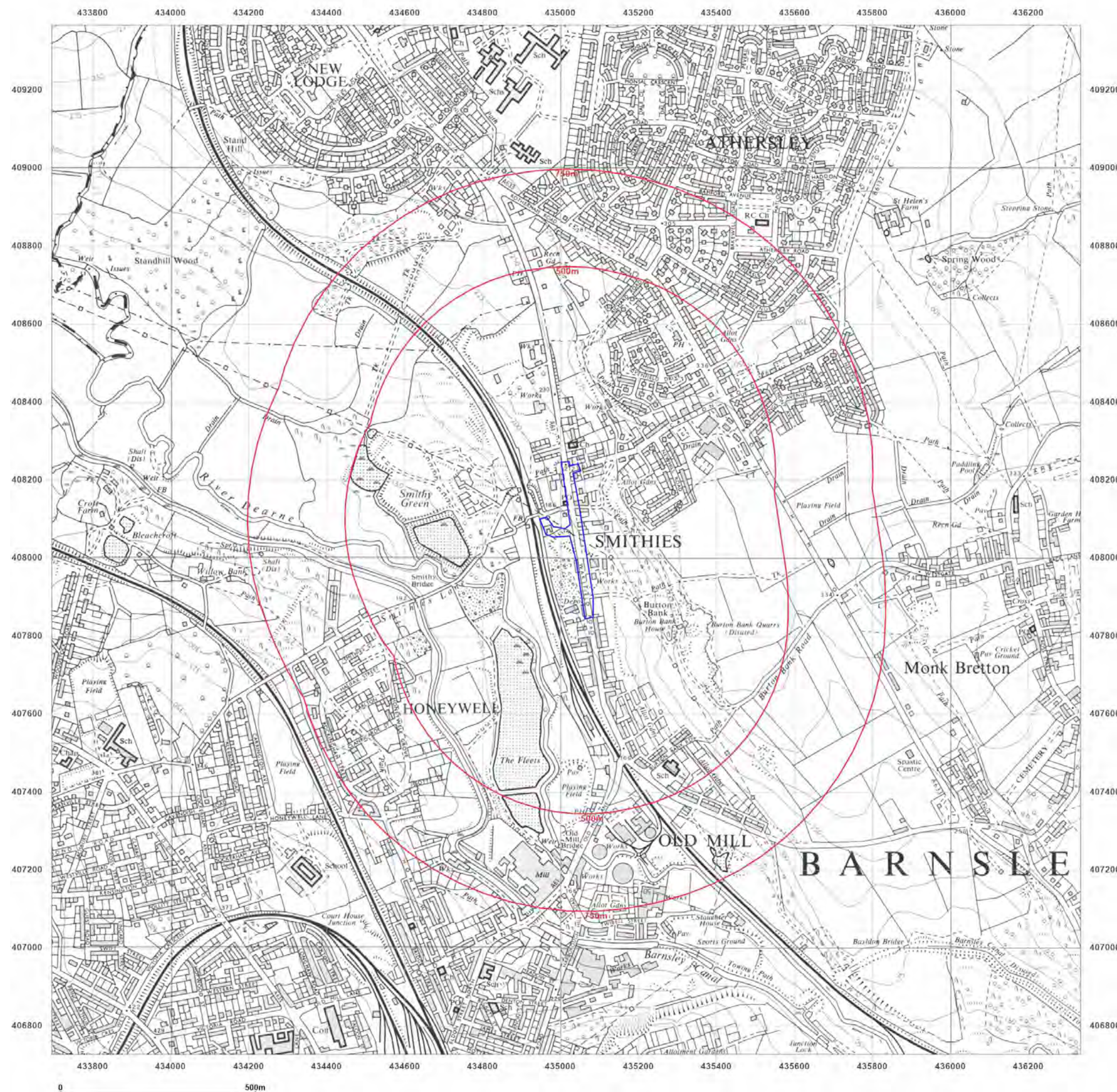


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Client Ref: 253511
Report Ref: GS-8267487
Grid Ref: 435014, 408046

Map Name: National Grid

Map date: 1973-1974

Scale: 1:10,000

Printed at: 1:10,000



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Surveyed 1974
Revised 1974
Edition N/A
Copyright 1975
Levelled 1978

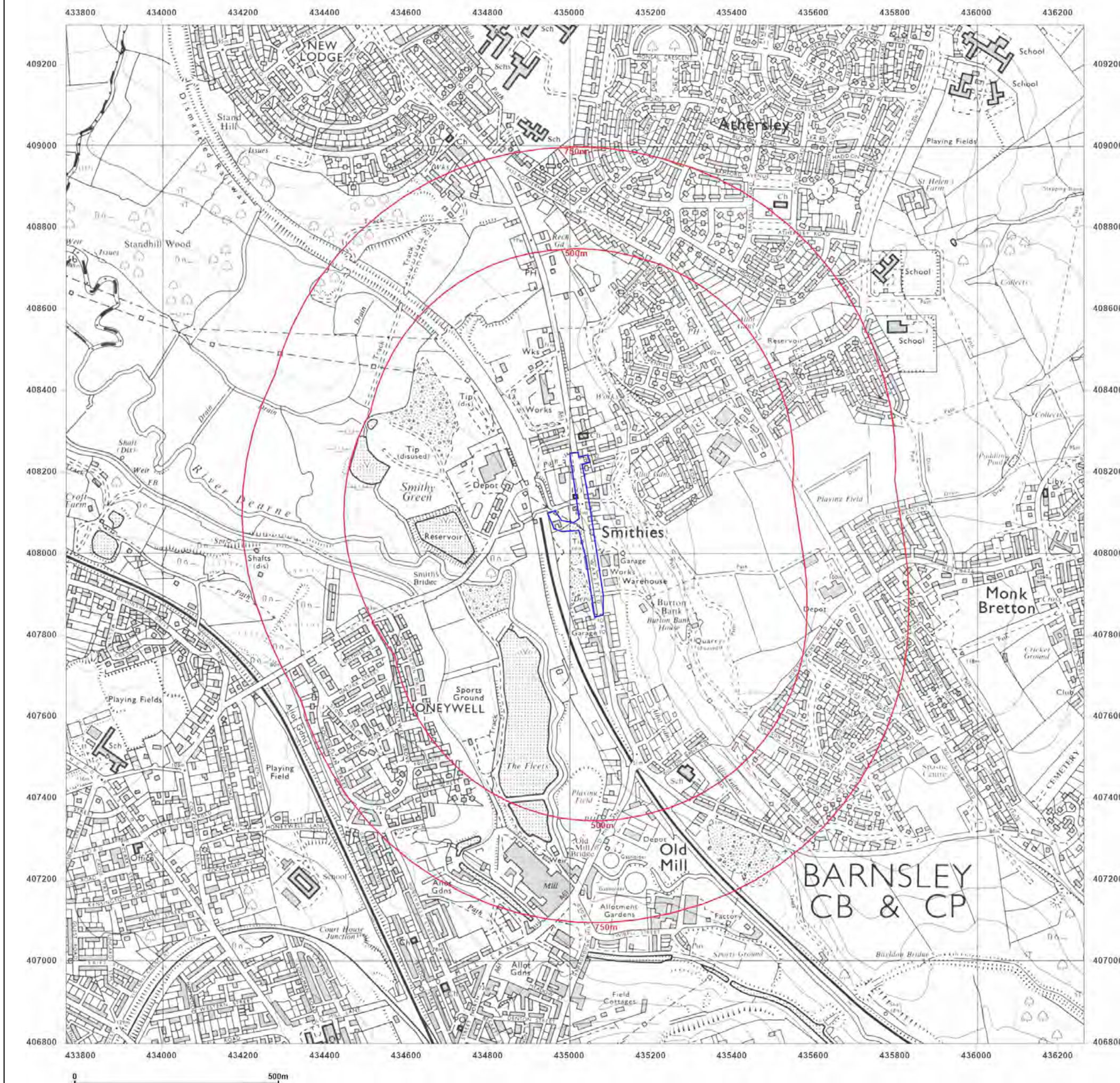


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Client Ref: 253511
Report Ref: GS-8267487
Grid Ref: 435014, 408046

Map Name: National Grid

Map date: 1982

Scale: 1:10,000

Printed at: 1:10,000



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Surveyed 1981
Revised 1982
Edition N/A
Copyright 1983
Levelled 1978

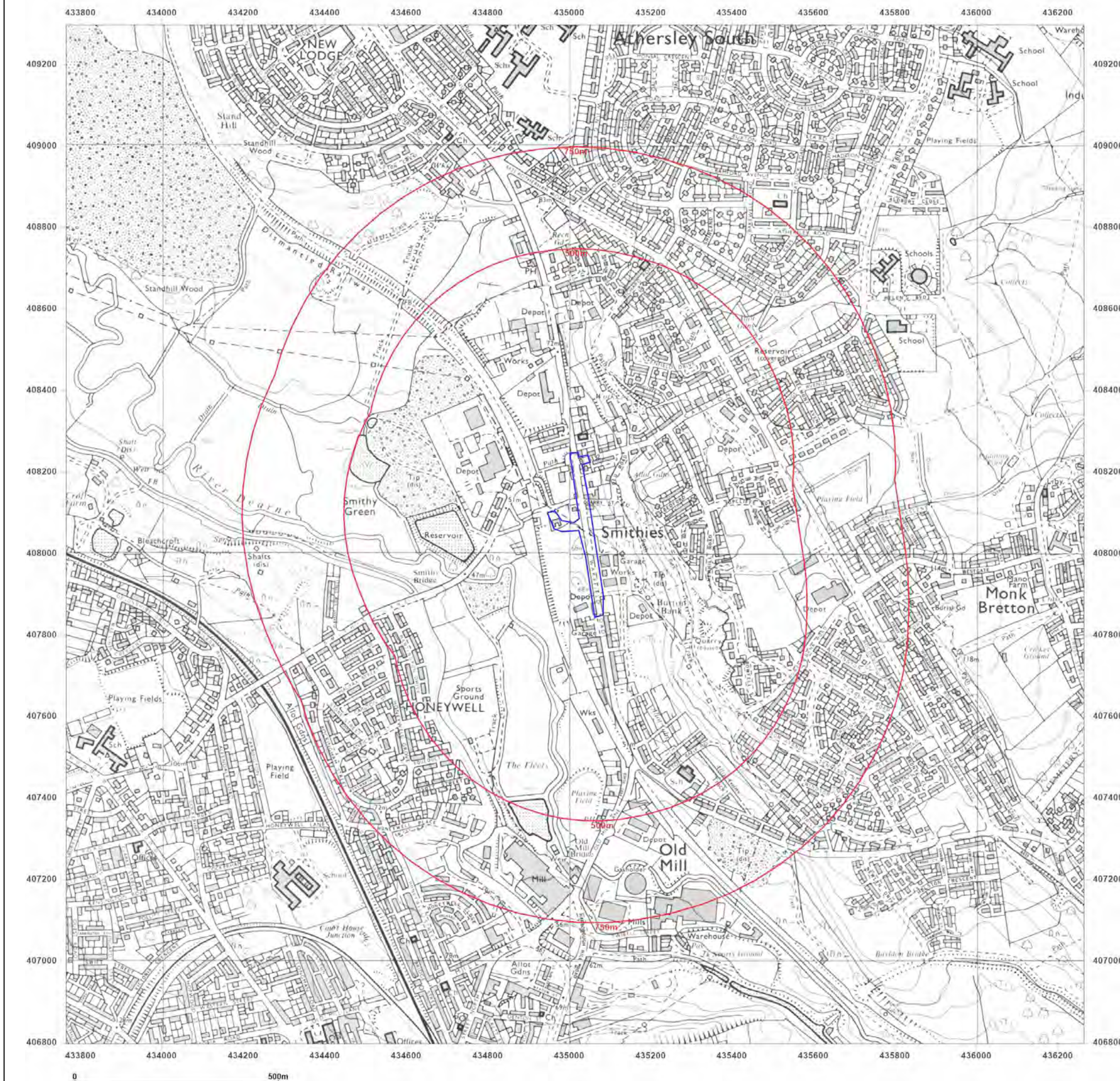


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Client Ref: 253511
Report Ref: GS-8267487
Grid Ref: 435014, 408046

Map Name: National Grid

Map date: 1992-1993

Scale: 1:10,000

Printed at: 1:10,000



Surveyed 1992
Revised 1993
Edition N/A
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Levelled N/A

Surveyed 1981
Revised 1992
Edition N/A
Copyright 1993
Levelled 1978

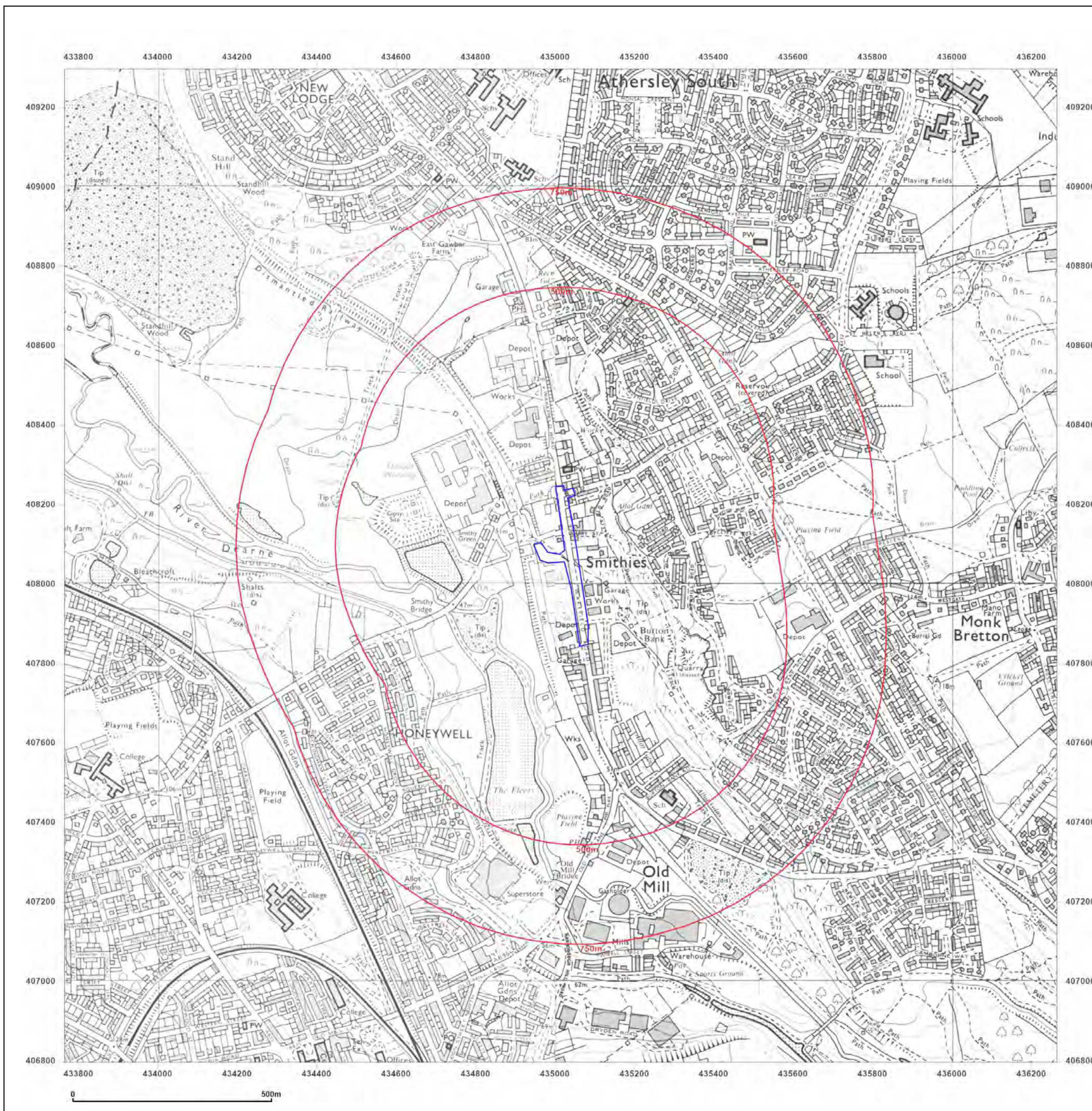


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1NN

Client Ref: 253511
Report Ref: GS-8267487
Grid Ref: 435014, 408046

Map Name: National Grid

Map date: 2001

Scale: 1:10,000

Printed at: 1:10,000

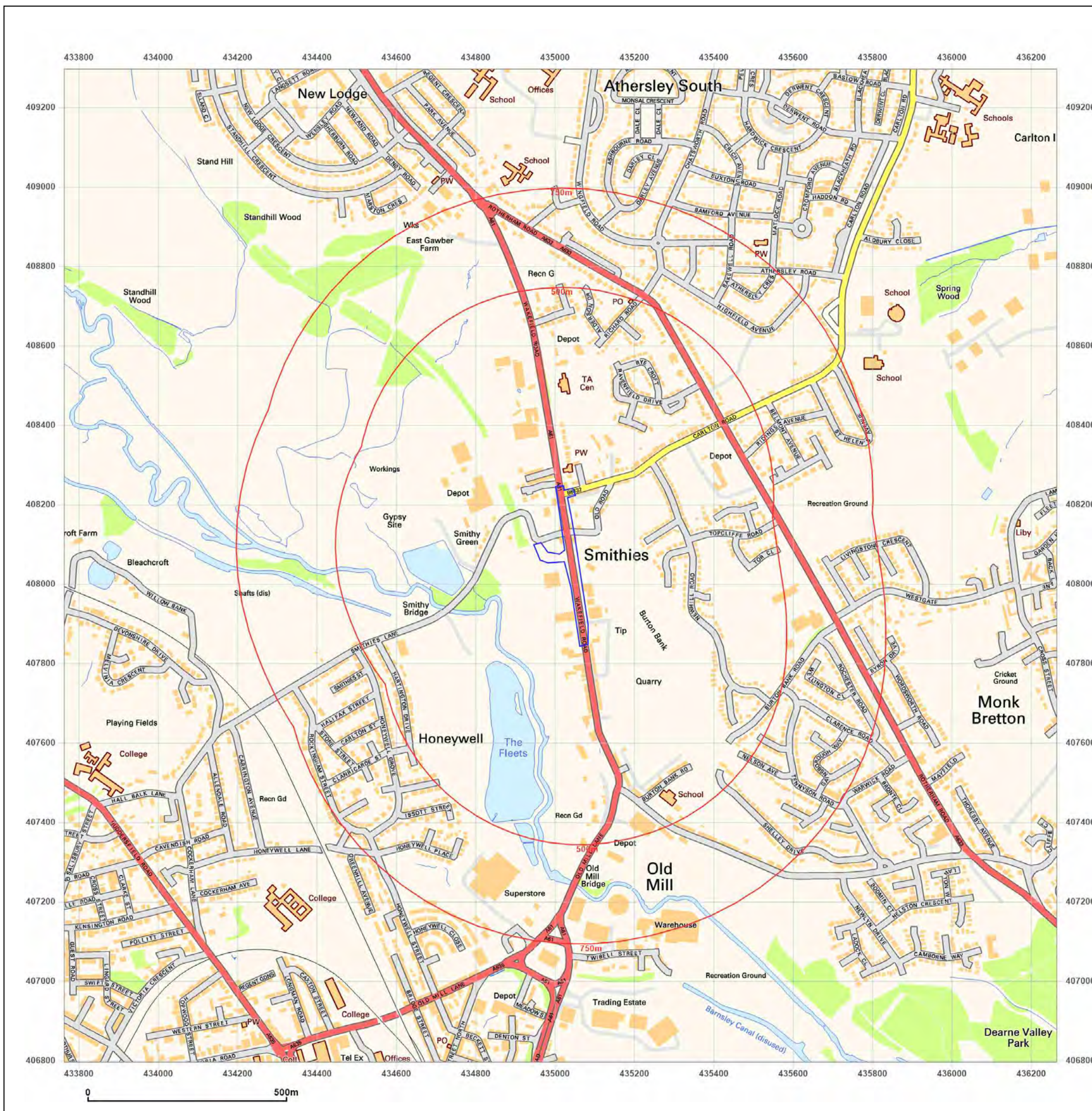


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1NN

Client Ref: 253511
Report Ref: GS-8267487
Grid Ref: 435014, 408046

Map Name: National Grid

Map date: 2010

Scale: 1:10,000

Printed at: 1:10,000



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1NN

Client Ref: 253511
Report Ref: GS-8267487
Grid Ref: 435014, 408046

Map Name: National Grid

Map date: 2021

Scale: 1:10,000

Printed at: 1:10,000

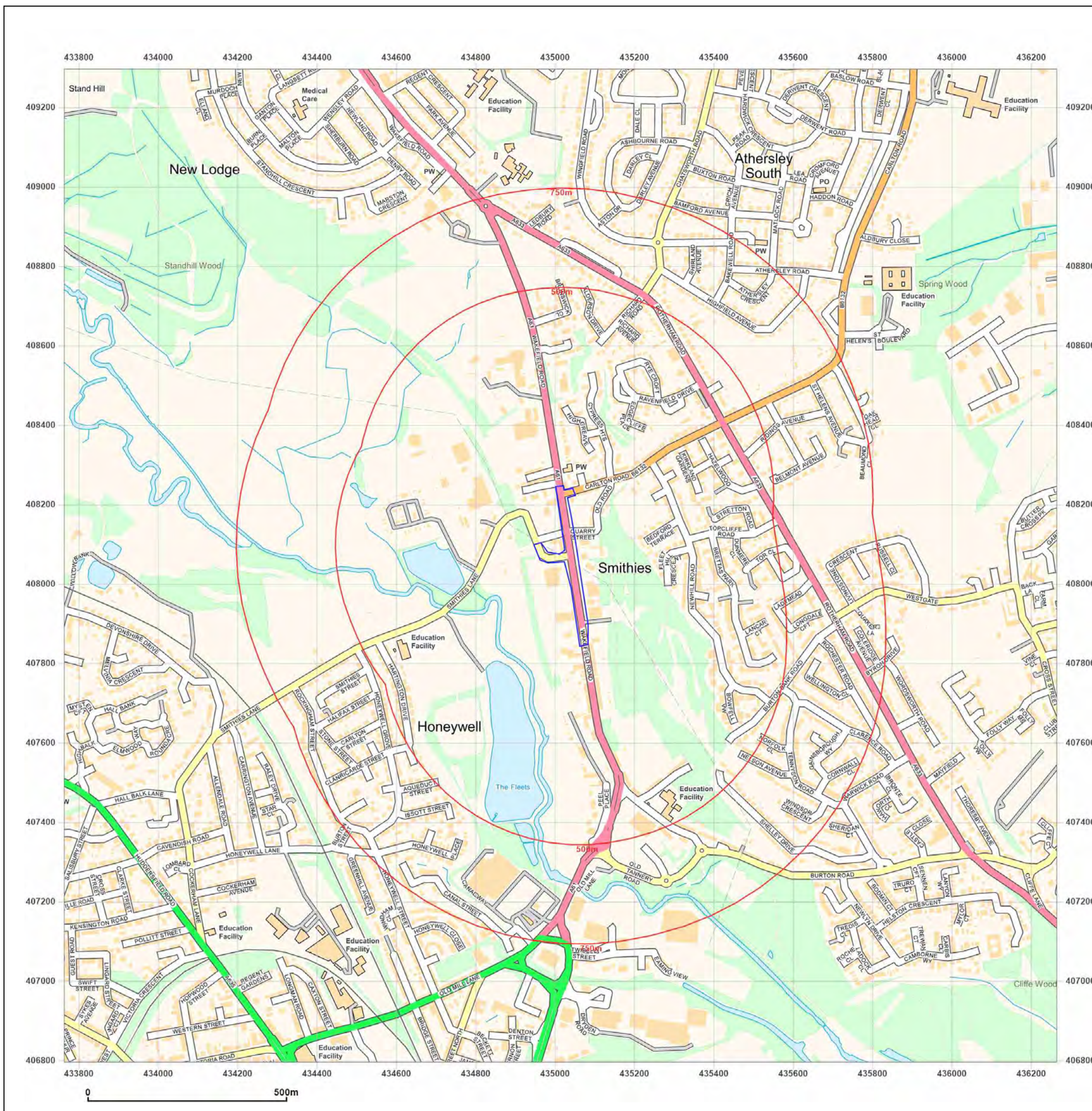


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Appendix C

South Yorkshire Mining
Advisory Service mining report

PLACE DIRECTORATE
South Yorkshire Mining Advisory Service



To: Highways & Engineering

FAO: Ian Wilson

My Ref: MAL.21.013

Your Ref: (A61 Corridor)

Date: 9th November 2021

Enquiries to: Mr. M. Lyons

Ext: 2690

Subject: A61 CORRIDOR – PROPOSED JUNCTION IMPROVEMENTS, SMITHIES LANE AND CARLTON LANE

Further to your consultation request of the 25th October 2021, I can confirm the following.

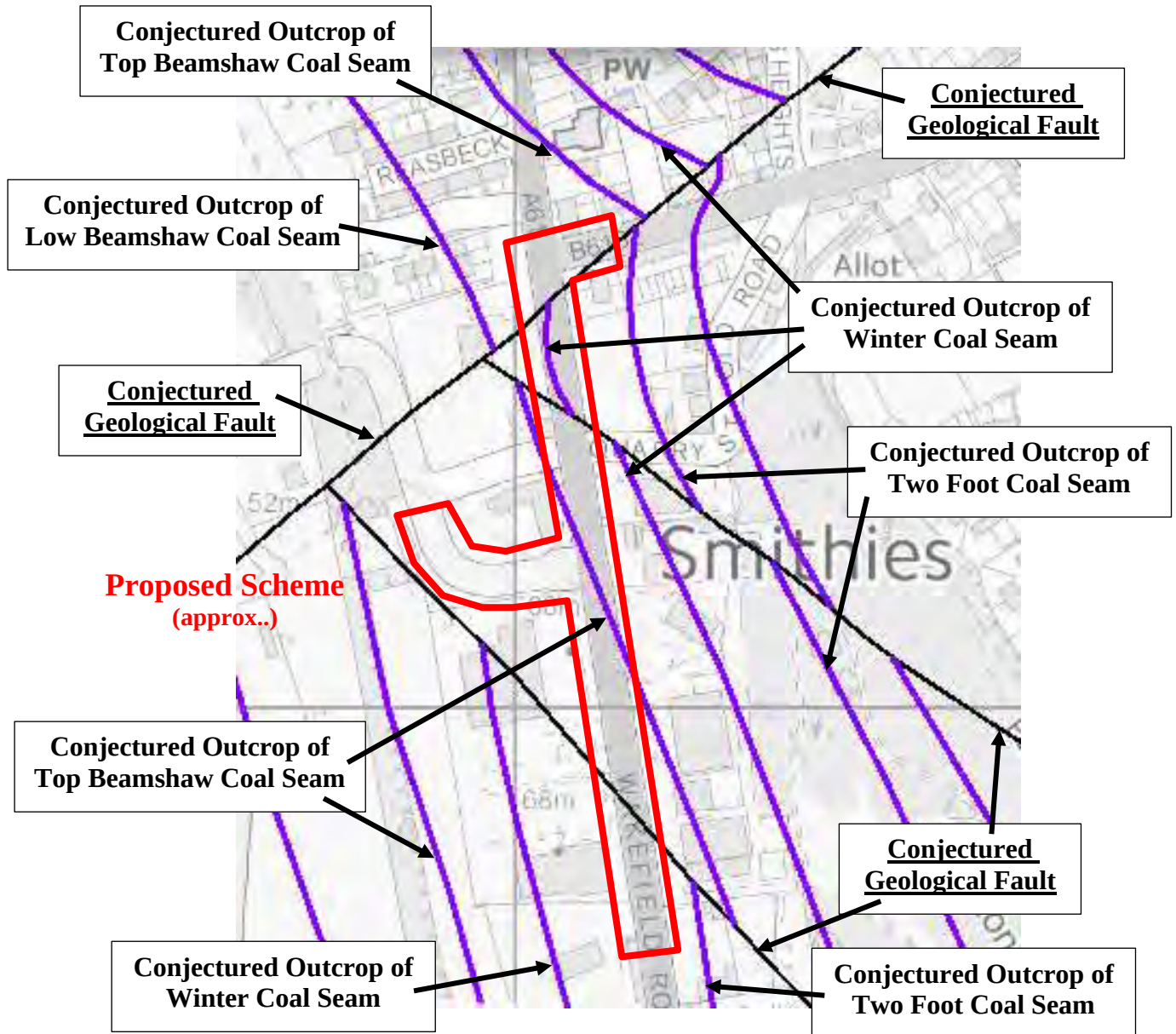
SITUATION

A scheme of junction improvement works is under consideration as illustrated in the following image, centred at approximate OS Grid ref: 435035 / 408109. This report provides a review of the mining and geological history of the area and an assessment for the potential for mining legacy risks. The report makes recommendations regarding the need for any investigative and/or remediation requirements depending on the nature/scale of the proposals.



GEOLOGICAL
INFORMATION

Geological records indicate that the land is underlain by shales and mudstones of the Middle Coal Measures. Various geological faults are conjectured through the scheme, as illustrated on the image below. No superficial deposits are indicated beneath the site. Strata will dip beneath the land at a steady rate of around 1 in 12 (5°) towards the east.



Various coal seams are conjectured to outcrop in the vicinity as shown above. In stratigraphical order, from shallowest to deepest, these can be summarised in the following table:

Coal Seam	Thickness (mm) (circa)	Details
Two Foot	900	Very unlikely to be present at depth; ‘may’ be exposed in southern and north-eastern extremities.
Winter	1000	Likely to be at shallow depth beneath the southern part (up to fault line); possibly exposed in the north (to the south of the fault line).
Top Beamshaw	1200	Relatively shallow depth beneath southern part (beneath Winter seam; up to fault line); possibly exposed centrally and in the north-eastern extremity; relatively shallow depth beneath a small section (bet. Fault lines) just to the south of the Carlton Rd Junction
Low Beamshaw	600	Over 20m deep beneath the southern part (up to fault line); relatively shallow centrally; very shallow, possibly exposed in the northern part (up to fault line).

MINING

Shallow Underground Mining

Although no shallow coal mining is known beneath the scheme area itself, there will be some potential for historic, possibly illicit, workings in the shallow coal seams in this vicinity. The main area at risk is the southern part of the scheme (up to the fault line) where the ‘Winter’ and ‘Top Beamshaw’ seams are likely to be at shallow depth. A much lower risk would be considered for the remaining parts of the scheme which will be at or below the Top Beamshaw seam horizon – considering that little knowledge of workings is known in the ‘Low Beamshaw’ seam in the wider area. The small section just to the south of Carlton road junction (between the two fault lines) will also have a slightly greater risk given the possibly shallow Top Beamshaw seam.

Deep Underground Mining

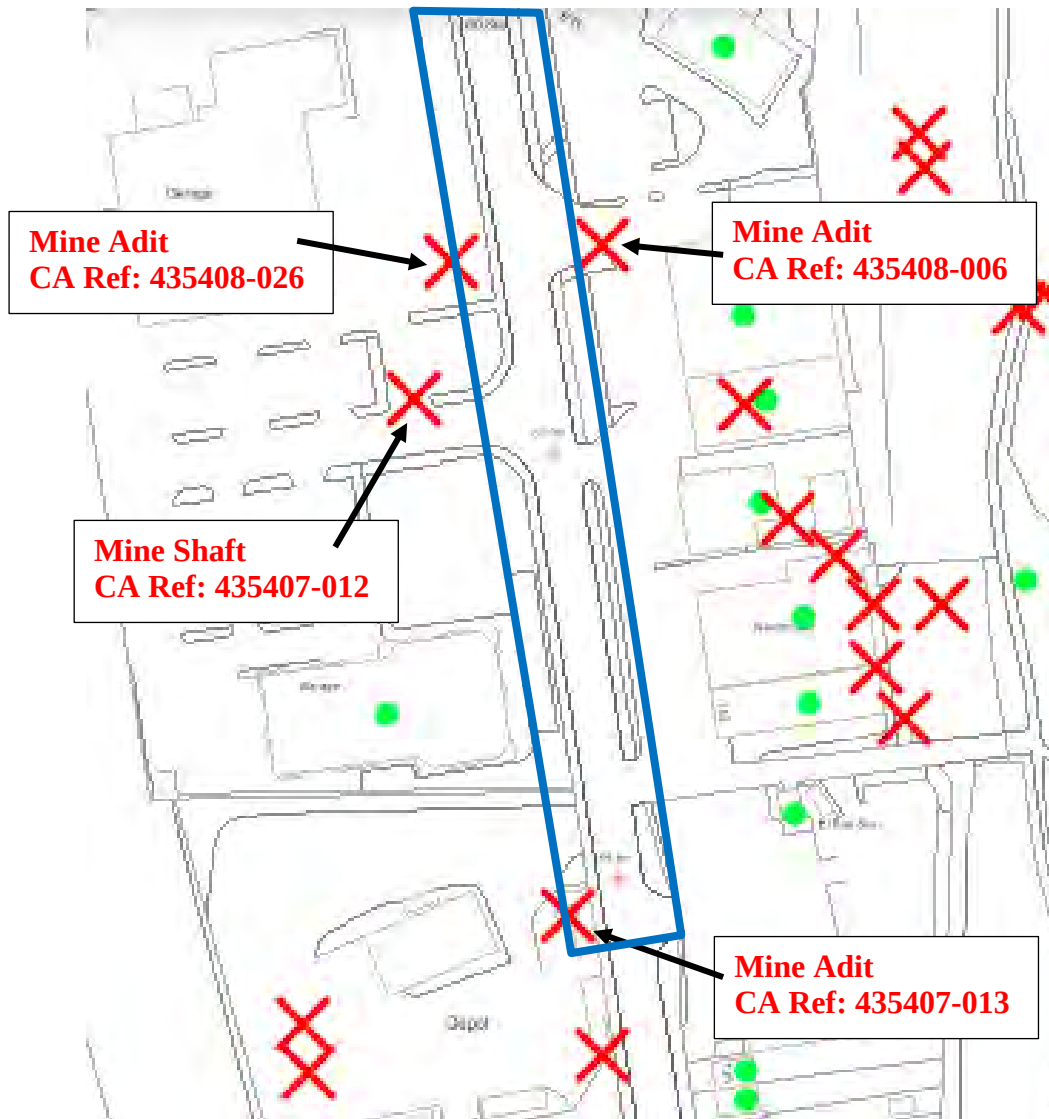
Deep coal mining operations have taken place beneath this area in various coal seams, all settlement from which will be long complete. As all deep mines in the area are now closed the scheme should not be affected by deep coal mining subsidence for the foreseeable future.

Opencast

No past opencast coal operations are known in the vicinity of the scheme.

Mine Entries

As illustrated on the image below, three mine adits (tunnel entrances) are indicated very close to the scheme area; along with one mine shaft to within 20m. The actual surface locations may be on private/third party land.



Details of these mine entries are summarised as follows:

Mine Entry	Details
'Adit' CA Ref: 435407-013	'Wallsend' mine; adit angle 78° (ENE); NOT treated; 2.5m diameter; Departure 13m. Possibly traveling beneath the highway
'Adit' CA Ref: 435408-026	'Winter' mine; adit angle 77° (ENE); NOT treated; 2.5m diameter; Departure 8m. Possibly traveling beneath the highway
'Adit' CA Ref: 435408-006	'Wallsend' mine; adit angle 80° (ENE); NOT treated; 2.5m diameter; Departure 5m. Traveling away from the highway
'Shaft' CA Ref 435407-012	(name unknown); shown to be treated; 2.3m diameter; Departure 0m. works unlikely to interfere with shaft cap

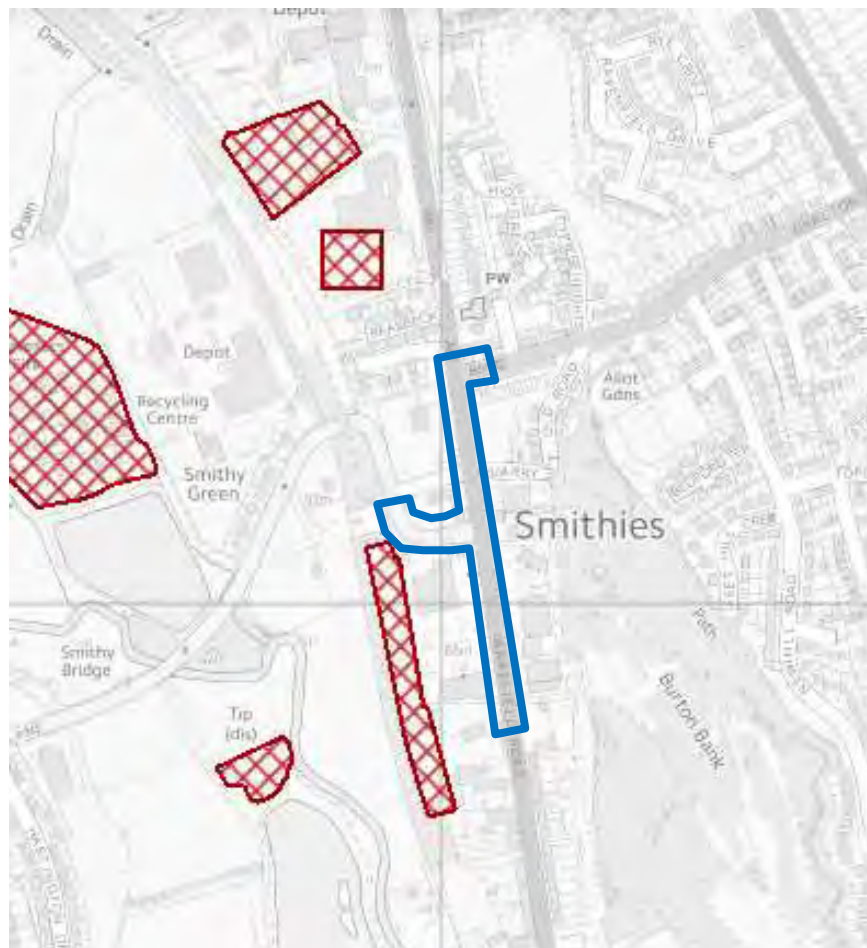
Abandonment plan detail from the former 'East Barnsley Colliery' and 'Winter Colliery' (of the late 19th century) illustrate the mine adits as 'day holes' or 'eye holes'. The two adits anticipated as traveling beneath the highway (435407-013 & 435408-026) are shown on the western side of Wakefield road on the abandonment plans; however, the actual tunnel entrance or 'portal' location will be uncertain-hence the indicated potential departures. The abandonment records detail workings in the Two Foot, Winter and Top Beamshaw coal seams beneath lands further to the east of the scheme.

COAL AUTHORITY

According to the Coal Authority details the site lies within a high-risk referral area due to the shallow workable coal seams and mine entries as detailed above. The Coal Authority also indicate the area as a "probable area of shallow mine workings".

LANDFILL

According to the Borough Landfill Register the scheme lies within 250m of five past landfill operations as illustrated in the following image.



FUGITIVE GAS

No known fugitive mine gas emissions are known in the vicinity of the scheme. However, some potential will exits given the shallow workable coal and particularly considering the mine entries which will create a pathway for such gases to travel through.

CONCLUSIONS

1. The site should be stable from the deep coal mining subsidence aspect for the foreseeable future.
2. The scheme is potentially at risk from shallow coal mining legacy issues, namely ground instability and fugitive gas migration due to the possible presence of shallow coal mine working's and mine entries beneath the site. A scheme of investigation should therefore be designed from which any necessary remediation and design mitigation can be considered. The actual surface position of the mine entry's may be on third party land. Investigations should be undertaken within the highway curtilage to check for any evidence of adit 435408-026 & 435407-013 and any voided/unstable ground. It is likely that the adits will now contain a degree of fill material although it is difficult to predict what will remain of these historic features. Intrusive site investigations should also be considered to determine the condition of shallow coals beneath the scheme and thus any ground improvement/mitigation requirements. Prior consultations with the Coal Authority (as owners) should be undertaken and a permit to investigate their interests obtained.
3. Mine entry CA ref: 435407-012 is recorded as being treated. Given the extent of the proposed scheme it is unlikely that this shaft will affect the proposals.
4. Similar to 3 above, the scheme does not appear to interfere with the adit 435408-006 on the eastern side of Wakefield road. However, given the limited amount of information held by the Coal Authority the actual position/condition of this adit remains uncertain.
5. Any exposed coal during future excavation works will require removal and blinding off to ensure appropriate pavement specifications are met and reduce spontaneous combustion risks.
6. A watching brief should be employed for any signs of weak geologically faulted bedrock which may require treatment/stabilisation works and suitably designed sub-base formation.
7. Safety precautions should be employed regarding potential fugitive gas accumulation in any deep or confined excavations, particularly in the vicinity of the former mine entries.

THIS REPORT IS BASED ON AND LIMITED TO THE RECORDS IN THE POSSESSION OF SYMAS AT THE TIME THE ENQUIRY IS ANSWERED.

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Report prepared by M. Lyons 9th November 2021.

P. James
Principal Mining Engineer.