

EXECUTIVE SUMMARY

PHASE II GROUND INVESTIGATION

CHERRY ORCHARD FARM HIGHAM ON THE HILL

Georisk Management Limited has been instructed to carry out a Phase II Ground Investigation for the proposed development scheme at the above site.

Phase I	Comments
Phase I	Reference should be made to the Phase I Geo-environmental Desk Study prepared by Mewies Engineering Consultants Ltd (MEC), report reference 26277-04-DS-01 Rev B dated May 2021. This provides an Initial Conceptual Site Model and provides recommendations for a subsequent intrusive site investigation.
Phase II	Comments
Ground Conditions	Topsoil was encountered across the site to depths of between 0.2 and 0.5 m begl (and commonly around 0.3 m in thickness) and typically consisted of dark brown sandy locally gravelly clay or dark brown clayey sand with rootlets. Superficial Deposits were encountered beneath the topsoil and were proved to a maximum penetrated depth of 5.0 m begl. These deposits typically comprised firm, firm to stiff or stiff brown or reddish brown sandy to very sandy locally gravelly clay with rare bands of brown or reddish-brown sand. Beneath the clay, loose or medium dense brown or reddish brown locally clayey or silty sand was encountered in WS3, WS4, WS5, WS6, WS7, WS8, TP3 and TP6 and directly beneath the topsoil in TP4. Evidence of soft or loose material was encountered at the following locations: • WS1: soft to firm clay at 1.1 to 1.3 m begl; • WS2: soft to firm clay at 0.3 to 0.6 m begl; • WS3: loose sand at 0.9 to 2.0 m begl, very soft clay from 2.7 to at least 3.0 m begl; • WS4: soft to firm clay at 0.3 to 1.0 m begl, loose sand from 3.4 to at least 5.0 m begl; • WS5: soft to firm clay at 2.0 to 2.8 m begl, loose sand at 3.2 to 4.0 m begl; • WS8: very soft becoming soft to firm clay at 2.0 to 2.5 m begl, loose sand from 2.5 to at least 3.0 m begl.
Contamination	No visual/olfactory evidence of potential significant contamination was recorded during the fieldwork.
Groundwater	Groundwater was encountered across much of the site during the fieldwork at depths of between 1.5 and 3.8 m begl, with subsequent groundwater monitoring recording standing water levels, where present, between 1.8 and 2.8 m begl.
Soil-Gas	No methane has been recorded during the monitoring programme. Steady state carbon dioxide levels ranged from 0.8 to 3.5 % by volume (% v/v) and a maximum positive gas flow of 0.1 l/hr has been recorded. Ambient atmospheric pressures ranged from 982 to 1016 mb.
Environmental Assessment	Comments
Soil Contamination	All test results for the potential contaminants of concern are below the relevant assessment criteria (S4UL/C4SL/SSV). TPH screening tests were carried out on selected samples of near surface soil and no significant TPH concentrations were detected. Pesticide screening tests were carried out on two samples of topsoil and pesticide levels were below the detection limit of the laboratory testing equipment. Concentrations of phytotoxic metals are present at levels below those considered to present a risk to plant growth.
Risk Evaluation: Human Health	Based on the findings of the ground investigation and chemical test results, no remedial action in respect of risk to human health is considered necessary for the proposed development at the site.
Risk Evaluation: Soil-Gas	From the monitoring results for carbon dioxide, a maximum GSV of 0.002 l/hr has been calculated, which is below the 'Characteristic Situation 1' GSV of 0.07 l/hr. No methane has been recorded and therefore a GSV has not been calculated. The GSV calculated from the monitoring results are indicative of a CS1 classification and the soil-gas levels are below the respective 'Typical Maximum Concentrations'. The ground investigation did not identify any pond infill or Made Ground at the site with natural soil present beneath surface topsoil and no other potential significant sources of soil-gas have been identified. On this basis, a CS1 classification is considered appropriate for the site - gas protection measures are not required for a CS1 classification.

Statutory Consultation	If required to satisfy planning and/or land quality conditions, this report should be submitted to the Local Authority and/or warranty provider for approval before any construction work starts on site.
Geotechnical Assessment	Comments
Foundations	The proposed development is anticipated to comprise traditional low-rise housing. Across most of the site, following site preparatory works, it is considered that conventional strip/trench fill foundations extending into competent Superficial Deposits should be viable for much of the proposed development. <i>Majority of Site</i> Geotechnical testing of the near-surface soil indicates it should be classified as a shrinkable soil of medium volume change potential and; therefore, a minimum founding depth of 0.9 m bgl would need to be adopted in accordance with NHBC Standards ensuring at least 300 mm penetration into competent undisturbed strata is achieved. Foundations near any trees and/or hedgerows would need to be deepened and heave protection measures adopted in accordance with NHBC Standards Chapter 4.2 '<i>Building Near Trees</i>'. Where foundation depths exceed 2.5 m due to tree influence, the NHBC require a design by an Engineer to demonstrate that potential heave uplift forces can be resisted by the foundation and this usually entails the use of a piled foundation. Further ground investigation may be required for pile design purposes. Any proposed deepened foundation dig depths should also be reviewed against the ground investigation data and the potential for encountering loose sands at depth. An alternative foundation solution may be appropriate in this instance. For a strip/trench fill foundation bearing onto firm-stiff Superficial Deposits, an allowable bearing pressure of 100 kN/m² is considered appropriate for design purposes. Due to the variability of the Superficial Deposits (both laterally and with depth) it is recommended that mesh reinforcement is incorporated into all foundation construction to minimise the risk of unacceptable settlement. Total settlements would not be anticipated to exceed 25 mm. Care should be taken to limit the exposure of any excavation prepared to receive concrete, which may cause deterioration and a reduction in bearing capacity. Foundation excavations should be inspected by qualified personnel and if any soft/loose material is encountered at formation level, foundations would need to be deepened further into competent material and infilled with lean mix concrete. <i>Central-Western Area</i> Towards the central and western areas of the site, the Superficial Deposits are typically more variable with soft or loose material near surface that is susceptible to collapse of excavation sides; these locations are identified on Drawing No. 23018/1 included in Appendix A. In these locations the use of traditional spread foundations is not considered viable, and consideration will need to be given to an abnormal foundation solution. Shallow vibro treatment of near surface soft and loose superficial deposits, in conjunction with reinforced widened strip foundations could be considered as a potential foundation solution. However, reference should be made to specialist subcontractors for advice on the detailed design and application of their proprietary vibro treatment system in the prevailing ground conditions. To assess this further, they may wish to view the ground in trial pits which would be best undertaken once the housing layout has been finalised. Mini piling is another potential option; however, discussions would need to be held with specialist contractors to determine the most suitable pile design and the piling scheme. As the load bearing characteristics of piles are dependent upon the type of pile used, method of installation, construction and workmanship, it is recommended that detailed discussions are held with suitably experienced piling contractors prior to finalising design. In any event, positive assurances should be sought from the piling contractor in respect of performance and a representative number of piles should be subject to pile loading tests. Further ground investigation comprising deeper boreholes may be required for pile design purposes.
Floor Slabs	Given the presence of shrinkable soil beneath the site, it is recommended that a suspended floor slab design (cast in situ or 'beam and block' with underfloor void) is adopted for the proposed development.
Buried Concrete	For the near-surface Superficial Deposits, water soluble sulphate testing results (expressed as SO ₄ in a 2:1 water:soil extract) range from 0.0019 to 0.064 g/l with pH values of 7.2 to 8.1. Following the guidance given in the BRE Special Digest (2005) and assuming ' <i>mobile</i> ' groundwater conditions for a ' <i>natural ground</i> ' site, the Aggressive Chemical Environment (ACEC) classification has been determined. These indicate a Design Sulphate Class of DS-1 and an ACEC class of AC-1 apply at the site.

Pavement Design	Final road and pavement levels are not known at this stage, however, assuming a firm clay subgrade and based on the laboratory test results from the present investigation, an equilibrium CBR value of 3% should be assumed for preliminary design purposes. The proposed formation should be proof rolled and caution must be exercised to ensure that any soft/loose areas identified within the formation are excavated and filled with suitably compacted granular fill. The near-surface soils have the potential to be disturbed by weathering and site traffic. Suitable workings methods should therefore be employed to avoid this and therefore reduce the potential to create volumes of unsuitable fill material. Once road alignments and levels have been finalised, in situ CBR tests should be undertaken to allow detailed design of road formations to be made.
Dewatering	The findings of this investigation indicate that significant water ingress is unlikely to occur in shallow temporary excavations; however, any localised seepage should be controllable by sump pumping.
Excavations	Conventional mechanical excavation should be readily achievable through the near-surface soils to depths of at least 3.0 m begl. Trial pit instability was recorded in some locations where sand was encountered; however, shallow foundation excavations typically should not extend to this depth. Shallow excavations should remain stable in the short term; however, instability may occur in any deeper excavations or excavations left open for extended periods of time. Support should be provided in any excavations requiring man entry.
Soakaways	Infiltration testing has not been carried out as part of this investigation; however, due to the ground conditions encountered comprising predominantly clay with bands of sand with associated perched groundwater, it is considered that the use of soakaway drainage is not considered viable, and an alternative drainage solution will need to be adopted.
Additional Work	Comments
Various	If required to satisfy planning and/or land quality conditions, this report should be submitted to the Local Authority and/or warranty provider for approval before any construction work starts on site.

The above summary is intended for reference purposes only and specific details should be obtained by reading the entire report.