Technical Note

Project:	Land South of Church Street, Church Gresley	**To:**	St Modwen Developments Limited
Subject:	Coal Mining Risk Assessment	**Prepared by**	Zara Rostance
Date:	October 2013	**Checked by /Authorised by**	Jane Morris/Mark Smith

1. Introduction

St Modwen Developments Limited (SMD) propose to submit a planning application for the proposed residential development at Land South of Church Street, Church Gresley. The application will be submitted for a residential development of up to 306 dwellings, access, parking, public open space, landscaping and associated infrastructure (outline with all matters reserved other than principle means of vehicular access).

Atkins Limited has been commissioned to prepare a Coal Mining Risk Assessment of the proposed development site, in order to provide the Local Planning Authority with information on coal mining and an assessment of its impact on land stability.

2. Site Location and Description

The site is located on the outskirts of the village of Castle Gresley approximately 1.5km from the centre of Swadlincote. The National Grid Reference for the centre of the site is 428020, 318700. Drawing 5064268/001 shows the location of the site.

The site area is approximately 12 hectares. The site is an irregular shape and comprises a series of undeveloped fields of roughly equal size.

A gate provides access through the hedgerow between the two fields. The ground is poorly drained and at the time of the ground investigation was wet underfoot, leading to significant rutting. A ditch runs roughly north-east to south-west direction through the approximate centre of the site, following the line of the hedgerow.

There is a public right of way running approximately north-west to south-east through the approximate centre of the site. Two small stands of semi-mature trees are present within the site, one in the northernmost corner and the second in the eastern field along the southern boundary.

Vehicular access to the site is currently gained from the western corner, which is approached off Church Road along a private tarmac and concrete access road. This leads to light industrial units located to the west of the site, and to the site entrance. There is a second existing vehicular access point in the north of the site at the boundary between the eastern and western fields, which is secured by a padlocked metal gate. The northern gate can be accessed via Silkstone Close.

The site generally slopes down from the west and north-west to the east and south-east. The difference in levels between the western boundary (124mAOD) and the eastern boundary (105mAOD) is approximately 19m.

The site is generally bounded by dense mature hedgerows with wooden and wire fencing (often two fences either side of the hedges). Mature trees and the playing field of St. George's Primary School form the northern boundary and residential properties are present along the north-eastern and north-western boundaries. Semi-mature woodland and an area of marshy / boggy land bound the site to the east. Public footpaths are present beyond all of the site boundaries.

Surrounding Site Area

The area immediately surrounding the site predominantly comprises residential development with some light industrial / commercial properties to the north and west and a mix of open grassland / woodlands to the east and south.

A watercourse/drain is present close to the southern boundary. Church Gresley Woods is located to the south. A large lake is located approximately 420m east with opencast further south and east.

Surrounding ground levels beyond the site boundaries generally slope to the south-east. However, the area immediately adjacent to the north-eastern and south-western boundaries site have been cut and are generally 0.5m to 1.5m lower than the site.

3. Description and Layout of Proposed Development

It is proposed that the site will be developed for a residential use. The application will propose a residential development of up to 306 dwellings, access, parking, public open space, landscaping and associated infrastructure.

The application will be submitted in outline except for means of access, and further details of the precise layout of the development will be the subject of future Reserved Matters applications.

4. Scope of the Coal Mining Risk Assessment

The purpose of this Coal Mining Risk Assessment is to:

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

5. Information Used To Inform This Report

5.1. An up-to-date Coal Mining Report or Ground Stability Report

The Coal Authority Report obtained for the site in April 2013 is included as Appendix A of this Technical note. The findings of the report are summarised below:

- The property is in the likely zone of influence from workings in 9 seams of coal at 150m to 460m depth, and last worked in 1977. Any ground movements from these coal workings should have stopped by now. In addition the property is in an area where the Coal Authority believes there is coal at or close to the surface. This coal may have been worked at some time in the past;
- The property is not in the likely zone of influence of any present underground coal workings;
- The property is not in an area for which a licence has been granted to remove coal using underground methods.
- However, reserves of coal exist in the local area which could be worked at some time in the future;

- There are two reported mine entries within 20m of the boundary of the property. The approximate position of the entries is shown on the plans included in the mining report. The Coal Authority are not aware of any records that record any treatment of the entries;

- The Coal 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;
- The property is within the boundary of an opencast site from which coal has been removed by opencast methods;
- The Coal Authority has not received a damage notice or claim for the property since 31st October 1994. There is no current Stop Notice delaying the start of remedial works or repairs to the property.

The Coal Authority has not received a request to carry out preventive work before coal is worked under section 33 of the Coal Mining Subsidence Act 1991;

- There is no record of mine gas emission requiring action by the Coal Authority within the boundary of the property; and,
- The property has not been subject to remedial works.

5.2. Information obtained from a visit to The Coal Authority's Mining Records Office

Due to the potential for mine working legacy, further information on worked seams beneath the site held by the Coal Authority has been obtained. This information includes a summary if the seams worked and the dates of the working. A copy of the information is included as Appendix A.

5.3. Geological information obtained from the British Geological Survey

Reference to the 1:50,000 BGS Geological Map for Loughborough Sheet 141 (Ref. 2) indicates that drift deposits are absent below the site. The solid geology comprises Pennine Middle Coal Measures Formation typically comprising mudstone, siltstone and sandstone.

A geological fault is shown running through the eastern section of the site trending north-west to south-east with a down-throw to the south-east.

Significant thicknesses of Made Ground deposits are anticipated within the site due to its previous opencast use.

5.4. A Site History Based on Historic Ordinance Survey Mapping of the Area

The site history has been recorded and summarised within the Desk Study Report completed in May 2013 by Atkins Limited and based on the County Series and Ordnance Survey Historical Maps obtained for the site.

An extract of the site history has been included below:

Date	Land Use On-site	Land Use Off-site
1881 – 1883 (1:2,500) 1883 – 1887 (1:2,500) 1884 – 1885 (1:10,560)	The site comprises fields with trees along the field boundaries. A path extends through the site from the west to east (later identified as Railwayside). A mineral railway follows the eastern boundary encroaching into the north-eastern and south-eastern corners of the site.	Church Gresley is to the north. A mineral railway is located close to the southern boundary serving the Church Gresley Colliery approximately 100m west. An old shaft is adjacent the central-western boundary (no longer shown by 1901). Sloping ground (probable spoil mounds), 4No. shafts and 2No. air shafts are recorded at the main colliery Old shaft 340m west. Sewerage tanks 160m north. Albert (brick and tile) Works 340m north-east.
1901 (1:2,500) 1902 – 1904 (1:10,560)	A football ground encroaches into the central-western section of the site Additional railway spur constructed within the north-eastern corner of the site to service Donington Works beyond. No other significant changes identified.	Donington (fire brick) Works established adjacent the north-eastern boundary with an aerial railway extending eastwards to a clay mine (320m east). Church (sanitary earthenware) Works established adjacent the western boundary (redeveloped into housing by 1923). The Railway (sanitary pipe) Works established 60m south of the site. The main building is surrounded by numerous circular structures (chimneys). Clay pit established south of the mineral railway

Date	Land Use On-site	Land Use Off-site
		(30m south). Church Gresley colliery expanded - number of colliery buildings and spoil mounds increased. A reservoir and a small pond are shown 220m and 280m south-west. A number of clay mines and Tile works 400m north-east, brick works, pipe works and clay pit 400m west.
1923 (1:2,500) 1925 (1:10,560)	A small clay pit is shown in the central-northern area of the site. Allotment gardens area present within the north-western section of the site. The football ground is no longer marked.	Donington Works (renamed Church Gresley Works) extended - several chimneys and a reservoir. A second reservoir identified 30m south. Clay pit 30m south extended significantly, tramway established between the pit and the Railway works. (clay pit no longer shown by 1937). The colliery extended significantly - new condenser and clay pit shown. Further away, a mine or air shaft and pumping house recorded 200m north-east and east.
1937 (1:2,500) 1938 (1:10,560)	Clay pit extended (approx. 0.4 ha). No other significant changes are noted.	There is an absence in detail on the 1:2500 maps. The 1:10,000 indicates no significant changes in the surroundings since 1925.
1955 (1:10,560) 1960 – 1961 (1:2,500) 1967 (1:10,560)	The clay pit is now shown as sloped ground with a small pond. A football ground and two features (labelled air raid shelters in 1972) are recorded encroaching onto the north-western edge of the site The allotments are no longer shown	Church Gresley Works and clay pit extended towards the north-eastern boundary of the site. The clay pit 30m south extended significantly, with extensive areas of sloped ground shown. South of the main colliery redeveloped into commercial / industrial uses (200m south-west).
1972 -1975 (1:2,500) 1974 (1:2,500) 1976 – 1977 1:10,00	The football ground is no longer shown. The air raid shelters are recorded as disused. The railway line and mineral railway lines have been dismantled. A clay pit is shown throughout the majority of the site. The 1975 and 1989 maps show (active) opencast coal and clay workings. A cliff/highwall is shown on the western side of the site. A second area of clay pit is possibly indicated in the extreme eastern boundary (relating to an offsite opencast area). The line of a surface water course appears to follow the clay pit outline. This water course disappears in 1974. .	Church Gresley Works disused by 1972 and no longer shown by 1975. A confectionary works is shown adjacent the northern boundary. Spoil heaps and an electricity substation shown beyond the northern boundary. Opencast coal and clay works shown north-east of the site. Clay pit shown beyond the eastern boundary. By 1974 the majority of land to the east of the site comprised opencast workings Spoil heaps are shown beyond the southern boundary. The 1975 map shows these areas as opencast workings and clay workings. The line of a surface water course appears to follow the clay pit outline. This water course disappears in 1974. The colliery is shown as disused by 1972. The buildings have been demolished. .

Date	Land Use On-site	Land Use Off-site
1988 – 1989 (1:2,500) 1980 – 1991 (1:2,500 1986 (1:1,250) 1993 (1:1,250) 1995 (1:1,250) 1996 (1:1,250) 1990 (1:10,000)	The cliff within the opencast is no longer mapped by 1980 suggesting restoration works took place since 1978. The north-western and north-eastern corners of the site are covered with trees. It appears that the site had been restored to current condition by 1986, Paths are shown within the site and along the northern boundary. A drain is shown running north to south through the centre of the site.	By the 1980s, further works, a depot and later a factory (1986) established in the eastern side of the former colliery. A culverted drain/watercourse is present to the east of the site. Drains are shown adjacent the southern boundary. Adjacent the site the workings are shown as disused.
2006 (1:10,000) 2011 (1:10,000)	No changes are shown.	The plan shows the site located on the south-eastern side of Church Gresley, surrounded to the north and west by the village and the east by open space. To the south is Church Gresley Wood. Further disused workings are shown east and a lake 400m south-east.

5.5. Past desk-based assessments of ground conditions for the application site or adjacent/nearby sites

Atkins produced a Phase 1 Desk Study for SMD in May 2013. This includes details on ground conditions and summarises the findings of The Coal Authority Report. The information obtained for this report has been summarised above.

5.6. Results of past intrusive site investigation works undertaken to assess ground conditions for the application site or adjacent/nearby sites

There have been no known historical investigations of this site. Desk Study information indicated that the site has not been previously developed and had only been used for mineral extraction.

A Preliminary Site Assessment Report for SMD was completed in July 2013. The preliminary site investigation was focused on the identification of potential contamination and the depths of Made Ground deposits.

The site is surfaced with grass overlying a thin (generally <0.1m thick) band of clayey topsoil underlain by Made Ground described as cohesive colliery spoil. The shallow colliery spoil generally comprised firm to stiff grey brown occasionally orange and yellow mottled slightly sandy to sandy gravelly clay to depths of generally between 0.65m and 1.0m bgl. This is in turn underlain by firm to very stiff pale grey, grey and dark grey friable slightly sandy gravelly clay with occasional to frequent cobbles and rare boulders.

The natural bedrock was proven at one location (CP1 located in the west of the site) at a depth of 28.5m bgl but was not proven beyond 29.32mbgl. The Middle Coal Measures is described as comprising weak grey mudstone.

The ground-borne gas monitoring and risk assessment has identified elevated levels of carbon dioxide, likely to be generated from the breakdown of carbonaceous material within the backfilled colliery spoil. The data available to date classifies the site a Gas Characteristic Situation 3 / Amber 1, therefore the proposed building will require gas protection measures.

6. Identification and Assessment of Site Specific Coal Mining Risks

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

Coal Mining Issue	Yes	No	Risk Assessment
Underground coal mining (recorded at shallow depths)	✓		Mining was recorded at 150m below the surface of the site. However the Coal Authority report states that any movement from these workings should have stopped by now. Therefore it is not considered that this will pose a risk to the site.
Underground coal mining (probable at shallow depths)		✓	Subsequent open cast works will have removed any shallow seams.
Mine entries (shafts and adits)		✓	Two mine entries reports within 20m of the site boundary. Any potential for impact of being located within the site removed by subsequent open cast working.
Coal mining geology (fissures)	✓		There is an unnamed faults which cross the site.
Record of past mine gas emissions		✓	
Recorded coal mining surface hazard		✓	
Surface mining (opencast workings)	✓		The site is within an area that had been subject to open cast workings.

7. Mitigation Strategy Proposed

From the information available from the Coal Authority report the historical mine workings may not affect the site. According to the Coal Authority report any ground movement from these coal workings should have stopped by now. The site is also recorded as not in the likely zone of influence of any present underground mine workings. However it is the existing faults in the bedrock geology which could cause a potential risk to the development properties of the site.

Previous open cast works within the site has resulted in deep colliery spoil backfill. Colliery spoil has inherent engineering constraints associated with settlement, contamination and gas generation.

A preliminary site assessment report was completed by Atkins in July 2013. This consisted of a ground investigation of trial pits and cable percussion boreholes aimed at assessing the soil contamination and gas regime and the depth and consistency of Made Ground within the site. Bedrock was encountered in a single exploratory hole at a depth of approximately 29m bgl, consisting of unweathered Middle Coal Measures.

The ground-borne gas monitoring has identified elevated levels of carbon dioxide. The data available classifies the site a Gas Characteristic Situation 3 / Amber 1, therefore proposed buildings will require gas protection measures.

Based on the information above it is recommended that a detailed ground investigation is undertaken which includes a geotechnical assessment based on the final development layout.

8. Conclusions

The Coal Authority has confirmed that, although the site is within the zone of influence from nine worked coals seams, any ground movement from the seams identified between 150m and 460m deep and last worked in 1977 is expected to have stopped by now.

The Coal Authority has also confirmed that there are two reported mine entries within 20m of the site, no mine gas issues have been recorded, no damage notices have been received since 1994, and the site does lie within an area reported as subject to previous opencast works.

Attachments and Appendices

Figure 1 – Site Location
Appendix A – The Coal Authority Report and Information
Appendix B – Borehole Logs

FIGURES

APPENDIX A - The Coal Authority Report and Information

APPENDIX B – Borehole Logs