



Coal Mining Risk Assessment

**Land adjacent to 70 Kirkway
Middleton
Manchester
M24 1EL**

Date: 27th March 2024

Version 1

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Document Verification

Site Address	Land adjacent to 70 Kirkway, Middleton, Manchester, M24 1EL		
Report Title	Coal Mining Risk Assessment		
Job Number	ES02714	Document Ref.	ES02714
Date Issued	27 th March 2024	Report Version	1
Checked by	Tom Craig MSc BSc (Hons) FGS	Signature	
Checked by	Phil Shelton PhD BSc CEng MIMMM FGS	Signature	

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1 Introduction

1.1 Site Location and Description

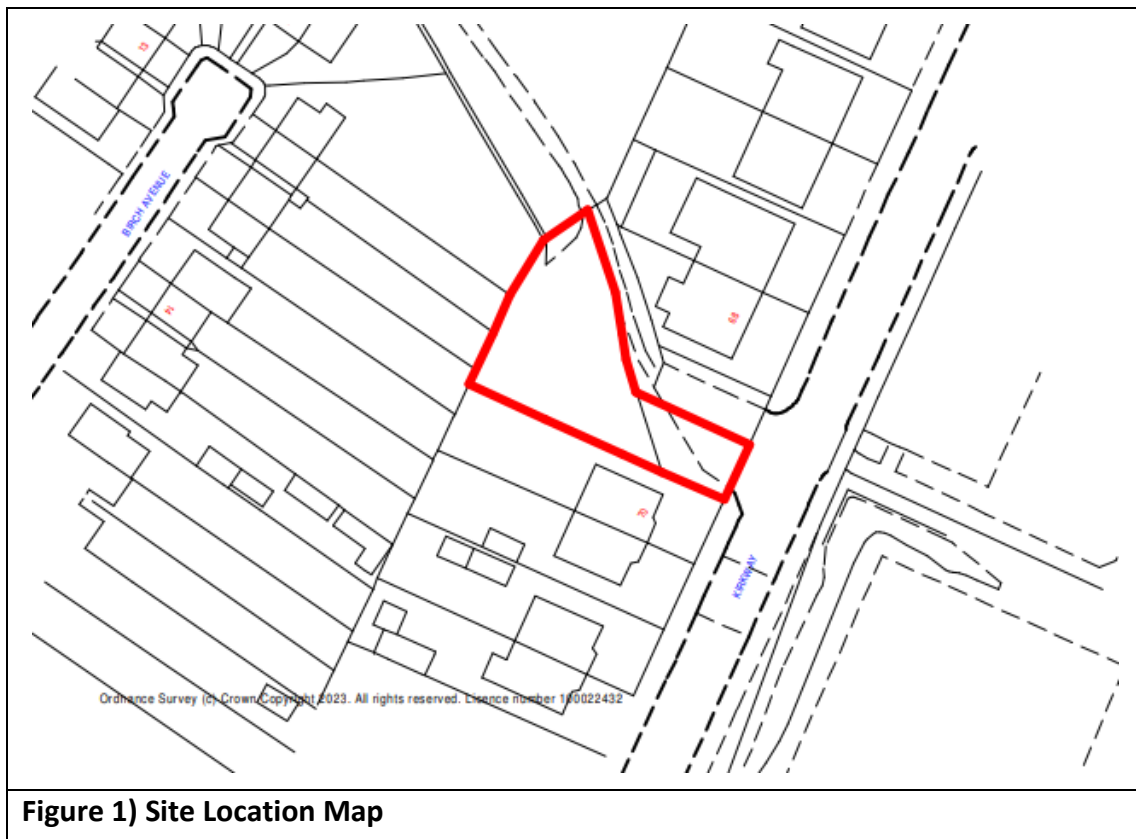
The site for the proposed residential development is located at land adjacent to 70 Kirkway, Middleton, Manchester, M24 1EL. The British National Grid Reference for the approximate site centre is GR: 387280 405360.

The site is roughly triangular in shape and occupies an area of approximately 550 square metres. It is currently undeveloped and heavily overgrown with bushes, trees and shrubs.

The site can be accessed via a driveway from Kirkway which forms the south-eastern boundary of the site.

The regional ground surface falls gently towards the east. The site is at an approximate mean elevation of 96m aOD.

A plan showing the location of the site is shown in **Figure 1**.



1.2 Development Proposal

It is understood that the development proposal includes the erection of 2 no. detached dwellings.

The development plans are included in **Figure 3** in **Appendix A**.

1.3 Scope of Coal Mining Risk Assessment

EnviroSolution Ltd has been commissioned to prepare a Coal Mining Risk Assessment Report (CMRA) for the proposed development site, in order to provide the Local Planning Authority with information on the coal mining legacy risk(s), an assessment of their potential impact on land stability, and provide recommendations for the need to carry out any further investigations (including intrusive boreholes) to address these risk(s).

The CMRA has been undertaken in accordance with the principles of best practice including the Coal Authority's guidance document "Risk Based Approach to Development Management - Resources for Developers Version 3" (2014) (Ref. 1), CIRIA "SP32 Construction over Abandoned Mine Workings" (2002) (Ref. 2) and CIRIA "C758D Abandoned Mine Workings Manual" (2019) (Ref. 3), CIRIA, Publication C665, Assessing risks posed by hazardous ground gases to buildings (Ref. 4) and CL:AIRE "Good Practice for Risk Assessment for Coal Mine Gas Emissions", October 2021 (Ref. 6).

The purpose of the CMRA Report is to:

- present a desk-based review of available information on the coal mining issues that are relevant to the application site;
- use that information to identify and assess the risks to the proposed development from coal mining legacy, including the cumulative impact issues;
- set out appropriate mitigation measures to address the coal mining legacy issues affecting the site, including any necessary remedial works and/or demonstrate how coal mining issues have influenced the proposed development; and
- demonstrate to the Local Planning Authority that the application site is, or can be made, safe and stable to meet the requirements of National Planning Policy with regard to development on unstable land.

1.4 Sources of Information

This report is based on current information of past mining activities relevant to the site. The following information sources have been used:

- Consultants Mining Report dated 5th September 2023 (Ref: 51003376274001, **Appendix B**);
- BGS Geoindex geological map;
- BGS geological 1:50,000 England and Wales Sheet 85 Manchester;
- BGS Geology of the Manchester district: a brief explanation of the geological map Sheet 85 Manchester. 2012;
- Coal Authority Interactive Website;
- Historical Ordnance Survey maps.

2 Environmental Setting

2.1 Historic Coal Mining Activity

The development site and surrounding area has been reviewed with reference to historical Ordnance Survey (OS) maps. The history of the site and immediate surrounding area are summarised in Table 1. Copies of the historical OS maps are included in **Appendix D**.

Table 1 - Historic Mapping Review

Date	Scale	Historic Mining Activity
1844-1848	1:10,560	- The site is undeveloped and lies on the eastern boundary of a refuse heap. - Allerington Colliery located 190m south of the site. - Sand pit located 260m north of the site.
1890	1:10,560	- Allerington Colliery demolished. Old shaft located 190m south of the site.
1915	1:10,560	- Sand pit developed with residential housing.
1928	1:10,560	- No significant change.
1938	1:10,560	- No significant change.

2.2 Geological Context

The BGS geological mapping (Geoindex and BGS Sheet 85 Manchester) show that the site lies on the boundary of glaciofluvial deposits (in the east) and diamicton (in the west). Glaciofluvial deposits generally comprise sands and gravels. Diamicton generally comprise unsorted, overconsolidated clays, silts, sands and gravels.

The underlying bedrock consists of the Pennine Lower Coal Measures Formation, which is of Carboniferous age. The Pennine Lower Coal Measures Formation generally consists of cyclical sequences of interbedded grey mudstones and siltstones with pale grey sandstones and frequent coal seams.

Information of recorded underground workings beneath the site obtained from the Coal Authority interactive map confirms that the bedrock has a dip of approximately 14° towards the south.

The nearest geological fault is located approximately 190m southwest of the site boundary with an approximate trend of 160° (Whole Circle Bearing). The fault downthrows towards the northeast.

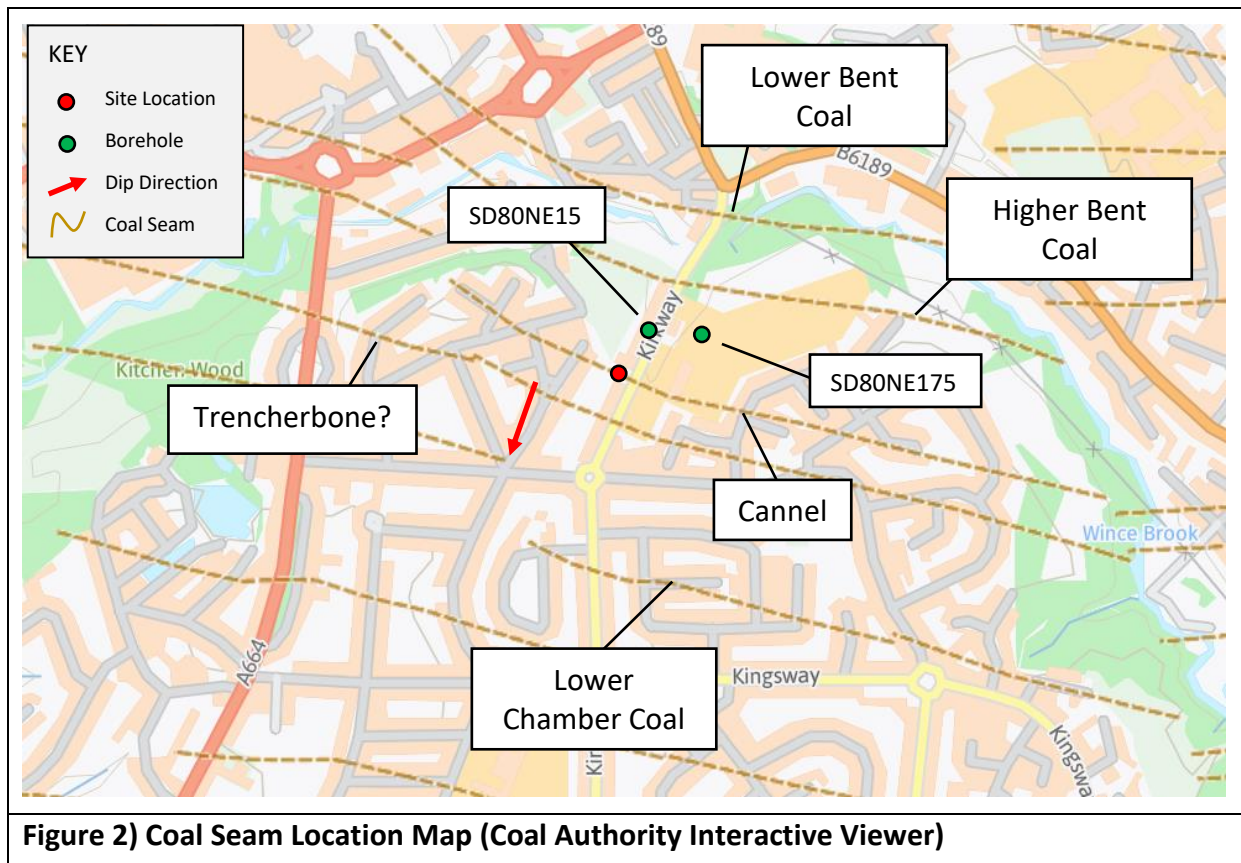
Two BGS borehole records (ref: SD80NE175 and SD80NE15) have been obtained from BGS online records 110m north and 70m northeast of the site respectively.

- Borehole SD80NE175 shows 2.0m of Made Ground overlying 6.20m of superficial silts and clays (diamicton). Weathered mudstone was encountered at 8.20m bgl.
- Borehole SD80NE15 refers to the historic Old Yates Pit (a former nearby colliery). The Bents Mine seam is recorded at 52m bgl where the shaft terminated.

The location of the boreholes is shown in **Figure 2**.

It should be noted that there is a discrepancy between the 1:50,000 geological map and the Coal Authority Interactive Viewer outcrop locations. Additional outcrops are recorded on the Interactive Viewer Map, notably the Cannel Coal which outcrops/subcrops beneath the site and likely the Trencherbone seam which the CA shows to outcrop to the south. The Cannel Coal is noted to have a recorded thickness of between 0.30m and 0.90m (Ref. 5).

The Trencherbone coal seam in this area has a history of spontaneous combustion but due to its outcrop position to the south of the site (down dip) it is not expected beneath the site.



The site is situated within a Primary Opencast Coal Resource Area (**Appendix G**). The Primary Opencast Coal Resource Area is defined by the BGS as “an area that constitutes the main target for opencast coal extraction and comprises a relatively closely spaced succession of variable but generally thick coals. Notwithstanding this, it is considered to be very unlikely that there will be any interest in developing open cast coal mining operations at this location in the short or medium-term.

3 Identification and Assessment of Site-Specific Coal Mining Risks

Table 2 below summarises the potential risks associated with coal mining legacy for the proposed development site, which have been identified from list sources of information.

Table 2 - Coal Mining Hazards Summary

Coal Mining Issues	Yes	No
Coal outcrops	X	
Underground coal mining (recorded at shallow depths)		X
Underground coal mining (probable at shallow depths)	X	
Recorded mine entries (shafts and adits)	X	
Unrecorded mine entries (shafts and adits)	X	
Coal mining geology (fissures)		X
Record of past gas emissions		X
Recorded coal mining surface hazard		X
Surface mining (opencast workings)		X

The Coal Authority Interactive Map Viewer (**Appendix H**) has identified that the site lies within a Development High Risk Area associated with the presence of a shallow sub-crop of the Cannel Coal seam which intersects the southern half of the site and a nearby recorded mine shaft. The Coal Authority has identified this coal seam as being of workable thickness.

A search of the Local Planning Authority planning records yielded no further information on site investigations in the surrounding area.

The report obtained from the Coal Authority (Consultants Mining Report, reference 51003376274001, dated 5th September 2023) revealed the property is in a surface area that is affected by recorded underground mining in 1 no. seam of coal at a depth of 119m. The seam was last worked in 1900. The seam is at sufficient depth to be considered safe from potential surface instability or crown hole development.

The Coal Authority report also states that the site is in an area where the Coal Authority believes there is coal at or close to the surface, which may have been worked in the past. The Coal Authority has drawn attention to this and has stated that the presence of unrecorded shallow coal should be considered.

The Coal Authority report states that they are aware of 4 no. recorded mine entries within 100m of the development site boundary. The locations of the shafts are shown in **Figure 3** below. The mine shaft information is summarised in **Table 3** below:

Table 3 - *Mine Shaft Summary*

Mine Shaft	Treatment	Shaft Depth	Departure	Assumed Shaft Diameter	Distance from Site
387405-001	No Information	52m	8m	2.5m	77m N
387405-002	The entry was drilled and grouted to NCB specifications in 1973. The drift deposits were also grouted.	48m	0m	2.5m	76m N
387405-003	No Information	No Information	8m	2.5m	15.6m E
387405-004	No Information	No Information	8m	2.5m	79m S

Shafts 387405-001, 387405-002 and 387405-004 are located in excess of 76m from the site. They are considered to be at such a distance from the site that the area of influence around the shaft will not intersect the proposed development.

The area of potential influence around shaft 387405-003 can be calculated by the sum of the diameter, departure and depth to rockhead. According to nearby borehole records the depth to rockhead is approximately 8.20m. The estimated areas of influence around the shaft is shown on **Figure 4**, which shows that the very eastern boundary is partially intersected by the area of influence. The area of influence does not intersect the area of the proposed dwellings. If the final position of the dwellings are moved eastwards, this must be reassessed.

Using the departure of 8m and the assumed shaft diameter of 2m, **Figure 5** shows that the shaft may be present within a small portion of the eastern side of the site, beneath the proposed driveway. This area has been calculated at 10m².

Notwithstanding this, there may be mine entries in the vicinity that have not been recorded.

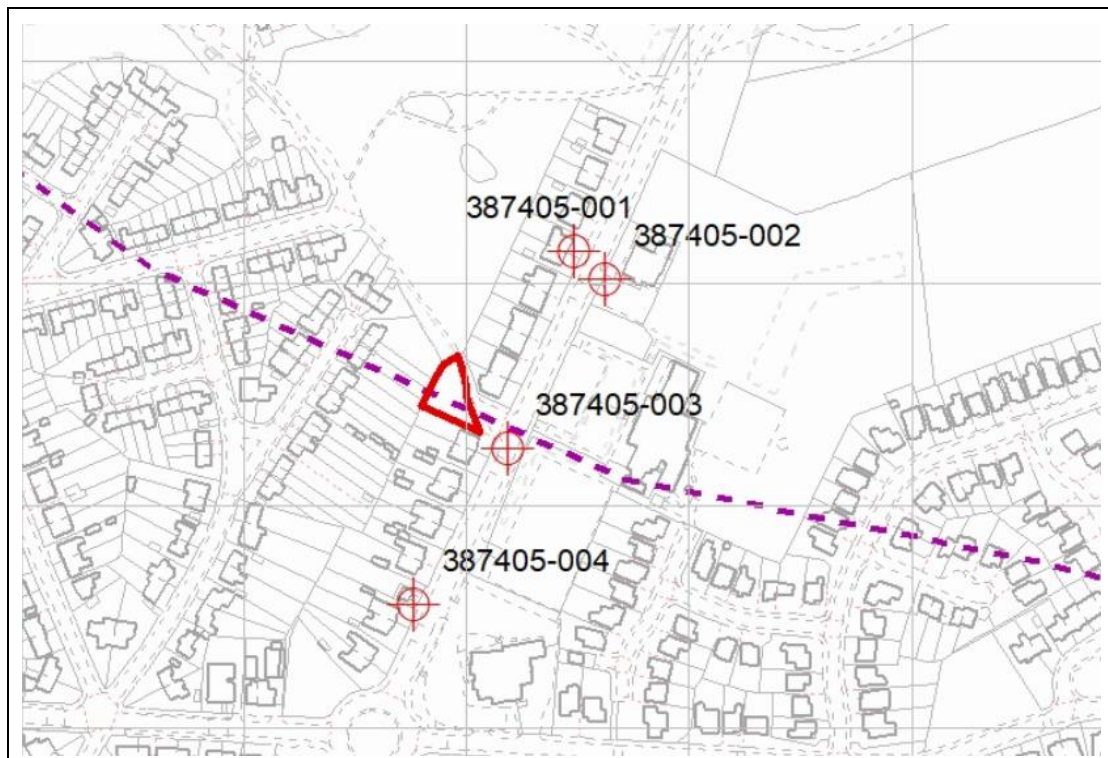
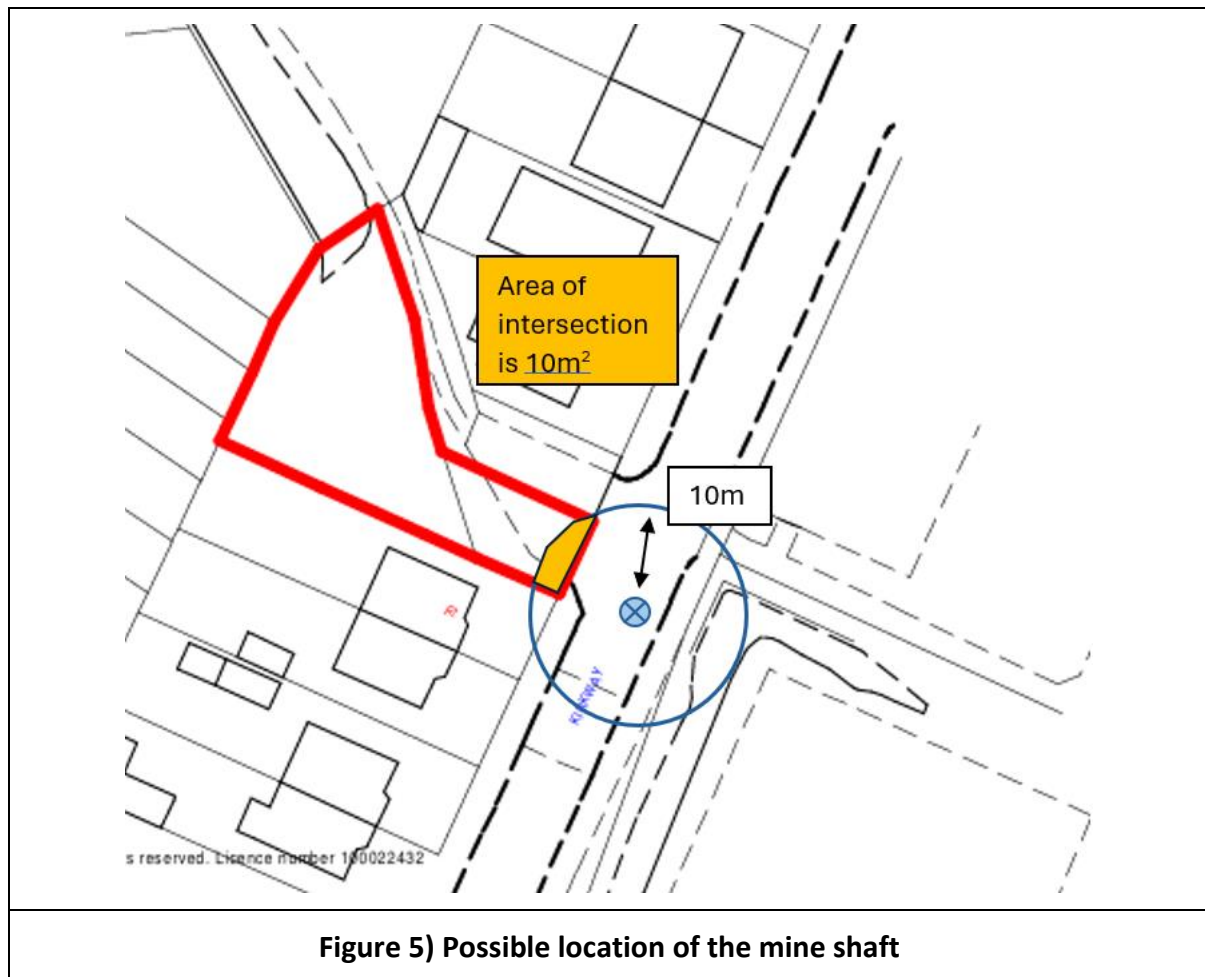


Figure 3) Coal Authority Summary Map



Figure 4) Area of influence



The Coal Authority mining report states the property is not within the boundary of a historic or current opencast site, and there are no licence requests outstanding to remove coal via this method in the future. The risk posed to the site from opencast mining methods is therefore considered to be negligible.

There are no recorded past mining gas emissions in the surrounding area; however, coal seams and coal mine workings pose a potential gas risk, which should be considered in any future investigations and development. At development sites with shallow coal workings, probable shallow coal mine workings, or pathway features such as mine entries and geological disturbances on or nearby the site, it is recommended that a detailed gas risk assessment is undertaken in accordance with relevant guidance.

4 Proposed Mitigation Strategy

- All built development should remain outside the area of influence around the proximate shaft.
- Because of the risk from unrecorded shallow abandoned coal mine workings in the Cannel and other coal seams, it is recommended that up to 3 no. rotary borehole are advanced to a minimum depth of 30m below ground level targeting the areas of proposed built development. Water flush should be used to safeguard against oxidation and potential spontaneous combustion of shallow coal. In order to undertake these works it will be necessary to obtain a drilling permit from The Coal Authority.
- Because the location of Shaft 387405-003 could potentially lie within the development boundary (beneath the driveway), it will therefore be necessary to include a targeted probe investigation in this area. Probe locations should be set out on a 1m spacing.
- The provision for the installation of a reinforcement geomembrane should be made for the road access and driveway to mitigate the risk of subsidence caused by a shaft collapse.
- The possibility of unrecorded mine shafts has been highlighted in the Coal Authority report. The potential risk can be dealt with through vigilance during the earthworks stage of construction.

5 Conclusions

The Coal Mining Risk Assessment for the site at Kirkway in Middleton has concluded that the potential risk associated with coal mining related issues are significant based on information from the Coal Authority and geological interpretation.

The principal risks to the development arise from:

- the potential presence of unrecorded shallow mine workings;
- the potential presence of a recorded shaft located within a small porting of the eastern side of the site;
- unrecorded mine entries;
- mine gas;

It is therefore recommended that further intrusive ground investigations are undertaken. These might include the drilling of 3 no. rotary probe boreholes to minimum depths of 30m bgl, located close to the proposed development to determine the superficial thickness (if any) along with obtaining evidence of potential unrecorded coal mine workings. Provision should be made to install gas monitoring standpipes and undertake a programme of gas monitoring. Additional targeted probe drilling should be undertaken in the small area along the eastern boundary to investigate the location of the mine shaft.

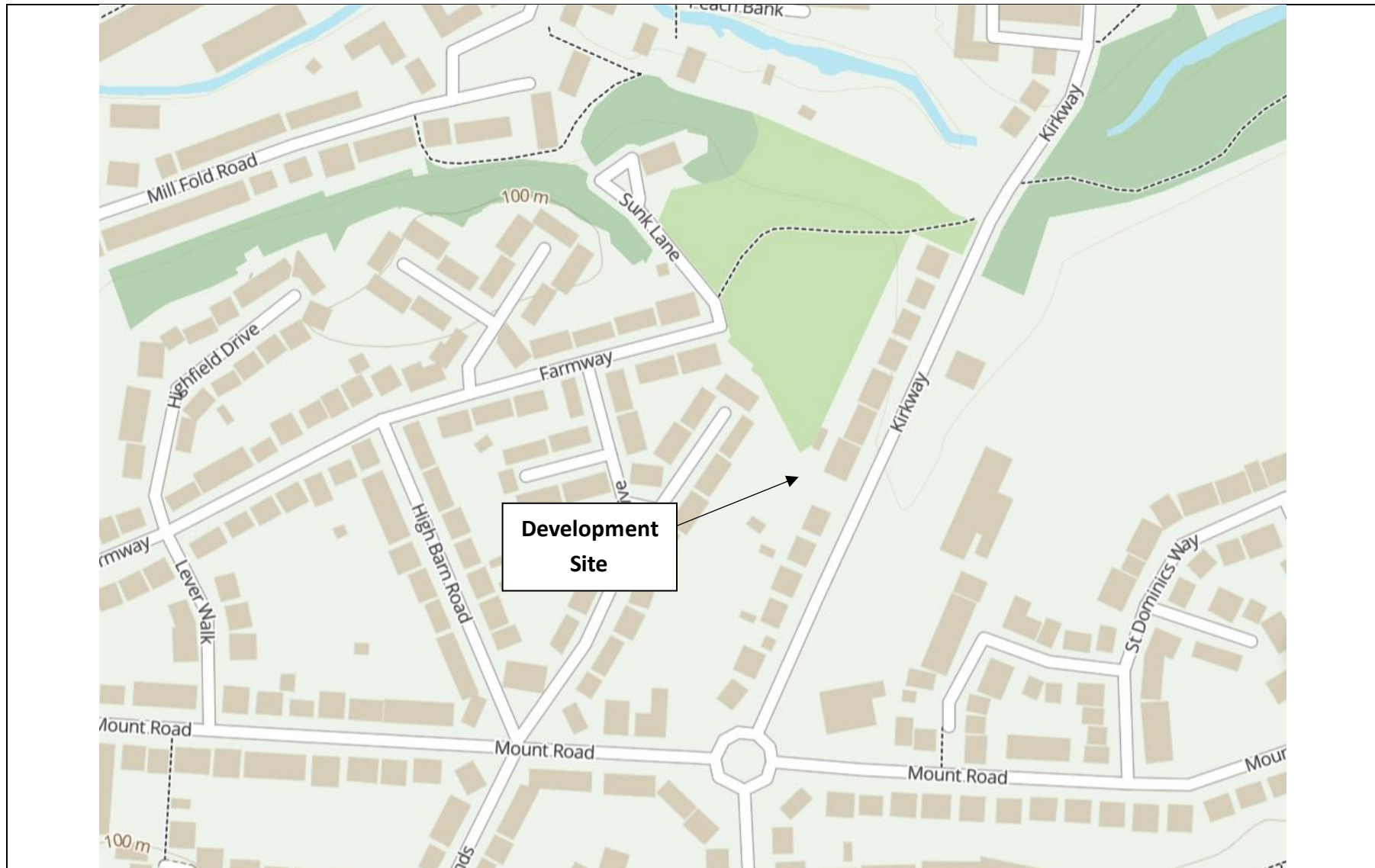
The provision for the installation of a reinforcement geomembrane should be made for the road access and driveway to mitigate the risk of subsidence caused by a shaft collapse.

Prior to the commencement of intrusive works, a Coal Authority Permit will be required for drilling activities, that will disturb or enter any coal seams, coal mine workings or coal mine entries (shafts and adits). The scope of works for the investigation will need to be submitted and approved by the local authority prior to the commencement of the intrusive works.

References

1. Coal Authority, 2014, Risk Based Approach to Development Management Resources for Developers, Version 3.
2. CIRIA, 2002, SP32 Construction over Abandoned Mine Workings.
3. CIRIA, 2019, C758D Abandoned Mine Workings Manual.
4. CIRIA, Publication C665, Assessing risks posed by hazardous ground gases to buildings.
5. BGS, 2012, Geology of the Manchester district: a brief explanation of the geological map Sheet 85 Manchester.
6. CL:AIRE, 2021, Good Practice for Risk Assessment for Coal Mine Gas Emissions.

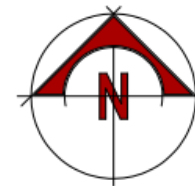
Appendix A – Site Location



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Site Location Map





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Proposed Site Plan

Appendix B – Site Photographs



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Site frontage

Appendix C – Coal Authority Report

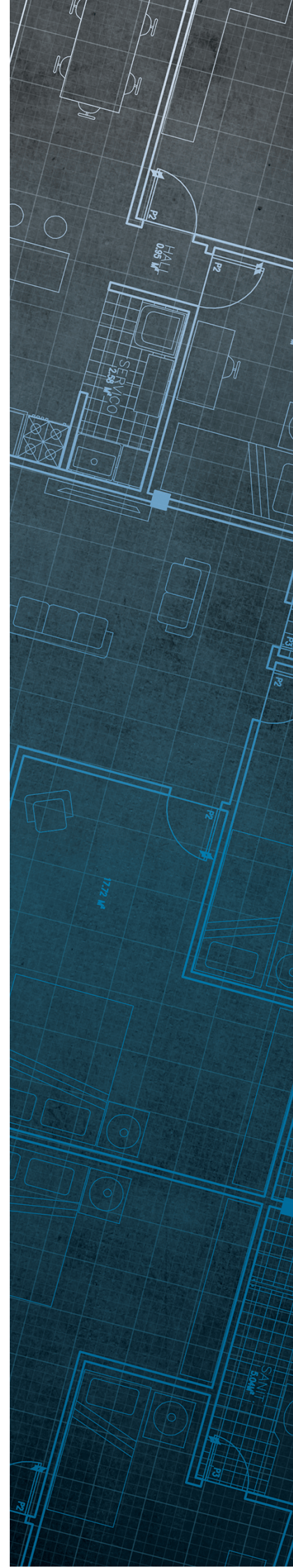


The Coal
Authority

Consultants Coal Mining Report

Land Adjacent To 70 Kirkway
Middleton
Rochdale
M24 1EL

Date of enquiry:	5 September 2023
Date enquiry received:	5 September 2023
Issue date:	5 September 2023
Our reference:	51003376274001
Your reference:	70 Kirkway



Consultants

Coal Mining Report

This report is based on and limited to the records held by the Coal Authority at the time the report was produced.

Client name

EnviroSolution Limited

Enquiry address

Land Adjacent To 70 Kirkway
Middleton
Rochdale
M24 1EL

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NG18 4RG

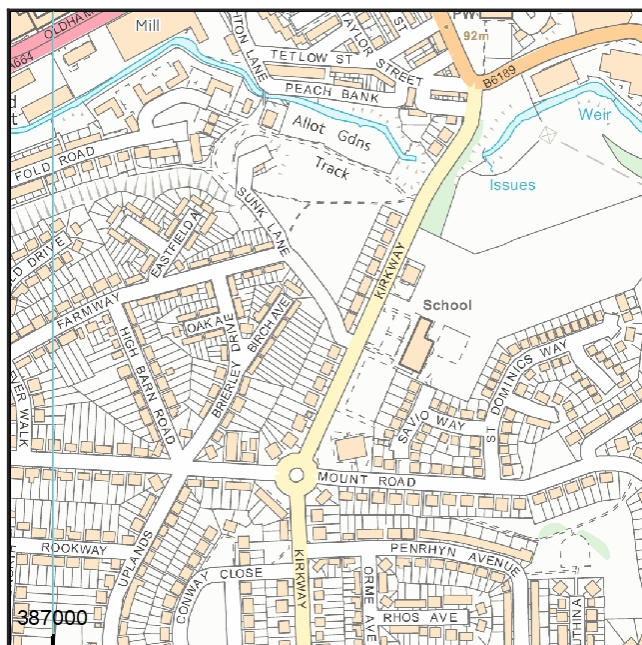
www.groundstability.com

 @coalauthority

 /company/the-coal-authority

 /thecoalauthority

 /thecoalauthority



Approximate position of property



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Section 1 – Mining activity and geology

Past underground mining

Colliery	Seam	Mineral	Coal Authority reference	Depth (m)	Direction to working	Dipping rate of seam worked (degrees)	Dipped direction of seam worked	Extraction thickness (cm)	Year last mined
unnamed	LOWER BENT	Coal	37B8	119	Beneath Property	14.0	South	130	1900

Probable unrecorded shallow workings

Yes.

Spine roadways at shallow depth

No spine roadway recorded at shallow depth.

Mine entries

Entry type	Reference	Grid reference	Treatment description	Mineral	Conveyancing details
Shaft	387405-001	387349 405414		Coal	
Shaft	387405-002	387363 405401	This entry was drilled and grouted to NCB specifications in 1973. The drift deposits in the vicinity of the entry were also grouted. These works were carried out by South Lancs Boring Co Ltd on behalf of Lancashire County Council	Coal	
Shaft	387405-003	387319 405325		Coal	
Shaft	387405-004	387277 405255		Coal	

Abandoned mine plan catalogue numbers

The following abandoned mine plan catalogue numbers intersect with some, or all, of the enquiry boundary:

17156	16820	NW92
PO0	3672	NW424

Please contact us on 0345 762 6848 to determine the exact abandoned mine plans you require based on your needs.

Outcrops

Seam name	Mineral	Seam workable	Distance to outcrop (m)	Direction to outcrop	Bearing of outcrop
CANNEL	Coal	Yes	Within	N/A	293

Geological faults, fissures and breaklines

No faults, fissures or breaklines recorded.

Opencast mines

None recorded within 500 metres of the enquiry boundary.

Coal Authority managed tips

None recorded within 500 metres of the enquiry boundary.

Section 2 – Investigative or remedial activity

Please refer to the 'Summary of findings' map (on separate sheet) for details of any activity within the area of the site boundary.

Site investigations

None recorded within 50 metres of the enquiry boundary.

Remediated sites

None recorded within 50 metres of the enquiry boundary.

Coal mining subsidence

The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres of the enquiry boundary, 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.

Mine gas

None recorded within 500 metres of the enquiry boundary.

Mine water treatment schemes

None recorded within 500 metres of the enquiry boundary.

Section 3 – Licensing and future mining activity

Future underground mining

None recorded.

Coal mining licensing

None recorded within 200 metres of the enquiry boundary.

Court orders

None recorded.

Section 46 notices

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

Withdrawal of support notices

The property is not in an area where a notice to withdraw support has been given.

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.

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.

Section 4 – Further information

The following potential risks have been identified and as part of your risk assessment should be investigated further.

Future development

If development proposals are being considered, technical advice relating to both the investigation of coal and former coal mines and their treatment should be obtained before beginning work on site. All proposals should apply specialist engineering practice required for former mining areas. No development should be undertaken that intersects, disturbs or interferes with any coal or coal mines without first obtaining the permission of the Coal Authority.

MINE GAS: Please note, if there are no recorded instances of mine gas within 500m of the enquiry boundary, this does not mean that mine gas is not present within the vicinity. The Coal Authority Mine Gas data is limited to only those sites where a Mine Gas incident has been recorded. Developers should be aware that the investigation of coal seams, mine workings or mine entries may have the potential to generate and/or displace underground gases. Associated risks both to the development site and any neighbouring land or properties should be fully considered when undertaking any ground works. The need for effective measures to prevent gases migrating onto any land or into any properties, either during investigation or remediation work, or after development must also be assessed and properly addressed. In these instances, the Coal Authority recommends that a more detailed Gas Risk Assessment is undertaken by a competent assessor.

Development advice

The site is within an area of historical coal mining activity. Should you require advice and/or support on understanding the mining legacy, its risks to your development or what next steps you need to take, please contact us.

For further information on specific site or ground investigations in relation to any issues raised in Section 4, please call us on 0345 762 6848 or email us at groundstability@coal.gov.uk.

Section 5 – Data definitions

The datasets used in this report have limitations and assumptions within their results. For more guidance on the data and the results specific to the enquiry boundary, please **call us on 0345 762 6848** or **email us at groundstability@coal.gov.uk**.

Past underground coal mining

Details of all recorded underground mining relative to the enquiry boundary. Only past underground workings where the enquiry boundary is within 0.7 times the depth of the workings (zone of likely physical influence) allowing for seam inclination, will be included.

Probable unrecorded shallow workings

Areas where the Coal Authority believes there to be unrecorded coal workings that exist at or close to the surface (less than 30 metres deep).

Spine roadways at shallow depth

Connecting roadways either, working to working, or, surface to working, both in-seam and cross measures that exist at or close to the surface (less than 30 metres deep), either within or within 10 metres of the enquiry boundary.

Mine entries

Details of any shaft or adit either within, or within 100 metres of the enquiry boundary including approximate location, brief treatment details where known, the mineral worked from the mine entry and conveyance details where the mine entry has previously been sold by the Authority or its predecessors British Coal or the National Coal Board.

Abandoned mine plan catalogue numbers

Plan numbers extracted from the abandoned mines catalogue containing details of coal and other mineral abandonment plans deposited via the Mines Inspectorate in accordance with the Coal Mines Regulation Act and Metalliferous Mines Regulation Act 1872. A maximum of 9 plan extents that intersect with the enquiry boundary will be included. This does not infer that the workings and/or mine entries shown on the abandonment plan will be relevant to the site/property boundary.

Outcrops

Details of seam outcrops will be included where the enquiry boundary intersects with a conjectured or actual seam outcrop location (derived by either the British Geological Survey or the Coal Authority) or intersects with a defined 50 metres buffer on the coal (dip) side of the outcrop. An indication of whether the Coal Authority believes the seam to be of sufficient thickness and/or quality to have been worked will also be included.

Geological faults, fissures and breaklines

Geological disturbances or fractures in the bedrock. Surface fault lines (British Geological Survey derived data) and fissures and breaklines (Coal Authority derived data) intersecting with the enquiry boundary will be included. In some circumstances faults, fissures or breaklines have been known to contribute to surface subsidence damage as a consequence of underground coal mining.

Opencast mines

Opencast coal sites from which coal has been removed in the past by opencast (surface) methods and where the enquiry boundary is within 500 metres of either the licence area, site boundary, excavation area (high wall) or coaling area.

Coal Authority managed tips

Locations of disused colliery tip sites owned and managed by the Coal Authority, located within 500 metres of the enquiry boundary.

Site investigations

Details of site investigations within 50 metres of the enquiry boundary where the Coal Authority has received information relating to coal mining risk investigation and/or remediation by third parties.

Remediated sites

Sites where the Coal Authority has undertaken remedial works either within or within 50 metres of the enquiry boundary following report of a hazard relating to coal mining under the Coal Authority's Emergency Surface Hazard Call Out procedures.

Coal mining subsidence

Details of alleged coal mining subsidence claims made since 31 October 1994 either within or within 50 metres of the enquiry boundary. Where the claim relates to the enquiry boundary confirmation of whether the claim was accepted, rejected or whether liability is still being determined will be given. Where the claim has been discharged, whether this was by repair, payment of compensation or a combination of both, the value of the claim, where known, will also be given.

Details of any current 'Stop Notice' deferring remedial works or repairs affecting the property/site, and if so the date of the notice.

Details of any request made to execute preventative works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991. If yes, whether any person withheld consent or failed to comply with any request to execute preventative works.

Mine gas

Reports of alleged mine gas emissions received by the Coal Authority, either within or within 500 metres of the enquiry boundary that subsequently required investigation and action by the Coal Authority to mitigate the effects of the mine gas emission. Please note, if there are no recorded instances of mine gas reported, this does not mean that mine gas is not present within the vicinity. The Coal Authority Mine Gas data is limited to only those sites where a Mine Gas incident has been recorded.

Mine water treatment schemes

Locations where the Coal Authority has constructed or operates assets that remove pollutants from mine water prior to the treated mine water being discharged into the receiving water body.

These schemes are part of the UK's strategy to meet the requirements of the Water Framework Directive. Schemes fall into 2 basic categories: Remedial – mitigating the impact of existing pollution or Preventative – preventing a future pollution incident.

Mine water treatment schemes generally consist of one or more primary settlement lagoons and one or more reed beds for secondary treatment. A small number are more specialised process treatment plants.

Future underground mining

Details of all planned underground mining relative to the enquiry boundary. Only those future workings where the enquiry boundary is within 0.7 times the depth of the workings (zone of likely physical influence) allowing for seam inclination will be included.

Coal mining licensing

Details of all licenses issued by the Coal Authority either within or within 200 metres of the enquiry boundary in relation to the under taking of surface coal mining, underground coal mining or underground coal gasification.

Court orders

Orders in respect of the working of coal under the Mines (Working Facilities and Support) Acts of 1923 and 1966 or any statutory modification or amendment thereof.

Section 46 notices

Notice of proposals relating to underground coal mining operations that have been given under section 46 of the Coal Mining Subsidence Act 1991.

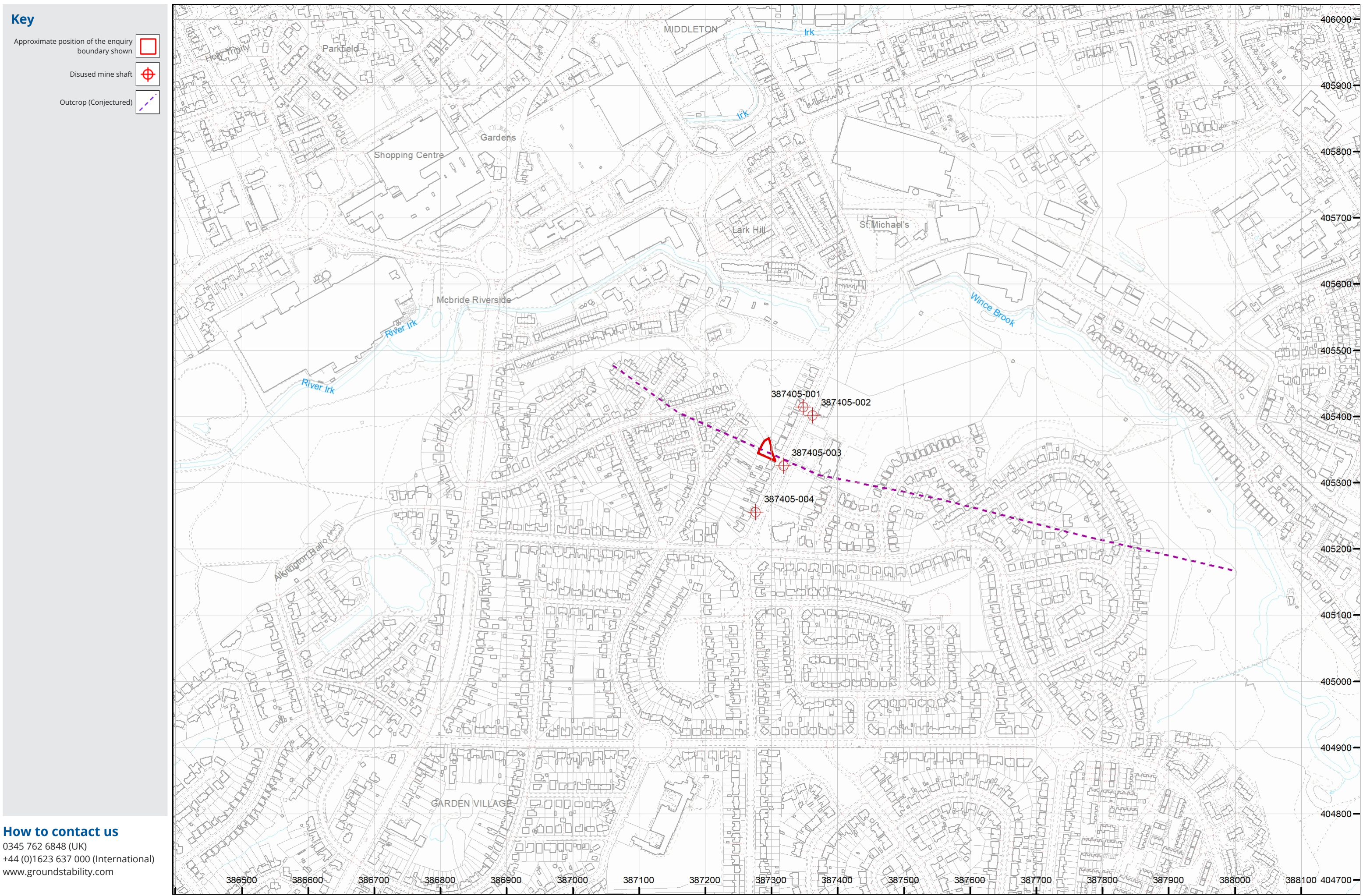
Withdrawal of support notices

Published notices of entitlement to withdraw support and the date of the notice. Details of any revocation notice withdrawing the entitlement to withdraw support given under Section 41 of the Coal Industry Act 1994.

Payment to owners of former copyhold land

Relevant notices which may affect the property and any subsequent notice of retained interests in coal and coal mines, acceptance or rejection notices and whether any compensation has been paid to a claimant.

The map highlights any specific surface or subsurface features within or near to the boundary of the site.



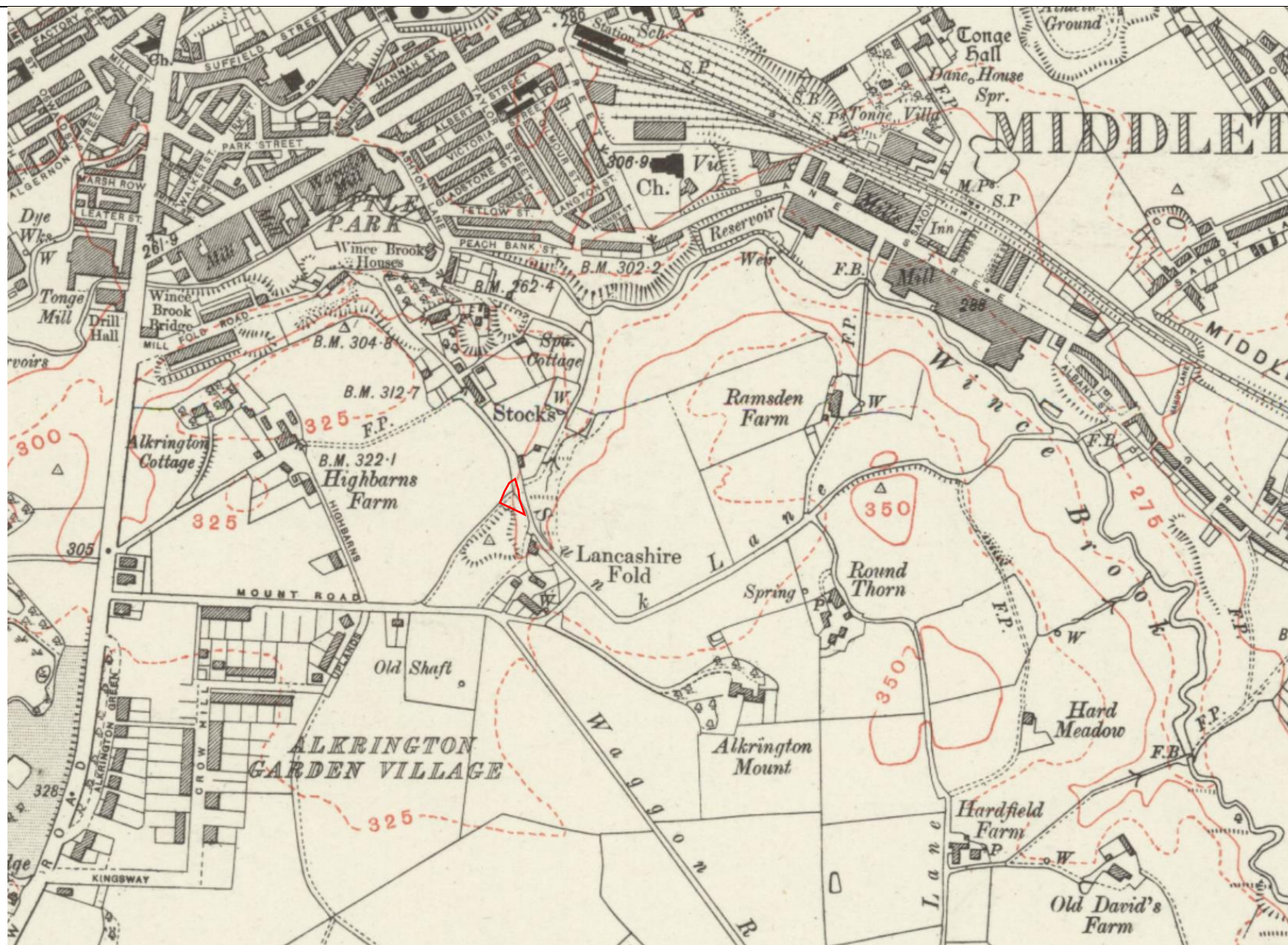
Appendix D – Historic Maps



Date: 1844



Date: 1890



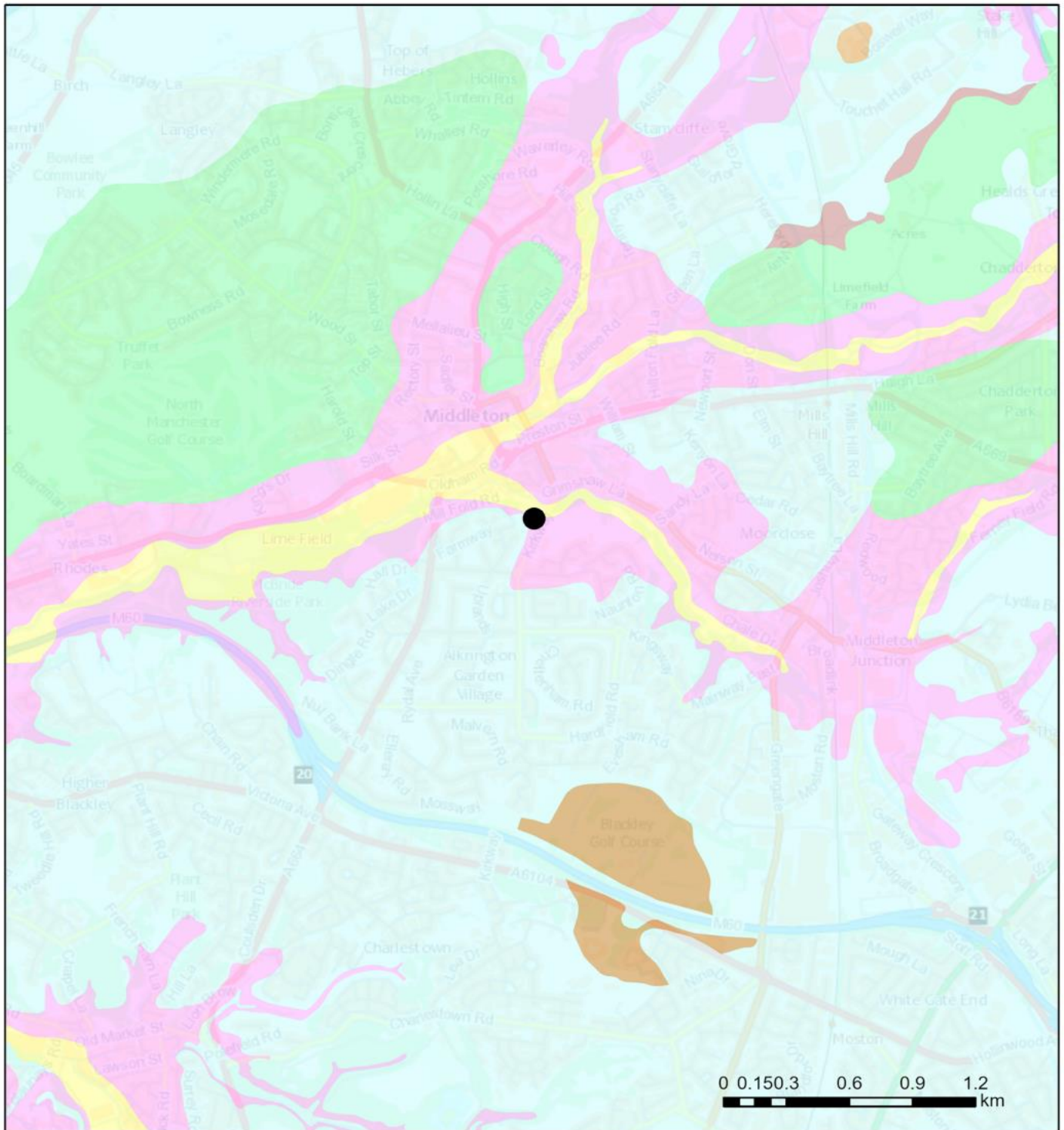
Date: 1915



Date: 1938

Appendix E – Geological Maps

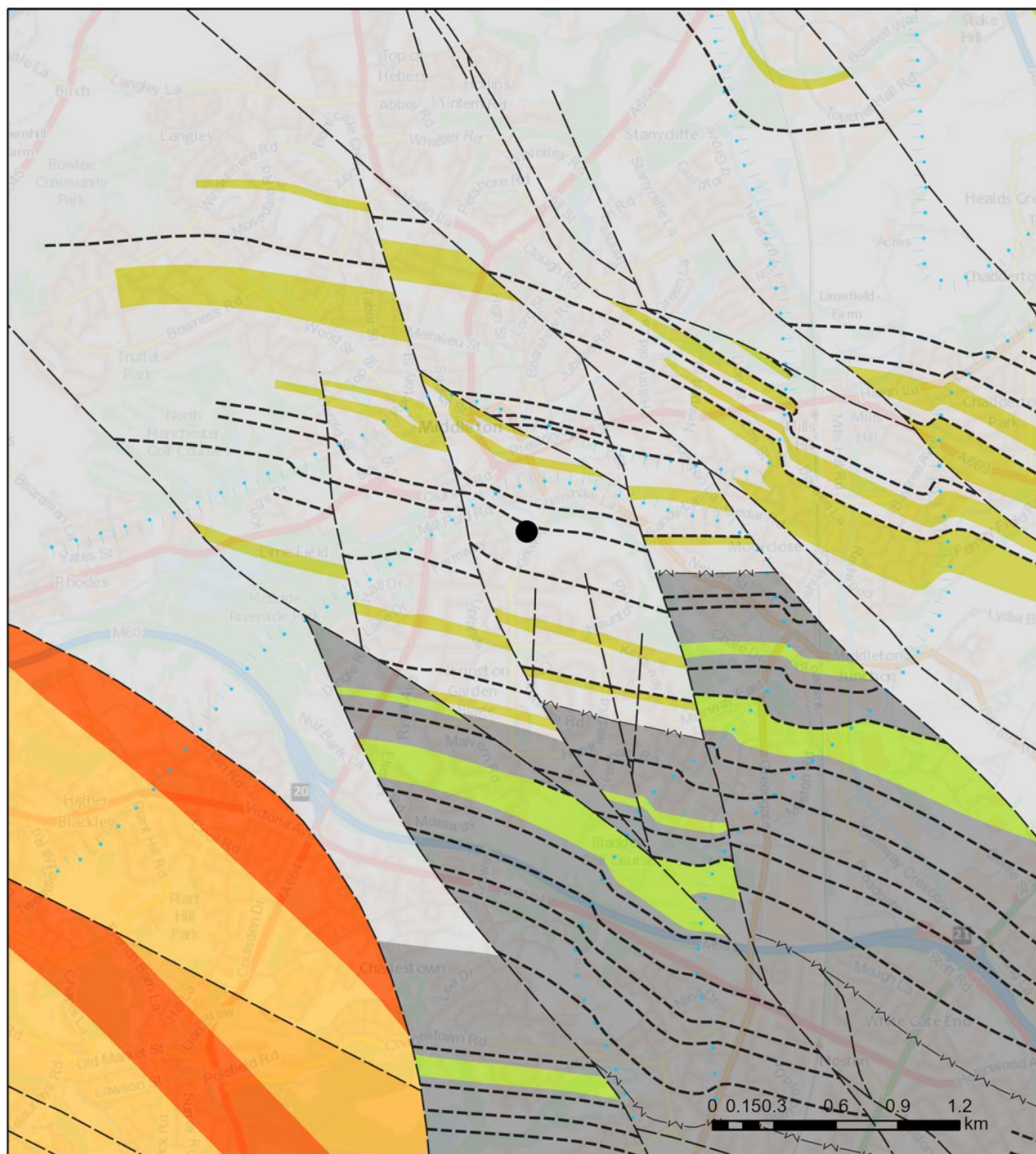
Superficial Geology



Superficial deposits 1:50,000 scale

- GLACIOFLUVIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL
- GLACIOFLUVIAL ICE CONTACT DEPOSITS, DEVENSIAN - SAND AND GRAVEL
- GLACIOFLUVIAL SHEET DEPOSITS, DEVENSIAN - SAND AND GRAVEL
- TILL, DEVENSIAN - DIAMICTON
- GLACIOLACUSTRINE DEPOSITS, DEVENSIAN - CLAY AND SILT
- HUMMOCKY (MOUNDY) GLACIAL DEPOSITS, DEVENSIAN - DIAMICTON
- HUMMOCKY (MOUNDY) GLACIAL DEPOSITS, DEVENSIAN - SAND AND GRAVEL
- ALLUVIUM - CLAY, SILT, SAND AND GRAVEL
- HEAD - CLAY, SILT, SAND AND GRAVEL
- LACUSTRINE DEPOSITS - SAND AND GRAVEL
- PEAT - PEAT

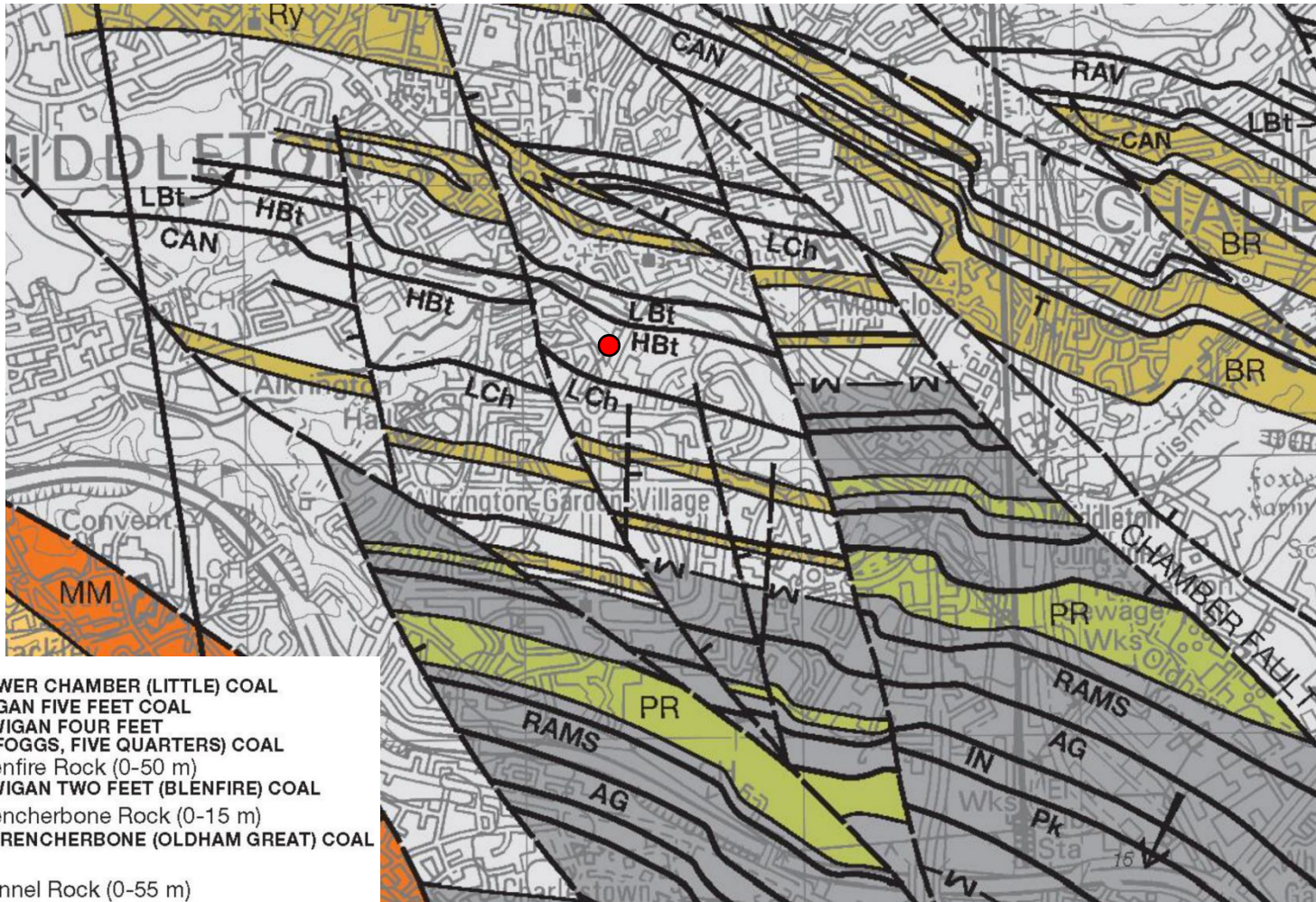
Bedrock Geology



Bedrock geology 1:50,000 scale

	<u>PENNINE LOWER COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE</u>
	<u>PENNINE UPPER COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE</u>
	<u>PENNINE MIDDLE COAL MEASURES FORMATION - MUDSTONE, SILTSTONE AND SANDSTONE</u>
	<u>CHESTER FORMATION - SANDSTONE</u>
	<u>COLLYHURST SANDSTONE FORMATION - SANDSTONE</u>
	<u>BLENFIRE ROCK - SANDSTONE</u>
	<u>CHAMBER ROCK - SANDSTONE</u>
	<u>OLD LAWRENCE ROCK - SANDSTONE</u>
	<u>PENNINE LOWER COAL MEASURES FORMATION - SANDSTONE</u>
	<u>ROYLEY SANDSTONE - SANDSTONE</u>
	<u>TRENCHBONE ROCK - SANDSTONE</u>
	<u>NEWTON HEATH SANDSTONE - SANDSTONE</u>
	<u>NOB END ROCK - SANDSTONE</u>
	<u>BARDSLEY ROCK - SANDSTONE</u>
	<u>HUNCLIFFE ROCK - SANDSTONE</u>
	<u>PENNINE MIDDLE COAL MEASURES FORMATION - SANDSTONE</u>
	<u>WORSLEY DELF ROCK - SANDSTONE</u>
	<u>MANCHESTER MARLS FORMATION - MUDSTONE</u>

BGS Geological Survey 1:50,000 Series England and Wales Sheet 85, Manchester



LCh	LOWER CHAMBER (LITTLE) COAL
Wg5	WIGAN FIVE FEET COAL
Wg4	WIGAN FOUR FEET (FOGGS, FIVE QUARTERS) COAL
BR	Blenfire Rock (0-50 m)
Wg2	WIGAN TWO FEET (BLENFIRE) COAL
TR	Trencherbone Rock (0-15 m)
T	TRENCHERBONE (OLDHAM GREAT) COAL
CaR	Cannel Rock (0-55 m)
CAN	CANNEL (BLACK) COAL
Q	QUEEN COAL
RAV	RAVINE (STONE, PLODDER) COAL
sa	Sandstone (0-5 m)
HBt	HIGHER BENT COAL
LBt	LOWER BENT COAL

Appendix F – BGS Borehole Logs

SD80NE175

STRATA SURVEYS LTD., Telephone: 0606 84 4637 Fax: 0606 84 6657						Borehole Number : 1 Sheet 1 of 1.						
Job Number : 5540 Location : St Dominics, Middleton. Client : Rochdale Borough.						Dia. & Drilling Methods 150mm Diameter light cable percussion						
Description of Strata	Red. Level	Legend	Thick-ness	Depth m	Sample Depths	Sample Types	N Value	Cu	g	Water Level	Pie -zo	Daily Prog.
Grass cover			(0.05)	0.00								
MADE GROUND (Medium dense becoming loose soily fine to medium sand fill, with fine to medium gravel)			(1.95)	0.50 - 0.95	S 1	N 17						
				1.50 - 1.95	S 2	N 9						
				2.00 - 2.45	S 3	N 11						
Medium dense brown very clayey sandy SILT			(2.00)	3.00 - 3.45	S 4	N 15						
				4.00 - 4.45	U 1			72.0				
				4.60	D 1							
				5.00 - 5.45	U 2							
				5.60	D 2							
			(3.60)	6.50 - 6.95	U 3							
				7.10	D 3							
				7.60 - 8.05	S 5	N 19						
			(0.40)	8.00	D 4							
			(0.20)	8.20 - 8.65	U 4			41.9				
				8.80	D 5							
			(1.80)	9.60 - 10.05	S 6	N 46						
				10.00								
Borehole Completed												12/5
General Remarks : No water encountered during drilling.						Dates : 12 MAY 90 Driller : D.H Engineer: G.H						

SECTION OF **Pits** of **Old Atterington Colliery**, (Old Colliery, closed 1914)
 near **Middleton**
 COUNTY **Lancashire.**

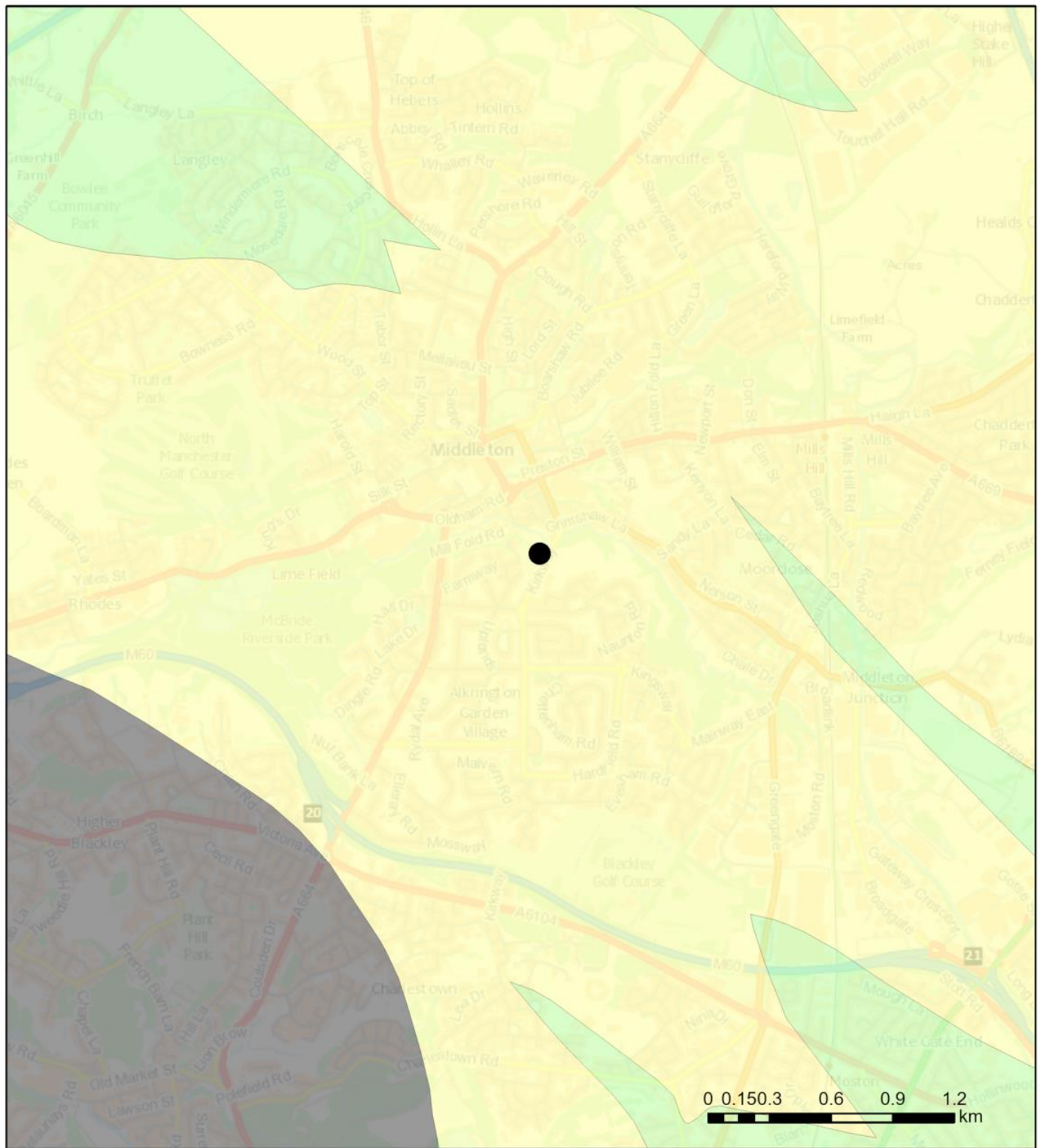
Communicated by **Chamber Colliery Co. Ltd.** Date of sinking **10-12**

One-inch Map (N.S.) **85** Six-inch Map **96 N.E.**

HEIGHT ABOVE O.D. _____ DIP OF STRATA _____

				Thickness.			Depth from Surface.		
				Yards.	feet.	ins.	Yards.	feet.	ins.
Copied 21.7.20. 1870s. 10 17	Engine Pit:								
	Little Mine	at	245 feet. (76.42)						
	Black Mine	at	300 feet. (91.44)						
	Bento Mine	at	450 feet. (137.16)						
	Bottom of Shaft	at	450 feet.						
11 16	No. 2 or Bye Pit:								
	Little Mine	at	170 feet. (51.81)						
	Black Mine	at	225 feet. (68.58)						
	Bento Mine	at	378 feet. (115.21)						
	Two Mines	at	450 feet.						
Bottom of Shaft at 450 feet.									
Level Tunnel joins Bottom of Shafts of Bye Pit & Engine Pit & goes South to Black Mine.									
12 15	Old Gate Pit.								
	Bento Mine	at	170 feet.						
	Bottom of Shaft	at	170 feet.						

Appendix G – Coal Resource Map



Appendix H – Coal Mining Summary Map

