GROUND INVESTIGATION INTERIM REPORT

Site Location	Land South of Polywell, Appledore, Bideford, Devon.
Client	Chichester Homes Developments Ltd.
Previous Report	The site has previously been the subject of a Phase 1 Desk Study report, undertaken by Geo Consulting Engineering Ltd in February 2017 (report ref: GCE00752/R1).
Fieldwork	8 No. machine-excavated trial pits, with soil sampling for both geotechnical and contamination purposes.
Proposals	It is understood that the site is to be redeveloped for residential purposes, with the construction of ten two-storey dwellings, with associated private garden areas and a new access road (adjoining Torridge Road). Given the moderately sloping nature of the site, some cutting and filling is proposed as part of the proposed development. The provided cross-section drawings indicate that that levels are to be cut by up to 3.5m in the (topographically higher) eastern part of the site, and up to approximately 2.0m in the west.
Site Description	The site is approximately rectangular in shape, measuring approximately 75m (north-south) by 60m (east-west) (~0.5 hectares), and slopes down moderately towards the west. Site levels step down by approximately 1m along the western site boundary, towards Torridge Road. The site comprises a vacant field, which is understood to have been used historically for agricultural purposes. The field comprises rough grass at the surface. An old water tank was observed within the north of the site and an associated water drainage pipe (flowing) was observed adjacent to the tank, which appeared to be coming from an adjacent property to the north. It is understood that a foul drainage pipe passes through the western part of the site, trending approximately northeast to southwest (i.e. parallel to Torridge Road). Areas of ground settlement (up to approximately 0.5m settlement) were observed at the surface within the area of the mapped pipe. The site is bordered to the north by residential properties along Polywell (road), to the east and south by similar agricultural fields, and to the west by Torridge Road, before a narrow field. Beyond the narrow field to the west of the site, a cliff-face is present, with ground levels falling by approximately 5m, to the Taw-Torridge Estuary.

Site Geology	The British Geological Survey (BGS) 1:50,000 Series map of the area (sheet 292) indicates the site to be underlain by the Carboniferous Ashton Mudstone Member and Crackington Formation. These deposits typically comprise dark blue-grey mudstones and subordinate predominantly grey sandstones and siltstones. Whilst not mentioned within the previous Phase 1 Report undertaken by Geo Consulting Engineering Ltd, according to the accompanying geological memoir for Sheet 292, a thin mantle of glacial deposits are mapped within the region, associated with an ice sheet advancing south across the Irish Sea, between 100,000 to 200,000 years ago.
Ground Conditions Encountered	In summary, Glacial deposits were encountered beneath the topsoil, to the base of the trial pits, to depths typically between 2.80m and 3.50m. Ground conditions encountered were typically: • TOPSOIL, to depths of between 0.20m and 0.60m, underlain by… • Firm, firm to stiff and stiff yellowish/ orangish and greyish brown, variably sandy, gravelly and silty CLAY (Glacial deposits), with localised cobbles, to depths of between 1.40m and 2.20m, underlain by… • (Loose to medium dense) and (medium dense), locally (loose), brown, orangish brown and greyish brown gravelly clayey/ silty SAND, or sandy clayey/ silty GRAVEL, with occasional cobbles and localised partings of firm clay, to the base of most of the trial pits, to depths of between 2.80m and 3.20m. • Some difficult excavation was encountered within the gravel and sand deposits encountered, due to the presence of cobbles. • Within TP03 (northeast corner of the site), (medium dense) becoming (very dense) sandy GRAVEL, with occasional partings of firm clay, was encountered to the base of the trial pit, to a depth of 2.50m (terminated due to difficult excavation). • Beneath the surficial sand/ gravel deposits within TP04 and TP05, TP07 (centre and east of the site), (loose), **locally (very loose)**, orangish brown clayey SAND was encountered, from depths as shallow as 1.90m, to the base of the trial pits, to depths of between 3.00m and 3.50m. • No groundwater was encountered, although within TP04, TP05 and TP07, the soils were recorded to be damp below 2.50m. • Bedrock strata of the Ashton Mudstone Member and Crackington Formation was not encountered during the investigation.

Foundations	The trial pits recorded Glacial deposits to be present beneath the site, as opposed to bedrock strata of the Ashton Mudstone Member and Crackington Formation, which are recorded to underlie the site on geological mapping. Given the variable strength of the Glacial deposits recorded, and that the lowest strength soils were typically encountered in the east of the site at depths of between 1.90m and >3.50m (i.e. at the depths of the proposed foundations within this area of the site), it is not currently possible to provide an allowable bearing capacity for foundation design for the soils encountered. In order to provide an allowable bearing capacity for use in foundation design, further work comprising percussive boreholes is required. Standard Penetration Testing (SPTs) should be carried out within the boreholes to provide quantitative strength information for the Glacial deposits encountered during this investigation, so that an allowable bearing capacity can be provided. Should the soils encountered be found to have insufficient bearing capacity to provide a suitable founding stratum, the boreholes should be used to determine the ground conditions at greater depth beneath the site, to provide information for use in piled foundation design. Geotechnical laboratory testing is currently being undertaken, to determine the shrinkability of the underlying soils and to provide information regarding concrete classification requirements. The results and our recommendations will be included in the final report.
Ground Floor Slabs	Where NHBC building near trees requirements mean that foundation depths are greater than 1.50m or where soft/ loose soil or non-engineered made ground is present at formation depth, fully suspended ground floor slabs are required. If NHBC building near trees requirements mean that foundation depths are less than 1.50m, and competent natural soil or engineered fill is present at formation depth, and provided construction is undertaken when the soils are not seasonally desiccated, i.e. in winter/ spring, ground bearing floor slabs may be adopted.
Groundwater & Excavations	No groundwater was encountered in any of the trial pits during the investigation, although within TP04, TP05 and TP07, the soils were recorded to be damp below 2.50m. Whilst no de-watering of excavations is likely to be required for shallow excavations (i.e. <2m), given the depths of cutting proposed (up to 3.50m), it is recommended that groundwater monitoring be undertaken, to determine the groundwater levels at depth beneath the site.

	Some collapse of trial pits was recorded during the investigation. Therefore, some shoring of temporary excavations may be required. No problems with excavatability are foreseen. However, it is noted that some difficult excavation was encountered within the sand and gravel deposits encountered, due to the presence of cobbles. In addition, TP03 was terminated due to difficult excavation at a depth of 2.50m, due to the dense nature of the gravel/ cobble deposits at this location. Therefore, some heavy plant and or/ pneumatic breaking may be required locally to achieve the required depths.
Roads	In-situ CBR testing (TRL DCP method) has been carried out across the site to provide an estimated CBR value for use in road pavement design. Calculations are currently being carried out but an estimated CBR value of 3% is currently anticipated. Further recommendations will be provided in the main report.
Contamination	From the desk study information and site observations, it is considered that there is a low risk of contamination at this site. 5 No. representative samples have been taken and are being tested at the laboratory. In addition, waste acceptance criteria (WAC) testing has been scheduled at the laboratory, to enable a waste classification exercise to be undertaken. The findings of the contamination laboratory testing and our recommendations will follow in the final report.
Radon & Ground Gas	The Phase 1 Desk Study report undertaken by Geo Consulting Engineering Ltd, indicates that no radon protection measures are required at this site. There are no recorded landfill sites within 250m of the site and no made ground was encountered. Therefore, additional ground gas protection measures are not considered to be necessary at this site.
Further Work	In order to provide an allowable bearing capacity for use in foundation design, further work comprising percussive boreholes is required. Standard Penetration Testing (SPTs) should be carried out within the boreholes to provide quantitative strength information for the Glacial deposits encountered during this investigation, so that an allowable bearing capacity can be provided. Should the soils encountered be found to have insufficient bearing capacity to provide a suitable founding stratum, the boreholes should be used to determine the ground conditions at greater depth

	beneath the site, to provide information for use in piled foundation design. Given the depths of cutting proposed (up to 3.50m), it is recommended that groundwater monitoring wells be installed and subsequent monitoring be undertaken, to determine the groundwater levels beneath the site, so that appropriate geotechnical recommendations can be made (e.g. retaining walls).

LIMITATIONS

1. The comments given in this report assume that ground conditions do not vary beyond the range revealed by the investigation. There may, however, be conditions at or adjacent to the site that have not been disclosed by the investigation and which, therefore, have not been considered in this report. Accordingly, a careful watch should be maintained during any future groundworks and the recommendations of this report reviewed as necessary.

2. All comments and recommendations relating to groundwater are based on conditions encountered at the time of investigation. It should be noted that groundwater levels might fluctuate according to the season and from year to year. This may have implications on other recommendations, including foundations and excavations. It should also be noted that observations of groundwater flowing into exploratory holes, whilst useful for giving recommendations on the practicalities of construction, may not accurately reflect the long-term groundwater pressures. The latter, which may be relevant for the assessment of slope stability or the design of geotechnical structures such as retaining walls, for example, can only be fully understood through the installation of groundwater monitoring instruments.

3. All third-party data referred to in the report, e.g. environmental searches and laboratory testing, has been obtained in good faith from bona-fide sources. Ruddlesden geotechnical ltd cannot be held liable for any incorrect information supplied to us.

4. The location of exploratory holes was limited by the presence of underground services.

5. Proposed foundation loads and building characteristics were not provided at the time of writing this report and it has therefore been assumed that lightweight residential dwellings up to two storeys in height are proposed.

6. The presence of asbestos containing materials (ACM) within buildings and invasive plants are outside the scope of this report and should be addressed by respective suitably qualified experts, if necessary.

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4. Whilst confident in the findings of this report, the recommendations may not necessarily be accepted by other authorities without question. It is advisable that, where appropriate, the report be submitted to the relevant statutory authorities and approval obtained before detailed design, site works or other irrevocable action is undertaken.

5. All samples recovered during this investigation shall be disposed of upon the expiry of 28 days after the issue date of this report, unless agreed otherwise in writing.