STRUCTURAL REPORT - EXISTING BARN BUILDING

RESIDENTIAL CONVERSION

Middle Barn, Anchor Farm, Elmhirst Lane, Dodworth, S75 4LD

Report Ref: TH/Anchor/Struct/01/Feb2020/v.01

20th February 2020

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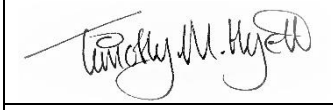
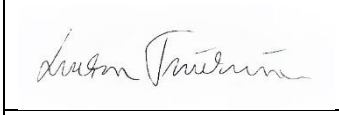
Document Control

Project title	**Middle Barn, Anchor Farm, Elmhirst Lane, Dodworth, S75 4LD.**	**Project Ref**	**TH/Struct/01**
Report prepared by	 Tim Hyett LLM MSc CEng MIEI CGeol FGS Chartered Engineering Geologist		
Approved for issue by	 Lenka Trnikova MA Managing Director		

Issue No.	**Status**	**Amendment Details**	**Approved for issue**
1	Final	-	LT

(i) Terms of Reference

In February 2020, on the instructions of the Planning Consultant (Mr Tom Warren, Prism Agriculture Ltd) acting for the owner (Mr Haywood) Earth-Tech Consulting Ltd were asked to prepare a *Structural Report* on a former agricultural building (Middle Barn) that is the subject of a proposed residential conversion at Anchor Farm, Elmhirst Lane, Dodworth, South Yorkshire, S75 4LD. The development proposal consists of the change of use of an existing building of moderately recent construction (20 to 25 years) to create a dwelling in accordance with a proposed full planning application to Barnsley Council (Ref: tbc).

Fig 1 - Aerial photographs: Middle Barn, Anchor Farm, Elmhirst Lane, Dodworth, South Yorkshire, S75 4LD

The client required a detailed assessment of the general suitability of the building for conversion - in particular, details of its general **STRUCTURAL CONDITION**, specifically relating to any evidence of *historic movement, subsidence, structural cracking* and *major defects* etc.

(ii) Mandatory Guidance

- *BS EN 1997-1: 2004 Eurocode 7 - Geotechnical Design - Part 1.*
- *BS EN 1997-2: 2007 Eurocode 7 - Geotechnical Design - Part 2.*
- *The Environmental Protection Act 1990.*
- *Department for Communities and Local Government, 2012, Nat Planning Policy Framework.*
- *Department for Environment, Food and Rural Affairs, April 2012.Environmental Protection Act 1990, Contaminated Land Statutory Guidance. The Stationery Office Ltd.*

(iii) The Parties

Property	Middle Barn, Anchor Farm, Elmhirst Lane, Dodworth, S75 4LD
Client/Owner	Mr Haywood
Planning Consultant	Prism Agriculture Ltd Mr Tom Warren
Engineering Consultants	Earth-Tech Consulting Ltd Mr T. M. Hyett MSc BSc CEng MIEI, MCIOB

(iv) The Project Site

The site is situated in a rural position off Elmhirst Lane just outside Dodworth, a former mining village in the metropolitan borough of Barnsley in South Yorkshire, England. Historically part of the West Riding of Yorkshire,

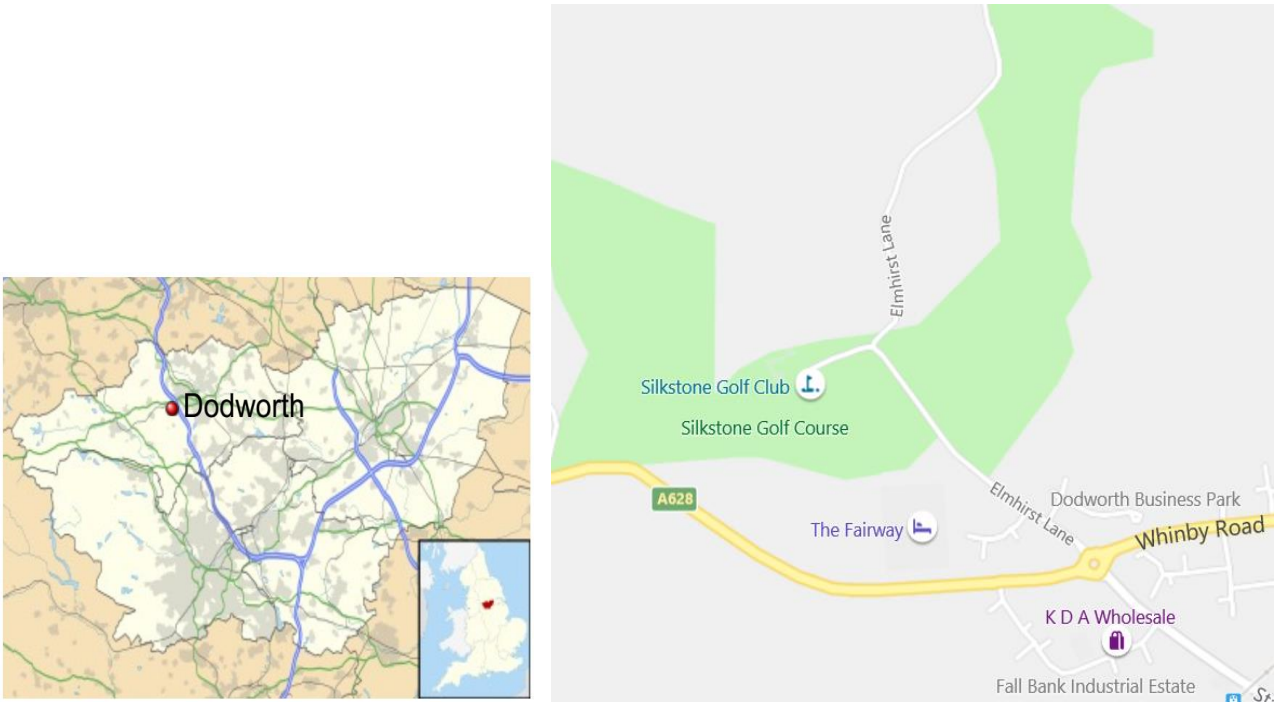


Fig 2 – General Location in South Yorkshire: Middle Barn, Anchor Farm, Dodworth, S75 4LD

Dodworth was historically a township in the ancient parish of Silkstone in the West Riding of Yorkshire. It became a separate civil parish in 1866, and an urban district in 1894.

The main crossroads between High Street, Station Road and Barnsley Road (around 1km south-east of the site) lead directly to Barnsley and Manchester. In ancient history these crossroads acted as a trading point for salt brought from Cheshire during medieval times proving to be one of the oldest trading routes in the area. Along High Street are a number of old weavers' cottages. The urban district and civil parish were abolished in 1974, when Dodworth was transferred to the Metropolitan Borough of Barnsley in the new county of South Yorkshire.

The village and its environs are traditionally associated with coal mining, and the land occupying the former pit is now the Dodworth Business Park, to the south-east of the subject site. The 'muck' stack from the old pit used to be clearly visible throughout the village, and in the 1980s there was a mass planting of silver birch trees to halt erosion and create a wildlife habitat. Over the past twenty years, trees and wildlife have flourished.

The proposed development consists of a single, existing detached non-agricultural storage building in good general order situated within the courtyard of Anchor Farm with proposed private access. The current land use is non-agricultural storage and vacant land, and there is good general curtilage to Middle Barn. The present surfacing consists some concrete and compacted stone and general hardstanding at the entrance. The site is generally level with well-defined boundaries, and there are established rural and semi-rural residential houses in proximity, off Elmhirst Lane directly to the south-west (Field Head Farm Cottages). Dodworth Business Park and Fall Bank Industrial Park lie to the south, with dense residential housing to the south-east, around Station Road and High Street (circa 1km from the site).

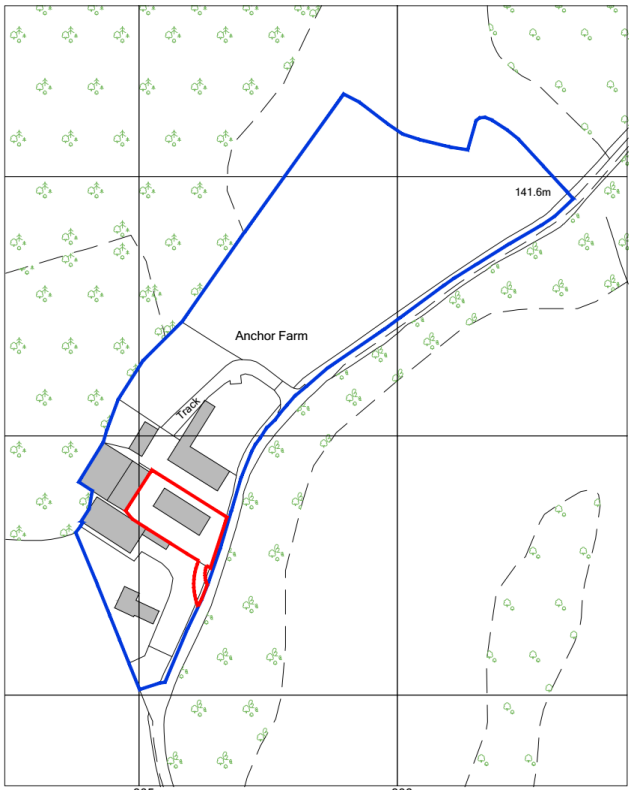


Fig 3 – Block Plan and Photo of the existing former agricultural barn at 'Middle Barn' at Anchor Farm, Dodworth

The footprint of the existing building is rectangular, arranged as part natural stone (lower) and part steel-frame structure with traditional timber infill panels (upper) and slatted timber cladding (rear and sides), with a profile steel standing seam monopitch sloping roof. It is situated within a well-defined, well-established land parcel with good access and well-defined driveway with hardstanding for vehicles and parking etc.

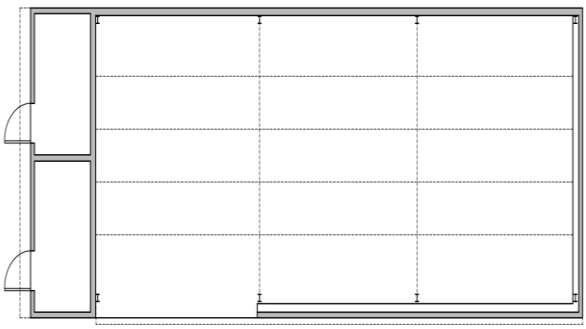


Fig 4 - Existing Floor Plan

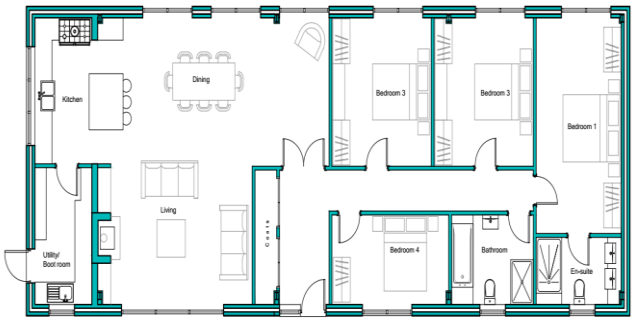


Fig 5 - Proposed Floor Plan

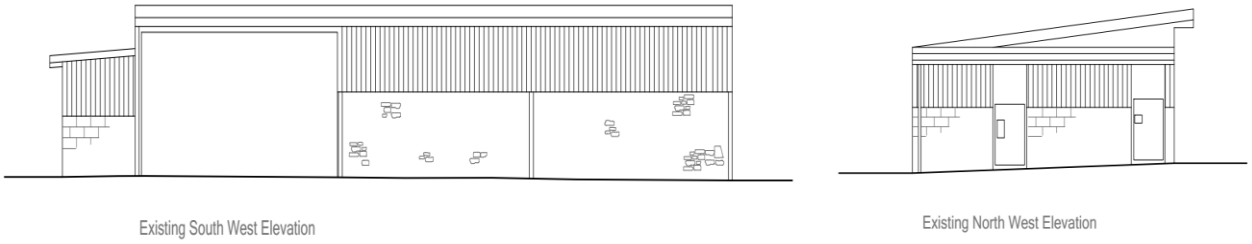


Fig 6 - Existing South West Elevation & North West Elevation

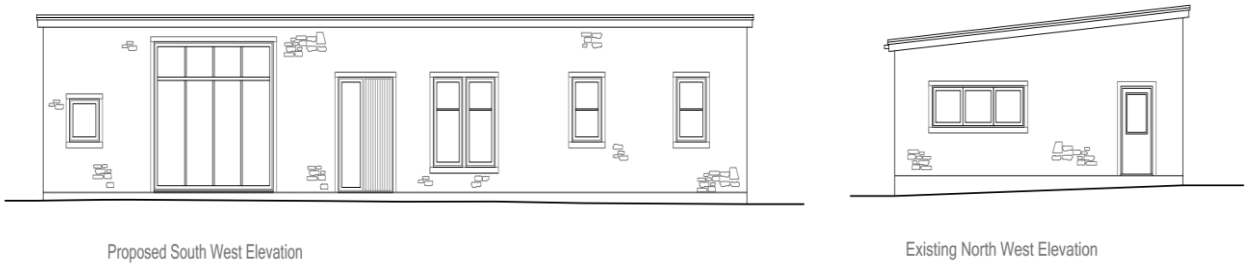


Fig 7 - Proposed South West Elevation & North West Elevation

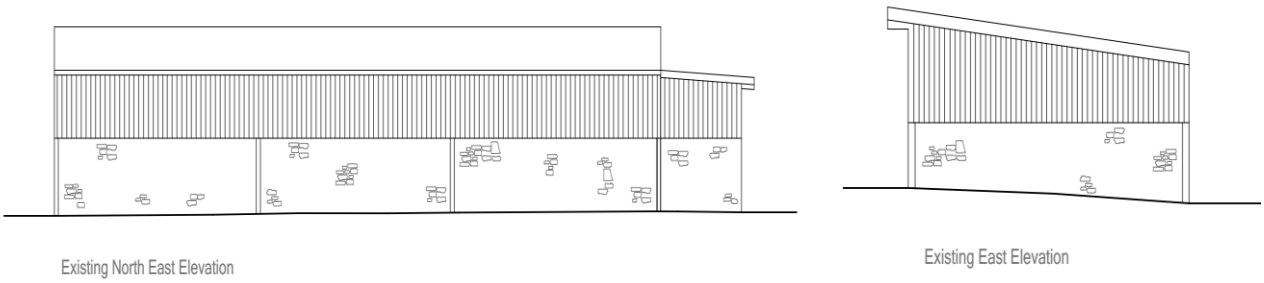


Fig 8 - Existing North East Elevation & East Elevation

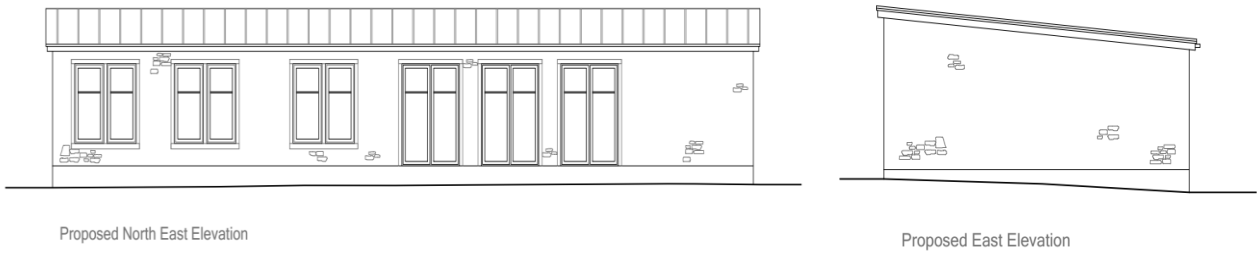


Fig 9 - Proposed North East Elevation & East Elevation

There is evidence that the site has been agricultural in the past (as the name suggests) but the building subject to this application has more recently been used for non-agricultural storage, as such Class Q cannot be used in this instance, and it has been established by inquiry with the current owner that the building has been used for various purposes, mainly for incidental storage to keep the hardstanding areas clear.

From initial research and from consulting historical mapping, the building was approved as an agricultural building in 1997, with agricultural use of the surrounding land from the 1700's.

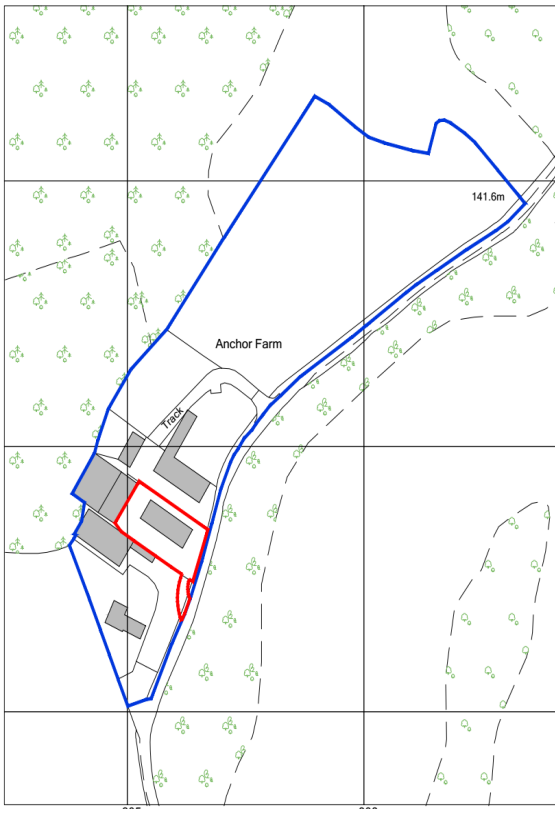


Fig 10 - Block Plan: Anchor Farm, Dodworth, S75 4LD

Fig 11 – Section of adjacent building to be removed if application granted

Prior to 1993 the site was open-fields, and there is no indication (from local knowledge, research, observations or otherwise) that suggests the site has had any other significant previous industrial uses.

(v) Available Information

The following information was made available prior to and during the course of this report:

1. Copies of Land Registry plans showing the property.
2. Historical photographs and miscellaneous information collected by the owner in recent years regarding local coal mining activity thought to have been carried out in the wider area.
3. Access to the site to carry out a detailed walk-over survey and structural inspection.
4. Access to, and the use of a 2t mini-excavator with operator to conduct basic intrusive investigations into the underlying soils, as required.

PART 1 INSPECTION / SURVEY METHODOLOGY

1.0 INTRODUCTION

Structural Survey

It was decided that, in order to meet the client's objectives in a timely manner, the property would be inspected and structurally surveyed by a qualified Chartered Engineer (CEng), and any potential defects recorded so that appropriate repairs could be properly planned, designed and carried out, subject to any conditions attaching to any approved development scheme. Attention was drawn to the overall structural condition of the main elevations of the steel framed building; potential foundation movement, and tolerances/deviations from perpendicular etc., and the question of whether the building was capable of full/partial retention in its current state.

The roof skeleton was also considered, and a basic crack assessment methodology was included, even though there were only partially infilled areas consisting stone or blockwork around the perimeter, in accordance with the accepted industry convention and best practice (see below) for any substantial movement indicators.

Other Indicators

In addition, general information was also requested by the Planning Consultant, including information regarding the land parcel (as a whole) and comments were invited on the likelihood of instability of near surface soils due to natural geological features, land contamination and/or past coal mining activity, and if applicable, how this might 'structurally' affect the proposals for conversion to re-use an existing building in accordance with Barnsley Council's Policy GB3 for a Change of Use of existing building within the Green Belt.

1.1 CRACK ASSESSMENT CONVENTION (if applicable)

Cracks are Indicators

Cracks occur in buildings for all sorts of reasons and the methodology adopted in this report is that cracks in buildings are the ***visual symptom*** of possible problems, not the problem itself.

Cracks are a mechanism for releasing stresses that have built up within a particular structure that will naturally exploit any inherent weaknesses in the building fabric.

Size convention of cracks

Negligible - hairline; with a dimension of less than 1 millimetre. Of little concern other than aesthetic and nuisance.

Slight - over a period of time, if structural movement has ceased and stabilised, cracks that are between 1mm and 5mm in width can normally be dealt with through filling the voids and re-decoration only.

Moderate - 5mm to 15mm; generally requiring building work to remedy; requiring the involvement of a professional to establish the real cause of the cracks; associated problems also likely, perhaps requiring the localised replacement of fractured elements such as cills and lintels. Work may also be required to remedy any associated concerns regarding the weather-tightness of the building that may have been compromised through disturbance of roof coverings and rainwater goods as a result of the movement.

Severe - 10mm to 25mm; usually indicates extensive structural repairs are required; involving possible replacement of affected sections of the building; cracks of this dimension are usually accompanied by a variety of lesser dimensioned cracks. Professional advice is required on the cause of the failure and the extent of remedial work. The installation of interim temporary support scaffolding or propping may also be necessary until the remedial works are carried out.

Very Severe - In excess of 25mm; usually indicates very severe structural damage requiring major repair works that could involve the partial or complete rebuilding of the affected area; structural underpinning may also be necessary due to the danger of associated collapse and instability. Professional advice is required immediately, and the building should not be occupied or inhabited. Temporary support is likely to be required immediately.

Shape convention of cracks

Fine - hairline cracks running across the face of a wall often indicates that a small degree of shrinkage has occurred in the fabric of the wall. Most buildings can accommodate such fine defects without undue concern. These cracks can also be seasonally driven, appearing and disappearing depending on climatic conditions.

Diagonal - stepped cracks often indicates that structural settlement is happening, possibly due to upheaval at foundation level or some other form of change in effective stress in the soil beneath the foundation. If foundation settlement is evident, this type of crack often grows in width with time. Professional advice is usually required at an early stage.

Vertical - often a sign of serious problems; if wide at the top and tight at the bottom this usually indicates that one or both ends of the buildings' foundation are dropping. Vertical cracks also usually indicate that the stresses have been sufficiently severe to crack individual elements (bricks) in the wall to such an extent that could make the broken elements unsafe. Professional advice is usually required at an early stage.

Horizontal - cracks following the masonry beds between brickwork should always be treated with concern and often indicate that walls are in an early stage of failure, particularly if they are retaining walls. Professional advice is usually required at an early stage.

1.2 DAMP, INSECT AND FUNGAL INFESTATION

Rising and Penetrating Damp

In agricultural barns (of any age) where there is no damp-proof course, it is common for buildings to suffer varying degrees of rising and penetrating damp caused by the absence of any form of DPC or DPM: the solid and/or open cavity wall construction and the deterioration of the roof coverings can give rise to water ingress into a building and any exposed wall core. These problems can be resolved by the introduction of solid concrete floors with a DPM (where practicable) on the ground floors and the injection or introduction during refurbishment of a suitable damp-proof course (where practicable) and re-pointing of the external brick/blockwork using a suitable cement mortar (or full/half rendering).

Insect and Fungal Infestation

Buildings of this type do occasionally exhibit varying degrees of *mould growth* (occasional white furry deposits and black spots on timbers) and occasional forms of wet rot in any exposed timbers that have been open to the elements over a period of time [i.e. usually in the form of *Coniophora Puteana* - a brown rot that favours wet conditions produced by persistent water leakage ; *Fibroporia Vaillantii* and other *Poria* species - brown rots that prefer higher temperatures causing cuboidal cracking of the wood where the mycelium appears as white or cream sheets, and strands (aggregations of *hyphae*) remain flexible when dry].

- *Wet rots can be grouped together collectively, and the above are typical building defects associated with old, redundant and dilapidated agricultural buildings that have been left exposed to weather, and in particular heavy precipitation, and have been poorly maintained for a considerable period of time. In all cases the presence of wet rot indicates that the MC (moisture content) of the timber on which they are growing has been well in excess of 20% for a considerable period.*

- *Wet rots are unable to colonise an area away from wet timber. If the source moisture can be eliminated, for example by roof repairs and/or re-roofing and the extensive refurbishment work as proposed, then as MC gradually drops below 20% any significant rot will become quiescent, and eventually die.*

Where observed, appropriate remedial action should be recommended, which usually includes provisions that all structural and non-structural timbers exhibiting signs of wet rot (if present within a building) are removed where practicable during the refurbishment phase, and all remaining and new structural timbers treated with a suitable course of preservative, as a matter of good building practice.

Any but the most serious infestation can be treated very easily during a comprehensive refurbishment program using a simple chemical insecticidal eradicator combined with the careful removal and replacement of defective timbers (or parts of timbers as identified during the construction phase of the works).

PART 2 STRUCTURAL SURVEY

2.0 OBSERVATIONS

The site was inspected on Tuesday 18th February 2020 by Mr T. M. Hyett MSc CEng MIEI CGeol FGS MCIOB, from Earth-Tech Consulting Ltd. The current use of the building is non-agricultural storage and vacant hard-standing. There is good general curtilage and the present surfacing consists concrete, compacted stone at the entrance off Elmhirst Lane. The site is generally level with well-defined boundaries, and there are established settlements to the south and south-west.

The footprint of the existing building is rectangular, arranged as steel-frame with natural stone concrete blockwork infill panels (lower) and traditional timber cladding (upper) with a profile steel shallow pitched roof. It is situated within a well-defined, well-established rectangular parcel of circa 0.15 acres with good access, passing places and hardstanding areas for vehicles, bin store, EV points, bike store and parking etc.

The building is enclosed on four sides with a single opening on the north-west elevation. The external walls are comprised of a mixture of blockwork base with timber and some aluminium steel sheet cladding. The roof is comprised of corrugated metal sheeting, and the main structure is of upright steel portal frames set in mass concrete foundation pads. The upper sections of the external walls are clad in vertical timber cladding. The cladding overhangs both the steel frame and the stone blockwork on all four elevations and the existing roof is covered with modern metal profile sheeting supported by steel columns and timber purlins fixed to the steel portals.

All the primary elevations are generally in good order and are intact, and no sections have collapsed (or) exhibit excessive (or any) signs of foundation failure and/or deviation from plumb.

2.1 SOUTH WEST ELEVATION

On the south west elevation at the (main) front of the building facing the courtyard area the general structure of the building is plumb and exhibits no signs of substantial (or any) movement and/or significant damage.

The structural fabric requires some nominal repairs and alterations but is capable of full retention with no major (or any) areas of deflection and no requirement to remove and/or replace large sections (although there may be a requirement to consider appropriate fire protection etc.).

The adjoining leant-too side at the north west elevation is also in good general structural order, with the main elements all reasonably plumb and exhibiting no serious signs of movement, deflection and/or significant damage.

2.2 NORTH WEST ELEVATION

The roof structure is intact and stable, and whilst there may be some fabric repairs and infilling etc., it should be capable of retention with no requirement to remove and/or replace large structural sections (although there may be a requirement to consider appropriate fire protection etc.).

2.3 NORTH EAST ELEVATION

On the north east elevation at the rear of the building the general structure of the frame is plumb and exhibits no major signs of structural movement and/or damage.

The fabric requires some nominal repairs but in the main it should be capable of retention.

The roof shows no signs of deflection and there is no immediate requirement to remove and/or replace large sections.

2.4 EAST ELEVATION

The north east elevation (viewed from the opposite side) is plumb and exhibits no signs of structural deflection and/or significant damage.

Some alterations will be required but in general the fabric is fully capable of retention with no areas of bulging/deflection and no requirement to repair by any means of disruptive dismantling or rebuilding.

The east gable to side is plumb and in very good general order. It exhibits no signs of structural deflection and/or damage. The gable elevation is fully capable of retention with no areas of bulging / deflection and no requirement for extensive replacement / repairs.

2.5 RISING & PENETRATING DAMP

There is no evidence that the building is suffering from any form of rising and/or penetrating damp caused by the absence of any form of DPC or DPM: the solid and/or cavity wall construction consists medium density concrete blocks, and the roof covering is in very good general order which has prevented any form of water ingress into the building or any part of the wall core. There may be areas that require some attention, but there is no evidence of water penetration, and any future potential problems can be resolved by the injection or introduction during refurbishment of a suitable damp-proof course (where practicable) and re-pointing of the external exposed blockwork using a suitable cement mortar (or half rendering).

2.6 INSECT & FUNGAL INFESTATION

The steel-frame building does not exhibit any signs of *mould growth* of the type usually found on exposed timbers in agricultural buildings (which often manifests as white furry deposits and black spots). There are no structural timber elements within the structure, hence no sign of wet rot in exposed timbers that are often left open to the elements over a period of time (which can sometimes manifest in the form of *Coniophora Puteana* - a brown rot that favours wet conditions produced by persistent water leakage ; *Fibroporia Vaillantii* and other *Poria* species - brown rots that prefer higher temperatures causing cuboidal cracking of wood where the mycelium appears as white or cream sheets, and strands (aggregations of *hyphae*) remain flexible when dry).

2.7 SUMMARY

All the primary structural elements consist of rolled steel joists and columns, and there is no evidence that these have suffered any significant corrosion, and all were observed to be true and plumb with no indication of excessive vertical, side or wind loadings.

The building is in its original condition and of a permanent and substantial construction. There is some (nominal) evidence that it has been repaired periodically in recent years using various corrugated and sheet materials but there was no indication that corrugated asbestos sheet materials have been used. The owner is nonetheless reminded of his obligations under **The Control of Asbestos Regulations 2012** when facilitating future repairs / alterations / modifications etc.

- All the primary elevations are generally in very good order and are intact, and no sections have collapsed (or) sections that exhibit excessive (or any) signs of foundation failure and/or deviation from plumb.

The conversion works will, nonetheless, be extensive - but there is no practical reason why the structure cannot be retained in full and repaired / improved / modified using building best practices in order to meet current building regulations through the addition of internal elements and suitable building fabrics.

PART 3 BASIC GROUND STABILITY ASSESSMENT

3.0 BEARING CAPACITY

During the walkover and site inspection on Tuesday 18th February 2020 it was possible to observe exposed areas of previously disturbed ground and some shallow (nominal) excavations that had been carried out for trenching in electrical power supply for a previously approved Class Q conversion adjacent to the subject building etc. This enabled a basic inspection of the near surface geology, which, along with information collated from the *British Geological Society (BGS)* and from *Groundsure*, we are able to comment on the likely bearing capacity of the soils for the existing foundations and ascertain whether the ground has been adversely affected as a result of its former use. The Groundsure Report GS-6630201 is attached at Appendix A.

Typically, buildings of this type and age are built on concrete pad foundations laid directly onto the subsoils. The walk-over survey and research are considered adequate to provide very basic geological information in order to comment on the general ground stability and the bearing capacity of the foundation soils beneath the structure, based on the observed geological sequence, as follows:

> "TOPSOIL (and some MADE GROUND) around the existing buildings: *brown compacted sandy gravels – gravels are likely to be angular coarse sandstone, occasional brick, ceramic, clinker*." (ARTIFICIAL FILL DEPOSIT) is possible with a thin covering approximately 100mm to 150mm thick, overlying natural *"yellowish brown, firm to stiff silty CLAY with sands and gravels – gravels are angular tabular fine to medium sandstone and mudstone litho-relics."* (GLACIOFLUVIAL DEPOSITS - ALLUVIUM)."

There was no unusual colouration or odours to any of the soils encountered in 'open' and 'exposed' positions and/or nominal excavations during the walkover investigation and no evidence that the site had any previous heavy industrial/engineering use and no visual indicators to suggest the presence of hazardous contaminants in high (or any) concentrations, or any evidence of high (or any) concentration of *oils, lubricants, sulphates, asbestos (chrysotile, amosite, tremolite, actinolite or ferroactinolite), radon gas, methane, high concentrations of carbon monoxide, hydrogen sulphide* or *carbon dioxide*.

From consulting *Geological Map Extracts* from the BGS -*British Geological Survey* the superficial deposits identified at near surface overly the natural bedrock consisting "*Weathered Sandstone*" (GRENOSIDE SANDSTONE and PENISTONE FLAGS SANDSTONE) and "*Weathered, moderately strong Mudstone, Siltstone and Sandstone*" (PENNINE LOWER COAL MEASURES FORMATION). The Penistone Flags is a prominent sandstone which can be expected to have weathered to a gravelly sand or sandy gravel in the near surface.

From consulting *Geological Map Extracts* from the BGS -*British Geological Survey* the superficial deposits that overly the natural bedrock consist loose, unconsolidated glacial soils that have been eroded, reshaped by water in some form, and redeposited in a non-marine setting. Alluvium (also known as *Drift*) is typically made up of a broad variety of materials,

including fine particles of silt and clay and larger particles of sand and gravel. When loose alluvial material is deposited or cemented into a lithological unit, or lithified, it is called an *alluvial deposit*.

Most alluvium is geologically *Quaternary* in age, and typically the cohesive soils present on the subject site originate in the early p[art of the *Quaternary* i.e. the *Pleistocene*, between 1m and 2.5 million years ago. The Quaternary Period is typically defined by the cyclic growth and decay of continental ice sheets associated with *Milankovitch* cycles and the associated climate and environmental changes that took place.

Typical Soil Parameters (from Index Testing)

Bulk Density	1900 Kg/cu.m
Unit Weight (γ)	18.6 Kn/cu.m
Angle of Internal friction	35 degrees
Cohesion	0 Kn/sq.m

Bearing Capacity Factors (Shallow Foundations) - (BS 8004: 1986)

Nc - 47
Nq - 35
Nγ - 40
Approximate Foundation width B – 0.6m
Approximate Foundation depth D – 0.5m

Approximation / Check on Bearing Capacity (after Terzaghi)

$qf = 0.5\gamma BN\gamma + cNc + \gamma DNq$

$qf = 0.5x18.6x0.6x40 + 0x47 + 18.6x0.5x35$

qf = 548.7Kn/sq.m >> than the existing and/or proposed loading and acceptable for domestic usage – therefore O.K

Groundwater was not observed, and it can be reliably assumed that ground water level is significantly below the zone of influence of the existing and/or proposed foundations and there is no evidence of a perched water table or artesian pressure within the soil at shallow depth.

Vegetation on the site was found to be sparse suggesting a mixed soil type with the primary soil type in the overall matrix comprising a high volume of cohesive soil - but there are no major problems envisaged with swelling or shrinkage of soil due to the movement of groundwater and the removal or propagation of trees, vegetation, flora and fauna. Groundwater, whilst not encountered in the location of the foundations can be estimated from empirical data to be in the region of between pH 5.5 – 7.0 representing a *low risk* in terms of acidic ground and potential sulphate attack on concrete and cement mortars. This risk is reduced further by the general absence of groundwater and in particular the absence of movement of groundwater.

3.1 GROUND STABILITY - General

Regarding the **Geology** beneath the site, the Groundsure Geo-Insight Report (Ref: GS-6630201) states:

2.2 Artificial and made ground (50k)

Records within 500m	5

Details of made, worked, infilled, disturbed and landscaped ground at 1:50,000 scale. Artificial ground can be associated with potentially contaminated material, unpredictable engineering conditions and instability.

ID	Location	LEX Code	Description	Rock description
1	17m W	WMGR-ARTDP	INFILLED GROUND	ARTIFICIAL DEPOSIT
2	196m SW	WMGR-ARTDP	INFILLED GROUND	ARTIFICIAL DEPOSIT
3	210m W	WMGR-ARTDP	INFILLED GROUND	ARTIFICIAL DEPOSIT
4	328m W	WMGR-ARTDP	INFILLED GROUND	ARTIFICIAL DEPOSIT

2.10 Bedrock faults and other linear features (50k)

Records within 500m	12

ID	Location	Category	Description
2	17m W	ROCK	Coal seam, inferred
8	188m SW	FAULT	Fault, inferred
12	193m E	ROCK	Coal seam, inferred
13	196m SW	ROCK	Coal seam, inferred
14	201m SW	ROCK	Coal seam, inferred
16	210m W	ROCK	Coal seam, inferred
17	215m W	ROCK	Coal seam, inferred
22	328m W	ROCK	Coal seam, inferred
24	343m NW	FAULT	Fault, inferred, displacement unknown
27	446m NW	ROCK	Ironstone bed, inferred
28	446m NW	ROCK	Coal seam, inferred
29	478m W	ROCK	Coal seam, inferred

Regarding **Radon**, the Groundsure Geo-Insight Report (Ref: GS-6630201) states:

Location	Estimated properties affected	Radon Protection Measures required
On site	**Between 1% and 3%**	**None**

Regarding **Ground Surface Workings**, the Groundsure Geo-Insight Report (Ref: GS-6630201) states:

Records within 250m	0

Regarding **Mining, Extraction & Natural Cavities**, the Groundsure Geo-Insight Report (Ref: GS-6630201) states:

ID	Location	Name	Commodity	Class	Likelihood
1	**On site**	**Not available**	**Iron Ore (Bedded)**	**B**	**Localised small scale underground mining may have occurred. Potential for difficult ground conditions are unlikely or localised and are at a level where they need not be considered**

Regarding **Natural Ground Subsidence**, the Groundsure Geo-Insight Report (Ref: GS-6630201) states:

Location	Hazard rating	Details
On site	**Negligible**	**Ground conditions predominantly non-plastic.**

Location	Hazard rating	Details
On site	Negligible	Running sand conditions are not thought to occur whatever the position of the water table. No identified constraints on lands use due to running conditions.

Location	Hazard rating	Details
On site	Negligible	Compressible strata are not thought to occur.

Location	Hazard rating	Details
On site	Very low	Deposits with potential to collapse when loaded and saturated are unlikely to be present.

Location	Hazard rating	Details
On site	Very low	Slope instability problems are not likely to occur but consideration to potential problems of adjacent areas impacting on the site should always be considered.

Location	Hazard rating	Details
On site	Negligible	Soluble rocks are either not thought to be present within the ground, or not prone to dissolution. Dissolution features are unlikely to be present.

Regarding **Estimated Background Soil Chemistry**, the Groundsure Geo-Insight Report (Ref: GS-6630201) states:

7.1 BGS Estimated Background Soil Chemistry

Records within 50m	**3**

The records of background estimated soil chemistry within 250m of the site boundary are:

Location	Arsenic	Bioaccessible Arsenic	Lead	Bioaccessible Lead	Cadmium	Chromium	Nickel
On site	25 - 35 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	90 - 120 mg/kg	30 - 45 mg/kg
On site	25 - 35 mg/kg	No data	100 mg/kg	60 mg/kg	1.8 mg/kg	90 - 120 mg/kg	30 - 45 mg/kg

For the purposes of this report, C4SLs screening levels (shown below) can be utilised as 'relevant technical tools' to help local authorities when deciding about further assessment of a site i.e. on the grounds that it falls within Category 4 (Human Health). The Impact Assessment which accompanied the revised *Statutory Guidance (Defra, 2012b)* provides further information on the nature and potential role of the C4SLs. Paragraph 47(h) of the IA states that: *'The new statutory guidance will bring about a situation where the current SGVs/GACs are replaced with more pragmatic (but still strongly precautionary) Category 4 screening levels (C4SLs) which will provide a higher simple test for deciding that land is suitable for use and definitely not contaminated land'.*

Analyte	Residential (with home grown produce) (mg/kg)	Residential (without home grown produce) (mg/kg)	Allotments (mg/kg)	Commercial (mg/kg)	PoS (mg/kg)
Arsenic	37	40	49	640	79
Benzene	0.87	3.3	0.18	98	140
Benzo(a)Pyrene	5.0	5.3	5.7	77	10
Cadmium	22	150	3.9	410	880
Chromium (vi)	21	21	170	49	21
Lead	200	310	80	2300	630

A key distinction between the previous guidance (i.e. using *Soil Guideline Values* (SGVs)) and the C4SLs is the level of risk that they describe. The Environment Agency (EA) consider that; 'SGVs are guidelines on the level of long-term human exposure to individual chemicals in soils that, unless stated otherwise, are tolerable or pose a minimal risk to human health'. C4SLs, therefore, should not be used as a legal trigger for the determination of land under Part 2A. As such, the approach taken in this report follows the 2014 CL:AIRE (Contaminated Land: Application in Real Environments) guidance published in the reference document '*Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination*' which lists the C4SLs above.

From research, the *background soil chemistry* and the *indicative soil chemistry from visual observation* suggest levels of contaminants **within the accepted range contained in the guidance in 2014 CL:AIRE** (Contaminated Land: Application in Real Environments) '*Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination*' based on the six C4SLs, with the exception of Chromium, which appears to be elevated considerably. This should be investigated at a later stage in a standard Phase I / Phase II Risk Assessment, as required by the Local Authority.

PART 4 CONCLUSIONS & RECOMMENDATIONS

4.0 CONCLUSIONS

From my Structural Inspection of the Middle Barn at Anchor Farm, Elmhirst Lane, Dodworth, S75 4LD, I can confirm to any third party that there are no observable significant *structural hazards* as at the date of inspection carried out on the 18th February 2020. The building is in good order and the existing structural fabric is suitable for retention and/or conversion in accordance with current building best practice, subject to planning approval.

Externally, there are no observable *structural instability* problems on any of the primary elevations, although the proposal will require a comprehensive scheme of modification works to meet current Building Regulations, subject to planning approval by the Local Authority. A new concrete floor may also be required for damp-proofing purposes.

The proposals do not seek to alter the existing structural capacity of the building considerably, although the works will involve extensive modifications internally and to the facades. If planning approval is granted, the building should be re-inspected by a suitably qualified, competent Building Engineer following initial strip-out and during the conversion works.

In summary:

- **The building is of a permanent and substantial construction, structurally capable of full retention, subject to a suitable engineered scheme of conversion and refurbishment. The existing building does not require any major building works or complete reconstruction.**
- **The building is not currently at risk from any extreme *damp, insect or fungal infestation*, and there is no potential for unexpected settlement during construction due to *compressible loessic soils* or any other external geological feature (from preliminary field observations & research).**

4.1 RECOMMENDATIONS

a. *The Control of Asbestos Regulations 2012* places an obligation on duty holders, if any material of this type is identified during future conversion works:

   - CDM2015 requires arrangements to be in place to deal with asbestos during all construction work, should it be present, including refurbishment projects and especially demolition works. This conversion project is small in scale. However, where construction or building work is to be carried out generally, there is still a requirement to collect project-specific information about the potential for presence of asbestos, so that the risks associated with design and construction work can be addressed. It is not

acceptable to make general reference to hazards that *may* exist. Therefore, site-specific asbestos surveys should be considered in advance of construction work to make sure that the information is available to those who need it.

- No asbestos was observed during this visit, it is well known that asbestos was used extensively as a building material in England and Wales from the 1950's through to the mid 1980's (and farm buildings were often temporarily repaired using ACMs). However, these buildings were erected circa 1996/97 and asbestos is usually present in older buildings. The works on this project consist of *Conversion* works to an existing building.

b. Similarly, should the initial phase strip-out works expose any significant movement indicators, or should any structural concerns be identified as the initial work progresses, it is strongly recommended that the building be re-assessed and the findings evaluated to enable a suitable repair/refurbishment program to be designed to meet any unforeseen eventualities.

TESTIMONY OF INDEPENDENCE

I am a professionally qualified Chartered Engineer and Consultant Engineering Geologist. I am a Fellow of *The Geological Society* (FGS), Member of the *Institute of Engineers Ireland* (MIEI) and Member of the *Chartered Institute of Building* (MCIOB). I hold a post-graduate degree in *Engineering Geology;* a degree in *Mathematics and Physics* and under-graduate qualifications in *Civil Engineering*, and I have more than 30 years of experience working in construction and specialise in the fields of underground space, mining and foundation engineering.

I confirm that under para. 2.E.2 of Appendix 2E of *Planning Policy Guidance Note 14 (PPG14) – Development on Unstable Land, DoE, 1990* I am suitably qualified to make these statements, and I understand that my overriding duty is to present independent and impartial expert analysis, and I believe I have complied with that duty. The facts I have stated in this report are true and the opinions I have expressed are correct and they are entirely my own, based upon the evidence I have been shown and my own observations.

Signed

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Tim Hyett MSc CEng MIEI CGeol FGS MCIOB
Building Consultant & Chartered Engineering Geologist
Earth-Tech Consulting Ltd
20th February 2020

Appendix A

Geo-Insight Report: GS-6630201