

Performance Specification for Consolidation of Abandoned Mine Workings

Site: Landon, Edenfield Road
Reference: 16-702-R3
Date: November 24





E3P

Taylor Road
Trafford Park
Urmston
Manchester
M41 7JQ

+ 44 (0) 161 707 9612
<https://e3p.co.uk>

Registered in England
CRN: 08725262

QUALITY ASSURANCE

Report reference	16-702-R3
-------------------------	-----------

REV REF:	DESCRIPTION	AUTHOR	CHECKED	AUTHORISED	DATE
1	First issue	JS	MD	MD	13/11/24

This report has been prepared solely for the benefit, use, and information of the Client. The liability of Environmental Engineering Partnership Limited T/A E3P with respect to the information contained in the report will not extend to any third party. This report has been prepared by the qualified persons as listed below.

WRITTEN BY	QUALIFICATIONS	POSITION
Jessica Sheridan	MeSci, FGS	Senior Consultant

REVIEWED BY	QUALIFICATIONS	POSITION
Martin Dyer	BSC Hons, FGS, FEnvSci, PIEMA, CEnv	Director

AUTHORISED BY	QUALIFICATIONS	POSITION
Martin Dyer	BSC Hons, FGS, FEnvSci, PIEMA, CEnv	Director



EXECUTIVE SUMMARY

Site Address	Edenfield Road, Rochdale OL12 7TN
National Grid Reference	E 359443, N 406177
Site Area	0.046 Ha
Background	Jackson, Jackson and Sons Ltd has instructed E3P to prepare a Performance Specification for the Consolidation of Abandoned Mine Workings that will facilitate safe residential development at the Site located off Edenfield Road in Rochdale, Greater Manchester. This E3P specification has been produced in due consideration of the geoenvironmental site assessment of ground stability risk associated with abandoned mine workings previously undertaken by E3P. The subject site is currently a vacant parcel of land, with a part built structure in the east. The client intends to construct single residential dwelling with associated driveway and landscaping.
Coal Mining – Shallow Workings in Coal Seams	Following industry best practice, as detailed within CIRIA 758, E3P has concluded that unrecorded shallow mine workings are potentially present below the Site. Three rotary open hole boreholes were drilled to 40 m (RO101-RO103) in accordance with Coal Authority permit: 28747. Bedrock comprising interbedded layers of SANDSTONE, SILTSTONE and MUDSTONE was recorded in the rotary boreholes from depths of c. 3.50 to 4.40 m bgl. Intact coal (1.00-1.10 m thick) and broken ground with void (1.30 m thick) and total loss of flush have been recorded beneath the site, inferred to represent the Bassey seam, with evidence of workings in RO101. The Bassey seam is variable in this area in both thickness and quality, but locally is around 3 ft thick (0.90 m) and also known as Yard Mine. Using the 10t rule (10 x seam thickness of competent rock cover required overlying the seam), there would be insufficient rock cover above this seam (intact or worked) at all locations. Based on the findings of the investigation proof drilling and grouting works are required to ensure the stabilisation of the site to ensure the risk of future subsidence is mitigated.
Coal Mining – Mine Enties (Shafts)	A shaft (CA Ref: 385414-017) is recorded on the western boundary of the site (NGR E385138 N414822). A series of trial trenches were excavated in the area of the 10 m departure zone within the site boundary (east of the suspected mine entry). Off-site investigation was not completed. No evidence of the mine entry were observed. It is therefore likely that the mineshaft in question lies off-site and is not located on-site.



Due to the presence of underlying cohesive drift deposits, the zone of influence will equate to 2.50 m based on bedrock encountered at 2.50 m bgl within this sector of the site. Therefore, a no build zone should be adopted 2.50 m bgl from the site boundary. In this area, the potential zone of influence on-site should be supported by a SS40 geogrid.

SUMMARY OF MINE CONSOLIDATION & STABILISATION WORKS

Overarching requirements	The overarching scope of works to consolidate unrecorded workings in the shallow coal sub-crop and stabilise the known mine entries will incorporate the following key attributes: ✳ Proof drilling across plot footprints and infrastructure with pressure grouting; ✳ Where voids are identified, a secondary (and, if necessary, tertiary) grid will be implemented with subsequent pressure grouting. ✳ The design and construction of structures and infrastructure will consider the constraints of the proven stabilised mine workings. ✳ Documentation and recording of all completed works in accordance with the Coal Authority permit requirements.
Consolidation of shallow workings in coal seam	Boreholes will be drilled on a primary staggered 6 m × 6 m grid across the building footprint, with treatment extending up to 4.5 m beyond the plot line. Where abandoned mine workings are identified, secondary boreholes will then be drilled at 4.5 m infill centres across the area of stabilisation. The boreholes will serve as injection points where grout will be pumped under pressure into the workings to consolidate the voids in accordance with the specifications herein. Where necessary, tertiary boreholes will be drilled on a 3 m grid where grout take is high and completion pressure cannot be achieved within a primary or secondary grout hole. Boreholes will be drilled on a staggered 10 m grid within areas of adopted highway, estate road and private driveway. Again, these boreholes will be used to pump and pressure grout voids within workings in the coal seam. Works will be considered to be completed when the required borehole grid and pressure grouting have achieved the performance specification. Validation test boreholes will be drilled to confirm consolidation at locations and centres, which will be dictated by the supervising engineer.
Consolidation & stabilisation of mine shaft	A shaft (CA Ref: 385414-017) is recorded on the western boundary of the site (NGR E385138 N414822), but trenching has confirmed this feature to not be located on-site.



	Allowance for a watching brief during the initial site strip/earthworks is recommended to ensure inclusion of a suitable mechanism for grouting and capping of any such feature and subsequent amendment to a development layout in the event that an unrecorded mine entry underlies a residential structure. If a shaft is encountered, a new consolidation specification and Coal Authority permit will be required to treat and cap the feature.
Building Foundations	Piled foundations cannot be set within a stratum that is underlain by treated mine workings at a depth where the effective bulb of pressure could stress grouted workings. A specialist pile designer should be consulted where piled foundations are proposed.



TABLE OF CONTENTS

EXECUTIVE SUMMARY	2
1. INTRODUCTION	6
1.1. Background	6
1.2. Report Objectives	6
1.3. Proposed Development.....	6
1.4. Summary of Parties Involved.....	7
1.5. Site Details	7
1.6. Site Summary.....	7
1.7. Summary of Previous Works	7
1.8. Summary of Reported Ground Conditions	8
1.8.1. Made Ground	8
1.8.2. Drift.....	8
1.8.3. Solid	8
1.8.4. Groundwater	8
2. SUMMARY OF COAL MINING ISSUES	9
2.1. Coal Mining Risk Assessment (REF: 16-702-R1-1, April 2023)	9
2.2. Mine Shaft Intrusive Investigation (REF: 16-702-L1-1, April 2024)	11
2.3. Intrusive Coal Mining Risk Assessment (Ref: 16-702-L3-1, September 2024)	12
3. GENERAL SPECIFICATION FOR MINE STABILISATION WORKS	1
3.1. Overarching Scope of Works	1
3.2. Supervision and Validation	1
3.3. Constituent Materials for Grouting.....	2
3.3.1. Storage and Use of Materials	2
3.3.2. Grouting Plant	2
3.3.3. Grout Mixes	2
3.3.4. Grout Properties and Testing.....	3
3.4. Treatment of Workings in Shallow Coal Seam	3
3.4.1. Drilling Procedures for Shallow Workings in coal seam	3
3.4.2. Grouting Procedures for Shallow Workings in coal seam.....	4
3.4.3. In-Situ Testing	5
3.5. Contractors Monitoring of Hazardous Gases.....	6
3.6. Records – Coal Seam, Shafts & Plugs	6
APPENDIX I LIMITATIONS.....	9
APPENDIX II GLOSSARY	15
APPENDIX III DRAWINGS	18

Drawing List

16-702-001 – Site Location Plan
16-702-003 – Historical Features Plan
16-702-004 – Site Features Plan
16-702-018 – Coal Mining Issues Plan
16-702-023 – Coal Mining Investigation Plan
16-702-024 – Drill and Grout Plan



1. INTRODUCTION

1.1. BACKGROUND

E3P has been instructed by Jackson, Jackson & Sons Limited on behalf of their client to develop a performance specification for the consolidation of abandoned mine workings to facilitate the safe and regulatory-compliant stabilisation of the land to facilitate the proposed residential development at the Site.

1.2. REPORT OBJECTIVES

The objectives of this report are as follows.

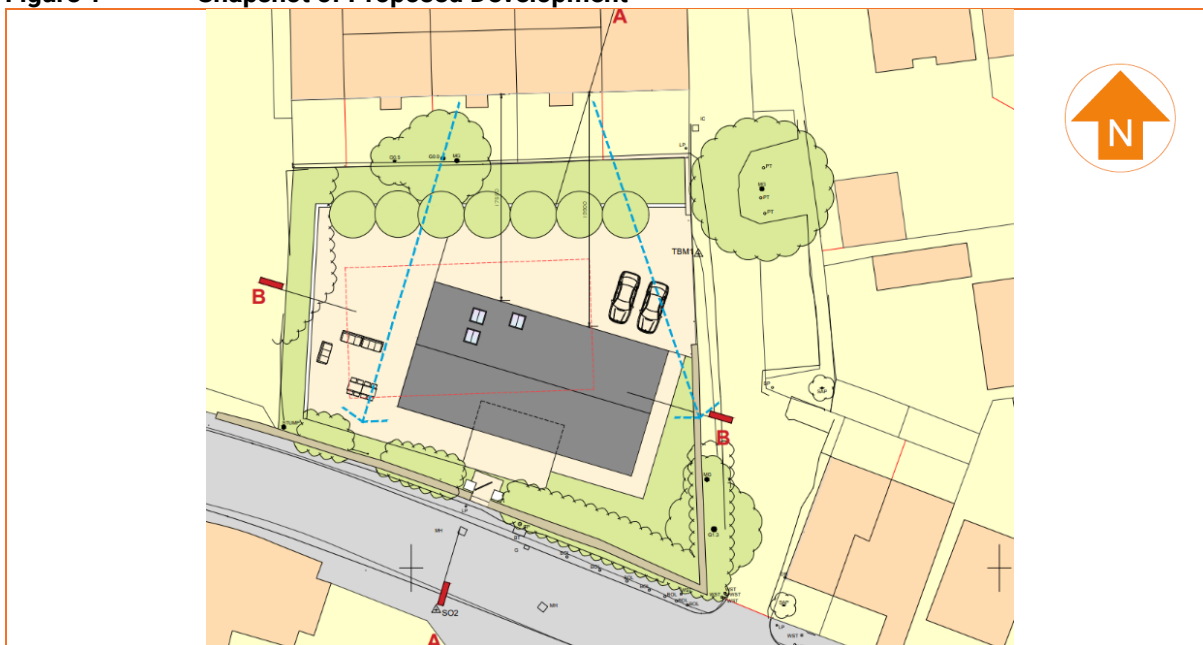
- ✿ Prepare an overview of identified issues associated with abandoned mine workings.
- ✿ Evaluate feasible consolidation and stabilisation options.
- ✿ Define the proposed scope of works for the stabilisation of abandoned mine workings within the sectors of the Site that have been determined to be at risk from a future subsidence event.
- ✿ Set out the validation criteria and protocols required to demonstrate the successful implementation of the mine stabilisation works with sufficient supporting information, test data and independent quality control to ensure successful implementation of the works.

1.3. PROPOSED DEVELOPMENT

Jackson, Jackson & Sons Limited are assisting their client in the proposed construction of a low-rise residential dwelling with associated garden and utility infrastructure in the centre of the current vacant plot of land.

A snapshot of the proposed development layout is indicated in **Error! Reference source not found..**

Figure 1 **Snapshot of Proposed Development**





1.4. SUMMARY OF PARTIES INVOLVED

FUNCTION/INTEREST	NAME OF PARTY
Local Planning Authority	Rochdale Metropolitan Borough Council
Developer	Jackson, Jackson and Sons Ltd
Geoenvironmental Consultant	E3P
Main Contractor	TBC
Mine Stabilisation Contractor	TBC
Regulatory	Coal Authority
Highways Authority	Rochdale Metropolitan Borough Council

1.5. SITE DETAILS

Table 1 Site Details

Site Address	Edenfield Road, Rochdale, OL12 7UG
Grid Reference	E385156 N414824
Site Area	0.12 Ha

All acronyms used within this report are defined in the Glossary presented in APPENDIX II.

A site location plan is presented in APPENDIX III as Drawing 16-702-001.

1.6. SITE SUMMARY

Table 2 Site Summary

Occupancy/Use	The site is located to the north of Edenfield Road, Norden, Rochdale and comprises a vacant, overgrown rectangular parcel of land. The southern boundary of the site is formed of mature trees and hedgerows. Boundaries are demarcated by dry stone walls.	
Structures	A partially constructed structure is present in the eastern sector of the site, comprising foundations and the lower brick course. Vegetation has grown through the internal part of the structure, indicating construction was abandoned some time ago.	
Access	Access to the site is gained via an access track (Brickground) that runs along the eastern boundary of the site.	
Slope	The land falls towards the east.	
Retaining Structures	Unknown.	
Surface Cover (%)	Buildings:	1 % (brick framework only)
	Hardstand:	0 % (slab not thought to be present)
	Soft cover:	99 %

1.7. SUMMARY OF PREVIOUS WORKS

Several phases of investigation have been carried out for the site by E3P. The most pertinent to this specification are summarised in Table 1 and Section 2.



Table 1 Previous Reports

AUTHOR	TITLE / REFERENCE	CLIENT	DATE
E3P	Coal Mining Risk Assessment (Ref: 16-702-R1-1)	Jackson, Jackson & Sons Ltd	April 2023
	Mine Shaft Intrusive Investigation (Ref: 16-702-L1-1)		April 2024
	Intrusive Coal Mining Risk Assessment (Ref: 16-702-L3-1)		September 2024

1.8. SUMMARY OF REPORTED GROUND CONDITIONS

1.8.1. MADE GROUND

Made Ground deposits were encountered to a maximum depth of 0.60 m bgl in HP101, HP104 and HP107. The base of the Made Ground was not proven within exploratory locations HP102, HP103, HP104 and HP107 (max depth .

Reworked topsoil was encountered between depths of 0.00 and 0.60 m bgl comprising brown gravelly, sandy clay with brick, ceramic, wood, plastic, coal, glass, concrete and frequent rootlets. Reworked topsoil was found within all hand pitted locations.

Beneath the topsoil Made Ground generally comprises dark brown to grey gravelly sandy clay with rare gravel of brick, ceramic, concrete and plastic.

1.8.2. DRIFT

Drift deposits were identified in the rotary boreholes between depths of 0.10 and 4.40 m bgl and generally comprise slightly gravelly slightly sandy CLAY with fine to medium gravel of mudstone. The cohesive soils were typically of a brown nature, becoming increasingly grey closer to rockhead.

1.8.3. SOLID

Bedrock comprising interbedded layers of SANDSTONE, SILTSTONE and MUDSTONE was recorded in the rotary boreholes from depths of c. 3.50 to 4.40 m bgl. During trial trenching, rockhead was reported at 2.50 m bgl, however, this is likely to be highly weathered and therefore not considered 'competent' cover

Broken ground was identified within RO101 between 7.80–8.00 m bgl. A void with total loss of flush was recorded beneath this to a depth of 9.10 m bgl. Hard drilling was recorded from 9.10–40.00m bgl in RO101.

Intact COAL seams were identified within RO102 and RO103 from 11.00–12.00 m bgl and 10.60–11.70 m bgl respectively.

1.8.4. GROUNDWATER

Groundwater was not recorded within any exploratory hole location.



2. SUMMARY OF COAL MINING ISSUES

2.1. COAL MINING RISK ASSESSMENT (REF: 16-702-R1-1, APRIL 2023)

Table 3 provides a summary of pertinent coal mining information gathered using various resources.

Table 3 Coal Mining Information

SOURCES OF INFORMATION	SUMMARY
Coal Authority Mining Report	The Coal Authority Mining Report (Ref: 51003343608001) dated March 2023 confirmed: ✳ Shallow unrecorded coal workings are probable; ✳ An unnamed coal seam outcrops 13 m east of the Site; ✳ A known coal mine entry (Ref: 385414-017) is identified within 20 m of the western boundary of the Site; ✳ There is no record of a damage notice or claim for on or within 50 m of the Site; and ✳ The property is not within an opencast site.
Coal Authority Interactive Map	The Coal Authority Interactive Viewer shows that the site is within a “development high-risk area”, and that there is probable shallow coal workings and coal outcrops beneath the site. A mine entry is shown immediately west of the site.
British Geological Survey Mapping	The 1:50,000 map (Sheet 76, Solid, 2008 – extract overleaf) shows the site to be located on a north west-south east trending fault line, located beneath the north east sector of the site. The local geology is shown to dip 5-10° to the south-south east from horizontal. The Bassy coal seam (B) is shown to crop to the west of the site, striking northeast-southwest and terminating at the aforementioned fault. It is possible that the seam extends within the site boundary, beneath the western sector of the site, and based on the local geology, would be anticipated to dip beneath the remainder of the site. The Lower Mountain coal seam (LM) is also shown to crop to the south of the site, dipping away from the site. Based on the geological section the Lower Foot coal seam would be anticipated to crop somewhere approximately mid-way between the Bassey and the Lower Mountain. This would place the crop off-site, to the southeast, and dipping away from the site. The 1:10,000 geological map for the area (SD81SE) concurs with the 1:50,000 map, again showing a fault trending northwest-southeast bisecting the north-eastern corner of the site. The downthrow is noted to be to the south. The local geology is indicated to generally dip to the south east. The strata south of the fault (representative of the site) is shown to be dipping in a south-easterly direction at 10° from horizontal. North of the fault, the strata dips 5° from horizontal.



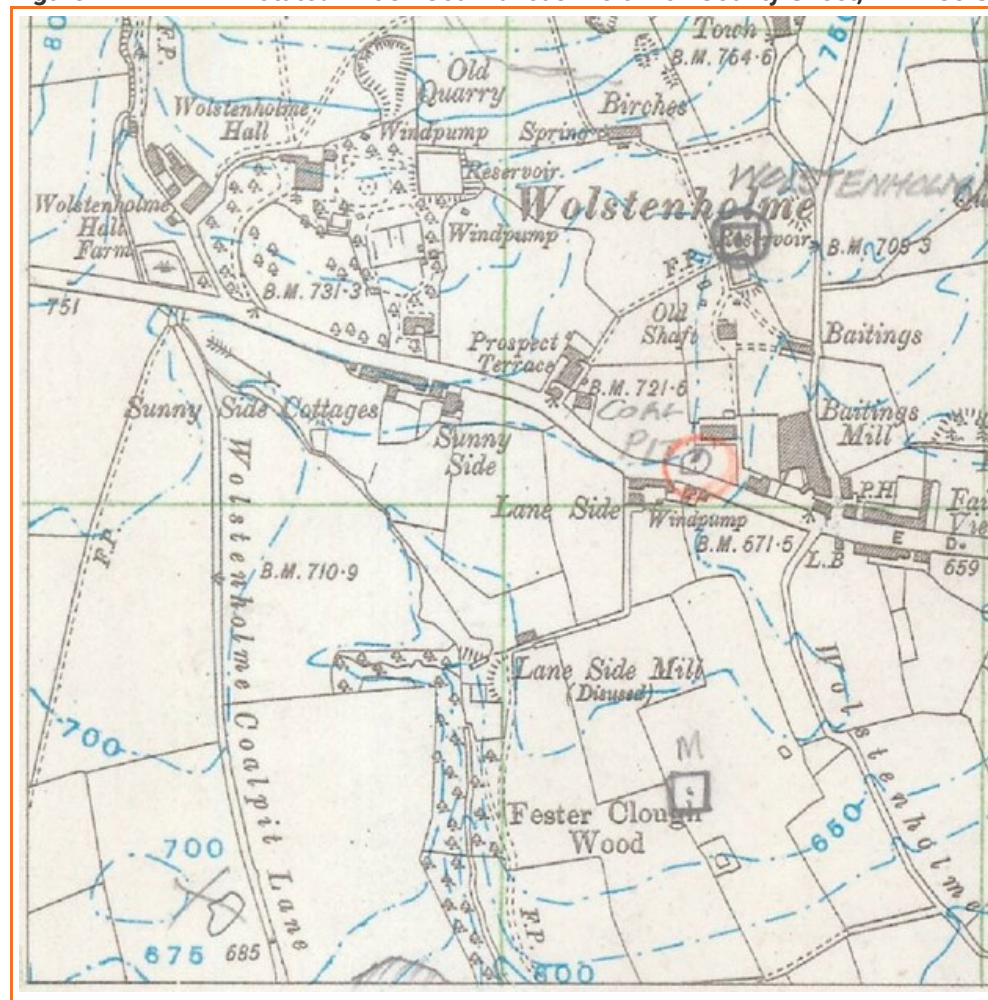
However, where the Bassey seam was indicated to crop the west on the 1:50,000 map, the 1:10,000 map indicates instead that the Lower Foot coal outcrops to the north west, potentially crossing through the northwest corner of the site. Given the indicated dip of the local geology, the Lower Foot Coal would therefore be anticipated beneath the remainder of the site.

The Bassey seam, being older in the geological sequence, may therefore also be present beneath the site at greater depth. It is noted that no mine shafts are evident within close proximity of the site.

Review of Coal Authority Archive

The Coal Authority has confirmed that the only reference to the shaft is a handwritten annotation on the British Coal Lancashire 6 inch County Sheet, 1911 80 SE as presented in Figure 2.

Figure 2 Annotated British Coal Lancashire 6 inch County Sheet, 1911 80 SE



Historical Ordnance Survey Mapping

A review of the 1:10,000 Ordnance Survey mapping from circa 1885 has identified an 'old shaft' noted 120 m to the north of the site. 1:50,000 geological mapping from 1971 also shows a colliery at this location. The colliery is absent from the subsequent 2008 geological map. It is considered that further historical mining features are likely to be present in close proximity to the site that have not been mapped or recorded. Contradictory

Historical Site Investigations

E3P has not been provided with any historic site investigation reports.

**Table 4 Summary of Coal Mining Risk Assessment**

COAL MINING RISK ASSESSMENT	YES/NO	RISK ASSESSMENT
Recorded Underground Coal Mining at Shallow Depth (< 30 m)	Likely	High
Recorded Underground Coal Mining at Shallow Depth (> 30 m)	No	Low
Unrecorded Underground Coal Mining at Shallow Depth (< 30 m)	Yes	High
Mine Entries (Shaft/Adits)	Yes	High
Coal Mining Geology – Fractures/Fissures	Yes	High
Recorded Gas Emissions	No	Low
Recorded Mining Surface Hazard	No	Low
Surface Mining (Opencast)	No	Low

There is concluded to be a high risk from mining related subsidence (associated with underground workings and the adjacent disused mine shaft) and a moderate to high risk from mine/ground gas.

Trial Trenching should be undertaken to investigate the potential presence of the mine shaft (385414-017) within the 10 m departure distance of its current recorded position. If the shaft is identified within the site boundary, treatment works would be required to stabilise the feature and a shaft cap or plug would be required at rockhead.

A series of rotary open holes should be advanced to a nominal depth of 30 m across the site to confirm the depth to rockhead and investigate the potential presence of the Bassy/Lower Foot Coal seam and any associated shallow workings.

Ground gas monitoring well should be installed within selected rotary boreholes to assess the risk from mine/ground gas.

Following the confirmation of the position of the mine shaft and the depth to rockhead a Zone of Influence/no build zone for 385414-017 should be calculated and if the proposed structure falls within this area, specialist foundation designs will require submission to the Coal Authority for an engineering appraisal.

2.2. MINE SHAFT INTRUSIVE INVESTIGATION (REF: 16-702-L1-1, APRIL 2024)

A shaft (CA Ref: 385414-017) is recorded on the western boundary of the site (NGR E385138 N414822). The Coal Authority has confirmed that the only reference to the shaft is a hand written annotation on the British Coal Lancashire 6-inch County Sheet, 1911 80 SE Map.

A series of trial trenches were excavated in the area of the departure zone within the site boundary (east of the suspected mine entry). Off-site investigation was not completed.

Based on the investigation completed, a total of six trial trenches have been completed in the west of the site. All trial trenches were completed a maximum of 2 m apart to ensure that a shaft of diameter 2.5mbgl would be encountered and was 10 m long to cover the suspected departure area fully.

No evidence of anthropogenic features, such as a shaft lining that would indicate the recorded mine entry in this sector, was identified in the excavations. It is therefore likely that the mineshaft in question lies off site and is not located on-site.

Due to the presence of underlying cohesive drift deposits, the zone of influence will equate to 2.50 m based on bedrock encountered at 2.50 m bgl within this sector of the site. Therefore a no build zone should be adopted 2.50 m bgl from the site boundary. In this area, the potential zone of influence on-site should be supported by a SS40 geogrid.



2.3. INTRUSIVE COAL MINING RISK ASSESSMENT (REF: 16-702-L3-1, SEPTEMBER 2024)

The ground investigation comprised the drilling of 3 no. rotary open hole boreholes to 40 m (R0101-R0103) in accordance with Coal Authority permit: 28747.

Three rotary boreholes were advanced at the locations detailed within the E3P Exploratory Borehole Location Plan (Drawing 16-702-002 in APPENDIX III) at positions to interject the potential coal seams and assess the potential for any workings.

A summary of findings from each borehole is presented in Table

Table 5 Rotary Borehole Summary

ROTARY BOREHOLE	DEPTH TO ROCKHEAD (m bgl)	DEPTH TO TOP/ (THICKNESS) OF COAL (m bgl)	EVIDENCE OF MINING ACTIVITY/SEAM	REMARKS
RBH101	3.60	N/A	Broken ground/ void/ loss of flush	Coal workings inferred.
RBH102	3.50	11.00–12.00	Seam thickness 1.00m	Coal seam intact
RBH103	4.40	10.60–11.70	Seam thickness 1.10m	Coal seam intact

Intact coal (1.00-1.10 m thick) and broken ground with void (1.30 m thick) and total loss of flush have been recorded beneath the site, inferred to represent the Bassey seam, with evidence of workings in R0101. The Bassey seam is variable in this area in both thickness and quality, but locally is around 3 ft thick (0.90 m) and also known as Yard Mine.

Using the 10t rule (10 x seam thickness of competent rock cover required overlying the seam to mitigate the risk of crown hole subsidence at the surface), there would be insufficient rock cover above this seam (intact or worked) at all locations.

It is noted that the trial trenching exercise records rockhead at 2.50 m bgl, however, this is likely to be highlight weathered and therefore not considered 'competent' cover. Additionally, even when applying 2.50 m depth to rockhead, there would still be insufficient rock cover at all locations.

Based on the phases of desk based and intrusive investigations, the following proof drilling and grouting works are required to ensure the stabilisation of the site to ensure the risk of future subsidence is mitigated.

-  Proof drill and grout on a 6 m primary grid until such a time where 10 x seam thickness can be proven beneath all proposed structures.
-  Where workings are identified, they should be subjected to pressure grouting across the primary grid (6 m²) and secondary (centre hole) grid. Where necessary the drill and grout grid will be extended to a 4.5 m secondary or 3 m tertiary grid. These works are required beneath all areas of proposed structures.



- ✿ All infrastructure to be constructed across the areas identified as being high risk will require a proof drilling exercise to be completed, where workings are identified pressure grouting will be required to ensure long term stability.
- ✿ Drill and grout works may preclude the use of piled foundations unless assessed by a specialist pile designer to transfer loads beyond the grouted seams with consideration for potential for workings in deeper seams.

It is possible that unrecorded mine entries may exist within the curtilage of the site and immediate surrounding area. Allowance for a watching brief during the initial site strip/earthworks is recommended to ensure inclusion of a suitable mechanism for grouting and capping of any such feature and subsequent amendment to a development layout in the event that an unrecorded mine entry underlies a residential structure.



3. GENERAL SPECIFICATION FOR MINE STABILISATION WORKS

3.1. OVERARCHING SCOPE OF WORKS

The overarching scope of works to consolidate unrecorded workings in the shallow coal sub-crop will incorporate the following key attributes:

- ✚ Proof drilling across plot footprint and infrastructure with pressure grouting;
- ✚ Where voids are identified, a secondary (and, if necessary, tertiary) grid will be implemented with subsequent pressure grouting.
- ✚ The design and construction of structures and infrastructure will consider the constraints of the proven stabilised mine workings.
- ✚ Documentation and recording of all completed works in accordance with the Coal Authority permit requirements.

The location of the coal sub-crops will be determined by drilling boreholes across the predefined grid in a linear sequence to establish the position of the sub-crop. Under the guidance of the supervising engineer, the proof drilling grid will be amended to ensure it accurately targets the sub-crop position.

The linear boreholes will then be extended down crop to determine the position where sufficient rock cover is established for the relevant coal seam under the supervision of the geotechnical engineer.

Boreholes will be drilled on a primary staggered 6 m × 6m grid across the building footprint with treatment extending up to 3 m beyond the plot line. Where voids or evidence of potential workings is identified, secondary boreholes are then. Where necessary, tertiary boreholes will be drilled on a 3 m grid where grout take is high, and completion pressure cannot be achieved within a grout hole.

Drilling and Grouting workings will be extended across areas of proposed driveways and infrastructure.

A mine entry is identified along the western boundary of the site. Investigations to date within the departure zone have not located the feature. If located during the site strip/enabling works, the shaft will be subject to pressure grouting in accordance with the specification set out herein prior to the construction of a reinforced concrete cap or grout plug cap.

The stabilisation works will be undertaken by injecting a PFA/cement grout into the workings via the boreholes in accordance with the design requirements of this specification.

3.2. SUPERVISION AND VALIDATION

The specialist Contractor will obtain a Permit from the Coal Authority for the completion of the works prior to the commencement of any activities on-site.

The Client will appoint a resident supervising engineer, who will be in attendance at the outset of the works and on a part-time basis thereafter to monitor the completion of the project to ensure compliance with the performance specification and criteria documented herein.

The mine stabilisation contractor will appoint a site manager or suitably qualified foreman of the works, subject to agreement with the supervising engineer prior to instigation.



3.3. CONSTITUENT MATERIALS FOR GROUTING

Water shall be from the mains supply or other source approved by the resident engineer (RE) and supplied by the Client.

Cement shall be Portland cement, complying with BS EN 197-1:2011.

PFA complying with BS EN 12715:2020 shall be conditioned hopper ash, or dry powder ash, or a type suitable as a constituent for grout and obtained from an approved supplier.

Sand shall generally comply with BS 882 and be of a grading suitable for use in the Contractor's plant and approved by the RE.

Pea gravel shall comply with BS 882, and be of grading approved by the RE. Thixotropic admixtures shall be bentonite or another admixture approved by the RE.

3.3.1. STORAGE AND USE OF MATERIALS

Storage of materials shall be such as to prevent contamination and deterioration. Cement shall be kept in a dry location, and the sequence of deliveries recorded so that cement can be used in rotation.

PFA shall be stored within a predefined area and will be kept dampened to mitigate against fugitive dust.

3.3.2. GROUTING PLANT

The Contractor shall submit to the RE, for approval, details of the proposed method of mixing, and pumping of grout to the injection points, together with the means of monitoring grouting pressures and the quantities injected.

The materials shall be introduced into the mixer via approved methods (volume batching).

The grout mixer shall be capable of producing a homogenous grout mix, with all particles being thoroughly wetted without segregation and suitably viscous to ensure the required flow and subsequent consolidation.

3.3.3. GROUT MIXES

In due consideration to the proposed residential development of the Site, the filling material (grout) shall generally consist of a PFA: cement grout, which should be mixed in the proportions of up to 10:1 where water is present.

Representative cubes will be formed from grout mixes with crushing strengths of not less than 1 MN/m² at 28 days.

Note: the 7-day test is performed to indicate that the 28-day strength is achievable, i.e. a 7-day value of about 0.4.5 MN/m² is considered to be on target to achieve the required 28 strength criteria.

Where excessive lateral flow of grout is anticipated or when voids greater than 500 mm are encountered, the RE may order or agree to the addition of sand or pea gravel to the mix in accordance with CIRIA C758.

The specified grout mix shall have the minimum water content consistent with effective pumping. The actual proportions to be used initially for the various grouts shall be agreed with the RE, paying due regard to the conditions met in drilling and the results of any trial grouting carried out before work commences.



3.3.4. GROUT PROPERTIES AND TESTING

With water/(cement and PFA) ratios generally in the range of 0.4 to 0.45, (including the moisture in the aggregates), the mixes proposed should produce “pumpable grout” with flowability readings of between 300 to 600 mm, when measured in a meter of the “Colcrete” type.

The sample for the flowability test shall be obtained by the grouting Contractor at the point of injection, i.e. from the end of the tremie pipe.

A minimum of two flowability tests per week shall be performed by the Contractor, as directed by the RE, with results to be provided in a timely manner to ensure appropriate review.

A minimum of two bleed capacity tests shall be performed by the Contractor per shift or as directed the RE. The sample of grout for the test shall be taken from the point of injection, i.e. the end of the tremie pipe.

Bleed capacity shall be measured in a clear plastic or glass graduated cylinder which has an internal diameter not less than 75 mm and with a volume of approximately 1000 ml. After placing the grout, a cover shall be placed over the cylinder to avoid evaporation. Bleed capacity shall be read at hourly intervals for neat cement grout, and readings should continue for not less than 3 hours. For PFA: cement grouts, readings should continue for not less than 6 hours.

The Contractor shall prepare two sets of test cubes of grout per week, or as directed by the RE, with all testing to be commenced within 48 hours of samples/cubes being obtained.

Each cube shall be of 100 mm side, or as agreed with the RE, and shall be taken from the grout at the point of injection, i.e. the end of the tremie pipe.

At the instruction of the RE, the Contractor shall arrange for them to be tested by crushing at 7 and 28 days in accordance with BS 1881.

The testing shall be carried out by an independent UKAS-Accredited laboratory or as agreed with the RE.

As stated previously, mixes shall produce cubes with crushing strengths of not less than 1 MN/m² at 28 days.

If the RE considers that the results of the test indicate that a change of mix proportions is required, then the Contractor shall make such modifications as the RE may direct.

3.4. TREATMENT OF WORKINGS IN SHALLOW COAL SEAM

3.4.1. DRILLING PROCEDURES FOR SHALLOW WORKINGS IN COAL SEAM

The drilling and Grouting grid will be as follows:

- 📍 **Plots (+4.5 m offset):** 6 m Primary grid.



- ✿ **Plots (+4.5 m offset):** Where suspected workings are identified, secondary holes will be drilled and pressure grouted where workings identified in primary 6m grid (equates to grouting at 4.50 m²);
- ✿ **Plots (+4.5 m offset):** Where grout exceeds 5 tonne in a 24hr period (single point of injection), a tertiary grid will be implemented and subject to pressure grouting.
- ✿ **Private drives and Hardstanding:** 10 m staggered grid, reducing to 5 m central holes where grout takes are in exceedance of 10 tonne.
- ✿ **Gardens & Landscaping:** No drill and grout unless grout take is >10 tonne per hole on the adjacent primary grid which will then trigger 10 m staggered grid across area of concern.

For level or shallow-dipping workings up to 50 m depth, the treatment grid should extend to 6 m outside the foundation footprint.

All boreholes to be used for the injection of grout, including those which strike coal pillars, shall be drilled by rotary or rotary percussive techniques down to a minimum of 0.5 m beyond the base of the old workings in the seam, or the floor of the seam itself, whichever is greater.

The drilling system and flushing medium to be used shall be as instructed on The Coal Authority licence, and approved by the RE. The Contractor shall allow for the provision of appropriate dust suppression for those holes that are to be drilled near sensitive receptors (e.g. nearby houses, highways, active commercial properties, car parks and public footpaths).

Boreholes drilled for the treatment of the plots will ensure that treatment extends up to 3 m out-with the building footprint, based upon anticipated grout flows.

The minimum diameter of the holes shall be 75 mm, unless otherwise specified by the RE. When it is impracticable to drill at the minimum diameter for the full depth, the diameter of the boreholes shall be increased in the upper lengths.

Boreholes shall be temporarily cased through superficial deposits down to the rockhead and, if directed by the RE, down through the rock strata. The boreholes shall be kept open until grout injection into the workings and rock is complete.

Where a borehole proves abortive because it becomes obstructed, it shall be re-drilled in a suitable location as directed by the RE, at a large diameter, and re-cased.

Boreholes shall be formed in general accordance with the locations shown on the plan in APPENDIX III (Drawing 17-602-024).

Any deviation from this proposed layout, including the drilling of additional secondary and tertiary holes, shall be recorded by the Contractor and a revised borehole location plan provided to the RE.

3.4.2. GROUTING PROCEDURES FOR SHALLOW WORKINGS IN COAL SEAM

The aim of the stabilisation work is to substantially fill any old workings within the coal seams as well as any voids or broken ground found within the overlying strata in order to prevent the development of crown holes at the surface\foundation level.

Perimeter grout walls, if required, shall be formed by filling boreholes with a viscous grout comprising appropriate proportions of cement, PFA, sand or pea gravel and water. The mix, proportions and method must be agreed with the RE.



Pressure need not be applied to the grout in affected boreholes unless required by the RE.

Unless specified otherwise, the section of the perimeter wall at the deepest part of the seam shall be constructed first.

Immediately prior to grouting each borehole, the contractor shall check that it is unobstructed to the required depth to receive the tubing or tremie pipes for grout injection. Obstructions shall be dealt with as described in the drilling procedures in Section 3.4.

Grout shall be injected into each hole via an approved flexible tube, or series of steel tubes, placed to the base of the hole or to such other depth to receive the tubing or pipes for grout.

Grouting shall proceed upwards from the base of each borehole to the base of the surface deposits. It is not intended that, as a general rule, significant quantities of grout shall be injected into the surface deposits unless specified otherwise. This requirement will be subject to review by the RE.

The grout shall be injected at the approved rates until grout appears near the point of injection, when the borehole shall be deemed complete. If this criteria is reached quickly, the grout tubes shall be lifted to check that a local obstruction is not preventing the flow of the grout into the strata.

Pressure shall be applied to the grout in every borehole. If grout has not appeared at the point of injection after 5 tonnes of grouting materials have been introduced, then sand and/or pea gravel (gravel which passes through a 6.33 mm sieve and is retained on a 2.36 mm sieve) may be added to the mix or placed down the borehole.

Treatment of adoptable highways will generally be undertaken as per the plots although, should a borehole within the highway accept more than 6 tonnes of grout, then treatment within the hole will be suspended for 12 hours. Thereafter, further grout will be injected in 2 tonne batches. If pressure has not been achieved, or grout appeared, after a total of 10 tonnes of grout has been placed, then a review of the borehole grid spacing, grout mix and materials used will be undertaken.

All boreholes within the highway will be filled under hydrostatic pressure and, once complete, will be pressurised utilising a pneumatic packer to the appropriate pressure.

The contractor shall take all necessary precautions, including making all reasonable liaison with the client, to ascertain the positions and depths of underground services and drains passing through the site, making full allowance for working around and protecting live services and drains.

The contractor shall be responsible for maintaining close liaison with the local authority and the public utility authorities to avoid any disruption of the existing services.

When introducing grout into any borehole, the contractor shall ensure, by regular inspections throughout the day, that the grout is not entering adjacent drains, services, culverts and ducts.

In the event that any such leakage is detected, the contractor shall immediately suspend the grouting operations and commence to remove any accumulated grout.

3.4.3. IN-SITU TESTING

The Contractor shall test the consolidated ground for permeability and strength.



Permeability by grout acceptance testing shall be checked by drilling test holes in positions to be selected by the RE and injecting grout at pressures appropriate to the depth, all in accordance with the requirements for infilling grouting. If the RE considers that the quantities of grout accepted are excessive, then further holes shall be drilled and grouted at the rates and prices agreed.

After testing, boreholes shall be completed in accordance with the requirements for grouting infill holes.

In general, test holes will be undertaken along the adoptable highways adjacent to boreholes exhibiting grout taken in excess of 6 tonnes.

3.5. CONTRACTORS MONITORING OF HAZARDOUS GASES

In accordance with industry best practices and the Coal Authority Permit requirements, the appointed Contractor will complete real-time (on-rig) monitoring of hazardous ground gasses throughout the duration of all mine stabilisation works.

The specialist Contractor will instigate the following works.

- ✳ **Risk Assessment:** Before commencing any stabilisation works, a comprehensive risk assessment should be conducted to identify potential hazards, including the presence of gases such as methane or carbon dioxide.
- ✳ **Gas Detection Equipment:** Suitable gas detection equipment should be used to monitor the levels of hazardous gases in the mine workings and surrounding areas during stabilisation works. This equipment should be calibrated regularly and operated by trained personnel.
- ✳ **Monitoring Frequency:** The frequency of gas monitoring should be determined based on factors such as the stability of the mine workings, the nature of the gases present, and the activities being carried out during stabilisation works. Monitoring will be completed throughout the works at each investigation or treatment position.
- ✳ **Action Levels:** Action levels should be established for gas concentrations, triggering appropriate responses if these levels are exceeded. This may include evacuation procedures, ventilation measures, or halting work until conditions are deemed safe. If hazardous ground gasses are identified at >1% by volume (bulk gasses), the supervising engineer should be notified.
- ✳ **Ventilation:** Adequate ventilation systems should be in place to control gas concentrations and maintain safe working conditions for personnel involved in stabilisation works.
- ✳ **Emergency Response:** Plans should be in place for responding to gas-related emergencies, including procedures for evacuation, rescue, and medical treatment if necessary.
- ✳ **Documentation and Reporting:** Gas monitoring results should be documented, including the locations monitored, gas concentrations observed, and any actions taken in response to these readings. This documentation is essential for regulatory compliance and future reference.

3.6. RECORDS – COAL SEAM, SHAFTS & PLUGS

The Contractor shall prepare and keep available for inspection on Site, plans showing the positions of all boreholes, daily drilling records, and the total amounts of grout injected.

The plans shall be updated daily in conformity with the records detailed herein. On completion of the works, the Contractor shall give fair copies of the plans and sections to the RE within one week of completion of the programme of grouting.



As works proceed, the Contractor shall maintain separate daily records for drilling, for grouting and for materials and plant received in a form to be approved by the RE. The daily records signed by the Contractor's agent shall be submitted each day to the RE for their agreement.

The Contractor shall provide one copy of the agreed record for the RE's retention and keep a further copy available for inspection on Site.

Daily drilling records shall be provided for each borehole and contain the following information:

- ✿ Job title and location;
- ✿ Borehole reference number;
- ✿ Date;
- ✿ Contractor's name;
- ✿ Plant in use, crew members and hours worked;
- ✿ Method of boring or drilling;
- ✿ Type, diameter and depth of casing used;
- ✿ Diameter and depth of hole at the beginning and end of each working day or shift;
- ✿ Loss of any flushing medium during drilling;
- ✿ Standing time, with reason, or time lost overcoming obstructions;
- ✿ Details of underground services located;
- ✿ Details of any settlement or ground heave;
- ✿ Daily and cumulative length drilled;
- ✿ Depth to each major change of stratum;
- ✿ Description, with identification, of the stratum and whether it is intact or broken;
- ✿ Each depth at which groundwater is encountered (if apparent), the depth to which it rose and any steps taken to stop the flow;
- ✿ Depths at which any samples are taken;
- ✿ Details and results of any permeability tests instructed by the RE;
- ✿ Details of any voids or suspected workings;
- ✿ Details of any emissions of gas, water, etc.; and
- ✿ Depth of completed borehole.

Daily grouting records shall be provided for each borehole and contain the following information:



- ✿ Job title and location;
- ✿ Borehole reference number;
- ✿ Date;
- ✿ Contractor's name;
- ✿ Plant in use, crew members and hours worked;
- ✿ Details of type of injection, grout-line dimensions and length of standpipes inserted;
- ✿ Type of grout mix and volumetric quantity injected, including total quantity by weight of each type of grouting material introduced;
- ✿ Grout pressures recorded, with the corresponding depths;
- ✿ The results of all flow and bleed tests;
- ✿ Details of casing abandoned;
- ✿ Details of grouting materials delivered to the Site and a running total of each of the materials delivered;
- ✿ The nature, frequency and results of all inspections of services to check for grout penetration; and
- ✿ Details of all stoppages or delays and any other relevant information.

The daily records of materials and plant received shall show in particular that day's quantities by weight of each type of material and cumulative quantities. With the daily records, the Contractor shall submit to the RE copies of receipts or invoices for all materials delivered and shall keep them on Site until the works are complete.

Notwithstanding the information listed above, the Contractor shall provide any other information required by the RE.

On completion of the drill and grout programme, the RE shall prepare a validation report containing copies of borehole records, a borehole location plan, procedures followed during the works, the results of validation boreholes and pressure tests, and a record of any deviation from this specification.

END OF REPORT

APPENDIX I

LIMITATIONS





GENERAL

1. This report and any associated works (together comprising the "Services") were compiled and carried out by E3P for the Client (as present in Section 1) under the E3P "Terms of Business" or with those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed and outlined in the body of the report.
2. Unless explicitly agreed otherwise, in writing, this report has been prepared under E3P Standard Terms and Business as included within our proposal to the Client.
3. Project-specific appointment documents may be agreed upon at our discretion and a charge may be levied for both the time to review and finalise appointment documents and also for associated changes to the appointment terms. E3P reserves the right to amend the fee should any changes to the appointment terms create an increased risk to E3P.
4. The report needs to be considered in light of the proposal and associated limitations of scope. The report needs to be read in full and isolated sections cannot be used without full reference to other elements of the report and any previous works referenced within the report.

PHASE 1 GEOENVIRONMENTAL AND PRELIMINARY RISK ASSESSMENTS

5. Coverage: This section covers reports with the following titles or combination of titles: Phase 1; Desktop Study; Geoenvironmental Assessment; Development Appraisal; Preliminary Environmental Risk Assessment; Constraints Report; Due Diligence Report; Geotechnical Development Review; Environmental Statement; Environmental Chapter; Baseline Environmental Assessment; Project Scope Summary Report (PSSR), Program Environmental Impact Report (PEIR), Geotechnical Development Risk Register; Agricultural Land Assessment; Mineral Safeguarding Assessment; Desk Top Coal Mining Risk Assessment; Hydrogeological Appraisal; Construction Environmental Management Plan; and Site Water Management Plan.
6. The works undertaken to prepare this report comprised a study of available and easily documented information from a variety of sources (including the Client), together with (where appropriate) a brief walkover inspection of the Site and correspondence with relevant authorities and other interested parties. Due to the short timescales associated with these projects responses may not have been received from all parties. E3P cannot be held responsible for any disclosures that are provided post-production of our report and will not automatically update our report.
7. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only for the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, E3P reserves the right to review such information and, if warranted, to modify the opinions accordingly.
8. It should be noted that any risks identified in this report are perceived risks based on the information reviewed. Actual risks can only be assessed following intrusive investigations of the Site.



9. Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials, this is for indicative purposes only and does not constitute or replace full and proper surveys completed by suitably qualified and experienced specialists in these fields.
10. E3P does not warrant work/data undertaken/provided by others.

INTRUSIVE INVESTIGATION REPORTS

11. Coverage: The following report titles (or combination) may cover this category of work: Geoenvironmental Site Investigation; Geotechnical Assessment; GIR (Ground Investigation Reports); Preliminary Environmental And Geotechnical Risk Assessment; Preliminary Summary; Coal Mining Risk Assessment, Ground Gas Addendum; and, Geotechnical Risk Register.
12. The investigation has been undertaken to provide information concerning either:
 - I. The type and degree of contamination present at the Site in order to allow a generic quantitative risk assessment to be undertaken; or
 - II. Information on the soil properties present at the Site to allow for geotechnical development constraints to be considered.
13. The scope of the investigation was selected on the basis of the specific development and land use scenario proposed by the Client and may be inappropriate to another form of development or scheme. If the development layout was not known at the time of the investigation the report findings may need revisiting once the development layout is confirmed.
14. Unless otherwise specified in the scope of works, any site drawing(s) provided in this report is (are) not meant to be an accurate base plan but is (are) used to present the general relative locations of features on, and surrounding, the Site. Features (intrusive and sample locations etc) annotated on site plans are not drawn to scale but are centred over the approximate location. Such features should not be used for setting out and should be considered indicative only.
15. For contamination purposes, the objectives of the investigation are limited to establishing the risks associated with potential contamination sources with the potential to cause harm to human health, building materials, the environment (including adjacent land), or controlled waters.
16. For geotechnical investigations, the purpose is to broadly consider potential development constraints associated with the physical property of the soils underlying the Site within the context of the proposed future or continued use of the Site, as stated within the report.
17. The amount of exploratory work, soil property testing and chemical testing undertaken has necessarily been restricted by various factors which may include accessibility, the presence of services; existing buildings; current site usage or short timescales. The exploratory holes completed assess only a small percentage of the area in relation to the overall size of the Site, and as such can only provide a general indication of conditions.



18. The number of sampling points and the methods of sampling and testing do not preclude the possible existence of contamination where concentrations may be significantly higher than those actually encountered or ground conditions that vary from those identified. In addition, there may be exceptional ground conditions elsewhere on the Site which have not been disclosed by this investigation and which have therefore not been taken into account in this report.
19. The inspection, testing and monitoring records relate specifically to the investigation points and the timeframe that the works were undertaken. They will also be limited by the techniques employed. As part of this assessment, E3P has used reasonable skill and care to extrapolate conditions between these points based on assumptions to develop our interpretation and conclusions.
20. The assumption made in forming our conclusions is that the ground and groundwater conditions (both chemically and physically) are the same as have been encountered during the works undertaken at the specific points of investigation and at the time of the investigation.
21. Conditions can change between investigation points both spatially and over time and these interpretations should therefore be considered indicative. The assessment of extreme weather events and their impact on ground conditions is not within the scope of E3P's work.
22. The risk assessment and opinions provided are based on currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values. Specific assumptions associated with the risk assessment process have been outlined within the body or associated appendix of the report.
23. Additional investigations may be required in order to satisfy relevant planning conditions or to resolve any engineering and environmental issues.
24. Where soil contamination concentrations recorded as part of this investigation are used for commentary on the potential waste classification of soils for disposal purposes, these should be classed as indicative only. Due consideration should be given to the variability of contaminant concentrations taken from targeted samples versus bulk excavated soils and the potential variability of contaminant concentrations between sampling locations. Where major waste disposal operations are considered, targeted waste classification investigations should be designed and the waste classification and any subsequent disposal option agreed upon with licenced subcontractors and/or the relevant regulators.
25. The results of the asbestos testing are factually reported and interpretation is given as to how this relates to the previous use of the Site, the types of ground encountered and site conceptualisation. This does not however constitute a formal asbestos assessment. These results should be treated cautiously and should not be relied upon to provide detailed and representative information on the delineation, type and extent of bulk ACMs and/or trace loose asbestos fibres within the soil matrix at the Site.
26. If costs have been included in relation to additional Site works, and/or site remediation works these must be considered as indicative only and must be confirmed by a qualified quantity surveyor.



EUROCODE 7: GEOTECHNICAL DESIGN

27. On 1st April 2010, BS EN 1997-1:2004 (Eurocode 7: Geotechnical Design – Part 1) became the mandatory baseline standard for geotechnical ground investigations.
28. In terms of geotechnical design for foundations, slopes, retaining walls and earthworks, EC7 sets guidance on design procedures including specific guidance on the numbers and spacings of boreholes for geotechnical design, there are limits to methods of ground investigation and the quality of data obtained and there are also prescriptive methods of assessing soil strengths and methods of design. Unless otherwise explicitly stated, the work has not been undertaken in accordance with EC7. A standard geotechnical interpretative report will not meet the requirements of the Geotechnical Design Report (GDR) under Eurocode 7. The GDR can only be prepared following confirmation of all structural loads and serviceability requirements. The report is likely to represent a Ground Investigation Report (GIR) under the Eurocode 7 guidance.

DETAILED QUANTITATIVE RISK ASSESSMENTS AND REMEDIATION AND ENABLING WORK STRATEGY REPORTS

29. These reports build upon previous report versions and associated notes. The scope of the investigation, further testing and monitoring and associated risk assessments were selected based on the specific development and land use scenario proposed by the Client and may not be appropriate to another form of development or scheme layout. The risk assessment and opinions provided are based on currently available approaches in the generation of Site Specific Assessment Criteria relating to contamination concentrations and are not considered to represent a risk in a specific land use scenario to a specific receptor. No liability can be accepted for the retrospective effects of any future changes or amendments to these values, associated models or associated guidance.
30. The outputs of the Detailed Quantitative Risk Assessments are based upon the manipulation of standard risk assessment models. These are our interpretation of the risk assessment criteria.
31. Before adoption on-site, assessment criteria will need to be discussed and agreed upon with the Regulatory Authorities prior to adoption on Site. The regulatory discussion and engagement process may result in an alternative interpretation being determined and agreed. The process and timescales associated with the Regulatory Authority engagement are not within the control of E3P. All costs and programmes presented as a result of this process should be validated by a quantity surveyor and should be presumed to be indicative.
32. E3P does not accept liability for any subcontract work that has not been completed in strict accordance with an approved E3P Remediation and Enabling Works Strategy.

GEOTECHNICAL DESIGN REPORT (GDR)

33. The GDR can only be prepared following confirmation of all structural loads and serviceability requirements. All the relevant information needs to be provided to allow for a GDR to be produced.



MONITORING (INCLUDING REMEDIATION MONITORING REPORTS AND BUILD PHASE MITIGATION)

34. These reports are factual and comprise monitoring, normally groundwater and ground gas and data provided by contractors as part of earthworks or remedial works.
35. The data is presented and will be compared with assessment criteria.

APPENDIX II

GLOSSARY





TERMS

ACM	Asbestos-containing material	MMP	Materials management plan
ADS	Acoustic design statement	ND	Not detected
AST	Above-ground storage tank	NDP	Nuclear density probe
BGS	British Geological Survey	NMP	Noise management plan
BSI	British Standards Institute	NPSE	Noise policy statement for England
BTEX	Benzene, toluene, ethylbenzene, xylenes	NR	Not recorded
CA	Coal Authority	PAH	Polycyclic aromatic hydrocarbon
CBR	California bearing ratio	PCB	Polychlorinated biphenyl
CIEH	Chartered Institute of Environmental Health	PI	Plasticity index
CIRIA	Construction Industry Research Association	PID	Photo ionisation detector
CLEA	Contaminated land exposure assessment	POS	Public open space
CML	Council of Mortgage Lenders	PPE	Personnel protective equipment
CoC	Contaminants of concern	ProPG	Professional practice guidance
CSM	Conceptual site model	QA	Quality assurance
DNAPL	Dense non-aqueous phase liquid (chlorinated solvents, PCB)	SGV	Soil guideline value
DWS	Drinking water standard	SPH	Separate-phase hydrocarbon
EA	Environment Agency	SPT	Standard penetration test
EQS	Environmental quality standard	SVOC	Semi-volatile organic compound
FFL	Finished floor level	TPH	Total and speciated petroleum hydrocarbon
GAC	General assessment criteria	TPH CWG	Total Petroleum Hydrocarbon (Criteria Working Group)
GL	Ground level	UKWIR	United Kingdom Water Infrastructure Risk
GSV	Gas screening value	UST	Underground storage tank
HCV	Health criteria value	VCC	Vibro-concrete column
ICSM	Initial conceptual site model	VOC	Volatile organic compound
LEL	Lower explosive limit	VRSC	Vibro-replacement stone columns
LMRL	Lower method reporting limit	VSC	Vibro-stone columns
LNAPL	Light non-aqueous phase liquid (petrol, diesel, kerosene)	WHO	World Health Organisation
MCV	Moisture condition value	WRAP	Waste and Resources Action Programme



MIBK	Methyl isobutyl ketone	WTE	Water table elevation
m	Metres	ppm	Parts per million
km	Kilometres	mg/m³	Milligram per metre cubed
% v/v	Percent volume in air	m bgl	Metres below ground level
mb	Millibars (atmospheric pressure)	m bcl	Metre below cover level
l/hr	Litres per hour	mAOD	Metres above ordnance datum (sea level)
µg/l	Micrograms per litre (parts per billion)	kN/m²	Kilonewtons per metre squared
ppb	Parts per billion	µm	Micrometre
mg/kg	Milligrams per kilogram (parts per million)		

APPENDIX III

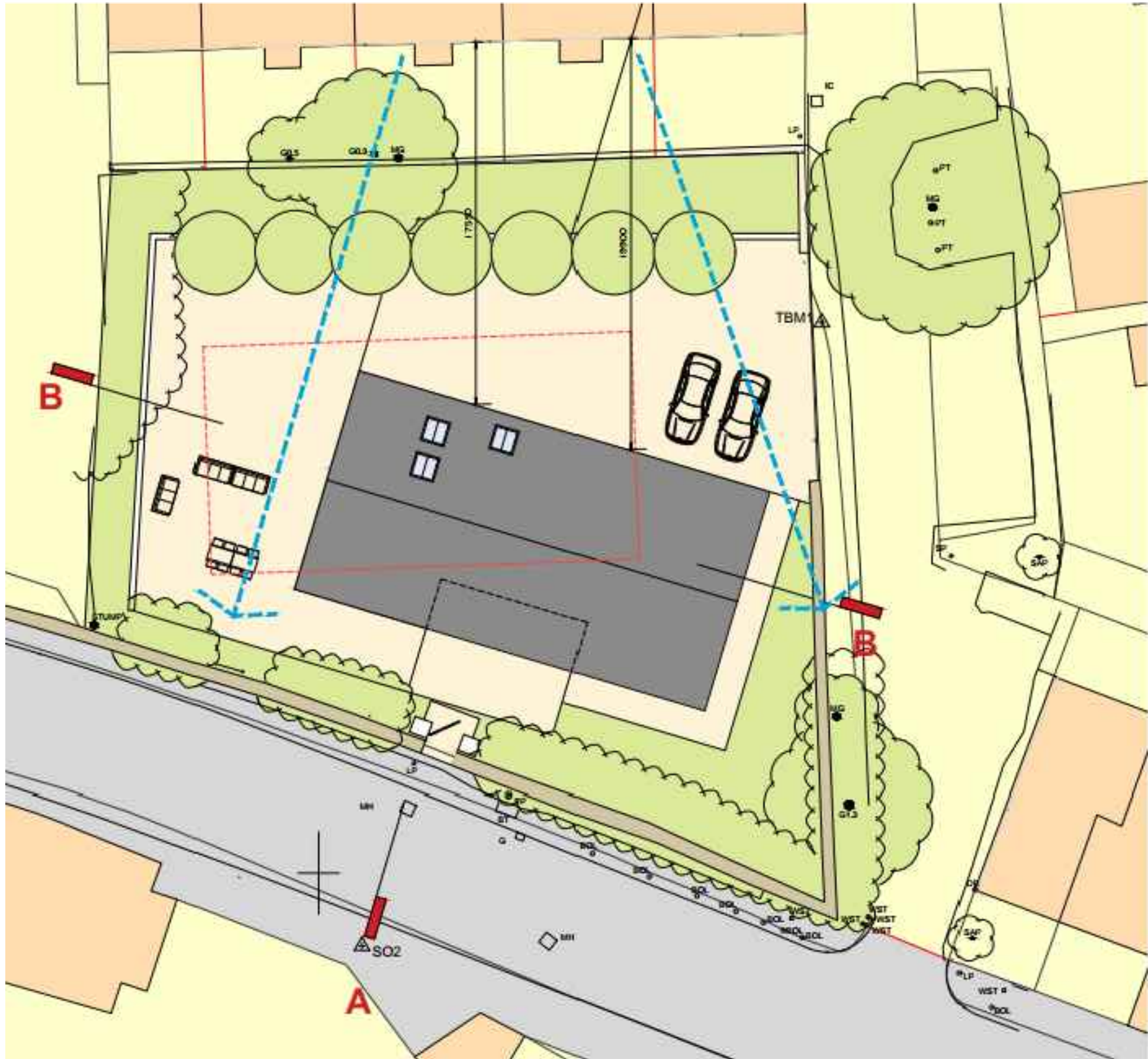
DRAWINGS





DRAWING 17-602-001 – SITE LOCATION PLAN





Notes:

Client:

JACKSON, JACKSON &
SONS LIMITED

Job No:

16-702

Date:

01.08.2024

Drawing No:

002

Scale:

NTS



Environmental Engineering
Partnership Ltd
Taylor Road, Trafford Park
Urmston, Manchester, M41 7JQ
Tel: 0161 707 9612
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

Job Title:

Edenfield Road,
Rochdale

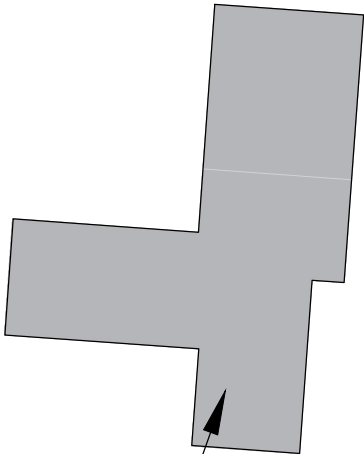
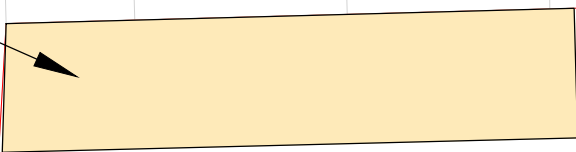
Drawing Title:

Proposed
Development Plan

The client must not amend any drawing, design or other intellectual property produced by E3P Ltd without permission in writing from E3P Ltd in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.

P1	REVA	01.08.2024	OW	PW
Phase	Issue	Date	Drawn	Checked

Former Building
Pre 1890 - Pre 1929



Construction of Foundations
Pre 2013 - Present



Historical Features

- Former Building
- Construction of Foundations

Notes:

P1	REVB	01.08.2024	OW	PW
P1	REVA	24.04.2023	OW	PW
Phase	Issue	Date	Drawn	Checked

Client:

JACKSON, JACKSON &
SONS LIMITED

Job Title:

Edenfield Road,
Rochdale

Job No:

16-702

Drawing No:

003

Date:

01.08.2024

Scale:

NTS



Environmental Engineering
Partnership Ltd
Taylor Road, Trafford Park
Urmston, Manchester, M41 7JQ
Tel: 0161 707 9612
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

The client must not amend any drawing, design or other intellectual property produced by E3P Ltd without permission in writing from E3P Ltd in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.



- Site Features
- Old Brick Foundations
 - Semi Mature Trees
 - Rough Scrub Vegetation and Semi Mature Trees
 - Overhead Cables
 - Dry Stone Wall
 - General Slope Towards the SE

Notes:				
P1	REVB	01.08.2024	OW	PW
P1	REVA	24.04.2023	OW	PW
Phase	Issue	Date	Drawn	Checked

Client:

JACKSON, JACKSON &
SONS LIMITED

Job Title:

Edenfield Road,
Rochdale

Job No:

16-702

Drawing No:

004

Date:

01.08.2024

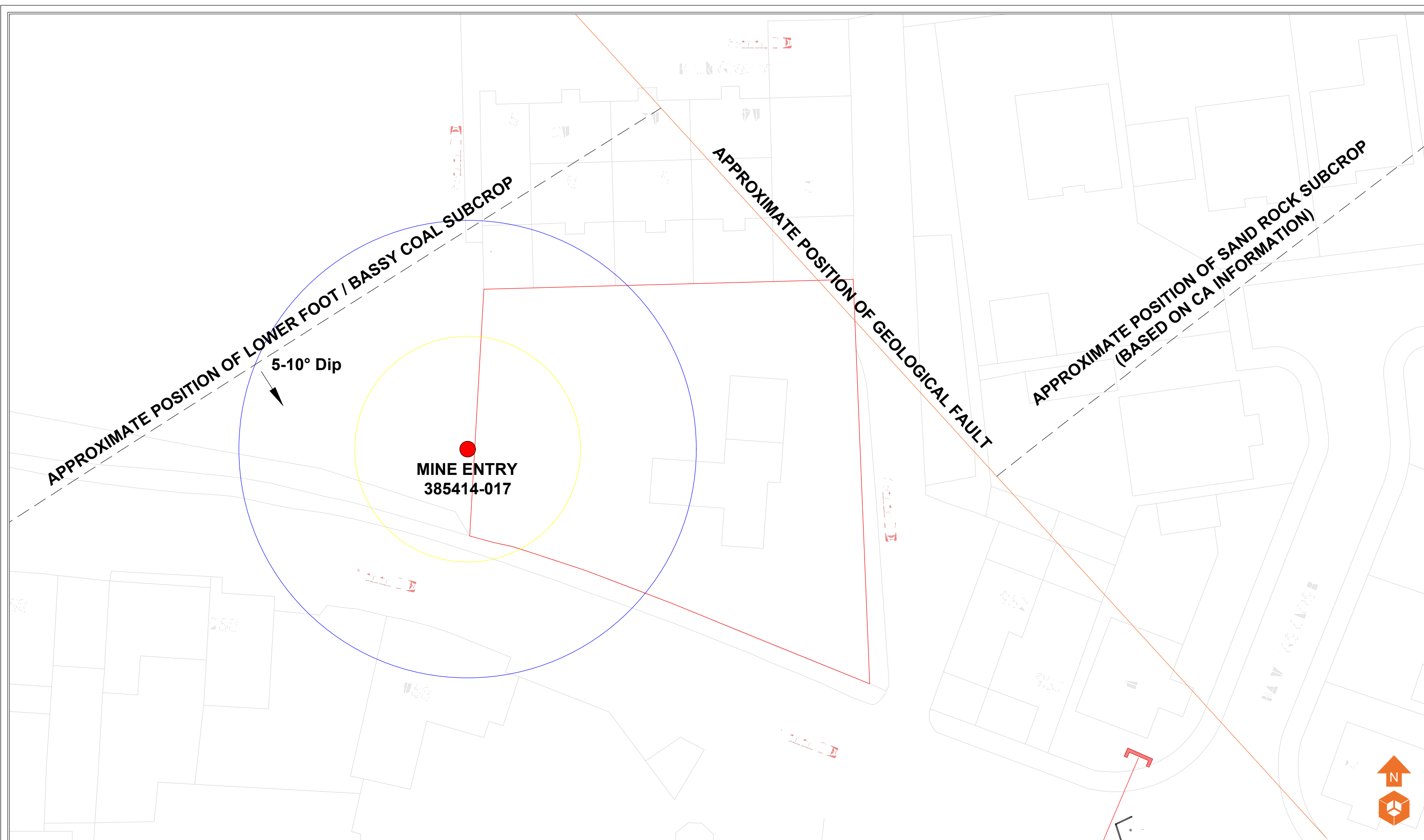
Scale:

NTS

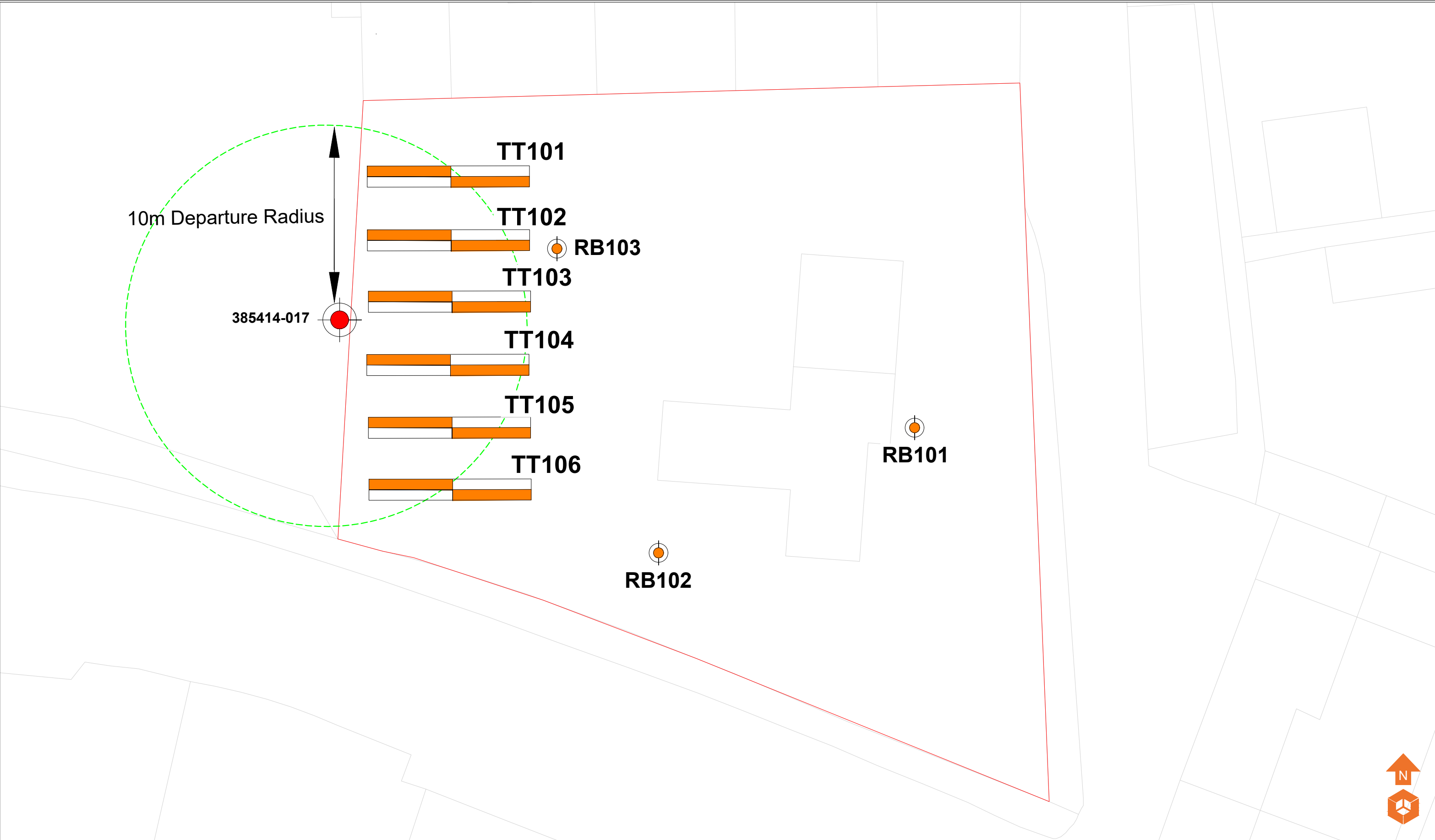


Environmental Engineering
Partnership Ltd
Taylor Road, Trafford Park
Urmston, Manchester, M41 7JQ
Tel: 0161 707 9612
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

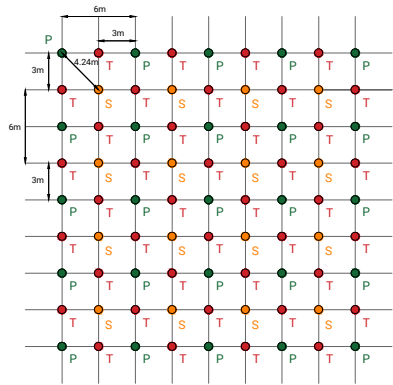
The client must not amend any drawing, design or other intellectual property produced by E3P Ltd without permission in writing from E3P Ltd in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.



Location Symbols W



Location Symbols Approximate Trial Pit Location Approximate Trial Trench Location Approximate Rotary Borehole Location	Notes:					Client: JACKSON, JACKSON & SONS LIMITED		Job No: 16-702	Date: 05.09.2024	 Environmental Engineering Partnership Ltd Taylor Road, Trafford Park Urmston, Manchester, M41 7JQ Tel: 0161 707 9612 E-mail: info@e3p.co.uk Website: www.e3p.co.uk
	P1 REVA 05.09.2024 OW JS					Job Title: Edenfield Road, Rochdale		Drawing No: 023	Scale: NTS	
	Phase Issue Date Drawn Checked							Drawing Title: Coal Mining Investigation Plan	The client must not amend any drawing, design or other intellectual property produced by E3P Ltd without permission in writing from E3P Ltd in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.	



- Typical detail on hole where grout take is high:
- P= Working identified in primary 6m grid. Where grout take is high and completion pressure cannot be achieved within a grout hole.
 - S= Secondary grid holes to be drilled and grouted where evidence of potential workings are identified within the primary 6m grid.
 - T= Tertiary boreholes drilled on a 3m grid, where grout take is high, and completion pressure cannot be achieved within a grout hole.



Location Symbols

- Approximate Primary Drill and Grout Location (6x6m Grid with 4.50m Offset from Edge of Building)

Notes:

Client:

Jackson, Jackson & Sons Ltd

Job No:

16-702

Date:

13.11.2024

Drawing No:

024

Scale:

NTS @ A3



Environmental Engineering
Partnership Ltd
Taylor Road, Trafford Park
Urmston, Manchester, M41 7JQ
Tel: 0161 707 9612
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

P1	REVA	13.11.2024	CB	JS	JS
Phase	Issue	Date	Drawn	Checked	PM

Job Title:

Edenfield Road, Rochdale

Drawing Title:

Drill and Grout Plan

The client must not amend any drawing, design or other intellectual property produced by E3P Ltd without permission in writing from E3P Ltd in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.