



A GROUND INVESTIGATION REPORT FOR AMBULANCE STATION, GLADSTONE ROAD, EXETER

NON-TECHNICAL EXECUTIVE SUMMARY

Introduction	Tier Environmental was commissioned by Watkin Jones Group to undertake a Ground Investigation Report for an area of land currently used as an Ambulance Station, located at Gladstone Road, Exeter, EX1 2EB (the "Site").
Site location	The site is located at Ambulance Station, located at Gladstone Road, Exeter, EX1 2EB.
Site history	The Site has historically been used as a nursery, later redeveloped in the late 1960's as an ambulance station (current use). The ambulance station includes above and below ground diesel storage tanks. Potential historical tanks were noted on and in the vicinity of the Site. A historical landfill is noted 147m south-east of the Site.
Fieldwork	<p>The investigation, which was supervised by a Tier Environmental Geoenvironmental Engineer, took place between 8th and 10th May 2019 and comprised:</p> <ul style="list-style-type: none"> • The excavation of 13 No. hand excavated pits (all locations) to depths between 0.40m (WS16) and 1.20m bgl for service clearance purposes and logging and to obtain samples for environmental and geotechnical laboratory analysis; • Advancement of 10 No. window sample boreholes (WS2 and WS5 to WS11) to depths between 3.45m and 5.45m bgl to enable in situ geotechnical testing, obtain samples for environmental and geotechnical laboratory analysis and install wells to monitor both gas and groundwater; and, • Advancement of 3 No. cable percussion boreholes (CP1 to CP3) to depths between 8.29m and 8.45m bgl to enable in situ geotechnical testing, obtain samples for environmental laboratory analysis, geotechnical laboratory analysis and to install wells to monitor both gas and groundwater.
Laboratory testing	Samples of soil, soil leachate and groundwater were submitted for analysis of a range of metal, other inorganic and organic components. Geotechnical testing was scheduled on selected samples.
Ground conditions	<p>The Site is underlain by Made Ground to a general depth of less than 1.0m bgl, but ranging to depths of 0.10m to 1.20m bgl.</p> <p>The Made Ground was underlain by bedrock of the Alphington Breccia Formation, generally recovered as a cohesive deposit of sandy clay. The breccia bedrock was found to be firm becoming stiff, then very stiff consistency and medium to very high shear strength.</p>
Foundations and floor slabs	<p>It is considered that bored/Continuous Flight Auger piles are likely to be the most economic foundation solution.</p> <p>It is considered that the majority of the Made Ground is likely to require removal to accommodate the construction platform and subsequent floor construction. It is therefore considered that if the remaining Made Ground is suitably compacted, then ground bearing floor slabs may be suitable. A sub floor ventilation system may be required for ground gas protection purposes if ground bearing slabs are utilised.</p>
Sulphate class	<p>A Design Sulphate Class of DS-1 and an ACEC Class of AC-1 has been derived.</p> <p>Gross hydrocarbon contamination can also have an adverse impact on the setting of concrete, which may affect foundation construction and piling. This should be considered, particularly in the vicinity of the storage tanks and interceptor.</p>
Contamination	Widespread elevated concentrations of lead and PAHs and the presence of asbestos and TPH hotspots within Made Ground soils across the Site represents a potentially significant risk to human health for the proposed residential without homegrown produce land use.
Gas protection	Ground gas protection measures are required based on a Characteristic Situation 2 - Low Risk classification. A hydrocarbon/volatile resistant membrane may be required, depending on the remediation works and removal of hydrocarbon contaminated soils and perched groundwater.
Radon Requirements	Basic radon protection measures are <u>not</u> currently required for the proposed development.

Waste Soils Classification	<p>It is anticipated that the majority of the Made Ground may require offsite disposal in order to accommodate a piling mat and floor slab construction.</p> <p>The majority of the general Made Ground soils have been classified as non-hazardous for disposal purposes, with the following exceptions that have been classified as hazardous waste:</p> <ul style="list-style-type: none"> • WS1 at 0.3m (asbestos cement); • WS5 at 0.3m (lead concentration); • WS7 at 0.2m (hydrocarbon and xylene concentrations); • WS10 at 0.4m (hydrocarbon concentration); and, • WS6 at 0.15m (hydrocarbon concentration). <p>Hazardous waste soils are present in the vicinity of the underground storage tank and are also considered likely in the vicinity of the above ground storage tanks (former and current), the interceptors and service trenches.</p> <p>Visible fragments of asbestos cement were locally identified. Any visible fragments of asbestos containing materials will require hand picking/segregation and disposed of as hazardous waste.</p> <p>The majority of the natural breccias/clay strata have been classified as inert waste (excluding the localised hydrocarbon impacted soils).</p>
Outline Remediation Strategy	<p>A 600mm clean cover system (comprising clean imported soil overlying a high visibility geotextile membrane) will be required in soft landscaped areas.</p> <p>The existing fuel storage tanks and interceptors will require decommissioning and removal prior to the commencement of the redevelopment works. Any hydrocarbon impacted soils and perched groundwater will also require removal and treatment/disposal at a suitably licensed facility.</p> <p>Ground gas protection measures will be required based on a Characteristics Situation 2, potentially including a hydrocarbon/volatile resistant membrane.</p>
Summary	<p>It is considered that the ground conditions and localised hydrocarbon impacted soils and perched groundwater are typical for a brownfield site with historic and current storage of hydrocarbons.</p> <p>It is also considered that the findings of the Tier Environmental ground investigation meet the criteria of EN2 and should not prevent the proposed redevelopment of the site for student accommodation, subject to the implementation of the remediation works and mitigation measures outlined above.</p> <p>In accordance with EN2, the remediation measures will ensure that the proposal will not:</p> <ul style="list-style-type: none"> • Expose the occupiers of the development and neighbouring land uses to unacceptable risk; • Threaten the structural integrity of any building built on, or to be built, on or adjoining the site; • Lead to the contamination of any watercourse, water body or aquifer; • Cause the contamination of adjoining land or allow such contamination to continue.