



STAGE 2 GEO-ENVIRONMENTAL REPORT

**AT
HART ROAD
THUNDERSLEY
ESSEX**

**ON BEHALF OF
LEGAL AND GENERAL
MODULAR HOMES**

ARP GEOTECHNICAL LTD

CHARTERED CONSULTING ENGINEERS

Northwest House 5/6 Northwest Business Park Servia Hill Leeds LS6 2QH

☎ 0113 245 8498 ✉ leeds@arpgeotechnical.co.uk 🌐 www.arpconsultingengineers.co.uk




CLIENT: LEGAL AND GENERAL MODULAR HOMES

JOB NUMBER: LEG/03

PROJECT: HART ROAD, THUNDERSLEY, ESSEX

REPORT TYPE: STAGE 2 GEO-ENVIRONMENTAL REPORT

REPORT REFERENCE: LEG/03r2

	Name	Signature
Prepared By:	D Bennett BSc MSc FGS	
Reviewed By:	J Race BSc CGeol FGS EurGeol	
Authorised By:	A Radcliffe BEng CEng MStructE	

ISSUE	DATE	STATUS
1	6 TH NOVEMBER 2020	V1 FINAL

CONTENTS

	Page
1.0 Executive Summary	4
2.0 Terms of Reference	5 - 6
3.0 The Site	7 - 8
4.0 Environmental Setting	9 - 10
5.0 Site Investigation	11 - 12
6.0 Summary of Ground Conditions	13 - 14
7.0 Contamination Analysis	15 - 21
8.0 Geotechnical Testing	22 - 23
9.0 Comments and Conclusions	24 - 29

APPENDICES

Appendix A	Site Location Plan, Aerial Photograph and Proposed Layout
Appendix B	Borehole and Trial Pit Location Plan and Logs
Appendix C	Laboratory Test Certificates and Screening Values
Appendix D	Risk Categorisation Tables
Appendix E	Contamination Remediation Statement

1.0 EXECUTIVE SUMMARY

The pertinent conclusions of the report are tabulated below. However, the information below is not exhaustive, and it is recommended the report is read in its entirety.

Proposed Development	Residential dwellings with private gardens.
Existing Site Description	Occupied by a residential dwelling and stables, and an equestrian ménage in the north of the site. Remaining site is undeveloped.
Site History	Buildings present in the north of the site and infilled pond present in the southeast of the site. Remaining site is undeveloped.
Geology	Head deposits, overlying Bagshot Formation (sands).
Coal Mining	Site not in a coal mining area and can be considered stable.
Radon	No protection measures required.
Landfill Gas	Borehole gas monitoring is ongoing and will be reported separately on completion.
Ground Conditions	Topsoil across majority of the site. Made ground in the north and southeast to a maximum depth of 0.8m. Natural strata comprise slightly sandy clays, commonly slightly gravelly.
Contamination	The basal pond material at WS1 below 0.6m, was found to contain elevated PAH compounds. The clay made ground at WS7 was found to be elevated in lead.
Remediation Strategy	The basal pond material is at 0.6m depth in an area not proposed for development and presents negligible risk on this basis. The material at WS7 should be excluded from any rear gardens, or alternatively covered by 0.6m of clean soils in rear gardens only.
Foundations	Natural strata considered suitable for strip/trench fill foundations. A tree survey is likely to be required due to the presence of clays.
Excavations	Liable to be stable in the short term, in the natural strata. Groundwater ingress unlikely, but probably controllable if encountered.
Soakaways	Not considered practical on the site.
Road Pavement	A design CBR value of 2% is considered applicable on the clay.

2.0 TERMS OF REFERENCE

- 2.1 Legal and General Modular Homes is considering developing the site at Hart Road, Thundersley, in Essex, with residential properties. It was considered appropriate to provide information to aid viability assessment and design of any subsequent development. In October 2020, ARP Geotechnical Ltd issued a Stage 1 Desk Study Report (Reference LEG/03r1, dated 9th October 2020). This involved an assessment of the geological and coal mining aspects, Ordnance Survey archive maps, radon gas, indicative flood risk, hydrogeology, landfill, and other environmental issues, primarily by assessment of a Landmark Envirocheck Report. In addition to comments and conclusions on a wide range of environmental and geotechnical issues, the report also provided recommendations for intrusive investigation and assessment.
- 2.2 In October 2020, ARP Geotechnical Ltd was appointed by Legal and General Modular Homes to undertake the recommended further works, with the intrusive investigation comprising trial pits and windowless sample boreholes to assess the ground conditions.
- 2.3 The investigation was implemented generally in accordance with BS 5930:2015 +A1:2020 "Code of practice for site investigations", NHBC Standard Chapter 4.1 "Land quality - managing ground conditions", Environment Agency LCRM "Land Contamination Risk Management" and BS10175 : 2011 + A2 : 2017 "Investigation of potentially contaminated sites - Code of practice". This report is limited to the data obtained as part of this investigation. It should be noted that there is a possibility of variation in ground conditions between test locations and interpretation of strata is given for guidance only. No liability is accepted for changes to site conditions, including groundwater levels, after the preparation of this report.
- 2.4 The findings or contents of the Stage 1 Desk Study Report are not reproduced here in full, and it is recommended that this report is read in conjunction with the Stage 1 Report.
- 2.5 The general observation and assessment of the ground surface, and the identification/classification of vegetation is made in general terms only. It would be prudent for a specialist to undertake a more detailed survey, including for any invasive/harmful weeds.

- 2.6 The assessment of any topsoil is carried out in terms of potential chemical effects on human health only, and no account is taken of aesthetic or horticultural properties. Such considerations should be referred to a horticulturist or landscape architect.
- 2.7 The report has been prepared for the use and reliance of the Client only. The report shall not be relied upon or transferred to any other parties without the written agreement of ARP Geotechnical Ltd. For the avoidance of any doubt, where ARP Geotechnical Ltd enters into a letter of reliance for the benefit of a third party, that third party will be permitted to rely on the report. No responsibility will be accepted where this report is used, either in its entirety or in part, by any other party without ARP Geotechnical Ltd.'s consent.
- 2.8 Attention is drawn to the requirements of the Construction Design and Management Regulations 2015, and in particular the duties and obligation of the Client.
- 2.9 The report refers to, and includes, a copy of an indicative proposed layout. This is only for the purposes of generating a conceptual site model for the contamination risk assessment. Unless the proposed layout changes significantly, such that the conceptual model and risk assessment is affected, there is no requirement to re-issue this report when the layout is revised.

3.0 THE SITE

Site Location

- 3.1 The site, which is centred on Ordnance Survey Grid Reference 579700, 188600, is located off Hart Road, Thundersley, in Essex.
- 3.2 A site location plan, aerial photograph, and proposed site layout, are presented in Appendix A.

Site Description

- 3.3 The site is currently occupied in the north by a residential property that fronts onto Hart Road, with associated hardstanding and a courtyard to the rear of the property. Small outbuildings and stables are present in the courtyard to the south of the building, comprising wooden frames and felt roofing. A small area of grass is also present in the courtyard. In the north of the site is an equestrian ménage which, at the time of the investigation, contained horses. The south of the site is undeveloped land which was boggy underfoot during the walkover and investigation. A wooden fence is present around the southeastern corner of the site, in the location of a former pond. A small stockpile of wood and tree branches was also present in the southeast of the site.
- 3.4 The site is bounded to the north by Hart Road and residential properties, beyond which are further residential properties. Cedar Hall School abuts the western boundary of the site, which includes buildings, playing fields and car parking. To the south and east of the site is undeveloped grassland, with residential properties beyond. The site slopes down gently to the southeast.

Site History

- 3.5 Ordnance Survey archive maps show the site was part of a larger agricultural field from at least 1876 to sometime before 1923. From 1923, small buildings were shown to be present on

the north. By 1962, a large residential dwelling is shown to be present on the north, and additional buildings on the northwest of the site. Google Earth aerial photography shows a large pond to be present in the southeastern corner of the site, which was presumably infilled by 2017. From at least 1971, Cedar Hall School is present beyond the western boundary of the site and the surrounding areas to the north and northeast have seen gradual residential development.

4.0 ENVIRONMENTAL SETTING

- 4.1 The environmental setting for the site was established by the Stage 1 Desk Study Report undertaken by ARP Geotechnical Ltd under reference LEG/03r1 and dated October 2020. The findings of the Desk Study Report, updated and amended where deemed appropriate, are summarised below.

Geology

- 4.2 The geological maps show the site to be underlain by superficial head deposits, comprising clay, silt, sand and gravel. The underlying bedrock geology comprises sands of the Bagshot Formation. There are no faults shown to affect the site.

Coal Mining

- 4.3 The site is not within a Coal Mining Reporting Area and is therefore considered stable in this regard.

Hydrogeology

- 4.4 The Landmark Envirocheck Report indicates the Bedrock Aquifer Designation to be "Secondary A Aquifer". The overlying superficial head deposits are designated "Unproductive Strata".
- 4.5 There are no groundwater abstractions within 1km of the site.
- 4.6 The site is not within a groundwater Source Protection Zone.

Hydrology

- 4.7 The nearest downslope surface water is an unnamed stream or open drain, flowing eastwards along the southern boundary of the site. Any surface water run-off, which is not intercepted by drainage, is likely to reach the stream. The site is not in an area at risk from river flooding.
- 4.8 There are no sensitive surface water abstractions within 1km downstream of the site.

Other Relevant Environmental Data

- 4.9 There are no closed or currently licensed landfills within 250m of the site. However, a former pond is present in the southeast of the site, which has likely to have been infilled.
- 4.10 No radon protective measures are stated to be necessary for new dwellings or extensions on the site, and the site is within a “lower probability radon area”.
- 4.11 The site is not within an area at risk from river flooding.

Potential Contamination Sources

- 4.12 The following potential sources of contamination were identified in the Stage 1 Desk Study Report
 - 4.12.1 Possible made ground (most likely in the north, and in the area of the former pond): – metals inorganics, total petroleum hydrocarbons (TPH), polycyclic aromatic hydrocarbons (PAH), phenol, asbestos.
 - 4.12.2 Possible asbestos within existing buildings.
 - 4.12.3 Possible harmful gases from infilled pond in southeast of the site: - methane, carbon dioxide.

5.0 SITE INVESTIGATION

- 5.1 A site investigation was undertaken by ARP Geotechnical Ltd on 8th and 9th October 2020. The purpose of the investigation was to produce an assessment of the site in accordance with BS10175 : 2011 + A2 : 2017 "Investigation of potentially contaminated sites - Code of practice", and to provide geotechnical information to aid design of the development.
- 5.2 The site was gridded on a maximum 25m spacing and trial pits were excavated and sampled on the grid, to satisfy the requirements of the British Standard, along with any targeted locations. Fifteen trial pits (TP1 to TP15) were excavated, to depths of between 1.1m and 1.9m and seven windowless sample boreholes were drilled to depths of between 3.5m and 5.45m (WS1 to WS7). The trial pits and boreholes were organised, supervised and logged by an Engineer from ARP Geotechnical Ltd. Justifications for the trial pit locations are given below.

LOCATION	REASON
TP1 to TP15	Part of grid.
TP12 to TP15 & WS7	Part of grid and in area of buildings on the north.
WS2 to WS6	Part of grid.
WS1	Part of grid and targeting position of infilled pond.

- 5.3 Four gas monitoring wells were installed, in WS1, WS2, WS3 and WS4, and monitoring is ongoing. The wells were installed to 3m depth, with the bottom 2m comprising slotted pipe with gravel surround, and the upper 1m comprising plain pipe with bentonite seal and lockable flush cover.
- 5.4 The trial pit and borehole location plan and logs are included in Appendix B. It should be noted that the co-ordinates on the logs have not been surveyed in, but are automatically determined by the logging software (which incorporates mapping) following positioning of

each location by the Engineer. However, each position has been located using smartphone GPS, with an indicated accuracy of 2m to 3m at the time of the investigation.

- 5.5 Chemical analysis of 22 soil samples for metals, inorganics, speciated PAH, TPH, phenols, and asbestos was undertaken by the UKAS accredited Eurofins Chemtest Ltd laboratory in Cambridge. Elevated determinands were tested further for leachability to determine the potential mobility of the contaminants. The test certificates are included in Appendix C.
- 5.6 Analysis for Atterberg Limits and moisture content was undertaken by the UKAS accredited Professional Soils Laboratory (PSL) in Doncaster. Geochemical testing comprising pH and water soluble sulphate was undertaken by Eurofins Chemtest Ltd. The test certificates are included in Appendix C.

6.0 SUMMARY OF GROUND CONDITIONS

Strata and Groundwater

- 6.1 Across the vast majority of the site, a surface covering of natural topsoil was present, comprising brown slightly sandy slightly gravelly clayey topsoil, with the gravel content being fine to medium, rounded, of mixed lithology. The topsoil was 0.3m thick across the site.
- 6.2 In WS1 (position of infilled pond) and WS7 (courtyard in the north of the site) made ground was encountered. The made ground in WS1 comprised brown slightly sandy gravelly clay, with the gravel content fine to coarse, angular to subangular, of mixed lithology, brick, wood fragments, and trace ceramics to a depth of 0.6m. Beneath this was a 0.2m thick layer of made ground comprising dark grey/black slightly sandy slightly gravelly clay, with the gravel content of wood, organic matter, and mixed lithology (probably basal pond material). In the north of the site (WS7), was concrete hardstanding to a depth of 0.3m, which was underlain by grey slightly sandy slightly gravelly clay, with the gravel content fine to medium, subangular, of brick.
- 6.3 Underlying the topsoil and made ground identified above was typically firm to stiff (medium to high strength) grey mottled brown slightly sandy clay, commonly slightly gravelly. Where present, the gravel content was typically fine to medium, subrounded, and of mixed lithology. In WS2, brown clayey silty sand was encountered from 4.4m to 4.5m depth. The strata are all interpreted to be superficial head deposits.
- 6.4 One dynamic probe (DP1) was implemented to 10m depth, from the base of WS7. Refusal was not reached within 10m, indicating that bedrock is not present within 10m of the surface.
- 6.5 The excavations generally remained stable for the short period of exposure, and the pits were backfilled with the arisings on completion. No groundwater seepages were encountered in any of the trial pits and the cores samples remained dry throughout, with the exception of WS2 from 4.4m to 4.5m, which coincides with a band of silty sand.

Gas Assessment

- 6.6 The ground gas investigation is currently in progress, and will be reported separately on completion of six monitoring visits.

7.0 CONTAMINATION ANALYSIS

Screening Values - Soils

- 7.1 There is presently conflicting opinion with regard to the appropriate generic assessment criteria, or screening values, for soils which should be used in contamination assessment for proposed development. In March 2014, DEFRA published Category 4 Screening Levels (C4SLs) for six contaminants: arsenic, benzene, benzo(a)pyrene, cadmium, chromium VI and lead. The values are based on the toxicological benchmark of a "low level of toxicological concern" (LLTC) rather than the previous regulatory approach of "minimal or tolerable level of risk". As the C4SLs are less protective of health than the previous approach, the Chartered Institute of Environmental Health (CIEH) has advocated an alternative approach based on minimal risk, but with some adjustment of exposure parameters to more realistic scenarios than those previously used. To this end, the CIEH has collaborated with Land Quality Management to publish "Suitable 4 Use Levels" (S4ULs) "The LQM/CIEH S4ULs for Human Health Risk Assessment", November 2014 (LQM/CIEH). However, DEFRA has reiterated its intention that the C4SLs should be used in generic risk assessment for proposed development, and there is indication that other parties will collaborate, in the near future, to extend the range of C4SL determinands beyond the six published so far.
- 7.2 In the absence of a final resolution to the debate, soil contamination test results in this report have been compared first against the more conservative S4UL, and where a C4SL exists for the same determinand, consideration given to the use of the C4SL for any exceedences of the S4UL, within the site specific context (including the use of benzo(a)pyrene as a surrogate marker for genotoxic PAH compounds, where appropriate). Where no S4UL exists for a determinand, for example lead, the C4SL has been used. The LQM/CIEH screening values have been calculated for soil organic matter contents of 1% and 2.5%, as well as 6%, and the appropriate screening value is used for the organic matter content of the soil. All the C4SL values published are for a soil organic matter content of 6%.
- 7.3 A table showing the screening values utilised is included in Appendix C.

Soils Analysis

- 7.4 Twenty-two soil samples were issued to Eurofins Chemtest for the suite of testing (As, Cd, Cr (VI), Cr(III), Cu, Hg, Ni, Pb, Se, Zn, Total Sulphate, Water Soluble Sulphate, pH, Phenol-monohydric, Speciated PAH, Total TPH, Asbestos, and Organic Matter). The testing comprised:

Nineteen samples of topsoil from TP1 to TP13, TP15, and WS2 to WS6

Three samples of made ground from WS1 and WS7

- 7.5 For each material, any determinands with exceedances of screening values were subjected to statistical analysis to determine the 95% Upper Confidence Level (UCL). This was only possible for the topsoil, as the limited number of made ground samples did not permit statistical analysis.

Topsoil

- 7.6 A results summary table for determinands within the topsoil found to be above screening values is given below

Sample Reference	Depth (m)	Lead	DahA
TP1 D1	0.0-0.3	82	<0.10
TP2 D1	0.0-0.3	74	0.11
TP3 D1	0.0-0.3	55	<0.10
TP4 D1	0.0-0.3	56	<0.10
TP5 D1	0.0-0.3	79	0.11
TP6 D1	0.0-0.3	72	<0.10
TP7 D1	0.0-0.3	66	<0.10
TP8 D1	0.0-0.3	35	<0.10
TP9 D1	0.0-0.3	84	0.21
TP10 D1	0.0-0.3	100	<0.10
TP11 D1	0.0-0.3	92	0.10
TP12 D1	0.0-0.3	72	0.34
TP13 D1	0.0-0.3	140	<0.10
TP15 D1	0.0-0.3	280	0.11
WS2 D1	0.0-0.3	52	<0.10
WS3 D1	0.0-0.3	88	0.13
WS4 D1	0.0-0.3	51	<0.10
WS5 D1	0.0-0.3	94	0.24
WS6 D1	0.0-0.3	800	<0.10
Screening Value at 2.5% SOM*		200	0.24
95% UCL Value		193	0.15

* Residential with Home-Grown Produce screening value. DahA=Dibenzo(a,h)anthracene
SOM= Soil Organic Matter. All units in mg/kg unless indicated otherwise.

Exceedance

Acceptable

- 7.7 The 95% UCL concentrations for lead and DahA are below the respective screening values, despite the exceedances highlighted. The concentration of lead at WS6 is an outlier but, as the description of the material is in keeping with the rest of the site, the concentration is attributed to random variation/scatter of the results, with no requirement to treat this sample differently. The topsoil on the site is concluded to be suitable, in terms of human health risks, for re-use on the site.

Made Ground

- 7.8 A results summary table for determinands within the made ground found to be above screening values is given on the following page.

Sample Reference	Depth (m)	Lead	BbF	BaP	DahA
WS1, D1 (clay including brick, ceramic)	0.3-0.4	29	<0.1	<0.1	<0.1
WS1, D2 (basal pond material with wood, plant matter)	0.7-0.8	120	4.3	3.3	1.0
WS7, D1 (gravelly clay with brick fragments)	0.3-0.5	300	2.2	2.0	0.22
^b Screening Value at 2.5% SOM*		200	2.6	2.2	0.24

F=Benzo(b)fluoranthene. BaP=Benzo(a)pyrene. DahA=Dibenzo(a,h)anthracene.

*Residential with Home-Grown Produce Screening Value. All units in mg/kg unless indicated otherwise.

Exceedance

- 7.9 It can be seen from the table that concentrations of lead, benzo(b)fluoranthene, benzo(a)pyrene and dibenzo(a,h)anthracene will need to be considered further in the risk assessment, as the maximum concentrations are above the screening values.

Updated Risk Assessment and Conceptual Model

- 7.10 The categorisations of risk adopted in this report are adapted from CIRIA Report C552 (Contaminated Land Risk Assessment: A Guide to Good Practice, 2001). This approach assesses the potential severity of any pollution event and the probability of the event occurring, to arrive at a risk category, for the various potential source - pathway - receptor linkages. The relevant tables used, with the definitions, are presented in Appendix D.
- 7.11 The updated source – pathway – receptor matrix is presented below, taking into account the findings of the investigation. Any pathways in italics are deemed not to be viable and the reason given.

Viable Source - Pathway - Receptor Matrix (Finished Development)

Contamination Sources	Pathways	Receptors	Severity of Consequence	Probability of Event	Risk
Basal pond material at WS1 - PAH, including BaP at 3.3mg/kg Made ground at WS7: - Lead at 300mg/kg.	<ul style="list-style-type: none"> Inhalation, ingestion and dermal contact with soil and dust Fruit and vegetable intake, with soil Vapour inhalation outdoor Vapour inhalation indoor 	Humans:- <ul style="list-style-type: none"> Future occupants Maintenance workers Adjacent residents and general public 	Medium	Low Likelihood	Moderate/Low
	<ul style="list-style-type: none"> Migration in surface water (negligible, as the materials should be below the surface). 	<ul style="list-style-type: none"> Surface water (nearest downslope is along southern boundary. There are no sensitive abstractions within 1km) 	Negligible		
	<ul style="list-style-type: none"> Migration in groundwater (source concentrations and volumes minimal) 	<ul style="list-style-type: none"> Groundwater (Secondary A Aquifer, no abstractions within 1km) 	Negligible		
	<ul style="list-style-type: none"> Root uptake 	Vegetation:- <ul style="list-style-type: none"> Landscape areas Private gardens 	Medium	Low Likelihood	Moderate/Low
	<ul style="list-style-type: none"> Migration 	Services/Utilities:- <ul style="list-style-type: none"> Potable water supply 	Medium	Low Likelihood	Moderate/Low
Infilled pond on site:- methane and carbon dioxide	<ul style="list-style-type: none"> Asphyxiation Explosive risk 	<ul style="list-style-type: none"> Construction/de-molition workers Future occupants Buildings 	Severe	Low Likelihood	Moderate
Possible asbestos within existing buildings	<ul style="list-style-type: none"> Inhalation 	<ul style="list-style-type: none"> Future occupants Maintenance workers Adjacent residents and general public 	Severe	Low Likelihood	Moderate

7.12 It can be seen from the above matrix that several pathways to receptors are operative, and this may affect users of the finished development, with a moderate risk applicable. Some form of remedial action is, therefore, considered necessary to allow residential development without excess risk.

Asbestos Within Existing Buildings

- 7.13 Provided an asbestos survey is carried out prior to any demolition or work on the existing buildings on the site, and any identified asbestos is removed and disposed to a licenced facility, then the risk to receptors is low. The work should be carried out by appropriately qualified Contractors.

Hazardous Gases

- 7.14 To address the potential risk from the infilled pond on the site, monitoring of borehole wells is in progress. This will determine whether or not protection measures are likely to be necessary. This will be confirmed by separate letter report on completion of the monitoring.

Made Ground at WS1 (Infilled Pond) - Ingestion, Dust Inhalation, Dermal Contact, Root Uptake, and Fruit and Vegetable Intake, With Soil

- 7.15 The basal pond material is already at a depth of 0.6m below existing ground levels. Provided it remains at this depth (this is likely to be the case, as no development is proposed on this area of the site), the risks to future occupants from these pathways are negligible.

Made Ground at WS7 (Existing Yard Area) - Ingestion, Dust Inhalation, Dermal Contact, Root Uptake, and Fruit and Vegetable Intake, With Soil

- 7.16 The concentrations in this material are compatible with front garden and public open space (POS) areas, but not rear gardens where vegetable may be grown and eaten. Therefore, the material should be removed where it is present in proposed rear garden areas, and placed either below hard areas, front gardens, or POS. Alternatively, protection could be provided by covering the material by at least 0.6m thickness of clean subsoil and topsoil.

Migration to Utilities

- 7.17 The local water company are likely to require details of the contaminants present on the site, to make a judgment on any requirement for protection of buried water supply pipes from chemical attack/ingress.

Risks During Construction Period

- 7.18 It is also necessary to consider the effects of the contamination present on the site in relation to the risks to adjacent residents, construction workers and the general public during construction. The concentration of contaminants is low and, therefore, conventional hygiene and PPE should provide adequate protection to construction workers. The risks to the environment and the surrounding residents should be minimised by the standard good practice of preventing public access by appropriate fencing, preventing dusting of material by damping down, and preventing any surface water run-off onto adjacent land or the watercourse.
- 7.19 The risk from asbestos in buildings is an exception to the above, and requires specialist attention:

Asbestos in existing buildings	Inhalation	High	Provided an asbestos survey is carried out, and any identified asbestos is removed from site prior to any other works commencing, the pathway is blocked and the risk is negligible.
--------------------------------	------------	------	--

- 7.20 Provision of all the above measures will ensure that all the identified pathways for the contamination will be blocked.
- 7.21 Any imported soils to be used on the site will need to be verified as suitable by inspection and testing.
- 7.22 A Contamination Remediation Statement is included in Appendix E.

8.0 GEOTECHNICAL TESTING

- 8.1 Selected samples of the natural strata were delivered to PSL in Doncaster for testing with regard to plasticity indices and moisture content. Test certificates are presented in Appendix C and a summary of the results, including Modified Plasticity Indices, is given below.

Location	Depth (m)	MC	LL	PL	PI	<425µm	I'p
TP3 D2	1.5-1.7	26	62	25	37	100	37
TP6 D2	1.2-1.4	36	60	24	36	100	36
WS1 D3	4.0-4.5	34	64	25	39	100	39
WS5 D2	3.0-3.3	30	54	22	32	100	32
	No. of results	4	4	4	4	4	4
	Min.	26	54	22	32	100	32
	Max.	36	64	25	39	100	39

I'p	VCP
>40%	High
20% - <40%	Medium
10% - <20%	Low

MC= Moisture Content (%) LL= Liquid Limit (%) PL= Plastic Limit (%)
 PI= Plasticity Index (%) I'p= Modified PI (%) VCP= NHBC Standard Chapter 4.2 Volume Change Potential

- 8.2 The plasticity test data shows the clays to be of high plasticity, in accordance with BS 5930:2015 +A1:2020 "Code of Practice for Site Investigations". When the percentage retained on the 425 micron BS sieve is considered, the Modified Plasticity Index, in accordance with NHBC Standard Chapter 4.2 "Building Near Trees" is a maximum of 39. In accordance with the Standard, this equates to Medium Volume Change Potential.
- 8.3 Geochemical testing (water soluble sulphate and pH) was undertaken on selected samples by Eurofins Chemtest, comprising four samples of natural strata, two samples of gravelly clay made ground, and one sample of basal pond, organic rich made ground. The results for the

gravelly clay made ground, and natural strata were similar and have been combined to one dataset, whilst the basal pond material had distinctively different results and has been considered separately. In accordance with the BRE Special Digest 1 "Concrete in aggressive ground", the characteristic values for the two materials are given below:

Characteristic Values

Material	pH	SO₄
Gravelly Clay Made Ground and Natural Strata	6.5	128
Grey/black Basal Pond Material (WS1 @ 0.6m)	6.1	1,000

SO₄ = Sulphate content in mg/l on a 2:1 water : soil extract pH = Acidity

- 8.4 The geochemical analyses show the natural strata and gravelly clay made ground to have low water soluble sulphate content and slightly acidic pH. The Aggressive Chemical Environment for Concrete (ACEC) class is AC-1. The use of GEN 1 designated concrete will, therefore, be satisfactory for unreinforced buried concrete, in accordance with BS 8500-1:2015+A2:2019. For any reinforced buried concrete, other design-specific mixes will apply.
- 8.5 However, testing on the grey/black basal pond material indicates class AC-3z. Therefore, the use of FND3z designated concrete will be necessary for any unreinforced buried concrete in contact with this material. However, no development is proposed for this area, based on the proposed layout received.

9.0 COMMENTS AND CONCLUSIONS

Site Description

- 9.1 At the time of the investigation, the site was occupied in the north by a residential property that fronts onto Hart Road, with associated hardstanding and a courtyard to the rear of the property. Small outbuildings and stables are present in the courtyard to the south of the building, comprising wooden frames and felt roofing. A small area of grass is also present in the courtyard. In the north of the site is an equestrian ménage, which at the time of the investigation contained horses. The south of the site is undeveloped land which was boggy underfoot during the walkover and investigation. A wooden fence is present around the southeastern corner of the site in the location of a former pond. A small stockpile of wood and tree branches was also present in the southeast of the site.
- 9.2 The site is bounded to the north by Hart Road and residential properties, beyond which are further residential properties. Cedar Hall School abuts the western boundary of the site, which includes buildings, playing fields and car parking. To the south and east of the site is undeveloped grassland, with residential properties beyond. The site slopes down gently to the southeast.

Site History

- 9.3 Ordnance Survey archive maps show the site was part of a larger agricultural field from at least 1876 to sometime before 1923. From 1923, small buildings were shown to be present on the north. By 1962, a large residential dwelling is shown to be present on the north, and additional buildings on the northwest of the site. Google Earth aerial photography shows a large pond to be present in the southeastern corner of the site, which was presumably infilled by 2017. From at least 1971, Cedar Hall School is present beyond the western boundary of the site and the surrounding areas to the north and northeast have seen gradual residential development.

Geology

- 9.4 The geological map shows the site to be underlain by superficial head deposits, comprising clay, silt, sand and gravel. The underlying bedrock geology comprises sand of the Bagshot Formation. There are no faults shown to affect the site.

Coal Mining and Coal Recovery

- 9.5 The site is not within a Coal Mining Reporting Area and is therefore considered stable in this regard.

Environmental Data

- 9.6 The strata beneath the site are classed as a Secondary A Aquifer. There are no groundwater abstractions within 1km of the site.
- 9.7 The nearest downslope surface water is a stream, flowing eastwards along the southern boundary of the site. Any surface water run-off, which is not intercepted by drainage, is likely to reach the stream. The site is not in an area at risk from river flooding. There are no sensitive surface water abstractions within 1km downstream of the site.
- 9.8 No radon protective measures are required for new properties constructed on the site.
- 9.9 A large infilled pond is present in the southeast of the site. Gas monitoring is ongoing and will be reported separately on completion.
- 9.10 The site is not at risk from river flooding. The risks of flooding from other causes such as adverse topography or insufficient surface water drainage, are not considered here. If such risk needs to be quantified, a separate specialist Flood Risk and Drainage Report should be commissioned, if not already available.

Ground Conditions Encountered

- 9.11 The ground investigation revealed a 0.3m thick surface covering of topsoil across the vast majority of the site, onto natural strata. Made ground was encountered only in WS1 (position of infilled pond) and WS7 (courtyard in the north of the site), comprising slightly sandy gravelly clay, including brick fragments, to a depth of 0.6m in WS1 and 0.5m in WS7 (below 0.3m of concrete). Below 0.6m in WS1 was a 0.2m thick layer of basal pond made ground, comprising dark grey/black slightly sandy slightly gravelly clay, including wood and organic matter.
- 9.12 The natural strata comprised typically firm to stiff (medium to high strength) slightly sandy clay, commonly slightly gravelly. Where present, the gravel content was usually fine to medium, subrounded, and of mixed lithology. In WS2 only, brown clayey silty sand was encountered from 4.4m to 4.5m depth. The strata are all interpreted to be superficial head deposits. A dynamic probe (DP1), carried out from the base of WS7, indicated that bedrock is not present within 10m of the surface. The excavations generally remained stable for the short period of exposure. No groundwater seepages were encountered in any of the trial pits and the cores samples remained dry throughout, with the exception of WS2 from 4.4m to 4.5m, which coincides with a band of silty sand.

Contamination Assessment

- 9.13 The contamination testing revealed the topsoil to contain occasional elevations of lead and dibenzo(a,h)anthracene, as a result of natural random variation, but the overall representative concentrations are considered to be acceptable for re-use of the soil on the site. The basal pond material at WS1 below 0.6m, was found to contain elevated PAH compounds (benzo(b)fluoranthene, benzo(a)pyrene and dibenzo(a,h)anthracene, at 4.3mg/kg, 3.3mg/kg and 1.0mg/kg respectively). The clay made ground at WS7 was found to be elevated in lead (300mg/kg).

- 9.14 The contamination risk assessment confirmed that, provided the basal pond material remains at 0.6m minimum depth (this should be case, as no development is proposed in this area), the risks to future occupants are negligible from the PAH. In relation to the made ground at WS7, the concentrations in this material are compatible with front garden and public open space (POS) areas, but not rear gardens where vegetable may be grown and eaten. Therefore, the material should be removed where it is present in proposed rear garden areas, and placed either below hard areas, front gardens, or POS. Alternatively, protection could be provided by covering the material by at least 0.6m thickness of clean subsoil and topsoil. Another option would be to test further samples of the material in a grid across the area in which it is present, to enable statistical analysis. This sometimes allows a reduction of the representative concentration, or may narrow down the area affected.
- 9.15 The above conclusions are subject to the agreement of the regulatory authorities. A Contamination Remediation Statement, which includes further detail on the remediation measures for the site, is presented in Appendix E.
- 9.16 An asbestos survey should be carried out on the existing buildings, unless one is already available, and any identified asbestos should be removed from site prior to any other works commencing.
- 9.17 This Report should be issued to the local water company for it to make a judgment on any requirement for protection of buried water supply pipes from chemical attack/ingress.

Foundations

- 9.18 The natural clays are considered suitable for the use of strip/trench fill foundations. On clays which are at least medium strength/firm, as found during the investigation, an allowable bearing pressure of 90kN/m² is considered applicable. In the area of the former pond (WS1), softer material was present near surface and material suitable for founding was only present below 1.4m depth. However, the present proposed layout does not show any proposed properties in this area.

- 9.19 The clays were shown to be of Medium Volume Change Potential. Therefore, in accordance with NHBC Standard Chapter 4.2 "Building Near trees", in the absence of trees, a minimum foundation depth of 0.9m below existing or proposed ground level is applicable, whichever is the lower. However, in the presence of any proposed, existing or removed trees, the foundation may need to be deepened, depending on the type of tree and its distance from the face of the foundation. If not already available, a tree survey may be required to enable a foundation schedule to be prepared. The tree survey will also need to consider trees on third party properties.
- 9.20 The foundation should be taken below the depth of any existing foundations or obstructions, onto natural ground. The whole plan area of the foundation should be placed on similar natural material.

Excavations

- 9.21 It is likely that excavations into the natural strata will remain stable in the short term, requiring minimal trench support, in accordance with the prevailing statutory guidance. However, some instability may be anticipated within made ground.
- 9.22 Significant groundwater seepages are not anticipated. Any encountered should be controllable by pumping from an artificial sump.
- 9.23 Excavations should be readily achieved using conventional hydraulic plant. However, excavations into buried foundations and structures on the north are likely to require a hydraulic breaker.

Chemical Precautions

- 9.24 For the natural strata and gravelly clay made ground, the Aggressive Chemical Environment for Concrete (ACEC) class is AC-1. The use of GEN 1 designated concrete will, therefore, be

satisfactory for unreinforced buried concrete, in accordance with BS 8500-1:2015+A2:2019. For any reinforced buried concrete, other design-specific mixes will apply. Testing on the grey/black basal pond material indicates class AC-3z. Therefore, the use of FND3z designated concrete will be necessary for any unreinforced buried concrete in contact with this material. However, no development is proposed for this area, based on the proposed layout received.

Road Pavement Construction

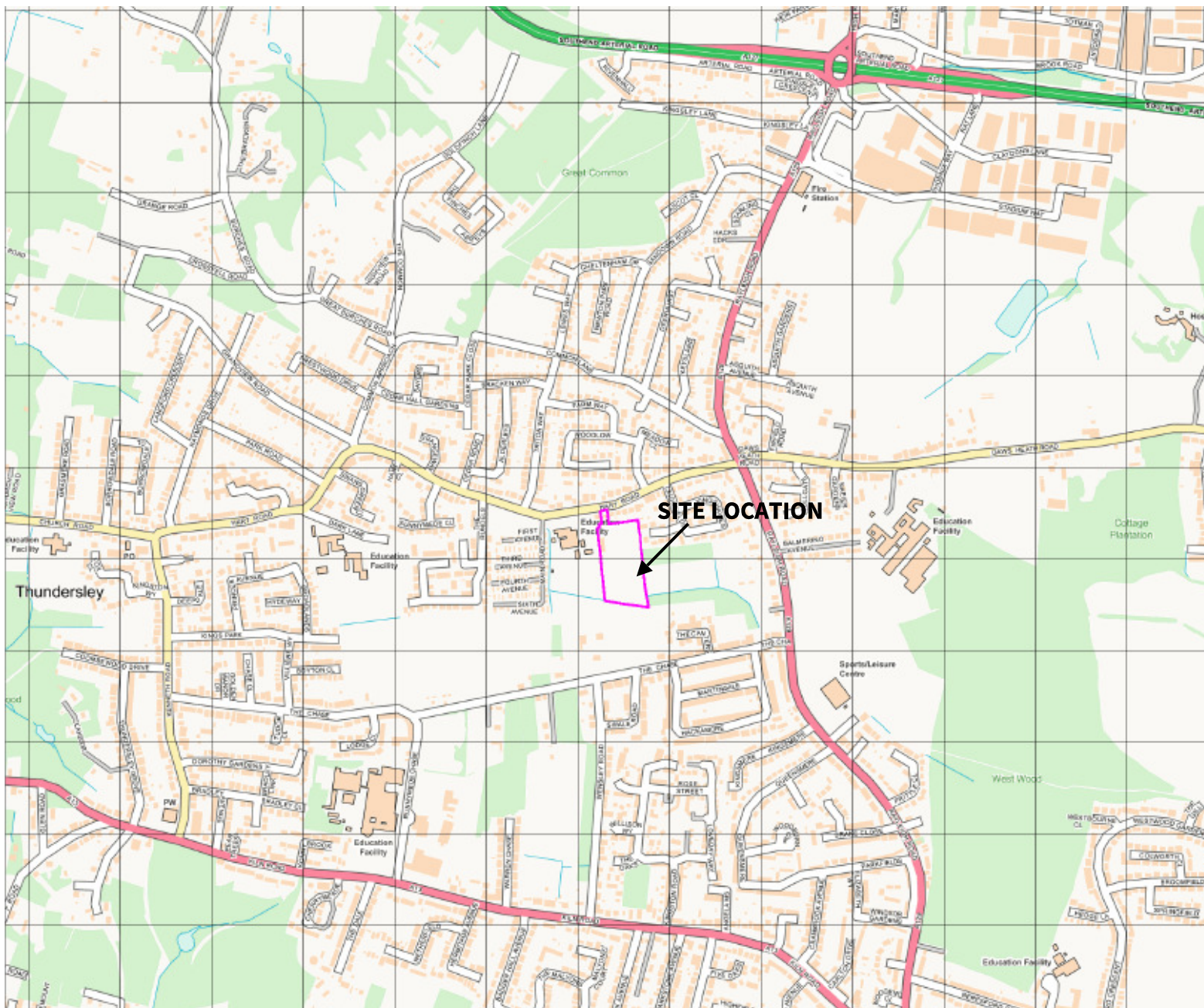
- 9.25 For any areas of road pavement, including parking areas, the formation will be the superficial clays. Based on the observed characteristics of the material, and the results of the plasticity testing a design California Bearing Ratio (CBR) value of 2% is considered applicable, below any obvious soft spots, and at equilibrium moisture content. If considered necessary, this should be confirmed by testing at proposed subgrade level before construction. Formation of roads on the existing made ground will not be acceptable.

Soakaways

- 9.26 The disposal of surface water using soakaways is not considered to be practical on the site due to the presence of deep low permeability strata.

A P P E N D I X A

S I T E L O C A T I O N P L A N , A E R I A L P H O T O G R A P H A N D P R O P O S E D L A Y O U T



0m 400m

Approximate Scale



ARP GEOTECHNICAL LTD
CHARTERED CONSULTING ENGINEERS

Northwest House 5-6 Northwest Business Park Senvia Hill Leeds LS6 2QH
Telephone: 0113 245 8498 Fax: 0113 244 3864 E-Mail: leeds@arpassociates.co.uk

Project **HART ROAD**
THUNDERSLEY
ESSEX

Client
LEGAL AND GENERAL
MODULAR HOMES

Title
SITE LOCATION PLAN

Date
SEPTEMBER 2020

Drawn DMB	Scale AS SHOWN
---------------------	--------------------------

Job No.
LEG/03



0m 56m

Approximate Scale



ARP GEOTECHNICAL LTD
CHARTERED CONSULTING ENGINEERS

Northwest House 5-6 Northwest Business Park Senvia Hill Leeds LS6 2QH
Telephone: 0113 245 8498 Fax: 0113 244 3864 E-Mail: leeds@arpassociates.co.uk

Project **HART ROAD**
THUNDERSLEY
ESSEX

Client
LEGAL AND GENERAL
MODULAR HOMES

Title
AERIAL PHOTOGRAPH

Date
SEPTEMBER 2020

Drawn DMB	Scale AS SHOWN
---------------------	--------------------------

Job No.
LEG/03

Hart Road, Thundersley

Design copyright is vested in the Company below from whom consent must be obtained for copying or reproducing this drawing.

PRELIMINARY



Schedule of Accommodation		
6no. 1b2p Flats	@	50sqm
4no. 2b4p Flats	@	70sqm
4no. 2b4p Houses	@	80sqm
6no. 2b4p Houses	@	85sqm
6no. 3b4p Houses	@	88sqm
15no. 3b5p Houses	@	93sqm
5no. 4b6p Houses	@	106sqm
Total of 46 dwellings		



ASHBY DESIGN
LIMITED

13 ARM & SWORD LANE
OLD HATFIELD HERTS AL9 5EH
T 01707 270 077 W www.ashbydesign.co.uk

Project
Hart Road,
Thundersley
Title
Proposed Sketch Scheme
Scale
1:750 @ A3
Date
November 2019

Drawing No.
F109/19/Feas/SK_02

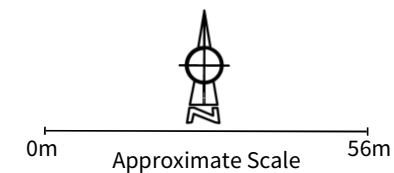
Drawn
LS/AM
Checked
LS

Revision

Proposed Sketch Scheme

APPENDIX B

BOREHOLE AND TRIAL PIT LOCATION PLAN AND LOGS



Key

- Trial Pit
- Windowless sample borehole
- Windowless sample borehole and gas well installation



ARP GEOTECHNICAL LTD
CHARTERED CONSULTING ENGINEERS

Northwest House 5-6 Northwest Business Park Senvia Hill Leeds LS6 2QH
Telephone: 0113 245 8498 Fax: 0113 244 3864 E-Mail: leeds@arpassociates.co.uk

Project HART ROAD
THUNDERSLEY
ESSEX






Client LEGAL AND GENERAL
MODULAR HOMES



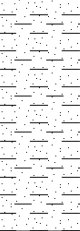
Title SITE INVESTIGATION PLAN

Date OCTOBER 2020

Drawn DMB Scale AS SHOWN

Job No. LEG/03


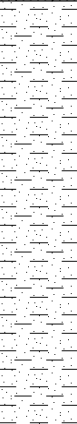
 ARP Geotechnical Limited				<h1 style="text-align: center;">Trial Pit Log</h1>				TrialPit No TP1 Sheet 1 of 1					
Project Name: Hart Road, Thundersley Essex				Project No. LEG/03		Co-ords: 579684.42 - 188535.32 Level:		Date 08/10/2020					
Location: Hart Road, Thundersley Essex						Pit Dimensions (m) Length: m Width: m Depth: 1.70 m		Machine Type: Hitachi Zaxis 17U					
Client: Legal and General Modular Homes								Scale 1:25 Logged: DMB					
Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description							
Depth	Type	Results											
0.00 - 0.30	ES	HSV=77	0.30			Brown slightly sandy slightly gravelly clayey TOPSOIL. Gravel is fine to medium rounded of mixed lithology.							
0.80								Stiff (high strength) brown mottled grey slightly sandy CLAY. [HEAD DEPOSITS]					
									Stiff brown mottled orange slightly sandy gravelly CLAY. Gravel is fine to coarse rounded of mixed lithology. [HEAD DEPOSITS]				
										Brown mottled grey slightly sandy CLAY. [HEAD DEPOSITS]			
										End of Pit at 1.700m Target depth achieved.			
<div style="display: flex; justify-content: space-between;"> Groundwater: No groundwater seepages encountered. 1 </div> <div style="display: flex; justify-content: space-between;"> Backfill: Backfilled with arisings on completion. 2 </div> <div style="display: flex; justify-content: space-between;"> Stability: Sides remained stable throughout. 3 </div> <div style="display: flex; justify-content: space-between;"> Remarks: 4 </div> <div style="display: flex; justify-content: space-between;"> RrTP_v1.053 5 </div>													

 ARP Geotechnical Limited				<h1>Trial Pit Log</h1>				TrialPit No TP2 Sheet 1 of 1	
Project Name: Hart Road, Thundersley Essex				Project No. LEG/03		Co-ords: 579721.47 - 188540.25 Level:		Date 08/10/2020	
Location: Hart Road, Thundersley Essex						Pit Dimensions (m) Length: m Width: m Depth: 1.10 m		Machine Type: Hitachi Zaxis 17U	
Client: Legal and General Modular Homes								Scale 1:25 Logged: DMB	
Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description			
Depth	Type	Results							
0.00 - 0.30	ES	HSV=110	0.30			Brown slightly sandy slightly gravelly clayey TOPSOIL. Gravel is fine to medium rounded of mixed lithology.			
0.75			1.10			Stiff (high strength) brown mottled grey slightly sandy CLAY. [HEAD DEPOSITS] <i>Old land drain intercepted.</i>			
						End of Pit at 1.100m Terminated due to steady water ingress from old land drain.			
<div>Groundwater: No groundwater seepages encountered.</div> <div>Backfill: Backfilled with arisings on completion.</div> <div>Stability: Sides remained stable throughout.</div> <div>Remarks: Redundant land drain intercepted at 0.4m.</div>									
RrTP_v1.053									



Date
08/10/2020



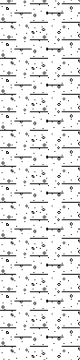
Logged:
DMB

Width:	m	Hitachi Zaxis 17U
Depth:	1.70 m	

Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
Depth	Type	Results					
0.00 - 0.30	ES	HSV=67 HSV=95	0.30			Brown slightly sandy slightly gravelly clayey TOPSOIL. Gravel is fine to medium rounded of mixed lithology.	1
0.75						Firm (medium strength) to stiff (high strength) brown mottled grey slightly sandy CLAY. [HEAD DEPOSITS]	
1.00							
1.50 - 1.70			D		1.70		End of Pit at 1.700m Target depth achieved.
							3
							4
							5

RrTP_v1.053



 ARP Geotechnical Limited				<h1 style="text-align: center;">Trial Pit Log</h1>				TrialPit No TP4 Sheet 1 of 1	
Project Name: Hart Road, Thundersley Essex				Project No. LEG/03		Co-ords: 579675.62 - 188568.51 Level:		Date 08/10/2020	
Location: Hart Road, Thundersley Essex						Pit Dimensions (m) Length: m Width: m Depth: 1.70 m		Machine Type: Hitachi Zaxis 17U	
Client: Legal and General Modular Homes								Scale 1:25 Logged: DMB	
Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description			
Depth	Type	Results							
0.00 - 0.30	ES		0.30			Brown slightly sandy slightly gravelly clayey TOPSOIL. Gravel is fine to medium rounded of mixed lithology.			
						Stiff brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to medium rounded to subrounded of mixed lithology. [HEAD DEPOSITS]			
						Firm brown mottled grey slightly gravelly sandy CLAY. Gravel is fine subrounded of mixed lithology. [HEAD DEPOSITS]			
						Brown slightly sandy gravelly CLAY. Gravel is fine to medium subrounded of mixed lithology. [HEAD DEPOSITS]			
						End of Pit at 1.700m Target depth achieved.			
Groundwater: No groundwater seepages encountered. Backfill: Backfilled with arisings on completion. Stability: Sides remained stable throughout. Remarks:									

 ARP Geotechnical Limited				<h1>Trial Pit Log</h1>				TrialPit No TP5 Sheet 1 of 1	
Project Name: Hart Road, Thundersley Essex				Project No. LEG/03		Co-ords: 579715.62 - 188574.01 Level:		Date 08/10/2020	
Location: Hart Road, Thundersley Essex						Pit Dimensions (m) Length: m Width: m Depth: 1.60 m		Machine Type: Hitachi Zaxis 17U	
Client: Legal and General Modular Homes								Scale 1:25 Logged: DMB	
Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description			
Depth	Type	Results							
0.00 - 0.30	ES	HSV=100	0.30			Brown slightly sandy slightly gravelly clayey TOPSOIL. Gravel is fine to medium rounded of mixed lithology.			
0.90			1.60			Stiff (high strength) brown mottled grey slightly gravelly sandy CLAY. Gravel is fine subrounded of mixed lithology. [HEAD DEPOSITS]			
						End of Pit at 1.600m Target depth achieved.			
Groundwater: No groundwater seepages encountered. Backfill: Backfilled with arisings on completion. Stability: Sides remained stable throughout. Remarks:									



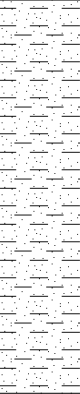
Date
08/10/2020

Logged:
DMB



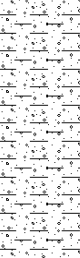
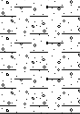
Width:	m	Hitachi Zaxis 170
Depth:	1.80 m	



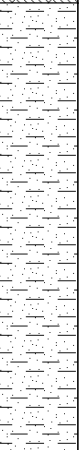
Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
Depth	Type	Results					
0.00 - 0.30	ES	HSV=83	0.30			Brown slightly sandy slightly gravelly clayey TOPSOIL. Gravel is fine to medium rounded of mixed lithology.	1
1.00	D					Stiff (high strength) brown mottled grey slightly sandy CLAY. [HEAD DEPOSITS]	
1.20 - 1.40						End of Pit at 1.800m Maximum reach of excavator.	2
			1.80				3
							4
							5

RrTP_v1.053

 ARP Geotechnical Limited				<h1 style="text-align: center;">Trial Pit Log</h1>				TrialPit No TP7 Sheet 1 of 1	
Project Name: Hart Road, Thundersley Essex				Project No. LEG/03		Co-ords: 579696.02 - 188591.51 Level:		Date 08/10/2020	
Location: Hart Road, Thundersley Essex						Pit Dimensions (m) Length: m Width: m Depth: 1.60 m		Machine Type: Hitachi Zaxis 17U	
Client: Legal and General Modular Homes								Scale 1:25 Logged: DMB	
Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description			
Depth	Type	Results							
0.00 - 0.30	ES	HSV=85	0.30			Brown slightly sandy slightly gravelly clayey TOPSOIL. Gravel is fine to medium rounded of mixed lithology.			
1.00			1.60			Stiff (high strength) brown mottled grey slightly sandy CLAY. [HEAD DEPOSITS]			
						End of Pit at 1.600m Target depth achieved.			
Groundwater: No groundwater seepages encountered. Backfill: Backfilled with arisings on completion. Stability: Sides remained stable throughout. Remarks:									

RrTP_v1.053

 ARP Geotechnical Limited				<h1 style="text-align: center;">Trial Pit Log</h1>				TrialPit No TP8 Sheet 1 of 1	
Project Name: Hart Road, Thundersley Essex				Project No. LEG/03		Co-ords: 579661.18 - 188592.50 Level:		Date 08/10/2020	
Location: Hart Road, Thundersley Essex						Pit Dimensions (m) Length: m Width: m Depth: 1.60 m		Machine Type: Hitachi Zaxis 17U	
Client: Legal and General Modular Homes								Scale 1:25 Logged: DMB	
Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description			
Depth	Type	Results							
0.00 - 0.30	ES	HSV=120	0.30			Brown slightly sandy slightly gravelly clayey TOPSOIL. Gravel is fine to medium rounded of mixed lithology.			
1.00			1.20			Stiff (high strength) brown mottled grey slightly sandy slightly gravelly CLAY. Gravel is fine to medium subrounded of mixed lithology. [HEAD DEPOSITS]			
			1.60			Stiff brown mottled grey slightly sandy gravelly CLAY. Gravel is fine to medium subrounded of mixed lithology. [HEAD DEPOSITS]			
			End of Pit at 1.600m Target depth achieved.						
<div style="display: flex; justify-content: space-between;"> <div> Groundwater: No groundwater seepages encountered. Backfill: Backfilled with arisings on completion. Stability: Sides remained stable throughout. Remarks: </div> <div> RrTP_v1.053 </div> </div>									

 ARP Geotechnical Limited				<h1 style="text-align: center;">Trial Pit Log</h1>				TrialPit No TP9 Sheet 1 of 1	
Project Name: Hart Road, Thundersley Essex				Project No. LEG/03		Co-ords: 579713.50 - 188610.13 Level:		Date 08/10/2020	
Location: Hart Road, Thundersley Essex						Pit Dimensions (m) Length: m Width: m Depth: 1.80 m		Machine Type: Hitachi Zaxis 17U	
Client: Legal and General Modular Homes								Scale 1:25 Logged: DMB	
Samples & In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description			
Depth	Type	Results							
0.00 - 0.30	ES	HSV=102	0.30			Brown slightly sandy slightly gravelly clayey TOPSOIL. Gravel is fine to medium rounded of mixed lithology.			
0.90			1.80			Stiff (high strength) brown mottled grey slightly sandy CLAY. [HEAD DEPOSITS]			
						End of Pit at 1.800m Maximum reach of excavator.			
Groundwater: No groundwater seepages encountered. Backfill: Backfilled with arisings on completion. Stability: Sides remained stable throughout. Remarks:									