

PERFORMANCE SPECIFICATION FOR CONSOLIDATION OF ABANDONED MINE WORKINGS

Site:	Wilson Road, Huyton
References:	18-824-R3-1
Date:	02 June 2026
Client:	DJL Construction NW Ltd





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QUALITY ASSURANCE

Report Reference

18-824-R3-1

REV REF	DESCRIPTION	DATE
01	First issue	2nd June 2026

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EXECUTIVE SUMMARY

SITE DESCRIPTION AND HISTORY

Site Address	Wilson Road, Huyton, Liverpool L36 6AE
Grid Reference	E 345759, N 389967
Site Area	4.54 Ha
Proposed Development	DJL Construction NW Ltd intends to construct a steel-framed industrial warehouse building with associated access, parking 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. A series of rotary boreholes were drilled to target potential workings in the identified underlying shallow coal seams. Rockhead was encountered at depths of between 1.70 m and 3.10 m bgl. Shallow coal seams were identified within three of the rotary boreholes, ranging in thickness between 0.60 m to 1.10 m, from depths between 3.00 m bgl to 22.30 m bgl. It is likely that RB102 is positioned at the Tenlands Mine sub-crop, given coal was identified directly beneath the superficial deposits at 3.00-3.60 m bgl. RB105 is positioned to the south of the Tenlands Mine sub-crop and encountered rockhead at 2.30 m bgl and coal at 6.20 m bgl. In RB104 to the south of the site, evidence of possible coal extraction was identified from 6.40 m bgl to 12.90 m bgl where broken ground followed by a void was encountered. Directly beneath the void, a potential steel structure was noted from 12.80-12.90 m bgl which may indicate an object left in a pillar and stall mine. E3P has concluded that shallow mine workings are potentially present beneath the site. The coal mining risk assessment has concluded that there is insufficient rock cover to provide the required degree of stability in the event of successive collapses (cavitation) within any unrecorded workings. Unrecorded workings have the potential to collapse in an unpredictable manner that can induce subsidence at the surface. The final extent of the works will be determined on-site by the drilling specialist and supervising engineer to ensure the required ratio of rock cover is achieved.
Coal Mining – Mine Entries	No mine entries are recorded within the site boundary. There are two mine entries circa 70 m to the west/southwest of the site. Given the known mining legacy and anticipated shallow mine workings, unrecorded mine entries may exist within the curtilage of the site and the immediate surrounding area. It will, therefore, be necessary to allow for a watching brief during earthworks and ensure the inclusion of a suitable mechanism for grouting and capping of any such features and subsequent amendment to a development layout in the event that an unrecorded mine entry underlies the proposed structure.



SUMMARY OF MINE CONSOLIDATION AND STABILISATION WORKS

Scope of Works	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 the site on an preliminary 12m grid for both warehouse footprint and external yard, car parking and roadways with pressure grouting and a centre hole where workings are identified. ✿ Where voids are identified, a primary (6m), secondary (4.5m) and, if necessary, tertiary (3m) 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 Mining Remediation Authority permit requirements.
Consolidation of Shallow Workings	Boreholes will be drilled on a preliminary staggered 12m x 12m grid across the building footprint, with treatment extending up to 3m beyond the warehouse line. Where abandoned mine workings are identified, primary and secondary boreholes will then be drilled at 6m and 4.5 m infill centres, respectively 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. 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.
Building Foundations	The final foundation solution will be dependent on the structural loadings, and elevation and should be designed by a suitably qualified structural engineer with detailed designs from a specialist contractor. Foundation loads associated with pad foundations or piled foundations shall be designed such that the resulting bearing pressure imposed on the stabilised mine workings does not exceed 160 kN/m². The foundation design should consider both dead and imposed loading conditions, together with any local stress concentrations, to ensure that excessive loading is not transferred to the treated strata which could otherwise result in localised instability or unacceptable post-treatment settlement.



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APPENDIX I: LIMITATIONS

APPENDIX II: GLOSSARY

APPENDIX III: DRAWINGS

DRAWING LIST

18-824 - 001 - Site Location Plan
18-824 - 002 - Proposed Development Plan
18-824 - 006 - Exploratory Hole Location Plan
18-824 - 007 - Depth of Made Ground Plan
18-824 - 012 - Depth to Bedrock Plan
18-824 - 018 - Coal Mining Issues Plan
18-824 - 023 - Drill and Grout Plan



1. INTRODUCTION

1.1. BACKGROUND

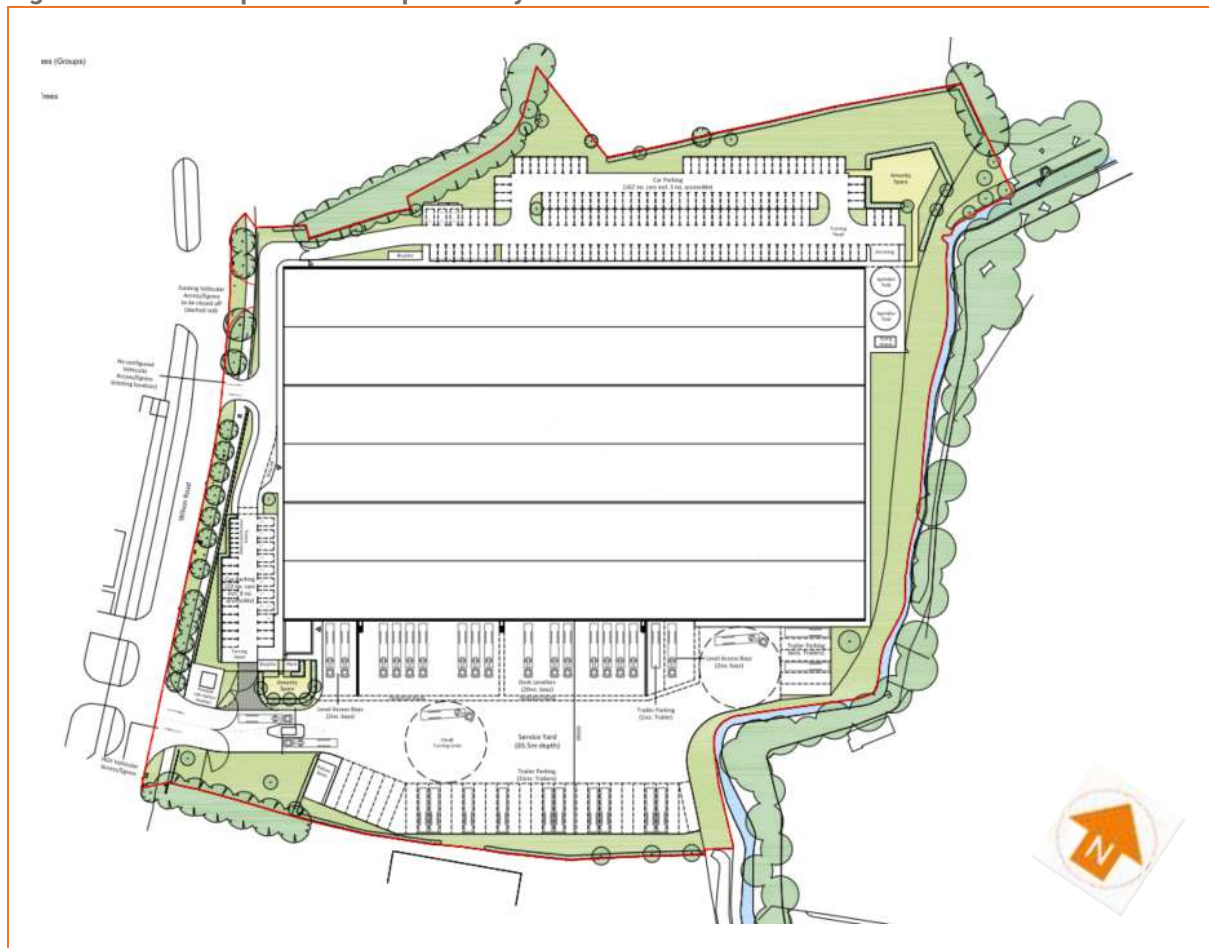
E3P has been instructed by DJL Construction NW Ltd to develop a Performance Specification for the Consolidation of Abandoned Mine Workings to facilitate the safe and regulatory compliant stabilisation of the site located to the east of Wilson Road, Huyton, Liverpool, L36 6AE; hereinafter referred to as the site.

1.2. PROPOSED DEVELOPMENT

DJL Construction NW Ltd intends to construct a steel-framed industrial warehouse building with associated access, service yard, parking and landscaping.

A snapshot of the proposed development layout is indicated in Figure 1.1 and Drawing 18-824-002 (APPENDIX IV)

Figure 1.1 Proposed Development Layout





1.3. OBJECTIVES

The objectives of the 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 site; and
- ❖ 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.

1.4. LIMITATIONS

The limitations of this report are presented in APPENDIX I.

1.5. CONFIDENTIALITY

E3P has prepared this report solely for the use of the client and those parties with whom a warranty agreement has been executed or with whom an assignment has been agreed. Should any third party wish to use or rely upon the report's contents, written approval must be sought from E3P; a charge may be levied against such consent.

1.6. STAKEHOLDERS

FUNCTION/INTEREST	NAME OF PARTY
Local Planning Authority	Knowsley Metropolitan Borough Council
Developer	DJL Construction NW Ltd
Geoenvironmental Consultant	E3P
Main Contractor	TBC
Remediation/Enabling Works Contractor	TBC
Human Health Regulator	Knowsley Metropolitan Borough Council
Controlled Waters and Waste Regulator	Environment Agency
Highways Adoption Authority	Knowsley Metropolitan Borough Council
Mining Authority	Mining Remediation Authority



2. SITE SETTING

2.1. SITE DETAILS

Table 2.1 Site Details

Site Address	Wilson Road, Huyton, Liverpool, L36 6AE
National Grid Reference	E 345759, N 389967
Site Area	4.54 Ha

The Glossary presented in APPENDIX II defines all acronyms used within the report.

A site location map is presented in APPENDIX IV as Drawing 18-824-001.

2.2. SITE SUMMARY

Table 2.2 Site Summary Details

Occupancy/Use	The subject site is an irregular-shaped parcel of land located east of Liverpool and is currently occupied by John Mason International Movers and associated car and lorry parking. Site activities at John Mason International Movers include international shipping, packing, loading containers, service and collection. The northern area of the site is used for vehicle/HGV and equipment storage. The east and southeast of the site is currently used to store caravans.
Structures	The site comprises a large steel-framed two-storey warehouse with a brick front along the western side of the building, situated in the south of the site. The remaining areas of the site are associated with car and lorry parking. An electricity substation is present in the west of the site. A further small brick building is present in the northwest.
Access	Vehicle access can be gained from Wilson Road to the west of the site through double gates to the southwest corner of the building, to the northwest corner of the building and northwest site boundary. Pedestrian access can be gained off Wilson Road to the main entrance of the building located to the southwestern corner of the building and through a door in the wall to the west of the site.
Slope	There is little topographical variance across the site, with site levels noted to be at circa 26.0 – 27.0 m AOD. It is expected that the site was levelled prior to the construction of the existing development.
Retaining Structures	No retaining structures have been identified, however, there is a wall running north of the building for the remainder of the western site boundary.
Surface Cover	Primarily hard standing with localised areas of landscaping.



2.3. PREVIOUS REPORTS

The following previous reports have been completed for the subject site and should be read in conjunction with this report:

Table 2.3 Previous Reports

AUTHOR	TITLE / REFERENCE	CLIENT	DATE
Jomas Associates	Desk Study/Preliminary Risk Assessment and Coal Mining Risk Assessment Report – Ref: P4131J2476/SC	Linden Hill – Capital Assets – ALX Limited	16th February 2022
E3P	Phase I Geoenvironmental Site Assessment – Ref: 18-824-R1-1	DJL Construction NW Ltd	21st May 2026
	Phase II Geoenvironmental Site Assessment – Ref: 18-824-R2-1	DJL Construction NW Ltd	21st May 2026
	Remediation Strategy Letter – Ref: 18-824-L1-1	DJL Construction NW Ltd	2nd June 2026

2.4. SUMMARY OF REPORTED GROUND CONDITIONS

2.4.1. MADE GROUND

Made Ground was encountered in all exploratory hole locations to a maximum proven depth of 5.40 m bgl (RB103). However, Made Ground was generally present to a depth of less than 2.00 m bgl.

Typically, the Made Ground comprises greyish brown sandy gravel of mudstone, sandstone and limestone from ground level. In the majority of locations, this is underlain by dark brown slightly sandy gravelly clay extending to a proven depth of 2.00 m bgl (WS106, WS107, WS108).

Reworked topsoil, comprising sandy gravel or gravelly sand, was recorded at three locations (WS104, WS106, WS108).

Concrete was encountered at four locations (WS101, WS112A, RB102, RB105) from ground level to a maximum depth of 0.35 m bgl (WS101). WS112B was positioned on a raised platform within the warehouse and encountered concrete to a depth in excess of 0.40 m bgl, it was not possible to penetrate the full depth of the concrete.

2.4.2. SUPERFICIAL

Natural superficial deposits were identified within all exploratory hole locations at a depth of between 0.80 – 5.45 m bgl (WS108), with the exception of RB103 where the Made Ground deposits were directly underlain by bedrock.

The natural deposits primarily consisted of either sandy CLAY or sandy gravelly CLAY, proven from depths of between 0.80–5.45 m bgl. Cohesive deposits generally ranged in consistency and strength, varying from firm low strength to very stiff high strength.

A band of COAL was encountered within the cohesive deposits in WS109 at 1.60 – 1.80 m bgl.

Brown gravelly fine to coarse SAND was identified within four exploratory locations, locally interbedded within the cohesive deposits between 0.30–4.00 m bgl. Where deposits were identified, the stratum was noted at a thickness of between 0.30–0.70 m and the soils were recorded to be loose.



2.4.3. BEDROCK

Bedrock was identified within all of the rotary boreholes and two of the window sample boreholes at depths of between 1.70 – 40.00 m bgl. Rockhead was encountered at depths of between 1.70 m and 3.10 m bgl.

The bedrock generally comprises red/grey SANDSTONE, or grey MUDSTONE with the presence of MUDSTONE, SANDSTONE and SILTSTONE bands or coal traces.

Coal seams were identified within RB101 between 3.80 – 4.90 m bgl, RB102 between 3.00 – 3.60 m bgl, and multiple seams within RB105 between 6.20 – 7.00 m bgl, 7.60 – 8.50 m bgl, 15.10 – 15.70 m bgl, and 21.40 – 22.30 m bgl.

2.4.4. GROUNDWATER

Groundwater strikes were recorded in the natural superficial deposits within three of the exploratory hole locations, between 2.00–2.50 m bgl. Subsequent monitoring completed to date has recorded groundwater between 0.60–2.94 m bgl.

2.5. PRELIMINARY MINING ASSESSMENT

2.5.1. COAL MINING

The Mining Remediation Authority (MRA) mapping and records indicate that the site is in an area that may be affected by coal mining.

A MRA mining report was obtained (Ref: 51003555637001) dated February 2026.

The MRA operates a risk-based approach to assessing potential instability issues associated with future land development located within the predefined MRA consultation areas. This risk-based approach subdivides the potential risk into “low” and “high” risk categories.

The risk categories can be defined as:

Low-Risk Sites – Deemed to be land where coal mining has taken place, however, it was at such depth not to pose a risk to new development, and it, therefore, contains no known recorded risks and as such, no further assessment is required.

For low-risk site, the MRA categorically states:

*If your proposed development is within the Development Low Risk Area, **there is no need for you to submit any coal mining information with your planning application** and The Mining Remediation Authority will not be consulted by the LPA. The LPA will include our Standing Advice as an informative note within the decision notice.*

High-Risk Sites – Deemed to be landholdings located within an area known to contain legacy risks that include:

- ❑ Mine entries (shaft or adit);
- ❑ Shallow coal working (recorded and probably);
- ❑ Workable coal seam outcrops;
- ❑ Mine gas sites and areas;
- ❑ Recorded coal-mining -related hazards;
- ❑ Geological features (fissures and break lines); and
- ❑ Former surface mining sites (sometimes using historic opencast extraction methods).



2.5.2. COAL MINING INFORMATION

Prior to the enactment of the Coal Mines Regulation Act (1872), which came into force on the 1st of January 1883, there was no statutory requirement to record the extent of abandoned mine workings and as such the MRA has no knowledge of extensive workings throughout the UK Coal Fields where shallow workings are present at a depth that could result in a subsidence event in the future (through successive cavitation) associated with failure of support mechanism.

Determining if a site may have unrecorded or recorded coal mine workings requires the consideration of a wide range of information, and E3P has completed a review of relevant information in relation to potential coal mining activities.

In the first instance, E3P has reviewed the Mining Remediation Authority Online Viewer, and an excerpt of this is presented in Figure 5.1. A coal sub-crop is shown in the central sector of the site and further sub-crops are shown to the north and south of the site. Areas of probable shallow workings are recorded to the south of the sub-crops. Mine entries are recorded to the west and south of the site. There are no recorded underground workings or opencast workings within the site boundary.

Figure 2.1 Excerpt of the Mining Remediation Authority Online Viewer

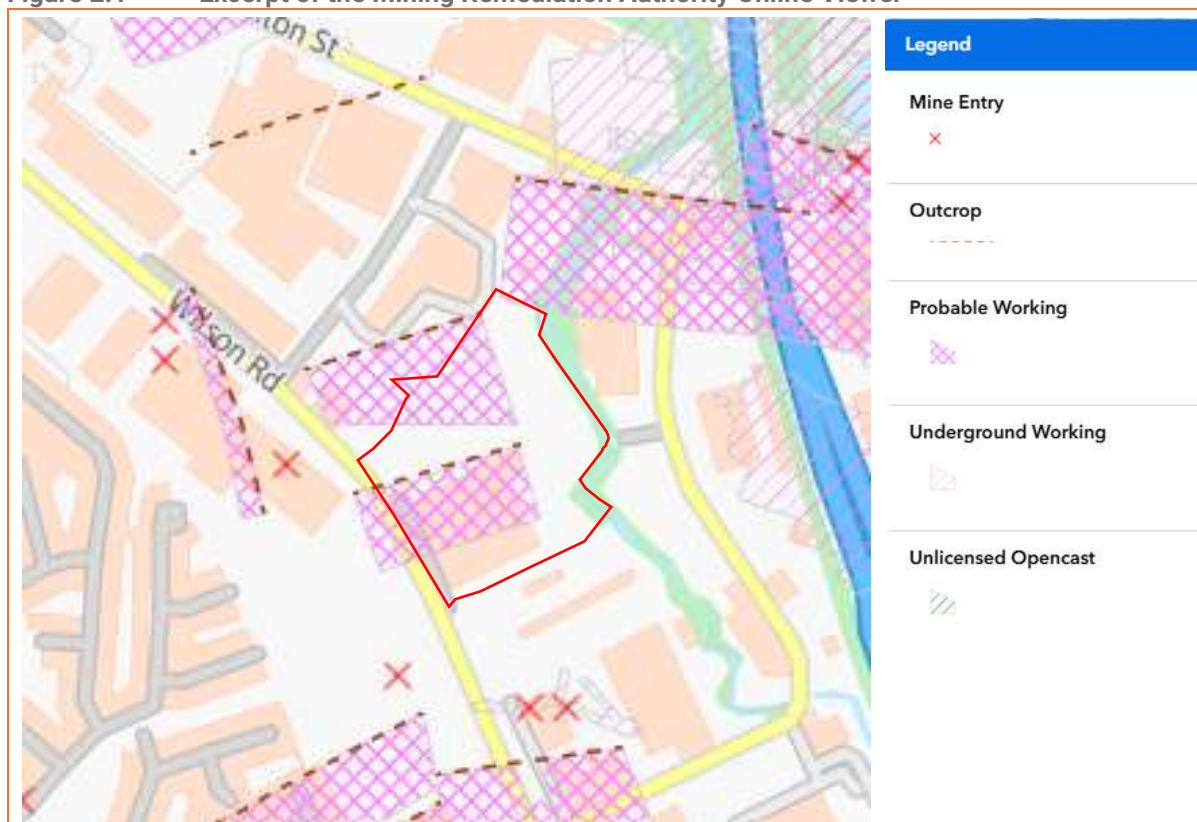


Table 2.4 provides a summary of pertinent coal mining information within the MRA Mining Report.



Table 2.4 Coal Mining Information

SOURCES OF INFORMATION	SUMMARY				
Known Past Underground Mining	SEAM	DEPTH	DIRECTION	THICKNESS (cm)	YEAR LAST MINED
	LONDON DELPH (BIN)	110	East	180	1877
	CROMBOUKE	130	Northeast	190	1883
	ST. HELENS YARD	147	East	90	1870
	HIGHER FLORIDA	157	East	180	1871
	LOWER FLORIDA	164	Northeast	120	1862
	WIGAN FOUR FEET	290	Northeast	160	1898
Probable Unrecorded Workings	Yes.				
Spine Roadways at Shallow Depth	No spine roadway recorded at shallow depth.				
Mine Entries Within 100m Of the Site	 Shaft reference 345389-002 – Grid Reference E 345559, N 389962 – Treatment details unknown – Located to the west of site.				
	 Shaft reference 345389-023 – Grid Reference E 345668, N 389760 – This shaft was found during development was capped with a 3m square RC raft at rockhead. It is thought that the shaft was then conveyed to Capital at Counties Ltd. In 1973 but we have no confirmation that this is so. – Located to the south of site.				
Mine Abandonment Plans	The following plans are listed: NW836, 13866, NW756, PO0, 16820, NW835, NW803, 2739, NW832. The Jomas Associates Report notes that no shallow coal working abandonment plans could be provided by the Coal Authority.				
Known Outcrops	SEAM NAME	WORKABLE?	DISTANCE (m)	BEARING OF OUTCROP	
	TRENCHERBONE	Yes	5.4	251	
	WIGAN FOUR FEET	Yes	Within	74	
Faults / Fissures	The geological mapping identifies the presence of two faults within the site boundary.				
Opencast Mines	None recorded within 500 metres of the enquiry boundary.				
Mining Remediation Authority Managed Tips	None recorded within 500 metres of the enquiry boundary.				
Remediated Sites	None recorded within 50 metres of the enquiry boundary.				
Coal Mining Subsidence	None recorded within 50 metres of the enquiry boundary.				
Mine Gas	None recorded within 500 metres of the enquiry boundary.				



SOURCES OF INFORMATION	SUMMARY
Mine Water	None recorded within 500 metres of the enquiry boundary.
Future Underground Mining	None recorded.
Mining Remediation Authority Development Advice	<i>"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."</i>
British Geological Survey Mapping	The 1:50,000 plan for the site shows the Tenlands Mine (Ravenhead Main Delf) sub-crop in the west of the site. The Bastions Mine sub-crops to the north of the site. The strata is shown to dip to the south, beneath the subject site.
Review Of Mining Remediation Authority Archive	N/A.
Historical Ordnance Survey Mapping	Historical OS mapping within 500 m of the site indicates the presence of Huyton Hey Colliery and coal pits to the north of the site, coal pits to the east and Houghtons Hey Colliery to the northeast between 1849-1850. An old colliery and shafts are recorded between 1891 and 1956 northeast of the site. Shafts are recorded northeast of the site between 1925 and 1956. In 1966 a disused mine and shaft is marked in the northeast of the site. No further coal related features were marked.
Historical Site Investigations	The Coal Authority has received information relating to past site investigations on-site, however this information has not been made available to E3P.

2.6. COAL MINING RISK ASSESSMENT

This risk assessment comprises a desk-based review of all available information on coal mining issues that are relevant to the application site deemed to be within a high-risk area. This includes:

- ⚙ Interpretation of information to identify and assess the risks to the proposed development from coal mining legacy, including the cumulative impact of issues;
- ⚙ Setting 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
- ⚙ Demonstrating 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.

The coal mining risk assessment is summarised in Table 2.5.



Table 2.5 Summary of Coal Mining Risk

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

Based on the above, a high risk of unrecorded coal mining at shallow depth is identified.

2.7. SUMMARY OF COAL MINING SITE INVESTIGATION

2.7.1. ROTARY BOREHOLES

Five rotary boreholes have been advanced at the locations detailed within the E3P Exploratory Hole Location Plan (Drawing 18-824-006) at positions to intersect the potential coal seams and assess the potential for any workings.

The findings are summarised in Table 2.6.

Table 2.6 Rotary Boreholes

ROTARY BOREHOLE	DEPTH TO ROCKHEAD (m bgl)	EVIDENCE OF MINING/SEAM	REMARKS
RB101	3.10	Intact coal: 3.80–4.90 m bgl	No loss of flush, voided, or broken ground encountered during drilling
RB102	3.60	Intact coal: 3.00–3.60 m bgl Intact coal: 14.30–15.30 m bgl	
RB103	5.40	No coal encountered	
RB104	2.30	Broken Ground: 6.40–6.80 m bgl Void: 6.80–12.90 m bgl Hard drilling and potential steel encountered: 12.80–12.90m bgl	Broken ground and voided ground with total loss of flush encountered 6.80-12.90 m bgl.
RB105	2.30	Intact coal: 6.20–7.00 m bgl Intact coal: 7.60–8.50 m bgl Intact coal: 15.10–15.70 m bgl Intact coal: 21.40–22.30 m bgl	No loss of flush, voided, or broken ground encountered during drilling.



2.8. SUMMARY OF COAL MINING ISSUES

The intrusive ground investigation comprising five, deep, rotary boreholes identified intact shallow coal seams within three of the rotary boreholes, ranging in thickness between 0.60 m to 1.10 m, from depths between 3.00 m bgl to 22.30 m bgl.

It is likely that RB102 is positioned at the Tenlands Mine sub-crop, given coal was identified directly beneath the superficial deposits at 3.00-3.60 m bgl. RB105 is positioned to the south of the Tenlands Mine sub-crop and encountered rockhead at 2.30 m bgl and coal at 6.20 m bgl.

The coal identified in RB101 at 3.80-4.90 m bgl and in RB102 at 14.30–15.30 m bgl is considered to represent the Bastions Mine which sub-crops to the north of the site. The depth of the coal suggests that the Bastions Mine may sub-crop closer to the site boundary than it is currently mapped.

Coal was not encountered in RB103, located to the east of the mapped fault in the central, eastern sector.

In RB104 to the south of the site, evidence of possible coal extraction was identified from 6.40 m bgl to 12.90 m bgl where broken ground followed by a void was encountered. Directly beneath the void, a potential steel structure was noted from 12.80-12.90 m bgl which may indicate an object left in a pillar and stall mine. Where coal seams are recorded as intact, this may be attributable to the presence of support pillars and should not be taken as conclusive evidence of the absence of workings within these areas.

There is insufficient rock cover above the identified coal seams and evidence of shallow workings has been identified, therefore proof drilling will be required across the proposed building footprint and infrastructure with pressure grouting. Where voids are identified, a secondary (and, if necessary, tertiary) grid will be implemented with subsequent pressure grouting.

Additionally, further instances of shallow coal are likely to be encountered at the location of the sub-crop. Where this interacts with proposed foundations coal will need to be removed and the footing founded beneath. A minimum of 1m cover must remain to manage potential gassing issued from an exposed coal crop. Any extractions required should be completed under an Incidental Coal Extraction permit application with the Mining Remediation Authority, with appropriate mitigation measures adopted to the substructure that will be designed by the structural engineers.

Given the historical mining setting of the site, there remains a risk that unrecorded mine entries may be present within the development area. In addition, the shallow depth to coal measures and evidence of historically disturbed and broken ground indicate the potential presence of former bell pits and other shallow artisanal workings which may not be identified within available Coal Authority records. Such features represent a potential geotechnical hazard due to the possibility of localised collapse, variable ground conditions and zones of weakened or poorly compacted infill material. Accordingly, an allowance for unforeseen shallow mining features should be incorporated within the development risk assessment and any intrusive investigation or remediation strategy.

The Mining Remediation Authority and Local Planning Authority will require a specification for the consolidation of Abandoned Mine Workings to be prepared to ensure all works are fully designed with suitable verification processes.



3. SPECIFICATION FOR MINE STABILISATION

3.1. SCOPE OF WORK

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 warehouse footprint and all external infrastructure (car parks, service yard etc) on a 12m grid with pressure grouting;**
- ✱ **Where voids are identified, a primary (6m), secondary (4.5m) and, if necessary, tertiary (3m) 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 Mining Remediation 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.

For the building footprint, proposed external service yards, car parks, adopted highway and infrastructure boreholes will be proof drilled on staggered 12m × 12m grid with treatment extending up to 3 m beyond the warehouse line.

Where voids or evidence of potential workings is identified, primary boreholes (6m), secondary boreholes (4.5m centres) are then required. 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.

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 Mining Remediation 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. CONTITUENT 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 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 0.4.5MN/m² is considered to be on target to achieve the required 28-day 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 bleed capacity tests should aim to achieve >950ml.

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 SEAM

3.4.1. DRILLING PROCEDURE

The drilling and Grouting grid will be as follows:

- ❁ **Building Structure (+3.0m offset):** 6m Primary grid (after 12m proof drill grid).
- ❁ **Building Structure (+3.0m 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 4.50m²);
- ❁ **Building Structure (+3.0m offset):** Where grout exceeds 5T in a 24hr period (single point of injection), a tertiary grid will be implemented and subject to pressure grouting.
- ❁ **Highways, Estate Roads and Hardstanding:** 12m staggered grid with primary and secondary centre hole where workings identified;
- ❁ **Landscaping:** No drill and grout unless grout take is >10T per hole on the adjacent primary grid which will then trigger 12m staggered grid across area of concern.

For level or shallow-dipping workings up to 20m depth, the treatment grid should extend 3m to 4.5m 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 warehouse 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 18-824-023-REVA).

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 PROCEDURE FOR SHALLOW WORKINGS IN COAL SEAMS

The aim of the stabilisation work is to substantially fill any old workings within the Tenlands Mine and Bastions Mine 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 warehouse 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

When directed by the RE, 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. DRILLING AND GROUTING PROCEDURE FOR THE TREATMENT OF MINE SHAFTS (IF IDENTIFIED)

3.5.1. SHAFT BOREHOLES

The boreholes shall be drilled by rotary methods employing water flush techniques unless otherwise agreed to by the MRA / Project Manager/Supervisor. Initially, a vertical borehole of minimum 72mm diameter will be drilled commencing at the centre of the shaft. Drilling will then continue until solid strata are reached at the base of the shaft.

It is required that the subsequent grouting of the shaft is to be carried out via the drill string. The minimum internal diameter of the drill string shall be not less than 35mm and external casing will not be necessary unless it is required to insert pea gravel.

If a cavity is located within the shaft the Project Manager/Supervisor may require it to be in-filled with pea gravel. The Contractor will, in this case, be required to insert casing of minimum 100mm diameter to the upper limit of the cavity to facilitate the placing of pea gravel into the cavity. The casing must remain in place until the base of the shaft is proved.

During the drilling the Contractor shall carry out regular checks and any necessary adjustment to the drilling rig to ensure that the drill is vertical. When the drilling encounters solid strata at the presumed base of the shaft, boring will continue into rock for a distance of at least 5 metres or as specified by the Project Manager/Supervisor

3.5.2. GROUTING TUBES

Grouting can then proceed via the drill string. Any casing may, at this stage, be withdrawn but the drill string must remain at the borehole base. A triple outlet, T- connection pipe will be attached to the top of the drill string, via a coupling of approved design. The connection pipe will be of such design that a free outlet is available to check the flow of grout and that a pressure meter, calibrated up to at least 1,725 kN/m² (250 p.s.i.) is permanently attached at the inlet location. It is anticipated that pressures in the region of 690 kN/m² (100 p.s.i.) to 1,035 kN/m² (150 p.s.i.) will be required.

Grouting will be injected via the drill string, previously placed to the base of the borehole until a pressure to be stipulated by the Project Manager/Supervisor has been recorded and maintained at the pressure meter attached to the T- connection pipe, or until grout overflow at the surface occurs. The drill string will be of such design that up to 3 metres (10 feet) lengths can be withdrawn, disconnected and the T-connection reconnected at the top of the borehole. When the stipulated pressure has been maintained and further grouting at that level is not possible without generating greater pressure, the Contractor will



withdraw the drill string up by 3 metres. Further grouting will then proceed and further withdrawal up the shaft shall not be carried out at this or any subsequent stage or level until the stipulated pressure has been recorded and maintained at that stage or level. This procedure will continue until the shaft has been pressure grouted to the surface or near surface, to the satisfaction of the Project Manager/Supervisor.

On completion of the grouting via the shaft centre borehole, an additional borehole is to be drilled within the shaft area, no less than 1.0m from the shaft centre and the sequence repeated. If/where grout takes in the secondary borehole are high (i.e. exceeding 5 tonnes), and/or at the Project Manager/Supervisor's discretion, a third grouting borehole may be instructed.

3.5.3. RECOVERY OF MATERIALS

The Contractor is expected to recover from each borehole, metal rods, connections and casings used in the operations, and it will be necessary for the Contractor to indemnify the Employer against any claims for loss of such items.

3.5.4. DRILLING PLATFORM

The Contractor's particular attention is drawn to the possibility of the collapse of fill material into the shaft, or of the shaft itself whilst drilling and/or grouting operations are being carried out. During the drilling and treatment of the shaft, the drilling equipment shall be supported on and secured to a suitable platform such that, in the event of a collapse, the drilling rig remains supported over the shaft.

When assessing the platform requirements, the Contractor shall consider whether the platform itself could become dislodged by a collapse and in such a case shall make provision for the platform to be secured to suitable anchorages so as to prevent such an occurrence.

The dimensions of the platform/ staging/scaffolding and any anchoring device must be provided to the Project Manager/Supervisor, prior to its transport and erection at the site. Subsequent to the shaft being located no drilling is to take place at any suspected old mine shaft until the Project Manager/Supervisor is satisfied that the appropriate platform and anchoring system has been established.

It is recommended that all personnel involved in the drilling and treatment of a shaft should wear appropriate safety harnesses secured at a safe distance from the shaft. No claims will be entertained for any damage to plant and equipment caused by settlement or collapse of the internal filling of the shaft.

3.6. DRILLING AND PRESSURE GROUTING PROCEDURES FOR GROUTED SHAFT CAP

3.6.1. METHOD OF DRILLING

The boreholes shall be drilled by rotary or rotary percussive methods employing water flush techniques unless otherwise agreed to by the Project Manager/ Supervisor.

It is proposed to construct the Grout Plug Cap by drilling boreholes on a staggered grid across the maximum extent of subsidence in the event of any future consolidation within the mine entry.

Boreholes to form the grout plug will be drilled at the following centres with a decrease in spacing across the calculated radial extent of influence in the event of total collapse.

- Shaft centre to 3.0m – 1.0m centres to 27m (1.0m into rock)



- ❶ 3.0m to 15m – 3.0 centres to be advanced to 1.0m below the calculated cone of influence in the event of total collapse.

It is suggested that the approach will be adapted on-site to reflect ground conditions encountered, where grout takes are considered to be excessive, the centres will be reduced, similarly if grout takes are equal to or marginally greater than the borehole volume centres will be reduced.

3.6.2. DIAMETER OF BOREHOLES

The minimum diameter of borings shall be 50 mm. Where an exploratory hole is to be of such depth that boring to the full depth at the minimum diameter is likely to be impossible, or where obstructions are expected, the Contractor shall begin boring at such greater diameter as he may choose. Should any boring prove abortive because of the Contractor's failure to begin with a sufficiently large diameter boring, the Contractor shall carry out any necessary re-drilling and provide and install any necessary casing at their own expense.

3.6.3. PLUMBING OF BOREHOLE

Immediately prior to grouting any borehole the Contractor shall check by plumbing or by other approved techniques that no collapse has occurred within the borehole after the drill rods have been withdrawn and that the hole is open to the depth specified by the Project Manager/Supervisor.

3.6.4. RE-DRILLING OF BOREHOLES

Grouting shall commence via flexible tubing or a series of metal rods having a minimum internal diameter of 25 mm placed to the base of the borehole or at such other depth specified by the Project Manager/Supervisor. Where it is realised that the tubing or rods cannot be placed to the specified depth, the tubing or rods must be withdrawn and the obstruction removed by re-drilling to the specified depth with casing, if necessary. The costs of any such extra drilling shall be borne by the Contractor, who shall indemnify the Employer against any such claims.

3.6.5. GROUTING TUBES

When the tubing or rods have been placed to the depth specified, and checked for blockages by a water test, a T-connection pipe of approved design shall be attached to the top of the tubing or rods. The connection pipe shall have a free outlet available in order that grout flow may be checked and a pressure meter calibrated up to at least 1,050 kN/m² (150 p.s.i.) but not exceeding 2,100 kN/m² (300 p.s.i.) must be permanently attached at the inlet during the grouting operations. There must be an adequate seal between the tubing/rods and borehole wall to ensure that grout is pumped into the formation. If grout cannot be satisfactorily pumped into the foundation, alternative methods shall be employed, such as grouting through casing, to pump grout into the superficial deposits.

3.6.6. GROUTING EQUIPMENT AND PRESSURES

The operating pressures shall be kept to a minimum and shall not exceed 104 kN/m² (15 p.s.i.) unless otherwise instructed by the Project Manager/Supervisor. Grout shall be mixed in approved plant and continuously agitated, until injected into the boreholes by a double acting long stroke reciprocating pump or other approved pump. When submitting the completed tender documents the Contractor must specify in writing the method of controlling, metering and pumping the materials to be used.

3.6.7. BACKFILLING BOREHOLES

Upon completion of the pressure grouting procedure, the Contractor shall ensure that each borehole is backfilled to the surface with grout. In the event that settlement of such backfill grout subsequently



occurs, the Contractor shall return to these borehole locations to top up the grout level. Only in exceptional circumstances - for example where unacceptably high quantities of grout might flow into loosely filled ground – will this requirement be relaxed by the Project Manager/Supervisor.

3.6.8. ABANDONED CASING

The Contractor shall make every attempt to recover all casing used in the drilling operations. However, if this becomes impractical then any abandoned casings must be filled with P.F.A./cement grout and cut at least 2 metres below ground level. The positions of such abandoned casings must be recorded and the information relating to them passed to the Project Manager/Supervisor.

3.6.9. DRILLING AND GROUTING SEQUENCE

The boreholes shall be drilled in a sequence and to depths agreed in advance with the Project Manager/Supervisor. Grout will be injected into the boreholes in an order and with grout mixes as agreed with the Project Manager/Supervisor. Other than the possibility of the Project Manager/Supervisor requiring a series of initial or final random test holes the majority of the boreholes will be drilled and grouted in a systematic manner. However, if deemed necessary by the Project Manager/Supervisor the Contractor may be required to return to specific areas intermittently to drill secondary injection boreholes or to continue grouting primary or secondary boreholes. No claim will be entertained for any inconvenience to the Contractor by such moving of drilling and/or grouting plant and it shall be necessary to indemnify the Employer against any such claims.

3.6.10. BOREHOLES TO BE GROUTED

Unless otherwise directed by the Project Manager/Supervisor the Contractor shall attempt to inject grout into each borehole. Care shall be taken to ensure that the grout is not injected into pipes, drains, cable ducts, etc.

3.7. 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.

3.8. RECORD KEEPING

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





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
MRA	Mining Remediation 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



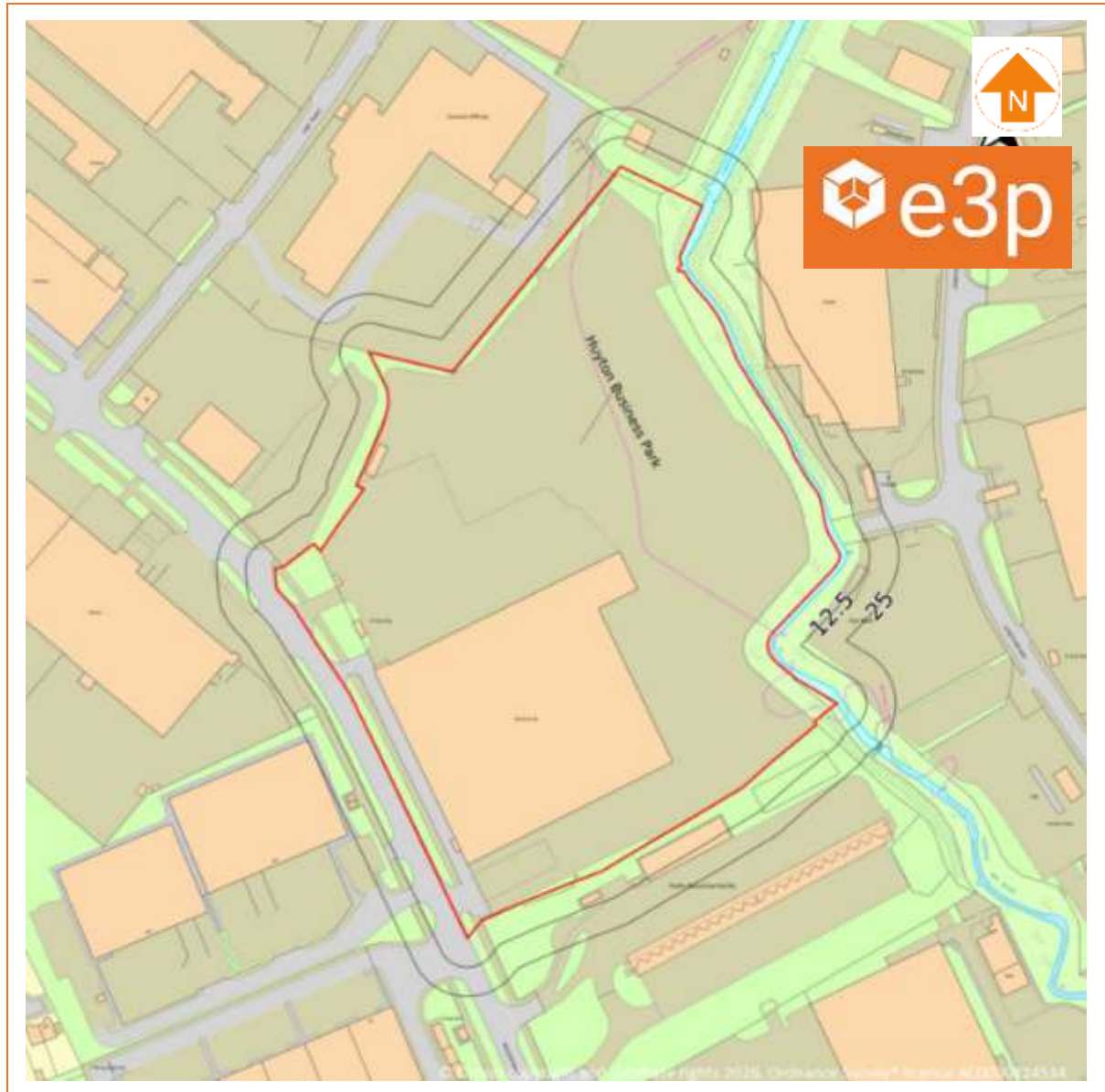
MIBK	Methyl isobutyl ketone	WTE	Water table elevation
m	Metres	ppm	Parts per million
km	Kilometres	mg/m³	Milligram per metre cubed
% v/v	Percent volume in air	m bgl	Metres below ground level
mb	Millibars (atmospheric pressure)	m bcl	Metre below cover level
l/hr	Litres per hour	mAOD	Metres above ordnance 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)	SSRT	Site Specific Remediation Target
PSD	Particle Size Distribution	DD	Dry Density
CL:AIRE	Contaminated Land: Applications in Real Environments	Mc	Moisture Content
ρ	Bulk Density	GPR	Ground Penetrating Radar
NDP	Nuclear Density Probe	FFL	Finished Floor Level
LEL	Lower Explosive Limit	UKWIR	UK Water Industry Research
CIRIA	Construction Industry Research and Information Association	LOD	Limit of Detection
PFAS	Per- and Poly-Fluorinated Substances	PFOA	Perfluorooctanoic Acid

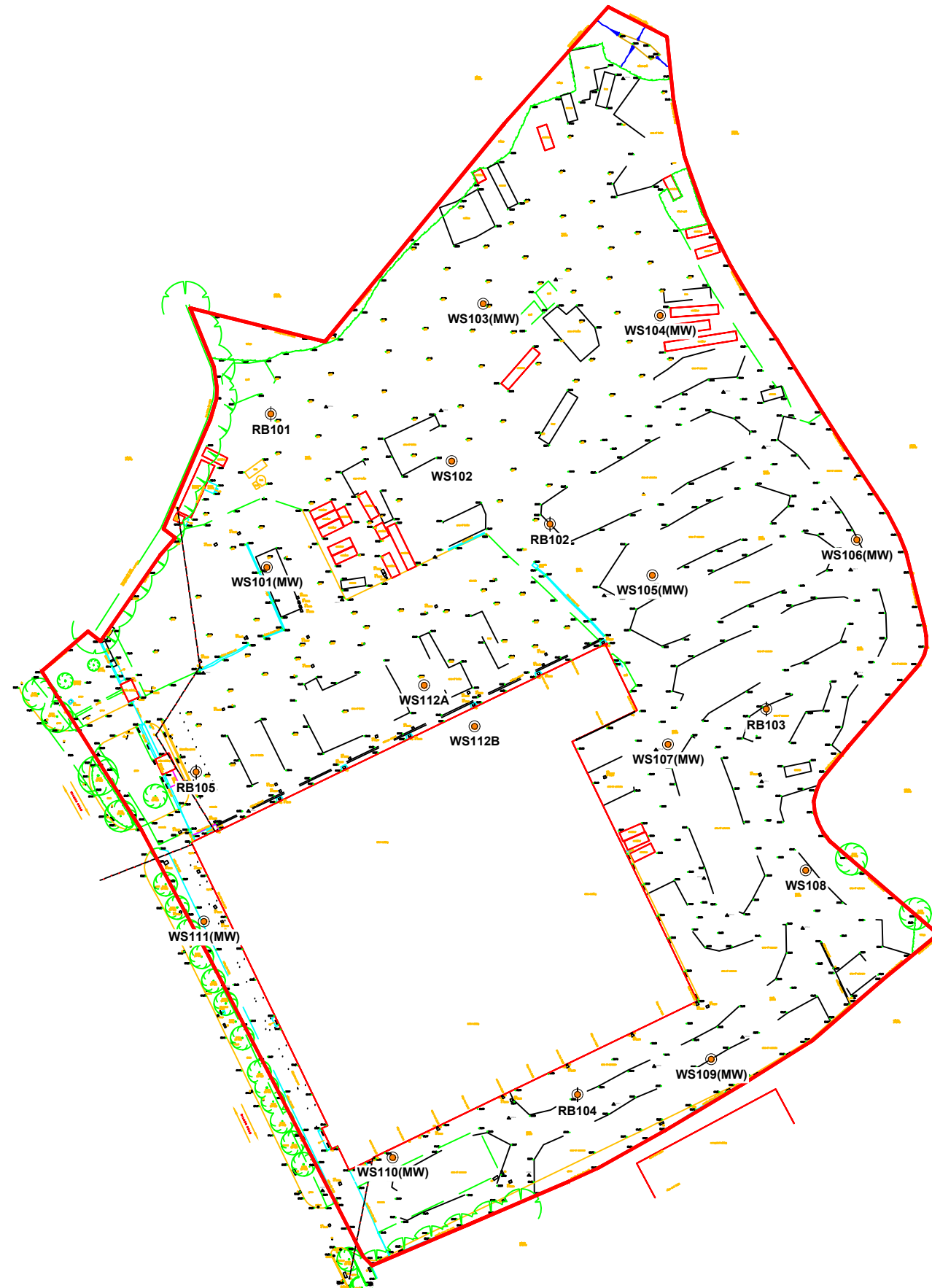
Appendix III: Drawings





DRAWING 18-824-R1-001 – SITE LOCATION MAP





- Location Symbols
-  Approximate Window Sample Probehole Location
 -  Approximate Window Sample Probehole Location with Install
 -  Approximate Rotary Borehole Location

Notes:					

Client:
DJL Construction NW Ltd

Job No:	18-824	Date:	18.05.2026
Drawing No:	006	Scale:	NTS



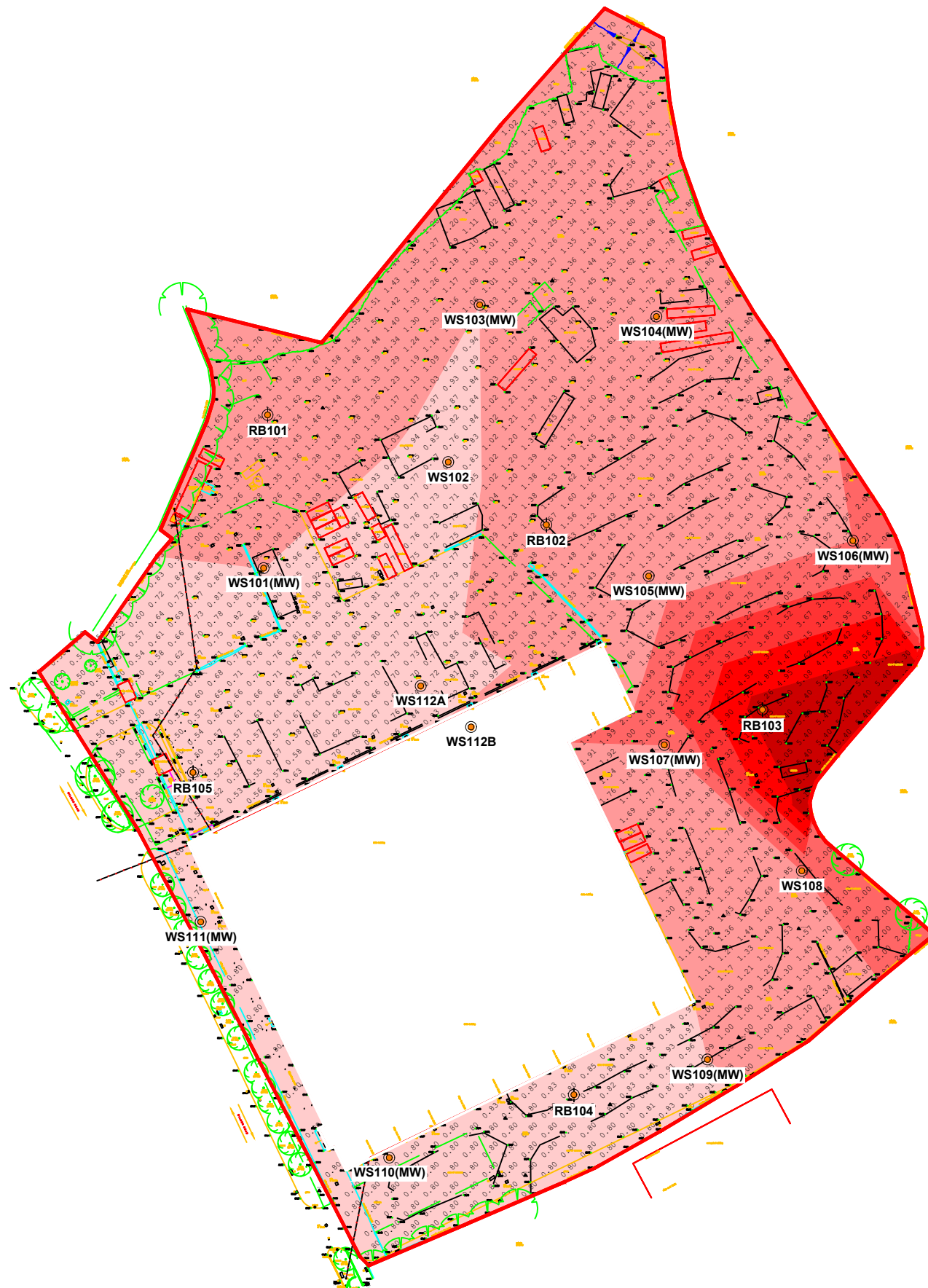
Environmental Engineering Partnership Ltd
Taylor Road, Trafford Park
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Website: www.e3p.co.uk

P1	REVA	18.05.2026	TG	NS	NS
Phase	Issue	Date	Drawn	Checked	PM

Job Title:
Wilson Road, Huyton

Drawing Title:
Exploratory Hole Location Plan

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- Location Symbols
- Approximate Window Sample Probehole Location
 - Approximate Window Sample Probehole Location with Install
 - Approximate Rotary Borehole Location

- Made Ground Depth (m)
- Depth of Made Ground 0.00 - 0.99m
 - Depth of Made Ground 1.00 - 1.99m
 - Depth of Made Ground 2.00 - 2.99m
 - Depth of Made Ground 3.00 - 3.99m
 - Depth of Made Ground 4.00 - 4.99m
 - Depth of Made Ground >5.00m

Notes:

P1	REVA	18.05.2026	TG	NS	NS
Phase	Issue	Date	Drawn	Checked	PM

Client:

DJL Construction
NW Ltd

Job Title:

Wilson Road, Huyton

Job No:
18-824

Drawing No:
007

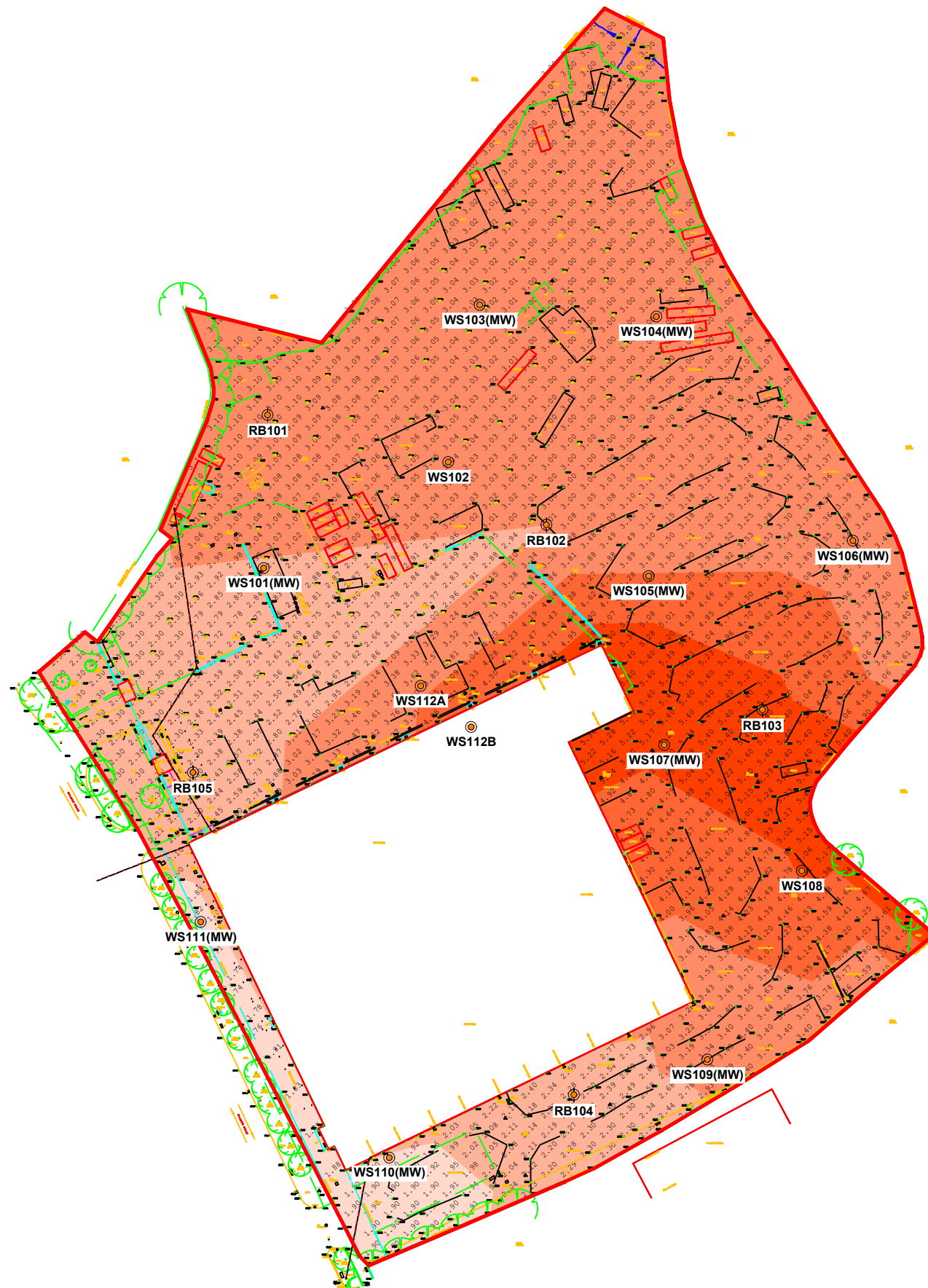
Date:
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Scale:
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Location Symbols		Bedrock Depth (m)	
	Approximate Window Sample Probehole Location		Depth to Bedrock 1.00 - 1.99m
	Approximate Window Sample Probehole Location with Install		Depth to Bedrock 2.00 - 2.99m
	Approximate Rotary Borehole Location		Depth to Bedrock 3.00 - 3.99m
			Depth to Bedrock 4.00 - 4.99m
			Depth to Bedrock >5.00m

Notes:					
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Phase	Issue	Date	Drawn	Checked	PM

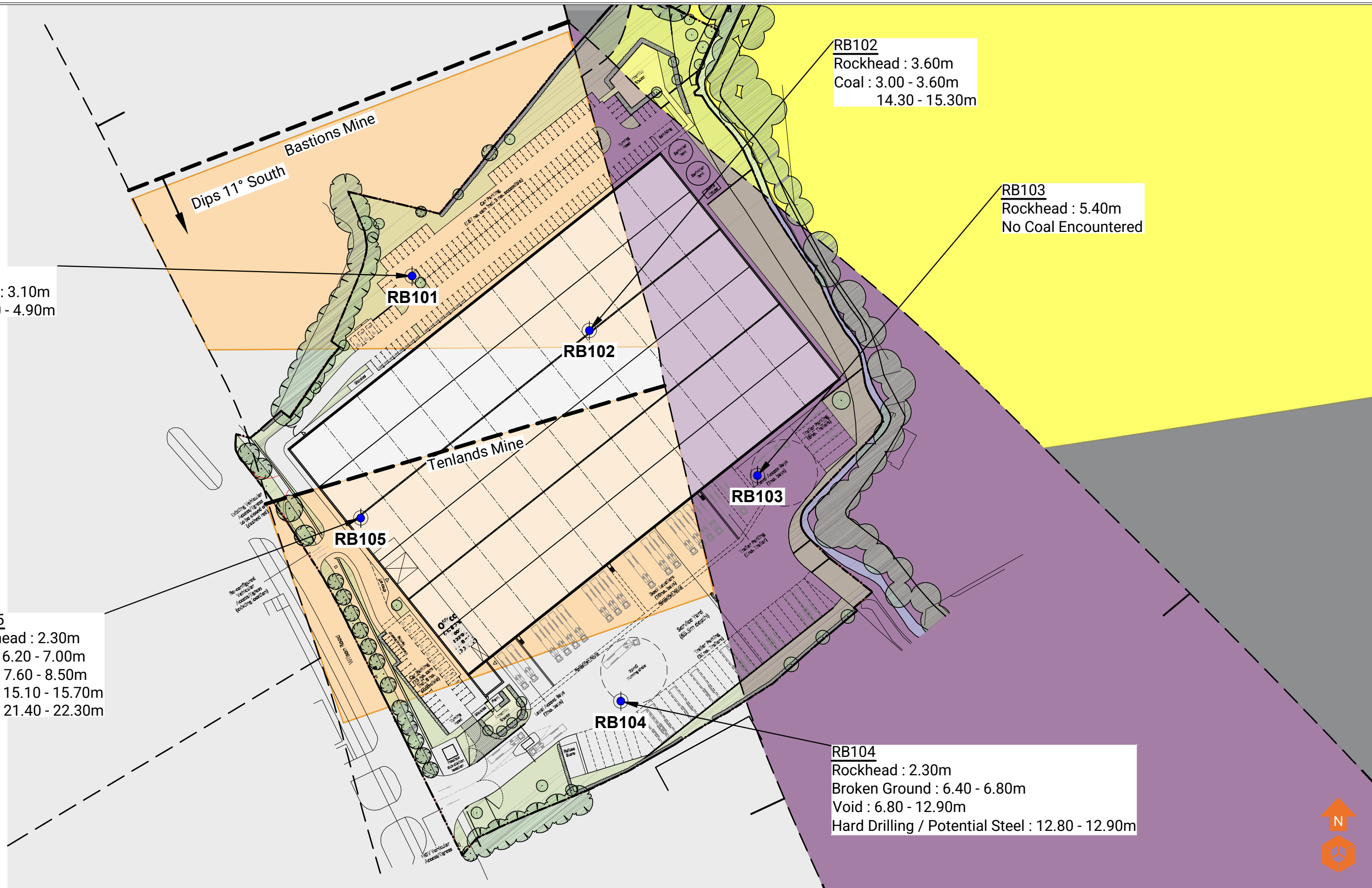
Client:	
DJL Construction NW Ltd	
Job Title:	
Wilson Road, Huyton	

Job No:	18-824	Date:	18.05.2026
Drawing No:	012	Scale:	NTS
Drawing Title:		Depth Of Bedrock Plan	



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Location Symbols
Approximate Rotary Borehole Location

Key
Zone Of Possible Shallow Workings
Etruria Formation - Mudstone, Sandstone And Conglomerate
Pennine Middle Coal Measures Formation - Sandstone
Pennine Middle Coal Measures Formation - Mudstone, Siltstone And Sandstone
Pennine Lower Coal Measures Formation - Mudstone, Siltstone And Sandstone
Coal Outcrop
Geological Fault

Notes:					
P1	REVA	18.05.2026	TG	NS	NS
Phase	Issue	Date	Drawn	Checked	PM

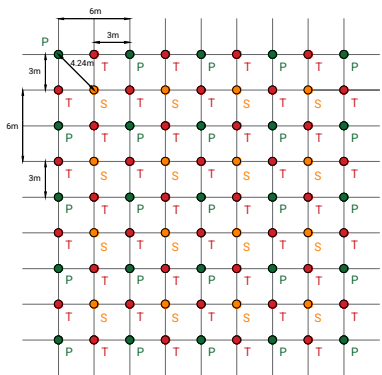
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Job Title:	
Wilson Road, Huyton	

Job No:	18-824	Date:	18.05.2026
Drawing No:	018	Scale:	NTS
Drawing Title:		Coal Mining Issues Plan	

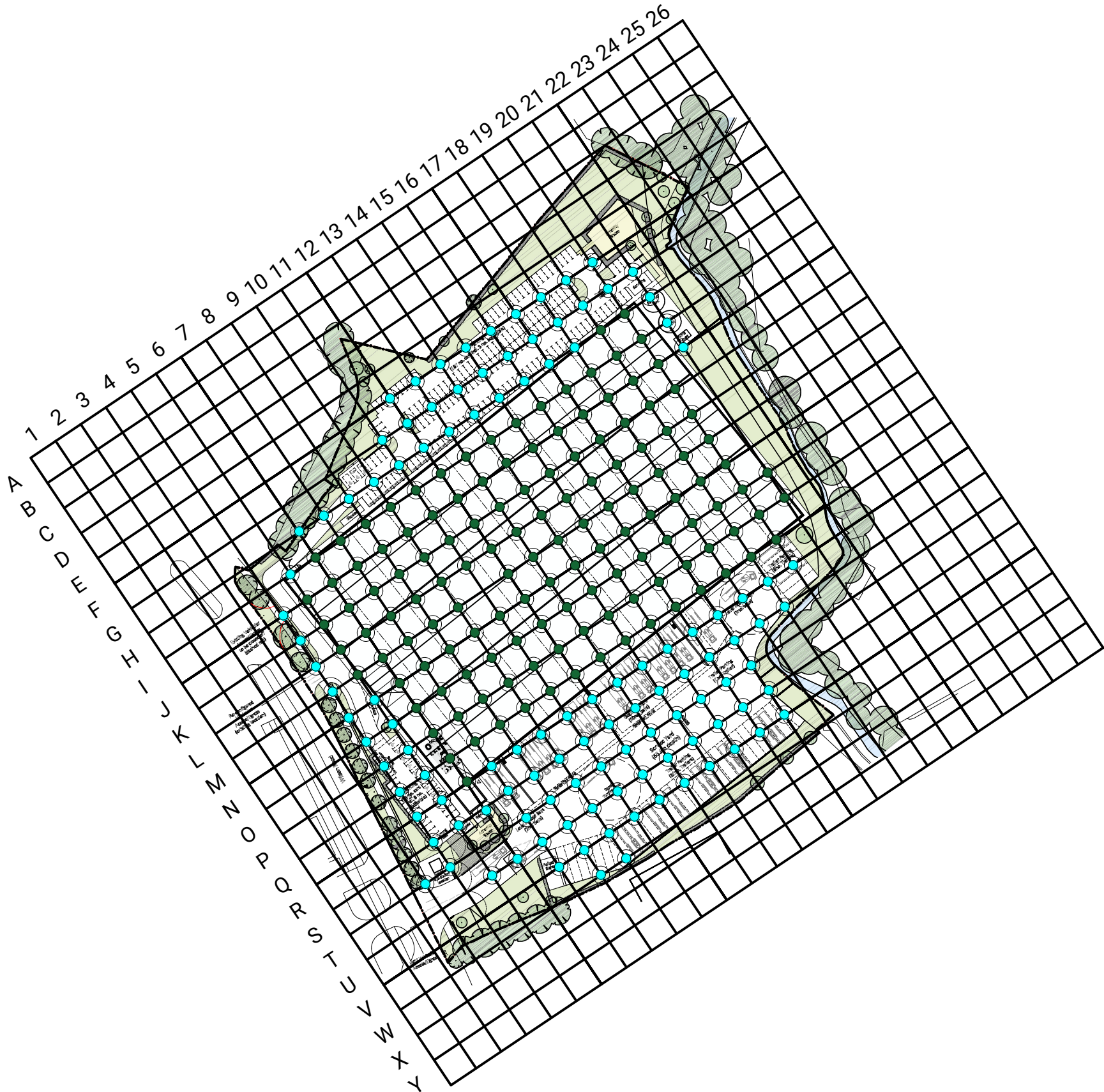


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- Typical detail on hole where grout take is high:
- P= Working identified in primary 6m grid. Where grout take is high and completion pressure cannot be achieved within a grout hole.
 - S= Secondary grid holes to be drilled and grouted where evidence 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
- Drill and Grout Locations - Structure 12x12m Grid
 - Drill and Grout Locations - External 12x12m Grid
 - 12 x 12m Grid

Notes:					

P1	REVA	26.05.2026	TG	NS	NS
Phase	Issue	Date	Drawn	Checked	PM

Client:
DJL Construction NW Ltd

Job Title:
Wilson Road, Huyton

Job No:	18-824	Date:	26.05.2026
Drawing No:	023	Scale:	NTS

Drawing Title:
Drill And Grout Plan



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