6. CONCLUSIONS AND RECOMMENDATIONS

6.1. General

This preliminary appraisal has been performed at land off Carrs Lane, Cudworth, Barnsley, South Yorkshire.

It is understood that BDW are considering developing the site for a low-rise residential end-use, comprising 263 two storey residential properties and 15 bungalows, with private gardens, areas of soft landscaping, Public Open Space (POS), areas of hardstanding, and highways. No loadings or development levels were known at the time of writing.

This report has been compiled to assist with planning purposes for the proposed residential end-use, assuming development levels will remain broadly as existed at the time of the preliminary investigation.

Advice should be sought from appropriately qualified highway and drainage engineers to assess the impact of the site gradient on development aspirations.

6.2. Flood Risk

According to the LIG Envirocheck report and the EA website, the site does not lie within an area at risk from flooding from rivers and sea (Zones 2 or 3).

6.3. Geotechnical

Mining and Quarrying

On the basis of information provided by the CA and inspection of available geological plans, the possibility of shallow unrecorded coal workings affecting surface stability cannot be discounted.

The presence/absence of shallow mine workings needs to be confirmed through rotary probing, to allow determination of any ground consolidation requirements (i.e. drilling and pressure grouting) and foundation solutions.

The CA mining report indicates that no mine entries are recorded to exist within the site. However, the CA mining report and from review of historical OS plans has highlighted the presence of a former mine entry / adit / airshaft located c. 20m to the south west of the site. It is unknown if any steps have been taken to treat the mine entry / adit / airshaft. It is recommended that a soil strip (if considered viable based on the proven thickness of topsoil / made ground present) be undertaken

in the vicinity of the former mine entry / adit / airshaft, along the south western site boundary, as part of the enabling works in order to confirm its absence within the development area.

The possibility of encountering unrecorded mine entries (including bell pits) within the site cannot be discounted, it is therefore recommended that a topsoil strip be undertaken prior to development to inspect for any such features. Additionally all excavations should be examined for evidence of mine entries / bell pits. If a mine entry is suspected works should cease and the advice sought of a suitably qualified consultant.

Inspection of historical OS plans has revealed evidence of a former quarry / quarry high wall to the sites north western / western perimeter, in addition to a number of former sandstone quarries within the vicinity of the site. As such the possibility of encountering unrecorded quarries / opencast workings / pits on site cannot be wholly discounted. It is recommended that all excavations be examined for evidence of such features. If evidence of an infilled quarry / pit / opencast workings is suspected works should cease and the advice sought of a suitably qualified consultant.

With regards to the former quarry high wall located to the sites north western boundary it would be prudent to undertake a visual assessment of the rock face by a suitably qualified Engineer in order to ascertain the stability of the feature and the potential risk of impacting the development site, particularly if residential properties are proposed in its proximity.

Foundations

Published geological information indicates that the majority of the site is underlain by the Glass Houghton Rock - Sandstone unit, with the Pennine Middle Coal Measures (PMCM) shown within the western portion of the site. The Sharlston Low and Sharlston Top Coal Seams are recorded to outcrop on or around the western and eastern portion of the site, respectively.

An unnamed fault, aligned approximately north east / south west, is conjectured to cross the western part of the site, with the downthrow to the north west.

No made ground is shown to underlie the site on published maps, however made ground may be locally identified within the south eastern portion of the site, owing to the presence of former buildings.

No superficial deposits are recorded to underlie the site; however Alluvial Soils are shown on published maps in close proximity (c. 20m) to the west of the site, associated with the presence of Small Bridge Dike.

Foundation solutions are very much dependant on the presence / absence of mined coal within influencing distance of the surface. Assuming that mine workings do not affect surface stability, spread foundations (strip/trench fill) should be viable for lightly loaded structures across much of the site, founded into either the Glass Houghton Rock (sandstone) or the PMCM strata of suitable bearing capacity. However, if mine workings within influencing distance of the surface are identified, ground stabilisation will be required (or coal removal) and alternative foundation solutions may be required.

Alternative foundation solutions may also be required if deep made ground, or loose / soft natural soils i.e. Alluvial Soils are encountered on site.

Overall the nature and depth of foundations will be dependent on loadings, development levels and the detailed site geology, including:

- Location and thickness of made ground or reworked soils.
- Presence/absence of workable coal within influencing distance of the surface.
- Location and extent of any relict foundations and other buried structures.
- Bearing capacity of the natural strata.
- Groundwater levels.
- Proximity to trees where potentially shrinkable soils are present.

A ground investigation is required to confirm ground conditions and foundation requirements.

If mine entries and / or shallow mine workings are proven within influencing distance of the surface, these will need to be treated (see above); additionally foundations may need to be designed to accommodate risk posed by residual movement. Foundation design will depend upon the depth to treated workings.

Reinforcement of foundations which are constructed over the fault (if encountered) may be required.

Other Considerations

Assessment of the suitability / stability of the retaining structure to the sites north western / western perimeter (if to be maintained and incorporated into the proposed development) within context of the proposed development levels is recommended.

Similarly, should earthworks (comprising cut and fill operations) be undertaken at the site, consideration will have to be given to the potential risk of undermining existing neighbouring buildings, adjacent highways and existing slopes.

6.4. Contamination

Risk Evaluation for the Proposed Land Use (Residential with gardens)

The preliminary conceptual site model indicates that pollutant linkages are possible to a variety of receptors. Potential heavy metals, petroleum hydrocarbons, asbestos fibres and pesticides may pose potential risks to human health (construction workers and site end-users) and controlled waters (Secondary A Aquifer / Small Bridge Dike). Risks related to these potential linkages are currently given qualitative assessments of **low through to moderate.** The precise nature of the risks should be investigated further through site investigation.

A Phase II (intrusive) geoenvironmental / contamination investigation should be undertaken to confirm the presence or otherwise of contaminants sources and quantify the risks to identified receptors.

6.5. Hazardous Ground Gases

A risk from hazardous gas sources, including mine gas, landfill gas and marsh gas, located both on and off-site, exists. To confirm the situation regarding hazardous gases on site, from potential on and off-site sources, a hazardous gas investigation would be required to determine the need or otherwise for gas protection measures in future buildings.

According to the BRE, radon protective measures are **not** required for the site.

6.6. Invasive Plants

Invasive plant species were not observed during the site walkover; although parts of the site / field perimeter were overgrown limiting access and we are not ecological specialists. For this reason it