

Appendix N

Phase 2 SI Executive Summary

EXECUTIVE SUMMARY

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| Site Address | Land off Stanifield Lane, Woodcock Estate, Lostock Hall, Preston PR5 5XT. | |
| Grid Reference | E 354770, N 424660. | |
| Site Area | 33.18Ha. | |
| Proposed Development | The project comprises the development of a new training facility for Lancashire County Cricket Club (LCCC) and is a joint venture with Lancashire County Council (LCC). It includes two new cricket pitches, a pavilion building, on-site roads and associated infrastructure. | |
| Current Site Use | <p>The site comprises an undeveloped parcel of agricultural land located to the west of Stanifield Lane. The site is split by hedgerows and occasional mature trees into seven fields. Occasionally the hedgerows are supplemented by a drainage ditch particularly in the north and west of the site.</p> <p>The site features an overhead power cable in the north with a pylon within the north eastern area.</p> <p>A farm is located in the northeast corner of the site comprising a brick built structure and several steel framed out buildings/storage sheds. Several residential properties are located around the south east and west of the site</p> | |
| Site History | A review of pertinent historical maps suggests that the site has remained largely undeveloped agricultural grazing land, with the addition of several residential properties and associated outbuildings and road infrastructure with Woodcock Hall Farm present in the north eastern corner of the site. | |
| Environmental Setting | Drift Geology | Till (Devensian – CLAY) across the site. |
| | Bedrock Geology | Singleton Mudstone Member– MUDSTONE |
| | Faults | There are no faults recorded within close proximity to the site. |
| | Hydrogeology | Secondary undifferentiated aquifer (drift) and secondary B aquifer (bedrock). There are no groundwater abstraction points recorded within 500 m of the site. |
| | Hydrology | The River Lostock is located 73m north of the subject site. Surface water drains are located on site and a pond is noted adjacent to the east. |
| | Flood Risk | The site is located within a Flood Zone 2, therefore a flood risk assessment will be required by a specialist. |
| Natural Landform and Geomorphology | <p>The subject site is underlain by Glacial Till. The underlying rock formations are associated with the Singleton Mudstone Member.</p> <p>The River Lostock is present to the north and LiDAR data indicates that the river may have once flowed across the northern sector of the site prior to development and road infrastructure.</p> <p>The depressions in the landscape may indicate historic ponds though no existing ponds were noted during the initial site walkover.</p> <p>It is anticipated that given the lack of development at the site the existing landform is predominantly natural.</p> | |



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| Utility Locations | <p>A formal drainage survey has not been completed, however, raised manholes were noted across the site.</p> <p>Additionally, there are overhead cables in the north of the site crossing east-west with a pylon situated adjacent to the north-eastern boundary.</p> |
| Landfill Sites and Ground Gases | <p>No landfill sites (current or historic) are recorded within 250 m of the site. The site has undergone some historic development and ground working in the northeast and to install the pylon.</p> <p>Made Ground associated with the historic development may produce hazardous ground gases such as methane and carbon dioxide, however these are likely to be localised and low level.</p> <p>Where the alluvial deposits are present to the north of the site in the former location of the river ground gas may be noted due to degradation of particles within this material.</p> |
| Radon | <p>Unaffected – no special precautions required.</p> |
| Coal Mining/Land Stability | <p>The site is not located in a coal mining reporting area.</p> |
| Brine Workings | <p>The site is not located within an area deemed to be at risk from ground instability arising from historic brine pumping activities and/or salt extraction.</p> |
| Hazardous Installations | <p>No hazardous installations that could potentially prejudice the proposed construction of highly sensitive residential dwellings have been identified within influencing distance of the subject site.</p> |

GROUND INVESTIGATION

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| Ground Investigation Works | <p>E3P has completed an intrusive ground investigation comprising:</p> <ul style="list-style-type: none"> ✿ 62 x mechanically excavated trial pits, ✿ 6 x soakaways, ✿ 18 x window sample boreholes, ✿ 26 x Dynamic Cone Penetrometers, ✿ 5 x cable percussive boreholes and ✿ Construction of environmental monitoring installations. |
| Ground Conditions | <p>Made Ground – 0.00 m bgl to 0.80 m bgl</p> <p>Made Ground deposits were encountered within nine exploratory hole locations to depths of between 0.25 m and 0.80 m bgl.</p> <p>Made Ground deposits generally comprised reworked topsoil of dark brown slightly gravelly sandy clay with sandstone, mudstone and brick and ceramic.</p> <p>In TP130 red very gravelly fine to medium sand was noted with gravel of red shale to 0.60 m bgl. In TP149 red sandy gravel of shale, plastic and metal was noted to 0.50 m bgl.</p> <p>A Depth of Made Ground Plan is presented as Drawing 14-886-006 in Appendix III.</p> |



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| Ground Conditions | <p>TOPSOIL – 0.00 m bgl to 0.70 m bgl</p> <p>Topsoil was identified in the majority of the exploratory hole locations to depths ranging from 0.05 m and 0.70 m bgl.</p> <p>Topsoil generally comprised brown sandy CLAY.</p> <p>DRIFT – 0.05 m bgl to >15.00 m bgl</p> <p>Drift deposits were encountered within all exploratory locations. The drift deposits are varied, generally comprising loose to dense brown slightly gravelly fine to medium SAND with gravel of sandstone and mudstone.</p> <p>The SAND is interbedded with very soft very low strength to very stiff very high strength reddish brown slightly gravelly CLAY with sandstone and mudstone.</p> <p>The deep cable percussive boreholes identified medium dense to dense brown SAND underlain by firm medium strength to very stiff very high strength sandy CLAY to depths in excess of 15.00 m bgl.</p> <p>Dark brown organic CLAY was identified in TP129, TP135, TP136, TP154 and SA104 between depths ranging from 0.25 m and 0.90 m bgl.</p> <p>Organic material was also noted in the natural SAND in TP114 between 1.70 m and 2.10 m bgl.</p> <p>SOLID - The solid geology was not encountered during the ground investigation.</p> <p>GROUNDWATER – Groundwater was encountered as seepages and strikes between 0.80 m and 13.00 m bgl.</p> |
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CONTAMINATED LAND ASSESSMENT

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| Human Health | <p>The Tier I assessment indicates that the data exceeds the screening criteria for arsenic in the natural sandy CLAY in TP106 at 0.80 m bgl.</p> <p>Within the remaining 20nr soil samples submitted for a range of contaminants, no results were found to exceed the tier 1 assessment criteria. No asbestos was identified in the soils analysed and no pesticides were detected.</p> <p>In consideration of the future site use the primary exposure pathway for arsenic relates to dermal contact and soil ingestion. The exceedance at TP106 is considered to be localised and can be mitigated by localised excavation and validation sampling to confirm the remaining soils are not affected. The contaminated soils can then be placed in an area of future low sensitivity.</p> <p>Where this is not completed the area will require a 300mm cover system to mitigate the risk of exposure to end users. Given the localised nature of the exceedance it is anticipated that this can be managed in a zoned approach and will therefore not be a requirement for the site as a whole.</p> <p>Following the removal of the farm buildings in the north and where any Made Ground remains a 300 mm clean cover system will be required to mitigate any potential risk from these materials. Excavation can cease where the natural drift deposits are identified.</p> |
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| <p>Human Health</p> | <p>It is expected that the newly constructed cricket pitches will feature 300mm of newly placed soils which will act as a mitigation cover system.</p> <p>Chemical analysis of the natural drift deposits confirmed these soils to be acceptable for use as subsoil within the proposed landscaped areas, however further chemical validation samples will be required to confirm this prior to use.</p> <p>Chemical analysis has indicated that the natural topsoil is suitable for use as topsoil in landscaping and public open space.</p> |
| <p>Controlled Waters</p> | <p>Groundwater analysis has not been completed to date due to access limitations; however, this will be completed at a time when the site is accessible. Leachate analysis has been completed to date which can be used to identify and mobile compounds within the soils present at the site. Generally the conditions of the test mobilise compounds that wouldn't normally in natural groundwater regimes however it can be used in the absence of groundwater sampling as a guide.</p> <p>Leachate analysis has identified exceedances above the EQS criteria level for copper and zinc compounds. The identified contaminants are generally of low solubility and mobility.</p> <p>In this instance, the Tier 1 Controlled Waters comparison indicates that the data does not exceed the DWS, with the exception of one exceedance for zinc. However, this is marginal of 11 ug/l compared to the target value of 10.9 ug/l. No DWS screening value is available for zinc, therefore, to be conservative the EQS target has been used for comparison.</p> <p>Given the absence of any significant exceedances in concentrations of leachable contaminants and given there are no significant sources of mobile contamination, there is considered to be no unacceptable level of risk to the underlying secondary B aquifer.</p> <p>Cohesive drift deposits are present to depths in excess of 15.00 m bgl which will act as an aquitard.</p> <p>When groundwater samples are been obtained, the Metal Bioavailability Assessment Tool (M-BAT) can be completed with respect to Zinc and copper to assess the bioavailability with respect to surface water receptors (Surface water drains/ditches and adjacent pond/river).</p> <p>The results of the groundwater sampling will be included in a revision to this report.</p> |
| <p>Ground Gas</p> | <p>Ground gas monitoring will be completed when access is available. Although the proposed pavilion building represents a low risk overall, precautionary CS2 measures are recommended due to the presence of organic clays and localised Made Ground identified through the site.</p> |
| <p>Potable Water Infrastructure</p> | <p>This will need to be confirmed following the completion of a UKWIR risk assessment. Post-remediation and enabling works ground conditions may be different from those identified during this site investigation.</p> <p>Current indications suggest that PE pipe will be suitable.</p> |



GEOTECHNICAL ASSESSMENT

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| <p>Underground Obstructions</p> | <p>The subject site is primarily undeveloped with the exception of the farm buildings to the northwest and residential property associated with Woodcock Hall Farm at the site boundaries. Obstructions are likely to be present beneath the existing buildings and hardstanding.</p> <p>During a phase of cut-and-fill enabling works to create a developable platform, all below-ground obstructions will require grubbing out to the base of the Made Ground to enable the construction of the pavilion, however obstructions could remain at depth in areas of future POS or soft landscaping provided suitable cover was placed above.</p> |
| <p>Allowable Bearing Pressure</p> | <p>The underlying natural granular drift deposits have been assessed as being very loose to dense with a net allowable bearing pressure (ABP) in the order of 50-210kN/m² between 1.00 m and 2.00 m bgl and an ABP of 230 – 352 kN/m² between 6.00 m and 15.00 m bgl. Areas of very loose granular material with an ABP <40kN/m² have been identified between 1.00m and 3.45m in WS105, WS106, WS108, WS109 and WS116.</p> <p>The natural clays have been assessed as being firm medium strength generally with a net ABP of 82-131 kN/m² between 1.00 m and 2.00 m bgl. Between 6.00 m and 14.50 m bgl the clay is firm medium strength to very stiff very high strength with a net ABP in the order of 125 – 406 kN/m². Two locations have identified soft low strength clay with an ABP <75kN/m² between 2.00m and 3.00m bgl.</p> |
| <p>Foundation Options</p> | <p>Based on the assessment of the relative undrained shear strength, relative in-situ densities and corresponding safe net allowable bearing pressure, the suitable target founding stratum has been identified as the underlying medium dense to dense SAND and firm medium strength to very stiff very high strength sandy CLAY where an ABP circa 100kN/m² can be achieved between 1.00m and 2.00m bgl.</p> <p>Due to the presence of very loose to loose natural SAND in the vicinity of the proposed building, it is considered that an engineered foundation solution will be required.</p> <p>Where structures are proposed in areas of soft organic clays and in the location of the historic pond, a piled foundation is likely to be required.</p> <p>Foundation depths within the conjectured influence of former, existing or proposed trees will need to be deepened to ensure that structural loading bears within the underlying target founding stratum, which cannot be subject to volumetric instability associated with fluctuation in moisture content.</p> <p>However in consideration of the proposed structure it may be possible to utilise a raft foundation depending on settlement of fills, compaction in underlying soils and the loading applied by the structure.</p> |
| <p>Building Floor Slabs</p> | <p>Ground-bearing floor slabs are likely to be viable given the limited depths of reworked Made Ground however, due to the shallow cohesive deposits and potential for volumetric instability the use will be subject to the detailed design from a structural engineer to include a thickness of compressible/granular material.</p> |
| <p>Heave Precautions</p> | <p>Given that the underlying clay is of low volume change potential, heave precautions will not be required to the internal face of a foundation less than 1.5 m in depth.</p> |








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| | <p>Heave precautions will be required to the underside of floor slabs (where there is no 200 mm void) and pile ground beams are required within the modelled influencing distance of trees.</p> |
| Soakaway Drainage | <p>BRE365 soakaway tests were carried out (SA101-SA106). Five of the six tests did not record a sufficient fall in water level to allow reliable calculation of the infiltration rate.</p> <p>The Infiltration rate in SA102 was calculated to be 5.74×10^{-7} m/s, suggesting poor soakage potential.</p> <p>Furthermore, given the high groundwater table and collapsible nature of the soils, soakaway drainage is unlikely to be suitable for the proposed development.</p> |
| Sulphate Assessment | <p>Chemical analyses for pH and soluble sulphate content shows that the soils at the site generally meet Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1s in accordance with BRE Special Digest 1 (2005).</p> <p>An elevated sulphate concentration meeting Class DS-3, AC-2s was noted in the Made Ground in TP149 at 0.40 m.</p> <p>An elevated sulphate concentration meeting Class DS-2, AC-1s was noted in the natural clay in TP154 at 0.60 m bgl. However, upon completion of site enabling works it will, in all likelihood, be DS1 AC1s.</p> |
| CBR Design % | <p>Granular soils can be re-engineered to ensure 5% within the subgrade during favourable climatic conditions.</p> <p>Natural clay soils will provide a CBR in the order of 3–5% during drier climatic periods. However, if water is allowed to shed onto the formation, the CBR will reduce to < 2%, which will require specialist engineering of the subgrade.</p> |
| Cut/Fill | <p>Development levels unknown at this time; however, an element of cut-and-fill works will be required to prepare the development platform.</p> <p>It is understood that an element of the cricket pitches will feature an embankment making use of the site won materials.</p> |
| Civil Engineering Excavations | <p>Granular drift deposits were noted to be unstable and prone to collapse, it is considered that all excavations are supported or battered back in accordance with guidance contained in CIRIA R97.</p> <p>Perched groundwater may also require localised pumping in excavations.</p> <p>The bedrock has not been encountered during the works completed to date.</p> |
| Waste Characterisation | <p>Any material that is to be disposed off-site should undergo assessment using Technical Guidance WM3: <i>Waste Classification – Guidance on the classification and assessment of waste</i>. Given the nature of the site and the results obtained to date it is likely that the vast majority of materials at the site will be non hazardous.</p> |



RECOMMENDATIONS

Based on the findings of the geoenvironmental site assessment, the following additional works are recommended to be completed in due course:

-  Completion of Groundwater sampling and ground gas monitoring.
-  Arboricultural survey.
-  Geotechnical earthworks strategy (infrastructure).
-  Materials management plan.
-  Remediation and enabling works strategy.

