

MM-EC Geoenvironmental Ltd
Langshiell
Westerhill
Perth
PH1 1DH

Our Ref: 10751

Date: 2 September 2015

Mr Ian McFarlane
2 Melville Street
Falkirk
FK1 1HZ

Dear Sirs,

**PROPOSED RESIDENTIAL DEVELOPMENT
LAND ADJACENT TO TAPPERNAIL FARM
COAL MINING RISK ASSESSMENT**

Introduction & Background

MM-EC Geoenvironmental Ltd was appointed by Mr Ian McFarlane to conduct a desk-based mineral stability assessment for a proposed residential development. The site is located to the north east of Shieldhill and is centred approximately on NGR NS 9069 7747.

Sources of Information

The desk-based study included an examination of published geological and mining data together with a Coal Authority Report.

The following tasks were undertaken during the course of the investigation:

- Review of geological maps (NS97NW);
- Review of Coal Authority Report (a copy of the report is appended); and
- Review of mine abandonment plans, economic memoirs and borehole records held at the BGS (British Geological Survey).

Identification and Assessment of Coal Mining Risks

The table below summarises the potential risks associated with coal mining legacy for the proposed development site, identified from the sources listed above.

Coal Mining Issue	Yes	No	Risk Assessment
Underground coal mining (recorded at shallow depths)	✓		Refer below for details
Underground coal mining (possible at shallow depths)		✓	
Mine entries (shafts and adits)		✓	
Coal mining geology (fissures)		✓	
Record of past mine gas emissions		✓	
Recorded coal mining surface hazard		✓	
Surface mining (opencast workings)		✓	

The published geological maps for the area indicate the superficial deposits beneath the site comprise glacial till which typically consists of a stiff sandy clay with rock fragments up to boulder size. An area of made ground is present immediately to the south. The thickness of the superficial deposits is recorded to be in the order of 25 metres.

The underlying solid geology comprises sedimentary strata representative of the Lower Coal Measures. These consist of cyclic sequences of sandstones, siltstones and mudstones with several coal seams. The general dip of the rock strata is to the south or south east at an estimated angle in the order of 7 degrees.

The conjectural outcrop position of the Lower Drumgray (Coxrod) coal seam is recorded across the north east corner of the site.

Two geological faults cross the site trending approximately north-north-west to south-south-east and downthrowing to the west. The throw on the faults is recorded on mine abandonment plans as 9 fathoms (about 16 metres) and 5 fathoms (about 9 metres) for the west and east faults respectively. These faults approximately divide the site into east, central and west zones.

The following general strata section for the area has been determined from the geological map, economic geology memoir and mine abandonment plans:

Stratigraphic Group	Stratum	Approximate Thickness (m)	Comments
LOWER COAL MEASURES	Mid Drumgray Coal (Mid Coal)	0.00 – 0.61	Seam may underlie west edge of site due to faulting. Irregularly developed and not a workable subject in the area of the site.
	Strata	17	
	Lower Drumgray (Coxrod)	1.67 Extracted thickness from mine plans	Expected at shallow depth over the site. Household coal which is recorded as worked beneath the site.
	Strata	12	
	Shotts Gas Coal (Lower Coxrod)	0.00 – 0.28	Not a workable subject in the area of the site.
	Strata	20	
	Mill Coal (Aunchengane)	0.61	Steam coal.
	Strata	13	
	Armadaile Ball (Brighton Main or Ball)	0.61	Overlain by 'Brighton Rock', a 12m thick sandstone bed.
	Strata	9	
	Armadaile Main (Glenfuir or Gutterhole)	0.76m (in leaves)	Steam coal.

The site lies within an area of historic mining activity and within an area known or suspected to contain shallow mining generally within 30 metres of the surface.

There are no records of any abandoned mine entries within the site. The closest mine entry is a mine shaft about 55 metres to the west.

The Coal Authority report states:

The property is in the likely zone of influence from workings in 4 seams of coal at 30m to 120m depth, and last worked in 1956. Any ground movement from these coal workings should have stopped by now.

In addition the property is in an area where the Coal Authority believe there is coal at or close to the surface. This coal may have been worked at some time in the past.

There are no known coal mine entries within, or within 20 metres of, the boundary of the property.

The Authority is not aware of any evidence of damage arising due to geological faults or other lines of weakness that have been affected by coal mining.

There is no record of a mine gas emission requiring action by the Coal Authority within the boundary of the property.

The Lower Drumgray Coal is expected at shallow depth (within 30 metres of rockhead) over the entire site, shallowest in the east on the upthrow side of the geological faults where it would be expected at or close to rockhead. Based on the recorded fault throws it is anticipated that the depth to the seam will increase to about 10-25 metres below rockhead over the central and west portions of the site.

Where thick glacial till soils form the superficial deposits an equivalent rock cover can be added to the solid rock cover using half the thickness of glacial till, discounting the upper 2 metres which are likely to be weathered. The glacial till cover is about 25 metres in thickness and therefore the rock cover (including glacial till contribution) above the workings in the east of the site is estimated to be in the order of 12-15 metres. This would be expected to increase to greater than 20 metres over the remainder of the site.

Based on extracted thickness of 1.67 metres it is considered that insufficient rock cover is present below the east portion of the site such that surface stability could be compromised in the event of a mine collapse. It is considered likely that rock cover over the central and west portions of the site will be such that there would be no impact on surface stability in the event of a mine collapse. The demarcation of the east, central and west zones is dependant on the position and throw of the two recorded geological faults.

The seams below the Lower Drumgray Coal are either not workable or lie at sufficient depth below rockhead such that no further consideration is required.

Mitigation Strategy Proposed

The presence of shallow recorded mineworkings in a single coal seam has been identified as the principal risk to surface stability. The zone of potential instability will be controlled by the position of two geological faults and it is anticipated that the coal seam will increase in depth from east to west across the site.

Areas affected by shallow underground mineworkings may require stabilisation by grout injection or the adoption of special foundation measures. The depth and condition of the recorded mineworkings is uncertain and therefore intrusive site investigation works are recommended in order to further assess the potential risks

The following scope of intrusive work is considered appropriate:

- Up to 8No. rotary boreholes utilising open-hole and core drilling techniques

In areas of past mining activity the possible presence of unrecorded mine entries cannot be completely discounted. It is therefore recommended that all formations exposed during site preparatory and construction work are examined by suitably experienced personnel such that anomalous ground conditions, possibly representing an abandoned mine entry, can be identified, assessed and subject to further investigation if deemed necessary.

Conclusion

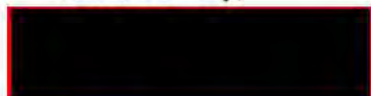
Intrusive investigation works are required to determine the condition and depth of recorded shallow mineworkings which will subsequently inform the design of any remedial work which may be required.

A Coal Authority permit will be required before any drilling work commences.

-ooOoo-

MM-EC Geoenvironmental Ltd wishes to thank Mr McFarlane for the opportunity to prepare this report and trust that it meets with your requirements. However, should you wish to discuss the contents of the report then please do not hesitate to contact the undersigned.

Yours faithfully,



Steven Curran
MM-EC Geoenvironmental Ltd

APPENDIX A: COAL AUTHORITY REPORT

Issued by:

The Coal Authority, Property Search Services, 200 Lichfield Lane, Berry Hill, Mansfield, Nottinghamshire, NG18 4RG
Website: www.groundstability.com Phone: 0345 762 6848 DX 716176 MANSFIELD 5

**MM-EC GEOENVIRONMENTAL
11 WESTERHILL
PERTH
PH1 1DH**

Our reference:	51000979943001
Your reference:	10751
Date of your enquiry:	31 August 2015
Date we received your enquiry:	31 August 2015
Date of issue:	31 August 2015

This report is for the property described in the address below and the attached plan.

Non-Residential Coal Authority Mining Report

TAPPERNAIL FARM, SHIELDHILL, FALKIRK, FK2 0DU

This report is based on and limited to the records held by the Coal Authority, at the time we answer the search.

Coal mining

See comments below

Information from the Coal Authority

Underground coal mining

Past

The property is in the likely zone of influence from workings in 4 seams of coal at 30m to 120m depth, and last worked in 1956.

Any ground movement from these coal workings should have stopped by now.

In addition the property is in an area where the Coal Authority believe there is coal at or close to the surface. This coal may have been worked at some time in the past. The potential presence of coal workings at or close to the surface should be considered prior to any site works or future development activity. Your attention is drawn to the Comments on Coal Authority Information section of the report.

Present

The property is not in the likely zone of influence of any present underground coal workings.

Future

The property is not in an area for which the Coal Authority is determining whether to grant a licence to remove coal using underground methods.

The property is not in an area for which a licence has been granted to remove or otherwise work coal using underground methods.

The property is not in an area that is likely to be affected at the surface from any planned future workings.

However, reserves of coal exist in the local area which could be worked at some time in the future.

No notice of the risk of the land being affected by subsidence has been given under section 46 of the Coal Mining Subsidence Act 1991.

Mine entries

There are no known coal mine entries within, or within 20 metres of, the boundary of the property.

Records may be incomplete. Consequently, there may exist in the local area mine entries of which the Coal Authority has no knowledge.

Coal mining geology

The Authority is not aware of any evidence of damage arising due to geological faults or other lines of weakness that have been affected by coal mining.

Opencast coal mining

Past

The property is not within the boundary of an opencast site from which coal has been removed by opencast methods.

Present

The property does not lie within 200 metres of the boundary of an opencast site from which coal is being removed by opencast methods.

Future

The property is not within 800 metres of the boundary of an opencast site for which the Coal Authority is determining whether to grant a licence to remove coal by opencast methods.

The property is not within 800 metres of the boundary of an opencast site for which a licence to remove coal by opencast methods has been granted.

Coal mining subsidence

The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres, since 31st October 1994.

There is no current Stop Notice delaying the start of remedial works or repairs to the property.

The Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.

Mine gas

There is no record of a mine gas emission requiring action by the Coal Authority within the boundary of the property.

Hazards related to coal mining

The property has not been subject to remedial works, by or on behalf of the Authority, under its Emergency Surface Hazard Call Out procedures.

Withdrawal of support

The property is not in an area for which a notice of entitlement to withdraw support has been published.

The property is not in an area for which a notice has been given under section 41 of the Coal Industry Act 1994, revoking the entitlement to withdraw support.

Working facilities orders

The property is not in an area for which an Order has been made under the provisions of the Mines (Working Facilities and Support) Acts 1923 and 1966 or any statutory modification or amendment thereof.

Payments to owners of former copyhold land

The property is not in an area for which a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

Comments on Coal Authority information

In view of the mining circumstances a prudent developer would seek appropriate technical advice before any works are undertaken.

Therefore if development proposals are being considered, technical advice relating to both the investigation of coal and former coal mines and their treatment should be obtained before beginning work on site. All proposals should apply good engineering practice developed for mining areas. No development should be undertaken that intersects, disturbs or interferes with any coal or mines of coal without the permission of the Coal Authority. Developers should be aware that the investigation of coal seams/former mines of coal may have the potential to generate and/or displace underground gases and these risks both under and adjacent to the development should be fully considered in developing any proposals. The need for effective measures to prevent gases entering into public properties either during investigation or after development also needs to be assessed and properly addressed. This is necessary due to the public safety implications of any development in these circumstances.

Additional Remarks

Information provided by the Coal Authority in this report is compiled in response to the Law Society's Con29M Coal Mining and Brine Subsidence Claim enquiries. The said enquiries are protected by copyright owned by the Law Society of 113 Chancery Lane, London WC2A 1PL. Please note that Brine Subsidence Claim enquiries are only relevant for England and Wales. This report is prepared in accordance with the Law Society's Guidance Notes 2006, the User Guide 2006 and the Coal Authority's Terms and Conditions applicable at the time the report was produced.

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Issued by:	The Coal Authority, 200 Lichfield Lane, Mansfield, Nottinghamshire, NG18 4RG
Tax Point Date:	31 August 2015
Issued to:	MM-EC GEOENVIRONMENTAL 11 WESTERHILL PERTH PH1 1DH
Property Search for:	TAPPERNAIL FARM, SHIELDHILL, FALKIRK, FK2 0DU
Reference Number:	51000979943001
Date of Issue:	31 August 2015
Cost:	£59.00
VAT @ 20%:	£11.80
Total Received:	£70.80
VAT Registration	598 5850 68

Location map



Approximate position
of property



Enquiry boundary

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Key

Approximate position of enquiry
boundary shown

