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PHASE 1: DESK TOP STUDY REPORT

PROPOSED REDEVELOPMENT

GREENSIDE HOUSE NURSING HOME

GREENSIDE AVENUE

STAINCROSS

BARNSLEY

SOUTH YORKSHIRE

S75 6BB

Project No: 11-281

Prepared By:

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Date:

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Date:

The information and/or advice contained in this Phase 1: Desk Top Study Report is based solely on, and is limited to, the boundaries of the site, the immediate area around the site, and the historical use(s) unless otherwise stated. This 'Report' has been prepared in order to collate information relating to the physical, environmental and industrial setting of the site, and to highlight, where possible, the likely problems that might be encountered when considering the future development of this site for the proposed end use. All comments, opinions, diagrams, cross sections and/or sketches contained within the report, and/or any configuration of the findings is conjectural and given for guidance only and confirmation of the anticipated ground conditions should be considered before development proceeds. Agreement for the use or copying of this report by any Third Party must be obtained in writing from Arc Environmental Limited (ARC). If a change in the proposed land use is envisaged, then a reassessment of the site should be carried out.

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1.0 Introduction July 2011

Arc Environmental Limited has been instructed by Alston Murphy Associates to undertake a Phase 1: Desk Top Study Report for the development of Greenside House Nursing Home, Greenside Avenue, Staincross, Barnsley, which will involve the construction of an 80 no. bed residential Care Home. The primary objectives of the report are to assess the geological and contaminated land conditions on and beneath the surface and a preliminary Conceptual Site Model (CSM) has been developed to define the scope and extent of any further investigation works deemed necessary, prior to commencing with any future redevelopment works. A site walkover (reconnaissance survey) was completed as part of this report with site photographs included within Appendix I, and all relevant observations noted in Section 2.1 below.

2.0 Physical Setting

2.1 Site Details:-

Table 2.1

Site Name & Address:	Greenside Nursing Home, Greenside Avenue, Staincross, Barnsley, South Yorkshire, S75 6BB
National Grid Reference:	433290, 410250 – representing the centre of the site.
Description of Location:	The site is located within the South Yorkshire village of Staincross near Barnsley, c.300m west of the A61 Wakefield Road.
Site Boundaries:	N = Residential properties, S = Playing field and school complex, E = Open Land, W = Cemetery, church, residential properties.
Site Shape & Development Details:	The site is irregular in shape with a site area of c.0.81Ha (Hectares). The redevelopment of the site will involve the construction of an 80 no. bed Residential Nursing Home.
General Topography:	The site topography appears to be generally level although an embankment is present on the northern & western portions of the site. The surrounding topography displays a fall in gradient to the south-west.
Site Surfacing:	Areas around the buildings consist of unmanaged soft landscaping and hardstanding (access roads, footpaths, etc.).
Above Ground Structures:	The existing Greenside House buildings still remain on site, but are no longer in use and boarded up.
Sub-surface Structures & Services:	Foundations will be present on site associated with the buildings currently recorded on site. In addition, services (i.e. electricity, gas, drains, etc.) will also be present..
Summary of Recorded Historical Features:	The site is recorded as undeveloped until c.1991, when Greenside House is located on site.

3.0 Environmental Setting

3.1 Site Geology:-

The geological assessment for this site has been based on records produced by the British Geological Survey (BGS). The following documents have been reviewed as part of this study: -

- Sheet 87, Barnsley, England and Wales, Solid and Drift Edition, 1:50,000 Series.

3.1.1 Made Ground

There is no recorded evidence of made ground on BGS plans. However, limited made ground (i.e. c.<1m) is anticipated to be present associated with the construction of the current development. Any made ground is likely to comprise disturbed natural strata with anthropogenic debris 9i.e. brick, concrete, etc.).

3.0 Environmental Setting (Cont'd)

3.1 Site Geology (Cont'd):-

3.1.2 Drift Deposits

British Geological Survey (BGS) plans indicate that the site is in an area where drift deposits are absent and bedrock is present at or close to the surface. However, limited drift deposits may be present on site associated with the weathering of the solid geological deposits.

3.1.3 Solid Geology

The solid geology underlying the site comprises the Pennine Middle Coal Measures deposited during the Carboniferous Period of the Earth's history, these deposits generally comprise interbedded grey mudstone, siltstone, pale grey sandstone and commonly coal seams, with a bed of mudstone containing marine fossils at the base.

3.2 Coal Mining Assessment:-

British Geological Survey (BGS) the site is shown to be situated within an area where bedrock deposits comprising mudrocks are present at or close to the surface. The Two Foot (T.F.) coal seam is shown to outcrop to the immediate north of the site generally trending from north-west to south-east, dipping in a north-easterly direction, away from the site. BGS plans infer that the shallowest coal seam below the site, based on outcrop positions, is that of the Abdy or Winter (A) seam which is locally split into 3 no. individual leaves. Below the A seam the Kent's Thin (K.N.) seam is shown to be present, but this is not anticipated to be located at a shallow depth or represent a significant risk to the proposed development. The A and K.N. coal seams exhibit similar outcrop patterns to that of the T.F. seam, and also dip in a north-easterly direction. It's worth noting that whilst the T.F. coal seam is shown to the immediate north of the site (outwith the site boundary) depending on the accuracy of the BGS plans this particular seam may also be present below the site at shallow depth.

To aid in determining the risks posed to the site from shallow coal mining activities a Non-Residential Coal and Brine Report was obtained for this site from the Coal Authority. The Coal Authority confirms workings below the site at depths ranging from 120m to 144m and last worked in 1982. Following discussions with the Coal Authority, the workings sited at a depth of 120m are attributable to that of the Top Haigh Moor seam. The Coal Authority also confirm that the property is in an area where they believe there is coal at or close to the surface and this coal may have been worked some time in the past. This corroborates with published BGS plans. It is therefore possible that workings (although, unrecorded) may exist below the site within the A coal seam which appears to be in the form of three individual leaves of coal below this site. Furthermore, depending on the accuracy of the BGS plans reviewed the T.F. coal seam may also encroach below the northern part of the site and may also have been worked at shallow depth in the past.

Given the anticipated depth to both the T.F. and A coal seams it is felt that if workings are evident there would be insufficient competent rock overlying the workings to be able to arrest any potential future void migration and the risk of crown holing / ground subsidence from occurring, as such a series of open hole rotary boreholes should be completed in order to further assess the geo-hazard. Furthermore, if shallow coal workings are present below the site, as a direct result the proposed development could be at risk from Stythe gas. Stythe gas (or black damp) is oxygen deficient air that may contain high levels of carbon dioxide, and is emitted from abandoned mine workings, usually when there is a sudden and prolonged drop in atmospheric pressure.

3.0 Environmental Setting (Cont'd)

3.3 Site Hydrogeology:-

Table 3.1

STRATA	Aquifer / Soil Leachability EA Classification	Comments
Made Ground:	Recorded as Soils of High Leaching Potential (U).	Soil information for restored mineral workings and urban areas is based on fewer observations than elsewhere. Subsequently, a worst case vulnerability classification (H) is assumed, until proven otherwise.
Drift Geology:	Not classified.	Any drift/residual soils present are likely to be of low permeability
Solid Geology:	Secondary A Aquifer	These will be fractured or potentially fractured rocks, which do not have a high primary permeability. Although not producing large quantities of water for abstraction, they are important for local supplies and in supplying base flow to rivers.

- The site does not fall within a Source Protection Zone (SPZ).
- There are no potable water abstraction points within c.1km of the site.

3.4 Site Hydrology:-

Table 3.2

SURFACE WATER FEATURE	Location	Comments
GQA Classified River	None recorded within c.250m.	~
Unclassified Watercourse(s), Canals, Ponds & Lakes	One recorded within c.250m.	An open drain is recorded c.216m to the south-east of the site.
Flooding	The site is shown to fall outwith the designated Flood Zone II & III.	It is recommended that further consultation with the LA and EA should be made with respect to the potential for flood events in this area and to establish local knowledge of periodic flooding, standing water or poor drainage problems.
RAINFALL	**Measurements (mm)**	**Comments**
Annual	824.7	Based on 'station average' records from Sheffield: 1971-2000.
Precipitation, January	86.5	
Precipitation, July	51.0	

3.5 Site Ecology

The site is recorded to be within a Nitrate Vulnerable zone. These are areas of land that drain into nitrate polluted waters, or water which could become polluted by nitrates. This is not considered to be of significant concern when considering the proposed development. See Envirocheck ref. no. 73 for further details.

3.6 Radon Assessment:-

The site lies in an area where between 1 and 3% of homes are above the action level, in accordance with the British Geological Survey (BGS), National Geoscience Information Service and their assessment suggests that the site does not require any radon protection measures for new dwellings.

3.0 Environmental Setting (Cont'd)

3.6 Radon Assessment (Cont'd):-

In addition, a UKradon risk report has been procured for this site in order to further assess the risk of Radon, this report confirms that no radon protective measures are required for the site.

4.0 Industrial Setting

4.1 Recent Site History:-

Copies of old survey plans covering this site area and adjacent land are included in Appendix II, and a summary of the site history based on these plans is provided in Table 4.1 below.

Table 4.1

Date	Scale	Site	Adjacent Areas
c.1854-c.1893	1:2500 & 1:10,560	The site is recorded as undeveloped.	The site is c.50m south of Staincross. **Coal Pits** are recorded c.220m to the south of the site and c.270m to the west. A potential **pond** feature is recorded c.30m to the south of the site and a **Quarry** c.300m north-west. Staincross Hall is c.50m north of the site.
c.1894-c.1907	1:2500 & 1:10,560	Generally as c.1854-c.1893.	The **coal pit** to the south is no longer recorded. **North Gawber Colliery** is recorded c.400m to the south of the site. The surrounding areas have become developed (e.g. housing, public houses, schools, etc.).
c.1918-c.1948	1:2500 & 1:10,560	Generally as c.1894-c.1907.	There are now residential properties recorded to the south-west of the site.
c.1956-c.1983	1:1,250, 1:2500, 1:10,560 & 1:10,000	Generally as c.1938-c.1948.	The **Quarry** to the north-west is now recorded as disused. Staincross Hall is no longer recorded and has been replaced by housing (as of c.1967). The potential **pond** is no longer recorded as of c.1962 (assumed **infilled**).
c.1991-c.2011	1:1,250 & 1:10,000	Greenside House is now recorded on site, with some evidence of cutting around the northern and western boundaries of the site.	**North Gawber Colliery** is no longer recorded a large **tip** is now recorded. As of 2011 this is recorded as disused.

Significant features / potential contamination sources highlighted in **bold** text

4.2 Landfill & Waste:-

The following information relating to landfill and waste has been obtained from the Landmark Information Group, the Environment Agency and from the walkover survey completed;

- There are no active Landfill Sites recorded on or within c.250m
- There are no historic Landfill Sites recorded on or within c.250m of the site
- There is one Licensed Waste Management Facility located c.185m south-west of the site, for 'End of Life Vehicles'. See Envirocheck ref. no. 16 for further information
- Historical infilling may have occurred c.30m to the south of the site associated with the former pond feature recorded. This may represent a potential risk to the proposed development with regards to hazardous ground gases and as such a programme of gas monitoring should be completed to determine the level of risk

4.0 Industrial Setting (Cont'd)

4.3 Statutory Requirements / Authorisations:-

Table 4.2

TYPE	Location	Comments
Local Authority Pollution Prevention and Controls	None recorded within c.250m.	~
Local Authority Integrated Pollution Prevention and Control	None recorded within c.250m.	~
Registered Radioactive Substances	None recorded within c.250m.	~
Prosecutions Relating to Authorised Processes	None recorded within c.250m.	~
Enforcement and Prohibition Notices	None recorded within c.250m.	~
Planning Hazardous Substances Consents/Enforcements	None recorded within c.250m.	~
COMAH Sites	None recorded within c.250m.	~
Contemporary Trade Entries	Sixteen recorded within c.250m.	Eight of these are recorded with inactive status. These are not considered to be a significant risk to the site or the proposed development. See Envirocheck ref. nos. 36-43 for further details.
Fuel Station Entries	None recorded within c.250m.	~

4.4 Pollution Incidents and Discharge Consents:-

Table 4.3

TYPE	Location	Comments
Discharge Consents	None recorded within c.250m.	~
Water Industry Act Referrals	None recorded within c.250m.	~
Prosecutions Relating to Controlled Waters	None recorded within c.250m.	~
Pollution Incidents to Controlled Waters	None recorded within c.250m.	~
Substantiated Pollution Incident Register	None recorded within c.250m.	~

5.0 Conceptual Site Model (CSM)

The Conceptual Site Model (CSM) is one of the primary planning tools that can be used to support the decision making process of managing contaminated land and groundwater on any given site, and allows a better understanding of what needs to be done to achieve risk management, and from this appropriate remediation techniques, if required for those risk management goals can be chosen. This can be done by undertaking a *source-pathway-receptor* analysis of the site. The anticipated *sources*, *pathways* and *receptors* for this site are summarized in Table 5.1 on the following page.

5.0 Conceptual Site Model (CSM) (Cont'd)

Table 5.1

	Sources (S)
S1	Made ground of unknown source
S2	Stythe gas associated with shallow coal workings present below the site.
S3	Potential ground gas migration from infilled pond feature c.30m to the south.

	Pathways (P)
P1	Ingestion
P2	Inhalation of indoor / outdoor air
P3	Dermal contact
P4	Migration through existing services
P5	Direct contact with building materials
P6	Surface run off and leachate Migration

	Receptors (R)
R1	Human health (End Users and construction workforce)
R2	Groundwater (Secondary A Aquifer)
R3	Building materials*
R4	Adjacent sites
R5	Flora and fauna*

* = Not included in the Human Health & Controlled Waters Risk Assessment

A graphical representation of the CSM has been produced for this site and is attached in Appendix IV which sets out the critical pollutant linkages of concern for this particular site, with regard to contamination.

5.1 Geotechnical Considerations:-

The following potential geotechnical issues and hazards have been identified for this site, and these issues should be considered before future development of the site is to take place.

- Actual depth, origin, variability and condition of made ground present on site
- Lateral support could be needed if localised significant thickness of made ground are present below the site
- Control of surface drainage
- Problems relating to the creation of deep excavations for drainage / sewers and the like, if competent bedrock is present at shallow depths below the site
- Possible ground instability from potential unrecorded shallow coal workings below the site

In order to determine the geotechnical considerations above with more certainty, it is recommended that boreholes and associated testing are carried out on this site prior to commencing with any developments in the future. Following this work detailed foundation proposals for future structures can then be prepared.

The information reviewed indicates that the site can be considered as being located within a **MODERATE** geotechnical risk setting.

5.2 Sources of Contamination and Probable Contaminants:-

The historical Ordnance Survey maps and other environmental information have not revealed any significant sources of heavy or gross ground contamination on or adjacent to this site. However, a number of contaminative issues have been highlighted and these are listed below:-

- Potential areas of made ground present on site associated with development of current buildings on site
- Stythe gas rise from below the site where coal workings may be present
- Possible pond feature c.30m south of the site (infilled c.1962) which could be a potential source of ground gas migration

5.0 Conceptual Site Model (CSM) (Cont'd)

5.2 Sources of Contamination and Probable Contaminants (Cont'd):-

It is therefore concluded, that ground contamination testing with groundwater and gas monitoring will need to be incorporated into the design of any intrusive investigation works. Laboratory testing should also be undertaken on representative samples taken from site for naturally occurring contaminants which could have a detrimental effect on building materials.

In consideration of the above and when taking into account the guidance contained in the DEFRA and EA Contaminated Land Reports and the appropriate DoE industry profiles, it would be prudent to test samples of soil from this site for a range of contaminants, as shown on the following page;

Soils – Human Health;

Typically comprising; Arsenic, Cadmium, Chromium (total, III & VI), Copper, Lead, Mercury, Nickel, Selenium, Zinc, Cyanide and Total Organic Carbon (TOC)

At this stage, there is currently no requirement for Total Petroleum Hydrocarbons (TPH's) or Polycyclic Hydrocarbons (PAH's) screening, as there are no potential sources identified. However, if evidence of fuel, oils, solvents etc. or 'ashy' debris are encountered during field works, additional testing for hydrocarbons should be undertaken.

The information reviewed indicates that the site can be considered as being located within a **LOW-MODERATE** ground contamination risk setting for Human Health.

Groundwater / Leachate – Controlled Waters;

The area is underlain by a 'Secondary A' aquifer contained within the solid geology, the site is not located within a Source Protection Zone (SPZ) and there are no groundwater abstraction points within c.1km of the site. If the soils on site have elevated levels of contaminants present, based on the soil screening carried out, then targeted leachate screening can be completed and the risk to controlled waters should be assessed. This can be carried out on an individual analyte by analyte basis.

The information reviewed indicates that the site can be considered as being located within a **LOW** ground contamination risk setting for Controlled Waters.

Similarly, supplementary contamination testing for hydrocarbons (TPH's & PAH's) may also be required of significant 'ashy' debris and/or evidence of fuels/oils are present within the made ground.

5.3 Preliminary Risk Assessment Summary & Recommendations:-

Human Health – There may be a risk to human health from on site sources of contamination associated with any made ground present on site. In addition, monitoring wells should be installed on site in order to assess the potential risk to the site from hazardous ground gases associated with both on-site and off-site sources (i.e. potential shallow coal workings & infilled pond to the south of the site).

Controlled Waters – At this stage it is considered that groundwater beneath the site is considered to be at low risk due to the lack of leachable contaminants and plausible pathways.

5.0 Conceptual Site Model (CSM) (Cont'd)

5.3 Preliminary Risk Assessment Summary & Recommendations (Cont'd):-

Therefore, it is recommended that a Phase 2: Ground Investigation (intrusive investigation) is completed for this site to determine if any ground contamination and / or gases are present on the site which could pose a risk towards the proposed end users or the environment. This investigation should be completed prior to commencing with any future developments and should include for the following or similar investigation works;

- A series of boreholes, including in-situ geotechnical testing (SPT testing) and sampling to assess with slope stability issues and help aid with future foundation design and to collect samples for subsequent laboratory testing
- A series of open hole rotary boreholes, in order to determine the level of risk posed to the site from shallow coal workings
- Installation of a minimum of 3 no. combined groundwater and ground gas monitoring standpipes with an appropriate number of visits in accordance with CIRIA C665. These can be incorporated with the boreholes
- Laboratory geotechnical testing (i.e. particle size distribution (PSD), plasticity, organic matter content, pH & soluble sulphate testing, etc.)
- Generic soil contamination screening on selected samples - typical contaminants detailed in Section 5.2
- Generic leachate contamination screening on selected samples - if elevated levels are recorded within the soils
- Site supervision and production of a factual and interpretive Phase 2: Ground Investigation Report, including a Level 1 Ground Contamination Risk Assessment

The samples of soil collected should be forwarded to UKAS and MCERTS accredited laboratory to undertake the recommended testing.

End of Report

GENERAL REFERENCES

- British Geological Survey: Maps, Reports, Memoirs, etc.
    - Sheet 87, Barnsley, England and Wales, Solid and Drift Edition 1:50,000 Series.
- DoE, DEFRA & EA - Contaminated Land Reports
- Sections of Strata of the Coal Measures of Yorkshire, together with a few sections in the neighbouring counties compiled from Records of Boring and Sinking By A Committee of the Midland Institute of Mining Engineers, 1927.

CLR 1: A framework for assessing the impact of contaminated land on groundwater and surface water. Report by Aspinwall & Co. Volumes 1 & 2. DoE, 1994
CLR 2: Guidance on preliminary site inspection of contaminated land. Report by Applied Environmental Research Centre Ltd. Volume 1. DoE, 1994
CLR 3: Documentary research on industrial sites. Report by RPS Group plc. DoE, 1994
CLR 4: Sampling strategies for contaminated land. Report by The Centre for Research into the Built Environment, The Nottingham Trent University. DoE, 1994
CLR 5: Information systems for land contamination. Report by Meta Generics Ltd. DoE, 1994.
CLR 6: Prioritisation & categorisation procedure for sites which may be contaminated. Report by M J Carter Associates. DoE, 1995
CLR11: Model Procedures for the Management of Land Contamination. DEFRA/EA, 2004
Science Report Final SC050021/SR2: Human Health Toxicological Assessment of Contaminants in Soils, 2009
Science Report Final SC50021/SR3: Updated Technical Background to the CLEA Model, 2009
Science Report SC050021/SR4: CLEA software (version 1.06) handbook, 2009

- BS10175:2001: Code of Practice for the Investigation of Potentially Contaminated Sites
- BS5930:1999: Code of Practice for Site Investigations
- Guidance on Investigation and Assessment for Contaminated Sites (CIRIA SP:103)
- BRE Digest BR211(2007): Radon: Guidance on Protective Measures for New Buildings
- Guidance for the Safe Development of Housing on Land Affected by Contamination, R&D66, 2008 (NHBC, EA, CIEH)
- Methane and Associated Hazards to Construction - CIRIA Reports 149,150,151 & 152
- Assessing Risks Posed by Hazardous Ground Gases to Buildings, CIRIA C665, 2007
- BS8483: 2007: Code of Practise for the Characterization and Remediation from Ground Gas in Affected Developments