

Scheme title: Residential development off Lingards Road,
Slaithwaite

Structure title: Road 2A Highway mass concrete burr wall

Struc Ref:-

Rev 0–Jan 24

APPENDIX C

ADDITIONAL INFORMATION

2.0 THE SITE

- 2.1 The site is located on land to the north of Lingards Road, Slaithwaite and lies around OS Grid Reference 407300, 413350. A site location plan is attached in Appendix A at the rear of the report.
- 2.2 The site is irregular in shape, with the southern boundary fronting onto Lingards Road. To the north and east the boundary is formed by the adjacent residential properties. To the west of the site is open field. The site area is approximately 2.1ha including the proposed P.O.S.
- 2.3 The site is divided into four separate grassed fields by dry stone walls with gated access between the fields allowing access throughout site. Access to the site is from Lingards Road in the south east of the site. At the time of the site investigation, the access area has been built up in crushed stone to form a level compound area to allow the access of plant to site, and currently contains a site cabin and some construction materials.
- 2.4 The central largest field is divided in two by an open watercourse in the northern third of the site crossing from west to east. A marshy area is noted in the south west of the field. The two fields to the west of the central field were also noted to have large marshy areas. At the confluence of the three fields there is a mature tree and a partially buried water tank. The small easternmost field contained a stable and was used for horse grazing at the time of the investigation, the remainder of the fields contained no livestock.
- 2.5 The boundaries to the site are formed by a mix of dry stone wall and post and wire fences.
- 2.6 The site initially falls steeply from the southern boundary with Lingards Road before recusing to an average grade of 1 in 4.5 to 1 in 6 towards the northern boundary. A high point of 203.13m AOD is recorded in the south western corner of the site with a low point of 170.65m AOD in the north western corner.
- 2.7 It was noted that there was a ripple effect to the topsoil on the existing slope supporting Lingards Road, indicating small movements within the shallow superficial strata over time.

10.0 CONCLUSIONS AND RECOMMENDATIONS

10.1 GEOTECHNICAL ASSESSMENT

- 10.1.1 The fieldwork generally proved varying depths of superficial clays overlying weathered mudstone or sandstone. For initial design purposes we would envisage a safe bearing capacity of 100kN/m² where foundations are cited into the clay strata and 200kN/m² where foundations are extended onto the solid sandstone or mudstone strata.
- 10.1.2 Due to the steep nature of the site, and varying depth of the underlying clays, we would initially suggest that the proposed two/three storey residential constructions should be constructed on foundations taken through the superficial clay strata and founded entirely onto the underlying mudstone or sandstone strata. The foundation widths will vary dependent upon the line loadings calculated and bearing strata.
- 10.1.3 However, it should be noted that the site is likely to undergo significant cut/fill to suit the new highway and proposed split level units. The design of the foundations will need to take into consideration the proposed finished floor levels in relation to the depth to suitable load bearing strata.
- 10.1.4 All foundations should be placed below a line of 45° drawn up from the base of any services or other structures.
- 10.1.5 Where existing foundations or structures are encountered during construction, these should be totally removed from the excavations to enable the new foundations to be constructed without obstructions.
- 10.1.6 At present it is not anticipated that excessive ground water control measures will be required outside of the marshy area identified in the west of the site. However, it is recommended that a land drainage scheme is established early in the development to prevent overland groundwater flow affecting the lower site areas once the topsoil is stripped. Please note that ground water flows can vary throughout the year and a further assessment should be undertaken if construction work is proposed following a prolonged rainfall event.

10.1.7 A single elevated level of sulphate of 0.72% was recorded in the clay of TP04 at a depth of 1.7m. In addition to this, pH values as low as 4.8 were recorded. This corresponds to a design sulphate class DS-3, ACEC class AC-4, when compared against the BRE Special Digest 1 "Concrete in aggressive ground" in the vicinity of TP04. No other elevated levels of sulphate were recorded, therefore a design sulphate class DS-1, ACEC class AC-2z may be used elsewhere on site.

10.1.8 Wherever any foundations are located near existing or proposed new trees, their foundations must be sited below the root growth zone. Reference should be made to the NHBC standards Chapter 4.2 "Building Near Trees" which provides guidance on foundation criteria, depths and construction. All services should be similarly protected. Plasticity testing of the clays on site has shown them to be of medium volume change potential. It should be noted however that limited clay was encountered in the north of the site, and there were very few trees in the south of the site where the clay was deepest. Additionally, due to the regrading works required, it is recommended that the foundations are taken down to the underlying bedrock.

10.2 GROUND FLOOR SLAB – GAS MEASURES

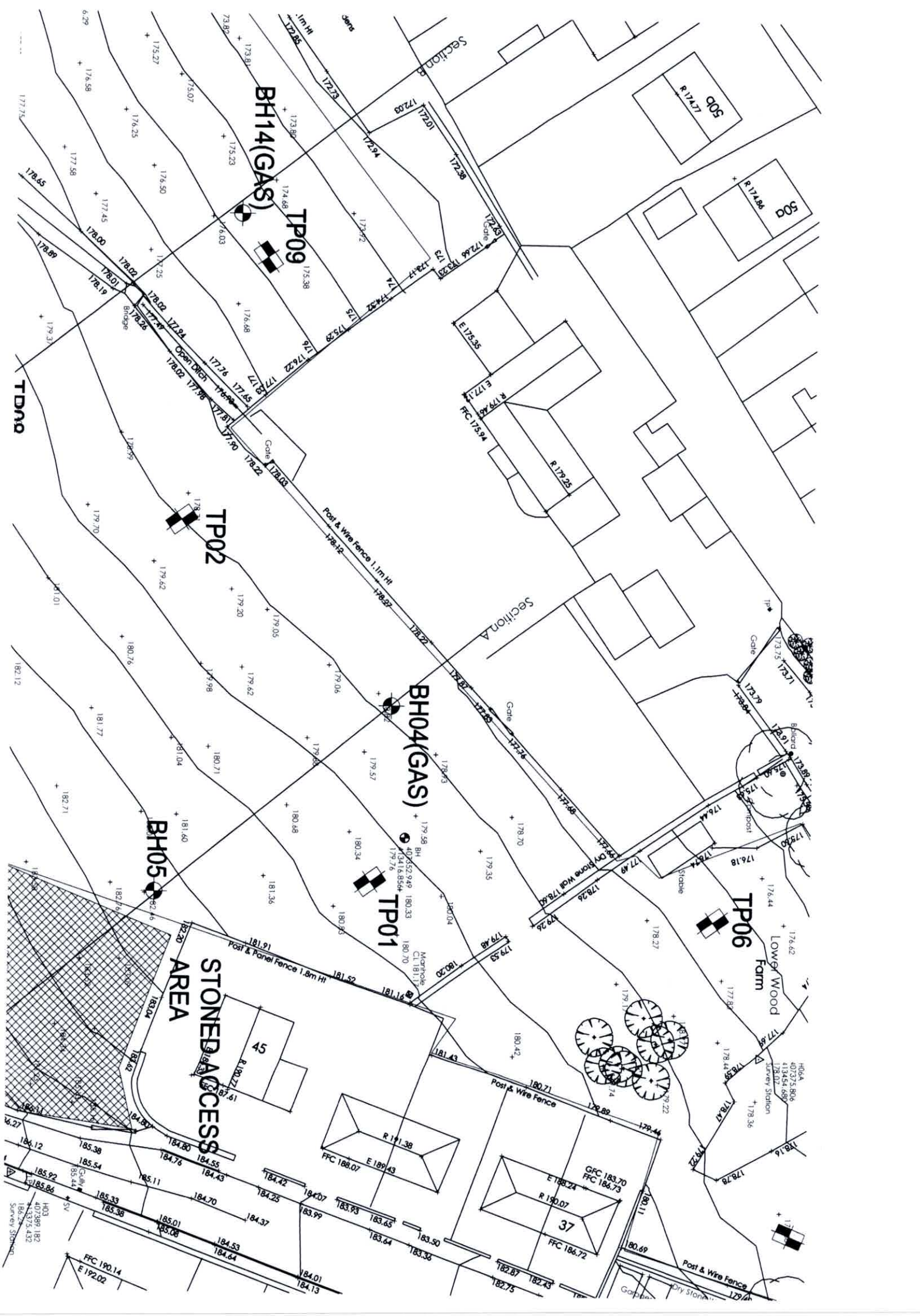
10.2.1 As discussed previously, gas monitoring stations were installed in six of the borehole locations on site due to the possibility of ground gas migration from infilled land in the vicinity of the site.

10.2.2 A maximum steady carbon dioxide concentration of 4.2% was recorded in BH06. No methane has been recorded. No flow rates have been detected on site.

10.2.3 The proposed development consists of low rise residential housing and therefore the gas regime has been characterised in accordance with the traffic light methodology as outlined in *CIRIA Report C665*. Due to the low carbon dioxide levels on site, we would recommend the gas regime on this site be currently classified as **Green** by the NHBC traffic light system, or **CS1** by BS 8485:2015 Table 2.

10.2.4 No Radon Protection measures are required for the site.

10.2.5 A detailed analysis of the results and any gas protection measures required will be confirmed on completion of the on-site gas testing in a separate report.



TRIAL HOLE NO. 1



Haigh Huddleston & Associates

Civil & Structural Engineering Consultants

Firth Buildings, 99 - 101 Leeds Road, Dewsbury WF12 7BU

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Client :	SB HOMES	Job No :	7567
Site :	LINGARDS ROAD, SLAITHWAITE	Date :	18/07/2023

0.0	0.1	Rough grass over light brown loamy topsoil with occasional gravels. Sample taken at 0.1m.
	0.2	
		Soft/firm very sandy orange brown clay.
0.5	0.5	Firm slightly sandy orange brown clay with occasional gravels of sandstone. Sample taken at 0.8m.
	0.8	Firm slightly sandy orange brown clay with occasional gravels of sandstone. Sample taken at 0.8m.
1.0		
	1.3	Soft/firm grey/brown slightly sandy clay with occasional sandy gravels and cobbles.
1.5		
	1.7	Firm grey boulders clay.
	1.9	Firm brown grey clay with occasional gravels of sandstone.
2.0		
	2.5	Very weak light grey highly weathered mudstone excavated as small angular gravels.
	3.0	
	3.5	
	4.0	

REMARKS:

Ground water encountered during excavation

NO

Sample taken

YES at 0.1 and 0.8m.

Sides of excavation remained stable

YES

Level

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NOTES:

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Haigh Huddleston & Associates

Civil Structural Engineering Consultants

Equipment & Methods		Client: SB HOMES						
		Site: LINGARDS LANE, SLAITHWAITE						
BOREHOLE No. 04		Ground Level				Date: 10/07/2023		
Co-ordinates:								
Description	Reduced Level	Legend	Depth (thick)	Sample/Tests				
				Depth	Sample Type	No.		
Clay			1.4 (1.4)					
Mudstone			1.8 (0.4)					
Sandstone			4.0 (2.2)					
Remarks Soilmec 400 Standpipe fitted 1m plain, 3m slotted								Logged by
								Scale
								FIG

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Coal Mining Search Report

Incorporating Cheshire Brine Enquiries

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Serial Number 309290

Your ref : 7364

Purchaser :

Vendor :

In accordance with your instructions received 02 Dec 2014 we have inspected plans and records of coal mine workings and have made enquiries with respect to Cheshire brine extraction in relation to the above property and can report as follows :

1. SEAM DETAILS FOR PAST UNDERGROUND COAL MINING : In relation to the property the undermentioned seam(s) have been worked within the likely zone of physical influence on the surface.

Seam	Depth (m)	Sect (cm)	Date	Remarks
See Remarks				No previous recorded coal workings

2. SEAM DETAILS FOR CURRENT AND FUTURE UNDERGROUND COAL MINING : The undermentioned seam(s) are currently being worked, or licenses to work are being determined, or have been granted to work, within the likely zone of physical influence on the surface in relation to the property.

Seam	Depth (m)	Sect (cm)	Date	Remarks
				No future workings likely.

3. UNDERLYING GEOLOGY :

The property is situated in an area of Gritstones.
Conjectured faulting at the surface.

4. OPENCAST COAL MINING :

Past Opencast Workings : The property is not situated within the boundary of a former opencast coal mining site.

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Present Opencast Workings : The property is not situated within 200m of the boundary of a currently operating opencast coal mining site.

Future Opencast Workings : The property is not situated within 800m of the boundary of an opencast site for which a license to extract coal by opencast methods has been granted or a license to do so is currently being determined.

5. SHAFTS, ADITS (MINE ENTRIES) AND ADDITIONAL INFORMATION :

We have no knowledge of any shafts or adits within 20 metres of the property or the boundary of the property.

There are no tips or lagoons in the vicinity of the property.

6. NOTICES IN RELATION TO FUTURE COAL MINING ACTIVITY :

We have no knowledge of any intention to work coal by underground methods within influencing distance on the surface in the vicinity of the property for which notices have been issued under the Coal Mining Subsidence Act 1991.

7. PAST COAL MINING RELATED SUBSIDENCE :

Our investigations have shown no evidence of coal mining related subsidence claims in relation to the property in the past 10 years.

8. CONCLUSION (COAL MINING) : In the light of the above facts we conclude that in relation to coal mining :

In our opinion it is unlikely that coal will be worked in the foreseeable future.

COAL MINING RISK LEVEL : We recommend that the transaction is treated as :

Where this report is to be used for development purposes particular attention is drawn to the paragraphs below concerning the ownership of in situ coal, coal workings and the risks from mine gases.

Please note that the overall coal mining risk level above is based upon an assessment of the detailed information contained in the body of the report. The risk assessment must be used in conjunction with the detailed report.

If development of the property is being considered then all necessary enquiries and investigations should be completed prior to the commencement of works to ensure that proposals follow good engineering practice for development in mining areas. The Coal Authority has ownership of in situ coal, coal mines (both current and disused) and coal mine shafts and adits. Activities that intersect, enter or disturb any of the Coal Authority's interests require the written permission of the Authority.

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Any development proposals should consider risks to the development, or adjacent property, of generating or displacing underground gases where coal seams or former mining works are disturbed. The need for effective measures to prevent gasses entering public properties should be assessed and properly addressed. These actions are necessary due to the public safety implications of development in these circumstances.

CHESHIRE BRINE EXTRACTION INFORMATION :

The property lies outside the Cheshire Brine Compensation District as prescribed by the Cheshire Brine Pumping (Compensation for Subsidence) Act 1952.

With respect to coal mining there is nothing to prevent a claim being made under the provisions of the Coal Mining Subsidence Act 1991 and subsequent legislation, but it must not be inferred that the Coal Authority or their licensees will necessarily accept that any damage has been caused as a result of mining subsidence.

If you require any further information or amplification please contact CoalSearchPlus+ on 01423 529911 or via our website www.coalsearch.plus.com.

This report is prepared in accordance with the CoalSearchPlus+ terms and conditions as published on the CoalSearchPlus+ website (www.coalsearch.plus.com) on the date of issue of this report.

This is a Coal Mining Search Report and is not to be interpreted as being part of an Environmental Assessment of the property.

We cannot be held responsible for the accuracy of the information provided to us by third party organisations.

The information and/or material supplied is composed from data based in many cases on measurements and records of various standards of reliability and age. We cannot be held responsible for the accuracy of such information.

This search report is based upon the privately owned CoalSearchPlus+ mining record database and plans and records publicly available at the time of inspection from the Coal Authority, including British Geological Survey and Ordnance Survey data. Organisations reserve the right to vary their proposals and intentions as to their future mining operations without prior notice save as provided in the Coal Mining (subsidence) Act 1991 and the Coal Industry Act 1994.

Coal Authority Address : The Coal Authority, 200 Lichfield Lane Berry Hill, Mansfield, Nottinghamshire, HG18 4RG
British Geological Survey Address : British Geological Survey, Kingsley Dunham Centre, Keyworth, Nottingham NG12 5GG

The information contained in this report relates to the property address given by the individual or organisation ordering the report. Where a plan indicating the property location and boundary is supplied with the instruction the report is based on that information. Where no plan is supplied the report is based on the property location as defined in publicly available mapping data. At all times it remains the responsibility of the instructing organisation or individual to define the boundary of the property.

Additional notes applicable to Residential Coal Mining Reports only :

David Bellis Consulting Surveyors Ltd is not aware of any personal or business relationship between the person conducting or preparing the search and any person involved in the sale of the property.

This report is a desk study of existing published geological and coal mining records and the CoalSearchPlus+ coal mining database. In order to compile this report enquiries have been made relating to the following :

Past Coal Mining - the existence of any previously worked seams of coal within influencing distance on the surface in relation to the property including an indication of the location, depth and age of the workings.

Present Coal Mining - the existence of any currently worked seams of coal within influencing distance on the surface in relation to the property including an indication of the location, depth and age of the workings. The existence of coal that could be worked at some time in the future will be enquired into and detail of any relevant licenses disclosed where available.

Underlying Geology - the underlying geology of the property will be reviewed and briefly described in relation to coal mining.

Opencast Coal Mining - the existence of past present and future opencast coal mining, specifically :

- if the property is situated within the boundary of a former opencast site. In the case of old opencast workings it must be understood that records are often unclear regarding the site boundary and/or worked areas. Published records will be reviewed to give our opinion of the existence of relevant former opencast coal workings.
- if the property is situated within 200m of the boundary of a currently operating opencast site.
- if the property is situated within 800m of the boundary of an opencast for which either a license to extract coal by opencast methods has been granted or a license to do so is currently being determined.

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Shafts, Adits (Mine Entries) and Additional Information – the existence of any mine entries within 20m of the property or the boundary of the property and its associated land and buildings (the definition of the boundary of the property is the responsibility of the individual or organisation ordering this report). Where a mine entry is found to exist the approximate location of the mine entry will be indicated on a plan to be provided by the instructing organisation or individual. The existence of unworked coal will be enquired into and our opinion regarding the likelihood of it being worked at some time in the past will be given where relevant. Any other relevant coal mining related features discovered will be noted.

Notices in relation to future coal mining activity – the existence of notices indicating an intention to work coal by underground methods in the future.

Past coal mining related subsidence – if any publicly available records indicate coal mining related subsidence affecting the property in the past 10 years.

Coal Mining Risk Level – the opinion of David Bellis Consulting Surveyors of the risk posed to the property from coal mining given all the information contained in the report. The risk to the property is given in relation to the majority of the housing stock in the immediate area.

Cheshire Brine – the location of the property in relation to the Cheshire Brine Compensation District and any relevant information to the property regarding brine extraction.

Additional information, including answers to many frequently asked questions, can be found on the CoalSearchPlus+ website, www.coalsearchplus.com

Complaints Procedure

David Bellis Consulting Surveyors Ltd is registered with the Property Codes Compliance Board as a subscriber to the Search Code. A key commitment under the Code is that firms will handle any complaints both speedily and fairly.

If you want to make a complaint, we will:

- Acknowledge it within 5 working days of receipt.
- Normally deal with it fully and provide a final response, in writing, within 20 working days of receipt.
- Keep you informed by letter, telephone or e-mail, as you prefer, if we need more time.
- Provide a final response, in writing, at the latest within 40 working days of receipt.
- Liaise, at your request, with anyone acting formally on your behalf.

If you are not satisfied with our final response, or if we exceed the response timescales, you may refer the complaint to The Property Ombudsman scheme (TPOs)

Tel: 01722 333306, E-mail: admin@tpos.co.uk

We will co-operate fully with the Ombudsman during an investigation and comply with his final decision.

Complaints should be sent to:

Mr M. Peace, Director, David Bellis Consulting Surveyors Ltd, 8 Mornington Terrace, Harrogate, North Yorkshire, HG1 5DH
Tel : 01423 529911 Fax : 01423 529922 Email : contact@coalsearchplus.com

Date : 03 Dec 2014

Signed :

Serial Number 309290

**Important Consumer Protection Information**

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The Search Code:

- provides protection for homebuyers, sellers, estate agents, conveyancers and mortgage lenders who rely on the information included in property search reports undertaken by subscribers on residential and commercial property within the United Kingdom
- sets out minimum standards which firms compiling and selling search reports have to meet
- promotes the best practice and quality standards within the industry for the benefit of consumers and property professionals
- enables consumers and property professionals to have confidence in firms which subscribe to the code, their products and services.

By giving you this information, the search firm is confirming that they keep to the principles of the Code. This provides important protection for you.

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Firms which subscribe to the Search Code will:

- Display the Code logo prominently on their search reports.
- Act with integrity and carry out work with due skill, care and diligence.
- At all times maintain adequate and appropriate insurance to protect consumers.
- Conduct business in an honest, fair and professional manner.
- Handle complaints speedily and fairly.
- Ensure that all search services comply with the law, registration rules and standards.
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TPOs Contact Details:

The Property Ombudsman scheme
Milford House
43-55 Milford Street
Salisbury
Wiltshire SP1 2BP
Tel: 01722 333306
Fax: 01722 332296
Email: admin@tpos.co.uk

You can get more information about the PCCB from www.propertycodes.org.uk.

PLEASE ASK YOUR SEARCH PROVIDER IF YOU WOULD LIKE A COPY OF THE SEARCH CODE

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 - b) The Applicant is the Individual, Organisation, or appointed officer of said Organisation placing a Request with the Service Provider.
 - c) The Third Party Provider is any Organisation from which the Service Provider obtains data and/or information on behalf of the Applicant in the normal course of fulfilling the Applicants Request.
 - d) The request is a formal Request by the Applicant with CoalSearchPlus+ to retrieve specific data and/or information.
2. CoalSearchPlus+ accept Requests only on the basis that the Applicant is acting as a principal and is directly liable for payment of our invoice or account.
3. It is the policy of CoalSearchPlus+ to observe confidentiality with regard to the identity and affairs of our customers to the extent permitted by law, but, in common with other service providers, we may be required exceptionally to disclose information to governmental and other public authorities.
4. The placing of a Request by the Applicant with CoalSearchPlus+ confirms acceptance of these terms and conditions.
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6. Orders will be accepted on order forms other than CoalSearchPlus+ forms however these will be accepted under the standard CoalSearchPlus+ terms and conditions only, subject to Clause 10.
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10. It is the responsibility of the Applicant to ensure the accuracy, legibility, clarity and completeness of all data and/or information provided to CoalSearchPlus+ as part of the Request, including but not limited to, names, numbers, addresses, location plans, and boundary plans. This applies whether the Request is submitted on CoalSearchPlus+ order forms either printed or published on the CoalSearchPlus+ website or on the Applicants own order form.
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22. A CoalSearchPlus+ coal mining search report is not a substitute for site investigation or a mining survey. Depending on the content of a coal mining search report, or whether development is intended, the Applicant must decide whether a site investigation or mining survey is required.
23. CoalSearchPlus+ coal mining reports comply with the Search Code.

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27. The Request is fulfilled when all reports, data and/or information requested by the Applicant have been retrieved and/or compiled by CoalSearchPlus+ and delivered by electronic mail (e-mail) or fax or post or document exchange (DX) or a combination of these methods as required by the Applicant. Alternative delivery arrangements are at the discretion of CoalSearchPlus+.
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29. CoalSearchPlus+ is not responsible for any loss or misdelivery of retrieved data and/or information caused by failure of Document Exchange (DX), Royal Mail or internet service provider. Most retrieved data and/or information is archived by CoalSearchPlus+ and a copy may be requested by the Applicant. If the data and/or information could not be archived CoalSearchPlus+ reserves the right to treat the request as a new Request.
30. Delivery, by whatever agreed means, will be accompanied by an invoice. Delivery by electronic mail may be followed up with a paper invoice by post or DX. Where Applicants have agreed account facilities with CoalSearchPlus+ invoicing may be on a monthly basis. In all cases the Applicant agrees to provide CoalSearchPlus+ with remuneration for the full amount shown on the invoice, including all Fees, Taxes and Disbursements.
31. The Applicant will be liable for payment of the full invoice amount within 14 days from the date of receipt of the invoice. CoalSearchPlus+ reserve the right to charge for costs and expenses incurred in recovering late payments and to charge interest at the rate of 8% above the Bank of England base rate per annum for the full period that the payments are overdue.
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35. If the Applicant shall pay in advance of receipt of the invoice, then the Applicant remains liable for any underpayment.
36. Any overpayment on the part of the Applicant will be refunded. Arrangements for refunds are agreed on a case-by-case basis, through discussion between CoalSearchPlus+ and the Applicant.
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43. No variation to these Terms and Conditions is effective unless and until CoalSearchPlus+ expressly agrees in writing.
44. CoalSearchPlus+ reserves the right to alter these terms and conditions as appropriate, without notice, at any time. Such amended Terms and Conditions will become effective upon publication on the CoalSearchPlus+ website.
45. These Terms and conditions are subject to English Law and the exclusive jurisdiction of the courts of England and Wales.

Proposed Development at Lingards Road, Slaithwaite for SB Homes.

Risk Evaluation – in accordance with “Guidance on the Design, Assessment and Strengthening of Masonry Parapets on Highway Structures” .

For masonry parapet over Home Zone cul-de-sac.

A parapet, alongside Road 2a. Parapet wall adjacent to access road, max speed 30 mph. The parapet wall is an unreinforced masonry parapet, the top of which is 4.05m above lower adjacent existing garden levels.

1. It is estimated that the parapet is struck by errant vehicle once every 10 years.

Assume

- a) There is one fatality in each vehicle/pedestrian on lower level, which is either hit by vehicle or falling masonry.
- b) From fig A1 – detached masonry projected 15.5m.
- c) Time taken for block to fall.
$$t = \frac{\sqrt{2 \times 4.05}}{9.81} = 0.9 \text{ sec}$$
- d) Assume 500 vehicle/pedestrian movements/ day adjacent to retaining wall (conservative).

Therefore subject vehicle exposure time, in hours

$$= \frac{0.9}{60 \times 60} = 0.00025$$

Total subject vehicle/pedestrian exposure period =
Subject vehicle/pedestrian exposure period x number of vehicles/hour.

$$= 0.00025 \times 500$$

$$= 0.125 \text{ exposure hours in 24 h period}$$

$$= 0.005 \text{ exposure hours/hour}$$

Frequency of parapet incident, per hour

$$= \frac{1}{10 \text{ years}} = \frac{1}{87,600}$$

∴ Probability of errant vehicle and subject vehicle/pedestrian simultaneous occurrence.

$$= \frac{1}{87,600} \times 0.0037 = \underline{5.7 \times 10^{-8}}$$

Using FAR (Fatality Accident Rate) units of 10^{-8}

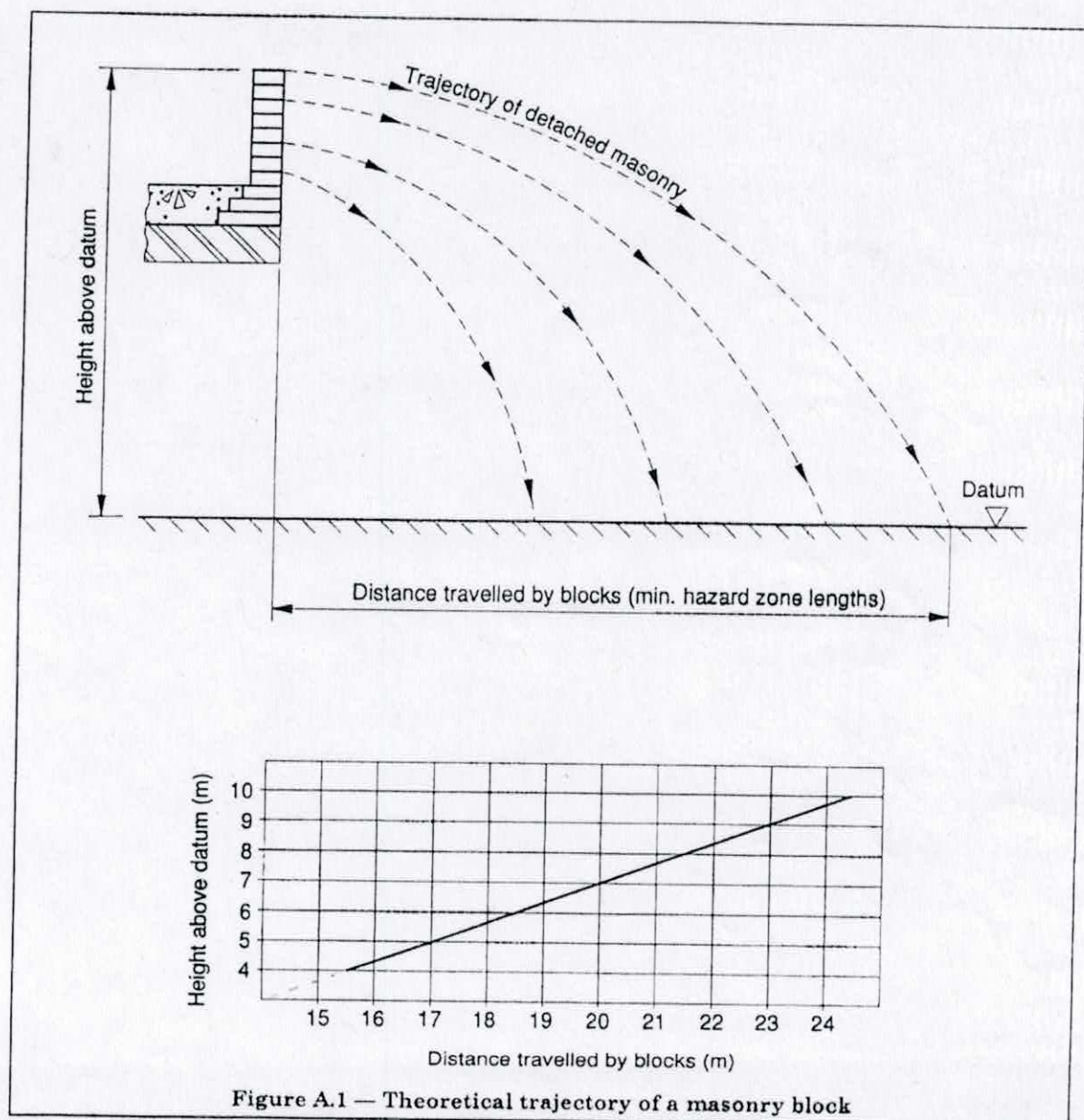
$$\therefore \text{FAR} = 5.7$$

This value is very low on Hambly's Chart and may be considered acceptable.

A.3 Falling masonry and length of hazard

Figure A.1 shows the theoretical trajectory of a masonry block detached from a 1 m high parapet for a range of bridge clearances and an impact velocity of 60 mph.

The chart has been determined from the principles of simple kinematics and has been verified from the slow motion videotape recording of vehicle impact tests. The chart shows only the trajectory of the block before impact and does not allow for post-impact rolling, bouncing or shattering on impact. The user may wish to consider an additional length beyond the hazard zone shown by the chart to form a safety clearance or buffer zone.



Annex A (informative)

Risk assessment related to vehicle impacts on unreinforced masonry parapets

A.1 General

A.1.1 In some instances the effects of a vehicle impact on an unreinforced masonry parapet will result in masonry becoming detached, most of which will fall from the supporting structure into the hazard zone outside the highway. The level of the risk of injury to any occupants of the hazard zone should determine whether such an occurrence is acceptable.

A.1.2 The risk of injury can be assessed on a quantitative basis using a risk evaluation process to determine whether it is within acceptable limits. Factors which will affect the risk evaluation include:

- a) the estimated frequency of parapet impacts which result in detached masonry;
- b) the use and frequency of occupation of the hazard zone.

A.1.3 The use of a risk evaluation procedure based on a method described in a paper by Hambly and Hambly [1] is suggested. The method is based on the calculation of the fatality accident rate (FAR), which is the risk of death per 100 million hours of exposure to the activity. The paper includes a list showing the approximate FAR values some of which are reproduced in the Table A.1 (the higher the number the greater the risk).

Table A.1 — Risk evaluation

Activity	FAR
Travel by bus	1
Travel by car or by air	15
Walking beside a road	20
Travel by motorcycle	300
Travel by helicopter	500

It should be noted that the paper is written in general terms and is not specifically aimed at parapet impacts.

A.1.4 Examples of the use of the method applied to parapet impacts are given in A.4. The following conservative assumptions have been made in the examples:

- a) that any person in the hazard zone will suffer a fatal injury in the event of an impact;
- b) that the parapet impacts being considered all result in detached masonry;
- c) that each impact affects all of the potential hazard zone; this would clearly be excessively conservative for a long bridge where only part of the bridge passed over a public area (e.g. public footpath);
- d) that the parapet impacts occur at a uniform rate throughout a 24 h day, whereas it is thought that most will occur during the hours of darkness when the hazard zones are less likely to be occupied.

A.2 Frequency of parapet impacts

In the examples, the frequency of parapet impacts has, arbitrarily, been assumed to be once every 10 years. When estimating the frequency at a particular site historical records should, if available, be used. However, in the absence of such records an estimate will need to be made taking into account the particular features appertaining at each site.

NOTE From records of one local Highway Authority, which is responsible for the maintenance of approximately 2 000 highway bridges, there were approximately 60 reported accident damages to bridge parapets (all types) over a 12 month period. About 40 of these reported accident damages involved unreinforced masonry parapets, but only about one-third of these resulted in detached masonry. The frequency of parapet impacts resulting in detached masonry could, at many bridge sites, be very much lower than the once every 10 years assumed in the examples in A.7.

Lingards Road, Slaithwaite Parapet Wall – Step-by-Step Justification of Parapet Choice for Road 2A.

The main purpose of the procedure below is to establish that proposed 450mm parapet is neither too weak collapsing under impact, nor too strong deflecting impact energy onto vehicle causing serious injuries to vehicle occupiers.

Road 2a has a maximum speed limit of 30 mph.

1. In the first instance, Guidance on the Design, Assessment and Strengthening of Masonry Parapets on Highway Structures was consulted as the current primary source of guidance on masonry parapets.
2. Due to traffic speed being limited to 30mph, plus risk in accordance with Risk Assessment of Hazard Zone* being very low, plus injury to vehicle occupiers not likely to be significant at 30mph impact speed, the Containment requirement for the site is Low.
*Risk Assessment calculations conform to the format given in "Guidance on the Design, Assessment and Strengthening of Masonry Parapets on Highway Structures".
4. Wind load need not be considered co-existent with impact.
5. Height of parapet determined from "Guidance on the Design, Assessment and Strengthening of Masonry Parapets on Highway Structures".
6. From Fig.2 – for new parapets (hence high mortar adhesion) + impact speed less than 30mph + parapet height more or equal 1.25m, the parapet thickness may be taken as = 225mm.
7. Parameters in "Guidance on the Design, Assessment and Strengthening of Masonry Parapets on Highway Structures" are based on a minimum 10m-long bay of parapet. Hence, the mass of hypothetical 10m-long bay of above parapet = $(0.225 \times 1.25 \times 10.0) \times 2200 = 6187\text{kg}$.
8. In this instance we have a 450mm thick parapet in approx. 10.3m long sections 1.25m high which equates to a mass of 12746kg.

Therefore we propose that a solid 450mm thick masonry parapet is satisfactory in this instance.

