

Technical Note

Project: NMGH

From: Ian Dorman

Subject: Southern Enabling Works Phase 2 SI Technical Note

Reference: 075805-CUR-01-XX-GN-GE-
00100_V01_SouthernEnablingSITechnicalNote

Date: 2nd July 2021

Appropriate Consultant:

Ian Dorman
BEng (Hons) Civil & Structural Engineering, MStructE

Summary report on application of existing Phase 2 Geoenvironmental Investigation reports to planning application in relation to NMGH Southern Enabling works:

This technical note has been prepared in support of an application for planning permission for a package of enabling works on land within the North Manchester General Hospital campus (hereafter referred to as the Southern Enabling Works”).

The package of works proposed within the planning application comprises:

- Constructing sections of the western access road which was approved as part of the New Park House development under reference 128563/FO/2020. It is necessary to create a free-standing planning permission for the same highway works to allow the highway works to progress ahead of the wider New Park House development.
- Constructing a new temporary substation;
- Installing below ground utility infrastructure to service the New Park House development.

The land affected by the works is shown in figure 1.

The land subject to the applications has been the subject of two separate geo-environmental investigations to date. One relates to an area of temporary modular office accommodation which was granted planning permission under reference 127914/FO/2020 (report reference 075805-CUR-00-XX-RP-GE-001-P02_Phase 2_Decant Village) the executive summary of which is included on pages 6 & 7 of this document. The other relates to the proposed New Park House development approved under planning permission 128563/FO/2020 (report reference - NMGNPH-CUR-VV-XX-RP-C-0002-P01_Phase 2_New Park House) the executive summary of which is included on pages 4 & 5 of this document.

The areas covered by each existing report, and the proposed planning application red line boundary can be seen on page 2.

As shown on figure 1, it is considered that the NMGNPH-CUR-VV-XX-RP-C-0002-P01_Phase 2_New Park House is most pertinent to the planning application. The executive summary findings of this report are included on pages 4 & 5.

51-55 Tithebarn Street
Liverpool
L2 2SB

t: 0151 726 2000
e: liverpool@curtins.com
w: www.curtins.com



The executive summary findings of the 075805-CUR-00-XX-RP-GE-001-P02_Phase 2_Decant Village report are included on pages 6 & 7.

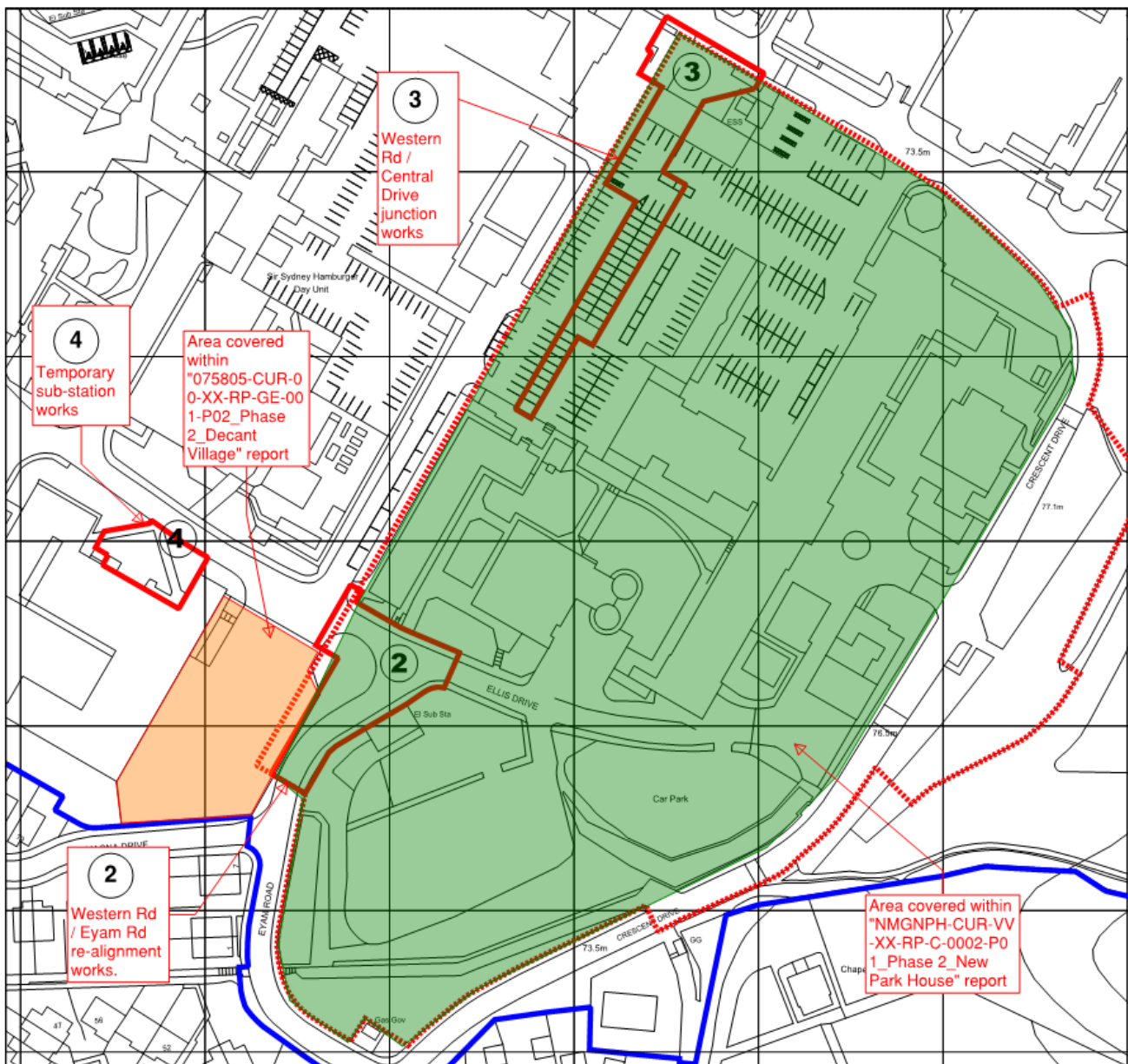


Fig 1 – Boundaries of planning application and existing geoenvironmental investigation reports

Appointment	In July 2020 Curtins were instructed by Greater Manchester MH Foundation Trust to undertake a Phase 2 Ground Investigation on land at the south east of the North Manchester General Hospital campus, Ellis Drive, Crumpsall, M8 5RL (approximately centred on NGR SD 84920 02150) that covers an area of approximately 3.32 Ha. Development plans for this site comprise the construction of a new single storey, part two storey, 150 bed health care unit following demolition and a cut and fill operation.
Current Site Status	The site is currently occupied by various hospital buildings, car parks, access roads and soft landscaped areas. The site can be accessed from Ellis Drive or Central Drive.
Summary of Preliminary Site Assessment	Historical mapping shows the site remained an area of undeveloped land from 1848 to 1894. By 1894 the northern two thirds of the site were occupied by the Manchester Workhouse, a chimney and mortuary were present from 1908. From 1908 a small building occupied the south of the site and an embankment along the southern boundary. In 1923 the workhouse became the Crescent Road Institution and Springfield Hospital by 1949. From 1978 Springfield Hospital joins with another, becoming the North Manchester General Hospital, the southern third of the site became occupied by car parks and roads. Made Ground deposits are not indicated to be present onsite according to BGS, however given the previous uses deposits are anticipated to be present. Superficial soils are identified as Glacial Till deposits across the majority of the site and Glaciofluvial Sheet Deposits across the north west. Bedrock deposits are identified as Chester Formation and Manchester Marls Formation (bedrock) separated by a fault. Environment Agency data indicates that the site, corresponding with the underlying Chester Formation and Manchester Marls Formation bedrock geology, overlies a Principal Aquifer and Secondary B Aquifer, respectively. The Glacial Till and Glaciofluvial Sheet deposits area associated with a Secondary Undifferentiated Aquifer and Secondary A Aquifer, respectively. The site is not located within a Source Protection Zone (SPZ). The nearest surface water feature is the River Irk approximately 270m east of site.
Fieldworks Undertaken	Fieldworks were carried out between 11th and 24th August 2020, comprising four cable percussive boreholes, one Geobore S borehole, nine window sample boreholes and fifteen hand dug foundation pits, primarily for the identification of foundations for existing buildings on the site. Ground gas and groundwater monitoring standpipes were installed within all cable percussive and Geobore S boreholes and three of the window sample boreholes (WS02, WS05 and WS07). Selected groundwater and soil samples were subjected to laboratory analysis. Six ground gas monitoring visits have been undertaken.
Encountered Ground Conditions	Made Ground was encountered in all exploratory holes from ground level to a depth between 0.40m and 1.60m bgl. In the upper Made Ground where Topsoil was not encountered, a layer of tarmacadam or paving slab was encountered. The Topsoil was typically a sand or a slightly gravelly very sandy clay, both with frequent rootlets. Deeper Made Ground was generally relatively variable both granular and cohesive with cobbles, gravel encountered was of mixed lithologies. In WS09 a void, associated with a possible hospital service tunnel was encountered. Underlying the Made Ground the glaciofluvial deposits were encountered as cohesive and granular material. Where encountered the cohesive material was typically recorded as a firm sandy slightly gravelly Clay with interlamination of sand and a soft slightly sandy to sandy gravelly Silt. Typically, the granular deposits comprised a medium dense to very dense slightly gravelly slightly clayey or silty sand with occasional interlaminated clay. In BH01, BH02, BH03 and BH05, the glaciofluvial deposits were underlain by cohesive glacial till. The cohesive material was recorded as stiff to very stiff brown grey slightly sandy slightly gravelly clay. The base of the deposit was not encountered. During returned monitoring visits, groundwater levels were between 1.80m and 11.25m bgl.
Environmental Laboratory Testing	With respect to the proposed 'Commercial' end-use of the site, no exceedances were noted in within the samples collected. No asbestos was identified in any of the samples tested. Concentrations of SVOCs and VOCs were recorded below thresholds where available and concentrations of PCBs were recorded below available thresholds. A Low risk rating is therefore identified to end users of the site, construction workers and adjacent residents (accounting for suitable PPE and environmental controls during construction). No exceedances were identified within the groundwater samples when screened against EU DWS thresholds. A Low risk rating is therefore identified to aquifers underlying the site. A Very Low risk rating is identified to the nearest surface water feature (River Irk), considering the considerable distance to the receptor.

Fig 2 – Executive summary of NMGNPH-CUR-VV-XX-RP-C-0002-P01_Phase 2_New Park House

Ground Gas Assessment	During the ground gas monitoring programme methane (CH₄) was recorded below the instrument's detection limit within all the monitoring wells. Maximum carbon dioxide (CO₂) concentrations were recorded at 4.2%. Gas flow was recorded at a maximum peak flow rate of 33.8 l/hr on the sixth visit in BH04 which dissipated quickly to steady state flow rates as did other high peak flow rates identified in deep boreholes. A maximum steady state flow rate of 1.5 l/hr recorded in BH05 on the second visit. Elevated peak flow rates recorded in deep wells have been attributed to flooded response zones and therefore are considered unrepresentative and have been discounted from hazardous gas screening value calculations. A maximum borehole Q₁₀ of 0.0038 l/hr for carbon dioxide was recorded and these values have been taken as the sites Gas Screening Value. The site is therefore classified as CS1 not requiring protection measures. A Low risk rating is therefore identified to the end user from hazardous gases from soils.
Geotechnical Assessment	Ground conditions across the site are highly variable laterally and vertically. In addition, a cut and fill exercise is proposed, which will potentially result in changes in the net load across the site. Therefore, during detailed design assessment of foundations, levels, shape and founding stratum is required. Preliminary assessments indicate that an allowable bearing capacity of 90 kPa for 1m wide strips or pads is acceptable, overlying the dense granular deposits outside the influence zone of groundwater. Areas of soft to loose deposits should be excavated prior to construction works and where cut and fill exercises result in foundations being placed within groundwater influence zones, the bearing capacity can be up to halve the presumed values. Ground bearing floor slabs should not span granular and made ground soils due to potential for differential settlement. For this reason, suspended floor slabs should be considered. It may be possible to re-engineer the existing made ground to adopt a ground bearing floor slab, subject to proposed formation levels and the findings of additional laboratory and in situ testing. Based on the laboratory test results it is considered that a Design Sulphate Class may be taken as DS-1 with an ACEC class of AC-1 within Made Ground and a Design Sulphate Class of DS-1 with an ACEC class of AC-1 within superficial deposits being appropriate.
Re-use of Site Soils	Based on the geochemical testing results presented as part of this investigation it is considered that there is no specific requirement to remove soils from site because of them presenting an unacceptable risk to human health or the environment. The re-use of site-won soils may therefore be undertaken if the following principles are met: i) the geotechnical suitability of the material needs to be confirmed; ii) the re-use of the material needs to be covered as part of the planning approval, e.g. site levels maintained within agreed limits; iii) the volume of the material being re-used needs to be confirmed and traceable; and iv) regulatory approval from the relevant authorities has been sought. The made ground and natural soils recorded do not indicate any clear signs that would result in it being deemed as unacceptable for re-use and re-engineering on site. However additional geotechnical testing is required to further assess the suitability of soils for re-use in general accordance with the Specification for highway works including laboratory analysis and in-situ trial tests to confirm the compaction properties of the material. In the meantime, it should be assumed that some degree of sorting will be required to allow re-use of soils on site. In addition, all topsoil and material containing organics must be removed and not used as capping, however it is likely it may be possible to re-use as topsoil/class 5 material elsewhere on the site. An earthworks specification should be produced which will detail requirements for testing. As large volumes of soils will be required for analysis it is recommended that these works are undertaken following demolition works when all areas of the site are accessible for bulk sampling.
Initial Waste Classification	An initial assessment for the waste classification of the Made Ground soils encountered on site has been carried out through a comparison of the soil testing results against the Tier 1 Thresholds and using the Waste Soils Characterisation Assessment Tool, Cat-WasteSoil. The initial classification of seventeen Made Ground soil samples collected and analysed during the investigation indicates that fourteen samples may be classed as non-hazardous waste with respect to Environment Agency waste classes, using the guidance given in WM3. Whilst all three of the natural soil samples collected and analysed during the investigation may be classed as non-hazardous waste. The initial classification classed three Made Ground samples as hazardous waste for off-site disposal, BH01 at 0.50m bgl, WS02 at 0.45m bgl and TP02 at 0.35m bgl. This is due to the recorded concentration of hydrocarbons/oils. Waste Acceptance Criteria (WAC) testing on these samples has revealed they may be disposed of as Stable Non-Reactive Hazardous Waste in a Non-Hazardous Landfill. Landfill operators are not obliged to accept waste, and if they were to do so, may have specific requirements beyond those outlines above prior to acceptance. Landfill operators should be contacted to confirm the above classifications or otherwise. Additional analysis of soils being removed from site may be required to confirm waste materials are compliant with the descriptions above.
Recommendations	Based on the findings of the ground investigation, the following recommendations are made: 1) Undertake further geotechnical classification testing for made ground and natural soils to inform re-use, to be undertaken when areas are accessible potentially as part of/following demolition works. Testing requirements should be detailed in an earthworks specification. 2) It is recommended that construction contractors ensure suitable environmental controls are in place during construction and provide staff with appropriate PPE and sanitary facilities, with reference to the environmental testing results presented herein and within Appendix C. 3) Should unexpected contamination be observed during construction advice should be obtained from a Geo-environmental Engineer.

Fig 2 – Executive summary of NMGNPH-CUR-VV-XX-RP-C-0002-P01_Phase 2_New Park House (cont'd)

Appointment	In July 2020 Curtins were instructed by Greater Manchester NHS Foundation Trust to undertake a Phase 2 Ground Investigation for Decant Village at North Manchester General Hospital, Ellis Drive, Crumpsall M8 5RL (approximately centred on NGR SD 84800 02100) that covers an area of approximately 0.18 Ha. Development plans comprise the construction of an offsite manufactured four storey modular building for use of temporary office accommodation.
Current Site Status	The site entrance is located off Ellis Drive, Crumpsall, M8 5RL. The site is part of the wider North Manchester General Hospital (NMGH), currently occupied by a service yard and car park associated with the Estates and Transport Department. The site is generally flat, surveyed to be 74.49m to 75.70m AOD.
Summary of Preliminary Site Assessment	Historical mapping shows the site remains an area of undeveloped agricultural land from 1848 to 1950. Two ponds are located 50m and 60m southeast of the site, no longer present from 1894. By 1950 the north of the site is occupied by tennis courts and a bowling green, with the remainder of the site a sports ground until 1978. The Manchester Workhouse is present directly north of the site from 1894, later extended to the east becoming North Manchester General Hospital by 1978. From 1978 the site is occupied by a car park with an electrical sub-station 20m east. Made Ground deposits are not indicated to be present onsite according to BGS, however given the previous uses deposits are anticipated to be present. Superficial soils are indicated as Glacial Till deposits overlying the Chester Formation (bedrock). Environment Agency data indicates that the site, corresponding with the underlying bedrock geology, overlies a Principal Aquifer. The Glacial Till deposit is associated with a Secondary Undifferentiated Aquifer. The site is not located within a Source Protection Zone (SPZ). Nearest surface water feature is the River Irk approximately 464m east of site.
Fieldworks Undertaken	Fieldworks were carried out between 10th and 13th August and on the 26th August, comprising one cable percussion with rotary open-hole follow-on and four window sample boreholes. Three hand dug pits were advanced primarily for the identification of possible tanks below the raised concrete slab on site. BH101-BH101A was advanced up to 42.0m bgl (33.37m AOD), terminated in granular superficial deposits. Ground gas and groundwater monitoring standpipes were installed within the cable percussive with rotary open-hole follow-on exploratory hole (BH101-BH101A) and three of the window sample boreholes (WS101 to WS103). Selected soil samples were subjected to laboratory analysis. No groundwater samples were taken. Six ground gas monitoring visits have been undertaken.
Encountered Ground Conditions	Made Ground was encountered in all exploratory hole locations from ground level to depths between 0.80 and 1.30m bgl. This generally comprised a tarmacadam layer overlying a sandy gravel layer which in turn overlies a sandy clayey gravel or a slightly sandy gravelly clay. Gravel comprises dolomite hardcore and brick. In BH101-BH101A a very gravelly sand was encountered above the sandy gravel layer. In all hand pits (HP101 to HP103) a slightly sandy SILT was noted. Underlying the Made Ground the superficial deposits were highly variable, comprising cohesive and granular Till. The cohesive Till deposits were recorded as soft to firm slightly to sandy Clay and soft to firm slightly sandy to sandy Silt. In BH101-BH101A the silt was thinly laminated and in WS101 it was recorded as organic. Cohesive Till deposits were absent in the northern-most window samples, indicating the top of these deposits deepen northwards to greater than 5.45m bgl. The base of the cohesive deposits, as recorded in BH101-BH101A, was 38.0m bgl (37.37m AOD). The granular Till deposits comprised a loose to medium dense, becoming dense, slightly clayey Sand. In BH101-BH101A and WS104 the granular Till deposits were recorded as a slightly gravelly Sand. BH101-BH101A recorded granular deposits from 3.45-8.90m bgl and 38.0-42.0m bgl, with the base of the superficial deposits not confirmed. Bedrock was not encountered in any of the exploratory holes. During returned monitoring visits, shallow groundwater levels were recorded 73-74m AOD, with BH101-101A recorded deeper groundwater 66.72 - 66.88m AOD.
Environmental Laboratory Testing	With respect to the proposed 'Commercial' end-use of the site, no exceedances were noted in within the samples collected. Soil samples were also screened for asbestos, no suspected asbestos containing materials were identified in any of the laboratory testing. Concentrations of SVOCs and VOCs were recorded below thresholds where available and concentrations of PCBs were recorded below the Environmental Agency Soil Guidance Values for dioxins, furans and dioxin-like PCBs in Soil.

Fig 3 – Executive summary of 075805-CUR-00-XX-RP-GE-001-P02_Phase 2_Decant Village

Ground Gas Assessment	During the ground gas monitoring programme methane (CH₄) was recorded below the instrument's detection limit within all the monitoring wells. Maximum carbon dioxide (CO₂) concentrations were recorded at 0.8% in BH101-BH101A on the sixth monitoring visit. Gas flow was recorded at a maximum steady state flow rate of 2.2 l/hr in WS101 on the sixth visit. The 'representative' scenario records a maximum Q_{h_g} of 0.0022 l/hr for carbon dioxide. The site is therefore classified as CS1.
Geotechnical Assessment	The Made Ground, shallow cohesive and granular Glacial Till deposits do not provide suitable founding strata for the proposed development. As such, it is likely a piled foundation is used to transfer the loads to the firm becoming very stiff cohesive deposits below to provide suitable resistance for the proposed loads. It is recommended that a specialist piling contractor is consulted for advice on most suitable piling solution and design. A suitably qualified temporary works designer and an experienced piling contractor must be consulted prior to commencement of any works. No ground floor slabs are proposed for the temporary office accommodation development. Based on the laboratory test results it is considered that a Design Sulphate Class may be taken as DS-1 with an ACEC class of AC-1 within Made Ground and a Design Sulphate Class of DS-1 with an ACEC class of AC-1 within superficial deposits being appropriate.
Recommendations	Based on the findings of the ground investigation, the following recommendations are made: 1) It is recommended that specialist piling contractors are to be consulted to establish suitable pile design. 2) It is recommended that construction workers are provided with appropriate PPE and sanitary facilities, with reference to the environmental testing results presented herein and within Appendix C. 3) Should unexpected contamination be observed during construction advice should be obtained from a Geo-environmental Engineer.

Fig 3 – Executive summary of 075805-CUR-00-XX-RP-GE-001-P02_Phase 2_Decant Village (cont'd)