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SITE INVESTIGATION & GROUND ASSESSMENT

LAND TO SOUTH OF ACCRINGTON ROAD WHALLEY, CLITHEROE

Report Ref BEK-19545-2 (Rev C) December 2021

Report Prepared for

Oakmere
CREATING QUALITY HOMES

GEO-ENVIRONMENTAL CONSULTING ENGINEERS

Project Quality Assurance Information Sheet

SITE INVESTIGATION & GROUND ASSESSMENT

Land to South of Accrington Road, Whalley

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TABLE OF CONTENTS

1.	**INTRODUCTION**
1.1	Appointment
1.2	Proposed Development
1.3	Objective & Scope of Work
1.4	Limitations
2.	**PRELIMINARY RISK ASSESSMENT**
2.1	Site Location
2.2	Site Layout & Description
2.3	Site History
2.4	Environmental Setting
2.5	Preliminary Conceptual Model
3.	**SITE INVESTIGATION**
3.1	General
3.2	Cable & Percussive Boreholes
3.3	Borehole Installations
3.4	Laboratory Testing
3.5	Ground Conditions
3.6	Environmental Monitoring
4.	**QUANTITATIVE RISK ASSESSMENT**
4.1	Potentially Significant Pollutant Linkages
4.2	Risk Assessment: Human Health Risks from Exposure to Contaminated Soil
4.3	Risk Assessment: Human Health Risks from Exposure to Ground Gas
4.4	Risk Assessment: Controlled Waters
4.5	Risk Assessment: Buildings
4.6	Risk Assessment: Conclusions
5.	**GEOTECHNICAL ASSESSMENT**
6.	**RECOMMENDATIONS**

APPENDICES	
Appendix A	Borehole Logs
Appendix B	Chemical Test Results
Appendix C	Geotechnical Test Results
Appendix D	Drawings

DRAWINGS	
BEK Drawing No 19545-1	Site Location Plan
BEK Drawing No 19545-2	Site Layout Plan
BEK Drawing No 19545-3	Borehole Location Plan
Drawing No 015/R-OAK/01 Rev G	Proposed Site Layout

1. INTRODUCTION

1.1 Appointment

1.1.1 BEK Enviro Limited (BEK) has been commissioned by Oakmere Homes (Northwest) Limited to carry out a site investigation for the proposed residential development at the land located to the south of Accrington Road, Whalley (hereafter referred to as 'the site'). The purpose of the investigation is to characterise the shallow ground conditions to inform a quantitative risk assessment with respect to contamination and ground gas, and to provide recommendations for foundation design for the new builds.

1.1.2 The site is located to the south of Accrington Road, Whalley and to the north of the River Calder approximately 5.5 km south of Clitheroe town centre.

1.1.3 The site occupies some 2.84 hectares (28,400 m²) and is roughly square in shape, comprising undeveloped open scrub land covered by medium to large grass and shrubs and occasional trees and marshy/boggy areas throughout. There is an embankment in the north east corner.

1.1.4 The site location and site layout are presented on BEK Drawing No 19545-1 and BEK Drawing No 19545-2, respectively. Copies of these drawing are presented in Appendix D.

1.2 Proposed Development

1.2.1 This report has been prepared to support a planning application for the construction of residential houses and apartments with associated gardens, access and infrastructure, see Figure 1 below:

***Figure 1**: Development Layout*

1.2.2 The full development layout is presented on Drawing No 015/R-OAK/01 Revision G, titled 'Reduced Development Proposal', dated November 2022, a copy of which is presented in Appendix D.

1.3 Objective & Scope of Work

1.3.1 The objection of the assessment herein is to provide a quantitative assessment of the potential risks from contamination and ground gas and to provide recommendations for foundation design for the new builds.

1.3.2 The site investigation was undertaken by BEK during June & July 2019 in accordance with the recommendations detailed in Preliminary Risk Assessment (PRA) prepared by BEK and with consideration to the development layout and anticipated ground conditions. The PRA should be read in conjunction with this report (Report Ref BEK-19545-1 Rev C).

1.3.2 This report has been prepared to provide a summary of the site details and ground conditions encountered as well as the quantitative risk assessment of the potential pollutant linkages identified within the PRA. The site investigation has been assessed as part of a geotechnical assessment to provide recommendations for foundation design.

1.4 Limitations

1.4.1 The conclusions and recommendations presented in this report are the result of our professional interpretation of the information currently available. BEK reserve the right to amend the conclusions and recommendations if further information becomes available.

1.4.2 However, it should be noted that much of the information has been derived from reports written by others and BEK takes no responsibility for the accuracy of that information. Notwithstanding the above, the reports reviewed have all been written by professional environmental consultants with a duty of care to provide relevant and accurate information.

1.4.3 The comments given in this report and the opinions expressed are based on review of reports provided to BEK, ground conditions encountered during site works and on the results of tests made in the field and in the laboratory. However, there may be conditions pertaining to the site that have not been disclosed by the investigations and therefore could not be taken into account.

2. PRELIMINARY RISK ASSESSMENT

2.0.1 This section provides an overview of the findings and recommendations presented in the PRA first prepared by BEK in April 2019.

2.1 Site Location

2.1.1 The site is located to the south of Accrington Road, Whalley and to the north of the River Calder approximately 5.5 km south of Clitheroe town centre. The National Grid Reference for the centre of the site is 373597, 436020.

2.2 Site Layout & Description

2.2.1 The site occupies some 2.84 hectares (28,400 m^2) and is roughly square in shape, comprising undeveloped open scrub land covered by medium to large grass and shrubs with frequent marshy/boggy areas. There is an embankment in the north east corner.

2.2.2 An engineer from BEK initially visited the site in April 2019 to carry out a site walkover/inspection. At the time of the walkover, access to the site was via the north-eastern corner of the site from Accrington Road.

2.2.3 The entrance to the site is formed by a relatively steep 'ramp' from Accrington Road with the majority of the site generally flat with a slight fall towards the south and the River Calder. The entrance 'ramp' appears to be formed from crushed building material and is vegetated with grass. There is a second steep entrance 'ramp' that has relatively recently been constructed from crushed aggregate in the centre north of the site.

2.2.4 The site is occupied by grass and shrubs with an area of brambles located towards the centre of the site. The site is generally bound by trees, hedgerows and fences with access gate in the south-east and another in the south-west of the site. A locked borehole was identified towards the south-east of the site during the site walkover.

2.2.5 A land drain flows from the centre of the eastern boundary of the site towards the south.

2.3 Site History

2.3.1 Based on the available historical maps the site has been occupied by agricultural fields from 1912 until circa 1967. Eleven poultry houses were located on site circa 1967 until circa 1994. The site has been vacant since 1994.

2.3.2 Adjacent areas of significance development include a gas works some 35m north shown on historic maps 1932 to 1975.

2.4 Environmental Setting

Geology

2.4.1 According to the GeoInsight report there is no artificial ground (made ground) present beneath the site.

2.4.2 The superficial deposits comprise that the underlying superficial geology comprises three different deposits including glacio-fluvial deposits (sand & gravel), alluvium (clay, silt, sand & gravel) and Glacial Till (Boulder Clay).

2.4.3 The underlying solid geology comprises of the Bowland Shale formation in the north-western corner of the site and the Pendle Grit Member in the south-east of the site.

Mining & Ground Stability

2.4.4 The site is located in an area that is unlikely to have been affected by coal mining. According to the Coal Authority interactive map, the site is not located within a coal mining reporting area.

2.4.5 The GeoInsight Report indicates the presence of a number (total of 16) of historical surface ground workings within 250 m of the site.

2.4.6 Six are located within 28 m of the site and are described as unspecified pit located 5 m south-east, sand pits located 6 m south-east and 13 m south-east, unspecified heaps located 11 m north-east of the site and unspecified ground workings located 28 m south-east. These date from 1846 to 1933.

2.4.7 There are no historical underground workings within 250 m of the site. However, the GeoInsight Reports that there are two non-coal mining reports on the site described as Vein Mineral. The report states that 'potential for difficult ground conditions are unlikely and localised and are at a level where they need not be considered'.

2.4.8 The site is unlikely to be affected by natural ground instability. However, consideration should be given with respect to the moderate classification for compressible deposits.

Hydrogeology

2.4.9 The Environment Agency (EA) classified the north of the site as a 'Secondary Aquifer (Undifferentiated)'. The remainder of the site is designated as 'Secondary 'A' Aquifer which are described as 'permeable layers capable of supporting water supplies at a local rather than strategic scale and in some cases forming an important source of base flow to rivers'. The underlying bedrock in the north-west of the site (Bowland Shale Formation) is described as 'Secondary Aquifer (undifferentiated)' and the Pendle Grit Member (Sandstone) located in the south-east of the site is classified as a 'Secondary A Aquifer'.

2.4.10 The EnviroInsight Report indicates the site is not located within a groundwater Source Protection Zone and there are no groundwater abstraction licenses within 250 m of the site.

Hydrology

2.4.11 The River Calder is located adjacent to the southern site boundary.

2.4.12 There are no licensed discharge consents located within 250 m of the site and one surface water abstraction license located within 250 m of the site. This relates to an active licence located some 34 m south of the site associated with Hydroelectric Power Generation. The licence expires in March 2028.

Contaminated Land & Landfill Activities

2.4.13 Information provided in the EnviroInsight Report indicates that there are no current, historic landfill or waste management sites located within 250 m of the site.

2.4.14 There is one EA recorded pollution incident located within 250 m of the site. The incident dates from May 2008 located some 204 m west of the site. There are no details on the type or description of the pollutant however it had a significant (Category 2) impact on water and no impact on land or air. There are no Part A(2), Part B or IPPC Authorised Activities located within 250 m of the site.

2.4.15 According to the EnviroInsight Report there are 40 potentially contaminative industrial sites located within 250 m of the site, the closest of which is located 5 m south-east of the site and refers to an unspecified pit dated 1892. These are unlikely to have impacted upon the site.

Sensitive Land Uses

2.4.16 The site is not affected by any of the ecological systems identified as a statutory receptor in the DETR Circular 01/2006.

Radon

2.4.17 Groundsure reports that the property is located in a Radon Affected Area, as 'between 1 and 3% of properties are above the Action Level'. However, no radon protection measures are required.

2.5 Preliminary Conceptual Model

2.5.1 This section identifies the potential contaminants of concern, sources, pathways and receptors that may be associated with the site based on its known history and the current condition and with respect to the redevelopment of the site for residential use.

2.5.2 The preliminary conceptual model is summarised in the following table:

Link	Source	Hazard	Transport Mechanism	Pathway	Medium of Exposure	Receptor	Risk Summary*
1	Contaminated Soils	Direct contact /ingestion of soil or dust	Direct contact with contaminated soil	Dermal contact/ingestion of soil at surface	Soil	Humans (on-site/off-site), domestic pets	Low-medium
2	Contaminated Soils	Particulate inhalation	Wind blown particulates	Inhalation of particulates	Air	Humans (on-site/off-site), domestic pets	Low-medium
3	Contaminated Soils	Impaired produce Growth	Uptake of contaminants by homegrown produce	Uptake during growth	Vegetable produce	Property (domestic produce)	Low-medium
4	Contaminated Soils	Inhalation of Ground Gas	Degradation of contaminants generating ground gas through unsaturated zone to soil leading to inhalation	Inhalation of Gases	Air	Humans (on-site/ off-site, domestic pets)	Low
5	Contaminated Soils	Vapour Inhalation	Volatalisation of organic compounds through unsaturated zone of soil leading to inhalation	Inhalation of Gases	Air	Humans (on-site/ off-site, domestic pets)	Low
6	Contaminated Soils	Ingestion of Contaminants	Uptake of contaminants by homegrown produce	Consumption of homegrown produce	Vegetable produce	Humans	Low-medium
7	Contaminated Soils	Damage to structure/services	Direct contact of contaminants with building structures/services	Direct contact	Soil/Water	Flora, services	Low
8	Contaminated Soils	Pollution of underlying groundwater	Dissolution or suspension of contaminants into groundwaters	Dissolution or Suspension	Water	Groundwaters	Low
9	Contaminated Soils	Degradation of land drain/River Calder	Dissolution or suspension of contaminants into surface waters	Dissolution or Suspension	Water	Watercourse	Low-medium

Table 1: Preliminary Conceptual Model

3. SITE INVESTIGATION

3.1 General

3.1.1 This section provides a summary of the site investigation works undertaken.

3.1.2 The site investigation has been designed to provide indicative information for the ground conditions across the site and to provide a quantitative assessment of potential risks associated with contamination, as well as a geotechnical assessment to provide recommendations for foundation design.

3.1.3 Eleven exploratory cable & percussive borehole locations were set out by the site engineer. The site engineer selected the cable and percussive borehole locations based on the information presented in the PRA and the ground conditions encountered in order to establish representative conditions at the site.

3.2 Cable & Percussive Boreholes

3.2.1 Eleven cable percussion boreholes were drilled across the site with 6 boreholes being drilled to 25 m and 5 boreholes drilled to 10 m bgl.

3.2.2 In-situ testing (Standard Penetrations Tests (SPTs) were carried out as the drilling progressed. The ground conditions were recorded by an engineer from BEK and representative samples were recovered for chemical and geotechnical testing

3.2.3 Copies of the borehole records are presented in Appendix A and a borehole Location Plan is presented in Appendix D. The SPT results are presented on the borehole records.

3.2.4 All exploration locations were set out by the site engineer and the exploratory locations are illustrated on BEK Drawing No 19545-3 presented in Appendix D.

3.3 Borehole Installations

3.3.1 Gas monitoring wells were installed in 3 boreholes (Borehole CP1, CP2, CP7 and CP10) to a depth of 5 m.

3.3.2 The well installation details are presented on the borehole record.

3.4 Laboratory Testing

Soil Chemical Testing

3.4.1 Following an assessment of the ground conditions encountered, BEK selected ten samples for chemical analysis. All of the samples tested were recovered from the topsoil at the site.

3.4.2 The samples were delivered to the laboratories of Exova for the selected analysis. All testing was undertaken to MCERTS standard (where available). Samples were tested for a wide range of potential contaminants of concern.

3.4.3 The chemical test results are presented in Appendix B.

Geotechnical Testing

3.4.4 Following a review of the ground conditions encountered, nine samples of the superficial strata were submitted to the UKAS accredited laboratory of Test Consult and tested for Particle Size Distribution.

3.4.5 The geotechnical test results are presented in Appendix C.

3.5 Ground Conditions

3.5.1 The ground conditions were relatively consistent across the site. Topsoil described as 'grass onto black/brown fine to coarse clayey sand with rootlets' was encountered in all locations to depths varying in thickness from 0.4 m (Borehole CP4) to 1.5 m (Borehole CP11). The topsoil contained brick fragments in one location in the south of the site (Borehole CP3)

3.5.2 The natural strata underlying the topsoil comprised varying proportions of 'sand, silts, clay and gravels'. This is characteristic of the varying published superficial deposits present at the site. A lense of 'peat' was encountered from 1.5 m to 2.3 m bgl in Borehole CP7 located in the north-east of the site.

3.5.3 The bedrock was not encountered during the site investigation.

3.5.4 There was no visual/olfactory evidence of contamination at the site.

Groundwater

3.5.5 Groundwater was encountered in 6 of 11 exploratory locations and a summary of the groundwater levels is presented in Table 2 below:

Location	Depths to Water (m)	Depth to Base of Borehole (m)	Comment
CP3	14.8	25	Groundwater Strike
CP4	20	24.95	Groundwater Strike
CP5	1.7	10	Groundwater Strike
CP6	2.0	10	Groundwater Strike
CP9	2	10	Groundwater Strike
CP11	1	10	Groundwater Strike

Table 2: *Summary of Groundwater Encountered During Site Investigation*

3.5.6 Based on the above information laterally continuous perched water is not considered to be present as 5 exploratory locations were dry and there are significant variation in water depth when encountered. The water is likely to represent water held within less permeable horizons within the natural strata.

3.6 Environmental Monitoring

3.6.1 Gas and groundwater level monitoring is ongoing and the results will be assessed within an addendum report that will be prepared when the gas monitoring programme has been completed.

3.6.2 However, a summary of the monitoring undertaken to date (1 monitoring visit) is provided below:

Groundwater

3.6.3 Groundwater levels have been monitored in the boreholes are summarised in the following table:

Borehole Location	Recorded Water Level (m bgl)	Depth to base (m)
CP1	2.22	3.06
CP2	1.85	3.36
CP7	0.54	4.69
CP10	0.81	4.13

Table 3*: Summary of Water Levels in Boreholes*

3.6.4 It can be seen from the above table that shallow water is present at different depths in each of the boreholes.

3.6.5 Based on the above information, the water depth encountered in the boreholes is variable and it is likely to reflect water held within less permeable horizons within the superficial deposits and the groundwater body is considered to be discontinuous across the site.

3.6.6 Note that seasonal variations in water levels cannot be accounted for over the short monitoring period. Laterally continuous perched water is no considered to be present.

Gas Monitoring

3.6.7 The boreholes have been monitored for ground gas on one occasion to date and a summary of the gas monitoring results are presented below:

Location	Concentrations (% v/v)			Flow Rate (l/hr)
	Carbon Dioxide	Methane	Oxygen	
CP1	7	0	9	0
CP2	3.6	0	15.4	0
CP7	1.8	0	19.7	0
CP10	0.8	0	19.7	0

Table 4: *Summary of Gas Monitoring Data*

3.6.8 It can be seen from the above table that the gas flow rates were zero l/hr at all resulting in gas screening values of zero for all boreholes.

3.6.9 However, carbons dioxide was above the typical maximum value of 5 % in Borehole CP1 (7 %) drilled in the south-east of the site and this coincides with a depleted oxygen concentration.

3.6.10 Based on the monitoring undertaken to date the risks from ground gas are considered to be low.

3.6.11 A full gas risk assessment will be prepared on completion of the gas monitoring programme.

4. QUANTITATIVE RISK ASSESSMENT

4.1 Potentially Significant Pollutant Linkages

4.1.1 Potentially significant pollutant linkages have been identified in the PRA as listed below:

(i) Human Health – risks associated with contamination in the made ground and/or natural strata: risk via ingestion (soil or home grown produce), inhalation (dust or vapour) or direct contact.

(ii) Human Health – risks associated with indoor inhalation of vapours/ground gases.

(iii) Controlled Waters - risks associated with contamination in the made ground and/or natural strata affecting water quality in the superficial secondary A Aquifer and bedrock Secondary A Aquifer. Risk are also associated with the dissolution of contamination into perched water/leachate and lateral migration to surface water receptors including the River Calder and the land drain to the east of the site.

(iv) Property (including services and flora) – risks associated contamination affecting concrete, service pipes and flora.

4.2 Risk Assessment: Human Health Risks from Exposure to Contaminated Soil

4.2.1 The risks to human health have been assessed by inspection of shallow soils for the presence of elevated contaminants based on the expected contaminant findings detailed in the conceptual model and completion of a quantitative risk assessment.

4.2.2 The soil contamination concentrations have initially been compared to a range of generic assessment criteria that have been prepared to allow the assessment of contamination relative to uncontaminated and/or background levels.

4.2.3 These include the use of the Land Quality Management and Chartered Institute of Environmental Health assessment criteria (S4ULs) and the Category 4 Screening Levels (C4SLs)

4.2.4 These assessment criteria have been derived using the CLEA model and fully justified input parameters. For contaminants of concern where generic assessment criteria are not available, BEK has derived assessment criteria using fully justified physical, chemical and toxicological parameters for each contaminants of concern input into the CLEA model. The derivation of the assessment criteria assumes a residential end use with plant uptake. The initial assessment assumes a soil organic matter (SOM) of 1 % as a conservative approach.

4.2.5 The following table summarises the chemical test results for the topsoil samples tested as well as the relevant assessment criteria. Note that only determinands with a concentration above the laboratory limit of detection are presented in the table below:

Determinands	Range of concentrations (mg/kg)	Assessment Criteria (mg/kg)	Samples Fail
Arsenic	<1 - 11	37[1]	---
Cadmium	0.6 - 1.2	11[1]	---
Copper	13 - 33	2400[1]	---
Chromium	13 - 49	910[1]	---
Lead	20 - 123	210[2]	---
Mercury	<0.017	40[1]	---
Nickel	14 - 39	180[1]	---
Selenium	<1 - 3	250[1]	---
Zinc	50 - 114	3700[1]	---
Acenaphthene	0.01 - 1.97	1100[1]	---
Acenaphthylene	<0.01	920[1]	---
Anthracene	0.02 - 1.07	11000[1]	---
Benzo(a)anthracene	0.1 - 4.3	13[1]	---
Benzo(a)pyrene	0.1 - 3.13	5[2]	---
Benzo(b)fluoranthene	0.11 - 5.46	3.7[1]	CP1 (0.2 m), CP7 (0.2 m)
Benzo(ghi)perylene	<0.05 - 1.62	350[1]	---
Benzo(k)fluoranthene	<0.07 - 1.8	100[1]	---
Chrysene	0.13 - 4.59	27[1]	---
Dibenzo(ah)anthracene	<0.04 - 0.56	0.3[1]	CP1 (0.2 m), CP4 (0.2 m), CP7 (0.2 m)
Fluoranthene	0.21 - 10	890[1]	---
Fluorene	<0.01 - 1.5	860[1]	---
Indeno(123-cd)pyrene	0.06 - 1.88	41[1]	---
Naphthalene	<0.03 - 0.62	13[1]	---
Phenanthrene	0.12 - 9.82	440[1]	---
Pyrene	0.18 - 7.35	2000[1]	---
Dibenzofuran	<100 - 746	25642[3]	---
Carbazole	<100 - 1060	42657[3]	---
3+4-Methylphenol	<100 - 140	48038[3]	---
2-Methylnaphthalene	<100 - 1010	53870[3]	---
Perylene	0.453 – 0.995	350*	---
Aliphatic Hydrocarbons >C8-C10	<1 - 15	150[1]	---
Aliphatic Hydrocarbons>C10-C12	<1 - 9	760[1]	---
Aliphatic Hydrocarbons>C12-C16	<1 - 17	4300[1]	---
Aliphatic Hydrocarbons>C16-C21	3.0 - 15	110000*[1]	---
Aliphatic Hydrocarbons>C21-C35	13 - 20	110000*[1]	---
Aromatic Hydrocarbon >C8-C10	1.0 - 7.0	380[1]	---
Aromatic Hydrocarbons >C10-C12	<1 - 8	380[1]	---
Aromatic Hydrocarbons >C12-C16	4.0 - 32	660[1]	---
Aromatic Hydrocarbons>C16-C21	6.0 - 61	930[1]	---
Aromatic Hydrocarbons>C21-C35	24 - 155	1700[1]	---
Asbestos ID	No Asbestos Detected		---

Table 5: *Summary of Contamination Assessment*

1 CIEH/LQM Derived Assessment Criteria (S4ULs based on 1% SOM)
2 Category 4 Screening Levels
3 BEK derived assessment criteria

*Given that WHO have assigned perylene as a class three carcinogen (not classifiable as to its carcinogenicity to humans due that further research being required) and in absence of any assessment criteria for perylene we have adopted the conservative assessment criteria for the structurally similar compound benzo(ghi)perylene.

4.2.6 It can be seen from the above table that there are concentrations of the polycyclic aromatic hydrocarbons compounds benzo(b)fluoranthene and dibenzo(ah)anthracene that are marginally elevated above the assessment criteria.

4.2.7 Furthermore, it can be seen that none of the samples tested proved positive for the presence of asbestos.

Further Assessment - Polycyclic aromatic Hydrocarbons

4.2.8 Marginally elevated dibenzo(ah)anthracene (Borehole CP1 (0.2 m), CP4 (0.2 m), CP7 (0.2 m)) and benzo(b)fluoranthene (Borehole CP1 (0.2 m), CP7 (0.2 m)) were both encountered within three topsoil samples recovered from the site.

4.2.9 Further assessment of the PAH compounds has been carried out using the surrogate marker (SM) approach in accordance with Appendix E of SP1010 entitled 'provisional C4SLs for benzo(a)pyrene (BaP) as a surrogate marker for PAHs'. When assessing the genotoxicity of a mixture of PAHs in an environmental matrix, the SM approach can be used to compare the mixture against similar toxicity data for a PAH mixture of known composition.

4.2.10 The Culp study provides known data for the 7 genotoxic PAHs (benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghi)perylene, chrysene, dibenzo(ah)anthracene and indeno(123)pyrene) within an environmental matrix for comparison with PAH profiles of samples collected within the field. If the ratio of genotoxic PAHs found at the site are sufficiently similar to those in the Culp study then BaP is considered an adequate SM to assess the genotoxicity of the PAH profile at the site and the LLTC for BaP may be used (note: the LLTC for BaP is 4.95mg/kg for an SOM of 2.5 % when the provisional C4SL is input into the CLEA model).

4.2.11 The table below provides a comparison of the profile of genotoxic PAHs found in the samples tested to those within known test soil samples in the Culp study. In order to be considered sufficiently similar the ratio relative to BaP should fit within the upper and lower limits defined within the table.

4.2.12 Note, the PAH ratio was calculated for each of the 7 genotoxic PAHs for the samples recovered from Borehole CP9 and the ratio for each of the 7 PAHs is provided.

PAH	Mean Ratio to BaP in Culp study	Lower Limit	Upper Limit	Ratios Relative to BaP for the samples recovered from Borehole CP1 (0.2 m), CP4 (0.2 m), CP7 (0.2 m)
Benzo[a]anthracene	1.24	0.12	12.43	1.12 – 1.41
Chrysene	1.16	0.12	11.61	1.33 -1.47
Benzo(b)flouranthene	1.08	0.11	10.85	1.22 – 1.74
Benzo(k)Flouranthene	0.37	0.04	3.72	0.43 – 0.58
Dibenzo(ah)anthracene	0.14	0.01	1.38	0.12 – 0.18
Indeno(123)pyrene	0.73	0.07	7.27	0.55 – 0.61
Benzo(ghi)perylene	0.82	0.08	8.22	0.47 – 0.53

Table 6: *Assessment of the Genotoxic PAH Profile*

4.2.13 It can be seen from the above table that the samples collected from the topsoil on site have genotoxic PAH profiles which fit within the upper and lower limits of those defined within the Culp study. Therefore, BEK considers BaP as an adequate SM to assess the genotoxicity of the PAH profile at the site for which the LLTC for BaP is below the assessment criteria in all samples that contained PAH compounds elevated above the generic assessment criteria.

4.2.14 Based on this assessment, PAHs are not considered to be contaminants of concern at the site.

4.3 Risk Assessment: Human Health Risks from Exposure to Hazardous Gases

4.3.1 Based on the ground conditions encountered at the site the risks from ground gas are considered to be low.

4.3.2 A separate Ground Gas Risk Assessment will be prepared upon completion of the gas monitoring programme.

4.4 Risk Assessment: Controlled Waters

4.4.1 Potential risks to the quality of surface & groundwater have been identified in the ground conceptual model.

4.4.2 The BEK report has identified risks to surface water and groundwater in the deeper aquifer.

4.4.3 Ground conditions encountered during the site investigation works as well as borehole monitoring suggests that laterally continuous perched water is not present

4.4.4 Moreover, no significant contaminants of concern have been identified in the shallow strata and potential risks to controlled waters are not considered further.

4.4.5 Potential risks to controlled waters are not considered further.

4.5 Risk Assessment: Buildings

4.5.1 Risks to buildings include the assessment of the aggressive nature of the shallow ground with respect to concrete, the risks to the degradation of water pipes and flora due to contamination.

Risk to Concrete

4.5.2 To assess the potential risks to concrete, BEK has compared the site investigation data to assessment criteria presented in the BRE Special Digest 1: Concrete in Aggressive Ground.

4.5.3 The sulphate concentrations (water soluble 2:1) in the shallow ground range between <0.01 and 0.07 g/l which all fall below the maximum concentration for DS-1 sulphate class.

4.5.4 With consideration to the range of pH values (6.73 to 8), the concrete classification suitable for the site would be DS-1 AC-1s.

Risks to Services

4.5.5 Potable water supply pipes can be at risk from degradation if the shallow ground consists of specific organic contamination. Guidance published by UKWIR includes a methodology for the site investigation and risk assessment to determine pipe specification.

4.5.6 For brownfield sites, site investigation may be required along the intended route of the water pipeline and samples recovered from specific depths and tested for specific contaminants of concern.

4.5.7 On the basis of the ground conditions encountered, risks to water supply pipelines are considered to be negligible. However it is recommended that consultation is undertaken with the water service supplier to confirm this.

Risks to Flora

4.5.8 Copper, nickel and zinc are toxic to plants. The effects of copper, nickel and zinc are often regarded as additive.

4.5.9 The assessment criteria used for copper, nickel and zinc, are 'pseudo total concentrations' are derived from BS3882:2007 as follows:

Phytotoxic Contaminant	pH Range		
	<6.0	6.0 to 7.0	>7.0
Zinc (nitric acid extractable)	<200	<200	<300
Copper (nitric acid extractable)	<100	<135	<200
Nickel (nitric acid extractable)	<60	<75	<110

Table 7: *Limits for Phytotoxic Contaminants (Units mg/kg)*

4.5.10 By comparing the chemical test results (Appendix B) to the concentrations in the above table, it can be seen that there are no elevated concentrations above the limit for phytotoxic contaminants.

4.6 Risk Assessment: Conclusions

4.6.1 Ground conditions were relatively consistent across the site comprising topsoil overlying natural 'sand, clay, silts and gravels'

4.6.2 Topsoil samples recovered from the site investigation have been tested for wide range of potential contaminants of concern. The chemical test results have been compared to relevant generic assessment criteria to identify potential contaminants of concern.

4.6.3 Based on the contamination assessment herein and with respect to the redevelopment of the site for residential use with gardens, no contaminants of concern have been identified.

4.6.4 Potential risks to the service pipes are considered to be negligible but confirmation should be sought from the water supply provider.

4.6.5 Risks to concrete are considered to be low and concrete classification of DS-1 AC1s will be suitable. No risks to the environment or controlled waters have been identified.

5. GEOTECHNICAL ASSESSMENT

5.1 The proposed development is for residential use with two storey domestic detached and semi-detached properties located in the north-west of the site and there will be a residential apartment building in the north-east. It is understood that the maximum height of the apartment buildings will be three storeys. Should the development use change from this profile, re-assessment will be required to consider the likely loads imposed by the specific development.

5.2 Eleven cable percussive boreholes were driven to across the accessible area of the site, and the logs for these are provided in Appendix A. Boreholes CP1 to CP3 relate to the apartment blocks to the river front. Boreholes CP6, CP7 & CP9 to CP11 relate to the low-rise domestic dwellings, and Boreholes CP4, CP8 and CP9 relate to the retirement apartment building. From the logs, it can be seen that the site is covered by made ground, consisting largely of organic materials, of varying thicknesses of between 0.4m (Borehole CP4) and 1.5m (Borehole CP11).

5.3 Most boreholes identify non cohesive soils underlying the topsoil with the exception of Borehole CP9 and CP10, where soft clays are present between 0.9 m and 2.1 m bgl. Underlying the clays in Borehole CP9 and CP10 are dense sands and gravels. The remaining boreholes indicate loose non cohesive materials present, these are generally overlying dense sands and gravels. The dense sands and gravel layers are found at approximate depths of between 2.0 m (Borehole CP5) to 3.5 m (Borehole CP3). Dense sands and gravels are not present in Borehole CP7.

5.4 Beneath the dense sands and gravels are firm to stiff clays. The clays extend to the base of Boreholes CP5, CP6, CP9 & CP11. To the remaining boreholes can be found non cohesive materials, generally consisting of dense sands and gravels. The top of the firm to stiff clays are encountered at depths of between 4.3 m (Borehole CP8) and 9.7 m (Borehole CP2). Bedrock was not encountered in any borehole.

5.5 Borehole CP7 has a lens of peat at between 1.5 m and 2.3 m, with very soft silts underlying this to a depth of 5.5 m.

5.6 Groundwater was recorded in 6 boreholes during drilling (see Table 2).

5.7 SPT values recorded in the upper levels of non-cohesive soils of between 1 and 8 blows. SPT readings within the dense sands and gravels are in excess of 20 blows, and SPT values in the upper level clays are between 3 and 8 blows.

5.8 Bulk samples were taken from varying depths within several boreholes to confirm the soils classification. The results of these sample tests are provided in Appendix C.

5.9 Plasticity testing of the upper level clay was not undertaken, as the thickness of clay layers close to the surface were not considered to have a significant impact regarding tree root appraisal in accordance with NHBC Ch.4.2 requirements.

Assessment and Conclusions

5.10 The site is generally underlain with materials that are unsuitable to sustain loadings for the proposed buildings, by use of simple spread foundations. There are some areas (Borehole CP8) where dense sands and gravels are encountered at approximately 2 m below the surface, however; these tend to overlie materials which have low load bearing capacity.

5.11 The proposed apartment block is associated with the peat layer found within Borehole CP7. Below the peat is very soft silty material, meaning that this building must be constructed upon a piled foundation system.

5.12 The residential development area is underlain with materials of very low bearing capacity. SPT values of 4 were recorded within the upper 2 m of ground. With ground water strike also recorded at depths between 1.7 and 2.0 m, the bearing capacity may be as low as 20 kN/m2. Between 2 m and 3 m materials offering bearing capacities of up to 150 kN/2 have been observed. This does not apply to borehole CP6, where bearing capacities of up to 80 kN/m2 exist at this depth. Trench filled foundations could therefore be adopted, at depths of up to 3 m, however; may be uneconomical due to the removal of spoil and increased required concrete quantities. A piled foundation solution will also be more beneficial due to the likely fluctuating ground water levels.

5.13 Due to the nature and thickness of the near surface deposits, ground bearing slabs are not recommended. All ground floor slabs should be suspended and supported by the main wall foundations.

5.14 All foundation designs must be reviewed and designed by a suitably qualified design engineer. The above advice is based upon the ground condition information obtained during the survey. The design engineer must satisfy themselves that the information meets with their design requirements.

5.15 All topsoil material will need to be removed in areas where hardstanding and road access ways are to be formed. Ground improvement, using vibrating rollers may assist with reducing road build up for sub-base materials, however; this will need to be carefully considered by the road designer.

6. RECOMMENDATIONS

6.1 This report provides an assessment of the ground conditions based on the assessment of available site investigation information and quantifies the potential risks associated with contamination and provides a geotechnical assessment with respect to foundation design.

6.2 The site investigation has proven that the site comprises topsoil overlying natural sand and gravels, silts and clays. Made ground was not encountered at the site during the site investigation.

Contamination Assessment

6.3 Based on the results of the contamination risk assessment undertaken at the Land to South of Accrington Road, Whalley and with consideration to the environmental setting and the proposed redevelopment of the site for residential use, no risks associated with ground contamination have been identified.

6.4 Notwithstanding the above BEK recommends the following:

- All groundworkers adopt standard PPE when on site and remain vigilant during ground excavations for the presence (or suspected presence) of contamination.
- If visual or olfactory evidence of contamination is encountered then works should cease and specialist advice sought.
- Consideration should be given to the requirements of the water supply provider. They may require the UKWIR risk assessment to be completed to confirm the specification for the water pipes.

Geotechnical Assessment

6.5 The proposed retirement apartment block is associated with the peat layer found within Borehole CP7. Below the peat is very soft silty material, meaning that this building must be constructed upon a piled foundation system.

6.6 The residential development area is underlain with materials of very low bearing capacity. SPT values of 4 were recorded within the upper 2 m of ground. With ground water strike also recorded at depths between 1.7 and 2.0 m, the bearing capacity may be as low as 20 kN/m2. Between 2 m and 3 m materials offering bearing capacities of up to 150 kN/2 have been observed. This does not apply to borehole CP6, where bearing capacities of up to 80 kN/m2 exist at this depth. Trench filled foundations could therefore be adopted, at depths of up to 3 m, however; may be uneconomical due to the removal of spoil and increased required

concrete quantities. A piled foundation solution will also be more beneficial due to the likely fluctuating ground water levels.

6.7 Due to the nature and thickness of the near surface deposits, ground bearing slabs are not recommended. All ground floor slabs should be suspended and supported by the main wall foundations.

6.8 All foundation designs must be reviewed and designed by a suitably qualified design engineer. The above advice is based upon the ground condition information obtained during the survey. The design engineer must satisfy themselves that the information meets with their design requirements.

6.9 All topsoil material will need to be removed in areas where hardstanding and road access ways are to be formed. Ground improvement, using vibrating rollers may assist with reducing road build up for sub-base materials, however; this will need to be carefully considered by the road designer.

Waste Soil Management

6.10 Careful management of soils during the excavation works will ensure optimum utilisation of soil resources.

6.11 Excavated soils which require off-site disposal are anticipated to be classified in accordance with the following document: Guidance on the Disposal of "Contaminated Soils" Version 3 (April 2001); produced by the Environment Agency. On the basis it is considered likely that soils from the majority of the site would classify as "Non-hazardous"/"Inert" for disposal; however this is subject to confirmation of the potential landfill use.

6.12 In all cases where excess soils require off-site disposal, the materials needs to be managed under the appropriate legislation and consideration given to any remedial techniques that could be used to improve the soil.

APPENDIX A

Borehole Logs

GEO-ENVIRONMENTAL CONSULTANTS Final Draft

GEO-ENVIROMENTAL CONSULTING ENGINEERS

PROJECT NUMBER 19545
PROJECT NAME Accrington Road, Whalley
CLIENT Oakmere Homes North West

DATE 25 June 2019
DRILLING METHOD Cable & Percussive
BOREHOLE NO CP1
SHEET 1/11

COMPLETION

COMMENTS Chiselling from 3.5-5.0 m for 2 hours 45 mins.

Depth (m)	Depth (m)	Samples/ Test	Field Records	Water	Well Instal.	Graphic Log	Material Description	Elevation (m)
	0.2	D = 0.2 m					Grass onto black/brown fine to coarse clayey sand with rootlets (Topsoil)	
1	1.2 - 1.65	SPT (S) N=8					Light brown fine to coarse clayey sand	1
	1.5	D = 1.5 m	1,2/2,3,2,1					
2	2 - 2.45	SPT (S) N=9	2,2/2,3,2,2					2
3	3 - 3.45	SPT (S) N=41	2,3/10,10,12,9				Very dense sand and gravel with large boulders	3
4	4 - 4.45	SPT (S) N=44	10,15/18,10,7,9					4
5	5 - 5.45	SPT (S) N=48	20,5/15,15,10,8					5
6	6 - 6.45	SPT (S) N=14	2,2/3,4,4,3				Stiff to very stiff brown/grey gravelly clay	6
7								7
	7.5 - 7.95	SPT (S) N=17	3,2/3,4,4,6					
8								8
9	9 - 9.45	SPT (S) N=34	3,3/4,8,12,10					9
10								10
	10.5 - 10.95	SPT (S) N=13	3,4/3,4,3,3					
11								11
12	12 - 12.45	SPT (S) N=25	4,4/5,6,6,8					12
13							Brown silt with clay bands	13
	13.5 - 13.95	SPT (S) N=23	3,4/5,5,7,6					
14								14
15	15 - 15.45	SPT (S) N=11	1,2/2,3,3,3					15
16								16
	16.5 - 16.95	SPT (S) N=19	3,7/4,3,6,6				Brown fine to coarse sand and gravels with occasional boulders and clay bands	
17								17
18	18 - 18.45	SPT (S) N=8	2,3/2,2,2,2				Brown sandy silt	18
19								19
	19.5 - 19.95	SPT (S) N=14	2,3/3,4,3,4					
20							Brown fine to coarse sand and gravels with occasional boulders	20
21	21 - 21.45	SPT (S) N=22	3,3/6,6,5,5					21
22								22
	22.5 - 22.95	SPT (S) N=27	4,7/6,7,8,6					
23								23
24	24 - 24.45	SPT (S) N=27	3,6/7,7,6,7					24
25								25
	25 - 25.45	SPT (S) N=25	4,5/8,6,6,5					
							Termination depth at: 25.45 m	

GEO-ENVIROMENTAL CONSULTING ENGINEERS

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PROJECT NUMBER 19545
PROJECT NAME Accrington Road, Whalley
CLIENT Oakmere Homes North West

DATE 28/30 June 2019
DRILLING METHOD Cable & Percussive
BOREHOLE NO CP2
SHEET 2/11

COMPLETION

COMMENTS Chiselling from 3.5-4.0 m for 1 hour. Chiselling from 10.6 to 12.0 m for 1 hour 30 mins

Depth (m)	Depth (m)	Samples/ Test	Field Records	Water	Well Instal.	Graphic Log	Material Description	Elevation (m)
	0.2	D = 0.2 m					Grass onto black/brown fine to coarse clayey sand with rootlets (Topsoil)	
1	1.2 - 1.65	SPT (S) N=7					Brown fine to coarse clayey sand with sandy clay lenses	1
	1.5	D = 1.5 m	1,1/2,2,1,2					
2								2
3	3 - 3.45	SPT (S) N=48	3,6/7,12,19,10				Dense sand and gravel with large boulders	3
4	4 - 4.45	SPT (S) N=12	2,3/3,4,3,2					4
5	5 - 5.45	SPT (S) N=8	2,2/2,3,2,1				Brown/grey silt	5
6								6
	6.5 - 6.95	SPT (S) N=20	3,4/5,5,4,6				Stiff to very stiff brown clay	
7								7
8	8 - 8.45	SPT (S) N=21	2,4/6,6,5,4					8
9								9
	9.5 - 9.95	SPT (S) N=18	3,5/5,4,4,5					
10								10
11	11 - 11.45	SPT (S) N=10	2,3/3,2,2,3				Wet stiff very sandy clay with fine to coarse gravels	11
12								12
	12.5 - 12.95	SPT (S) N=15	1,3/4,3,4,4					
13								13
14	14 - 14.45	SPT (S) N=36	7,7/7,7,10,12				Brown fine to coarse sand and gravels with occasional clay bands and boulders	14
15	15.5	B= 15.5 m						15
16								16
17	17 - 17.45	SPT (S) N=36	6,7/7,9,10,10					17
18								18
	18.5 - 18.95	SPT (S) N=29	7,6/6,7,8,8					
19								19
20	20 - 20.45	SPT (S) N=34	5,5/7,7,10,10					20
21								21
	21.5 - 21.95	SPT (S) N=31	6,7/6,8,8,9					
22								22
23	23 - 23.45	SPT (S) N=37	7,7/8,10,10,9					23
24								24
	24.5 - 24.95	SPT (S) N=34	6,8/7,9,9,9					
25							Termination depth at: 25 m	25
26								26

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GEO-ENVIROMENTAL CONSULTING ENGINEERS

PROJECT NUMBER 19545
PROJECT NAME Accrington Road, Whalley
CLIENT Oakmere Homes North West

DATE 24 June 2019
DRILLING METHOD Cable & Percussive
BOREHOLE NO CP3
SHEET 3/11

COMPLETION

COMMENTS Water added at 3.6 m

Depth (m)	Depth (m)	Samples/ Test	Field Records	Water	Well Instal.	Graphic Log	Material Description	Elevation (m)
1	0.2	D = 0.2 m					Grass onto black/brown fine to coarse clayey sand with occasional brick fragments and rootlets (Topsoil)	1
	1.2 - 1.65	SPT (S) N=4	1,1/0,1,2,1				Soft to firm brown/grey silty sandy clay	
2	2 - 2.45	SPT (S) N=5	1,1/1,2,1,1					2
3	3 - 3.45	SPT (S) N=6	1,2/1,2,1,2					3
4	4 - 4.45	SPT (S) N=25	4,5/4,7,7,7				Brown dense sand and gravels	4
5	5 - 5.45	SPT (S) N=15	2,3/4,3,4,4					5
6							Soft grey silty sand	6
	6.5 - 6.95	SPT (S) N=18	1,2/6,4,4,4					
7								7
8	8 - 8.45	SPT (S) N=14	2,3/3,4,3,4				Stiff brown/grey laminated silty clay with gravels	8
9								9
	9.5 - 9.95	SPT (S) N=25	4,4/5,6,7,7					
10								10
11	11 - 11.45	SPT (S) N=34	6,6/7,8,9,10					11
12								12
	12.5 - 12.95	SPT (S) N=26	4,5/6,7,7,6					
13								13
14	14 - 14.45	SPT (S) N=29	3,6/7,7,8,7					14
15				▽			Brown silty sand (blowing from 16.5 m)	15
	15.5 - 15.95	SPT (S) N=2	1,0/1,0,0,1					
16								16
17								17
18								18
19								19
20								20
21								21
	21.5 - 21.95	SPT (S) N=25	4,6/4,2,8,11					
22							Brown fine to coarse gravels with stiff sandy clay lenses and boulders	22
23	23 - 23.45	SPT (S) N=28	4,5/6,6,8,8					23
24								24
	24.5 - 24.95	SPT (S) N=35	5,7/6,9,10,10					
25							Termination depth at: 25 m	25
26								26

GEO-ENVIRONMENTAL CONSULTANTS

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PROJECT NUMBER 19545
PROJECT NAME Accrington Road, Whalley
CLIENT Oakmere Homes North West

DATE 4 July 2019
DRILLING METHOD Cable & Percussive
BOREHOLE NO CP4
SHEET 7/11

COMPLETION

COMMENTS Water added from 5.0 - 6.0 m

Depth (m)	Depth (m)	Samples/ Test	Field Records	Water	Well Instal.	Graphic Log	Material Description	Elevation (m)
1	0 - 0.3	B = 0 - 0.3 m					Grass onto black/brown fine to coarse clayey sand with rootlets (Topsoil)	1
	0.2	D = 0.2 m					Brown/orange/grey mottled silty sand	
	0.7 - 1.0	B = 0.7 - 1 m	1,0/0,1,0,0					
2	1.2 - 1.65	SPT (S) N=1						2
	2 - 2.45	SPT (S) N=1	1,0/0,0,1,0					
3	3 - 3.45	SPT (S) N=3	1,1/1,0,1,1				Brown clayey silt	3
4	4 - 4.45	SPT (S) N=4	1,1/1,1,1,1					4
	5 - 5.45	SPT (S) N=4						
5	5.2 - 5.5	B = 5.2 - 5.5	1,1/1,1,1,1					5
	5.9 - 6.0	B = 5.9 - 6 m						
6	6 - 6.45	SPT (S) N=10	1,1/1,3,3,3				Stiff brown laminated clay	6
7								7
	7.5 - 7.95	SPT (S) N=13	1,2/3,3,3,4					
8								8
9	9 - 9.45	SPT (S) N=17	2,4/4,4,4,5					9
10							Stiff to very stiff brown slightly sandy clay	10
	10.5 - 10.95	SPT (S) N=17	1,3/3,4,5,5					
11								11
12	12 - 12.45	SPT (S) N=18	2,2/3,5,5,5					12
13								13
	13.5 - 13.95	SPT (S) N=14	2,3/3,3,4,4					
14								14
15	15 - 15.45	SPT (S) N=14	3,3/3,3,4,4					15
16								16
	16.5 - 16.95	SPT (S) N=21	3,3/3,4,7,7					
17							Brown fine to coarse sand and gravels	17
18	18 - 18.45	SPT (S) N=32	5,6/7,8,8,9					18
19							Firm to stiff brown laminated clay	19
20				▽			Dense fine to coarse sand and gravels	20
21	21 - 21.45	SPT (S) N=22	3,3/6,6,5,5					21
22								22
	22.5 - 22.95	SPT (S) N=27	4,7/6,7,8,6					
23								23
24	24 - 24.45	SPT (S) N=27	3,6/7,7,6,7					24
25							Termination depth at: 24.95 m	25

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GEO-ENVIROMENTAL CONSULTING ENGINEERS

PROJECT NUMBER 19545
PROJECT NAME Accrington Road, Whalley
CLIENT Oakmere Homes North West

DATE 25 June 2019
DRILLING METHOD Cable & Percussive
BOREHOLE NO CP5
SHEET 4/11

COMPLETION

COMMENTS Water added from 1.7 to 5.0 m

Depth (m)	Depth (m)	Samples/ Test	Field Records	Water	Well Instal.	Graphic Log	Material Description	Elevation (m)
0	0.3	D = 0.3 m					Grass onto black/brown fine to coarse clayey sand with rootlets (Topsoil)	0
0.5								0.5
1	1 - 1.45 1.2	SPT (S) N=4 D = 1.2 m	1,1/1,1,1,1				Soft brown sandy clay	1
1.5				▽				1.5
2	2 - 2.45	SPT (S) N=34	7,9/9,8,8,9				Very soft silty grey clay Brown fine to coarse gravel	2
2.5								2.5
3	3 - 3.45	SPT (S) N=23	5,6/6,6,5,6					3
3.5								3.5
4	4 - 4.45	SPT (S) N=23	6,6/5,7,6,5					4
4.5							Grey coarse sand with fine gravels	4.5
5	5.0 5 - 5.45	B=5.0 m SPT (S) N=8	1,1/1,2,2,3				Firm to stiff grey silty clay	5
5.5								5.5
6							Firm to stiff silty/sandy clay with coarse grey sand bands	6
6.5	6.5 - 6.95	SPT (S) N=9	1,2/2,2,3,2					6.5
7								7
7.5								7.5
8	8 - 8.45	SPT (S) N=6	1,1/2,1,1,2					8
8.5								8.5
9								9
9.5	9.5 - 9.95	SPT (S) N=11	1,2/2,3,3,3					9.5
10							Termination depth at: 10 m	10

GEO-ENVIRONMENTAL CONSULTANTS

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PROJECT NUMBER 19545
PROJECT NAME Accrington Road, Whalley
CLIENT Oakmere Homes North West

DATE 4 July 2019
DRILLING METHOD Cable & Percussive
BOREHOLE NO CP6
SHEET 8/11

COMPLETION

COMMENTS Chiselling from 3.3 to 4.9 m. Water added from 3.3 to 5.7 m

Depth (m)	Depth (m)	Samples/ Test	Field Records	Water	Well Instal.	Graphic Log	Material Description	Elevation (m)
0	0.2	D = 0.2 m					Grass onto black/brown fine to coarse clayey sand with rootlets (Topsoil)	0
0.5								0.5
1	1 - 1.45 1.4	SPT (S) N=4 B = 1.4 m	1,1/1,1,1,1				Soft brown/grey very silty clay	1
1.5	1.5	D = 1.5 m						1.5
2	2 - 2.45	SPT (S) N=4	1,1/1,1,1,1	▽				2
2.5								2.5
3	3 - 3.45	SPT (S) N=16 B = 3.3 m	1,1/1,4,5,6					3
3.5							Dense fine to coarse gravels	3.5
4	4 - 4.45	SPT (S) N=16	2,2/2,3,5,6					4
4.5	4.9	B = 4.9 m					Very soft silty/sandy grey clay	4.5
5	5 - 5.45	B = 5 m SPT (S) N=19	4,4/4,4,4,3				Fine grey sand	5
5.5	5.7	B = 5.7 m						5.5
6							Firm silty grey clay	6
6.5	6.5 - 6.95 6.8	SPT (S) N=11 B = 6.8 m	2,2/3,2,2,4					6.5
7							Stiff grey clay	7
7.5								7.5
8	8 - 8.45	SPT (S) N=16	3,3/3,3,5,5					8
8.5								8.5
9								9
9.5	9.5 - 9.95	SPT (S) N=12	2,3/3,3,3,3					9.5
10							Termination depth at: 10 m	10

GEO-ENVIRONMENTAL CONSULTANTS

GEO-ENVIROMENTAL CONSULTING ENGINEERS

PROJECT NUMBER 19545
PROJECT NAME Accrington Road, Whalley
CLIENT Oakmere Homes North West

DATE 2nd & 3rd July 2019
DRILLING METHOD Cable & Percussive
BOREHOLE NO CP7
SHEET 9/11

COMPLETION

COMMENTS

Depth (m)	Depth (m)	Samples/ Test	Field Records	Water	Well Instal.	Graphic Log	Material Description	Elevation (m)
1	0 - 1.0 0.2	B = 0 - 1 m D = 0.2 m					Grass onto black/brown fine to coarse clayey sand with rootlets (Topsoil)	1
	1.0 -1.5	B = 1 - 1.5 m	1,0/0,0,0,0				Grey sandy silt	
2	1.2 - 1.65	SPT (S) N=0					Brown peat	2
	2 - 2.45	SPT (S) N=1	0,0/1,0,0,0					
3		SPT (S) N=1					Brown sandy silt	3
	3 - 3.45	B = 3.0 - 3.45 m	0,1/0,0,1,0					
4	4 - 4.45	SPT (S) N=1	0,0/0,1,0,0					4
5	5 - 5.45	SPT (S) N=3	1,1/1,0,1,1					5
6	6.5 - 6.95	SPT (S) N=14					Firm to stiff brown clay with large cobbles and wet sand	6
	6.5 - 7.0	B = 6.5 - 7.0	2,2/2,4,4,4					
7								7
8	8 - 8.45	SPT (S) N=9	2,2/2,3,2,2					8
9								9
	9.5 - 9.95	SPT (S) N=8	2,2/2,1,2,3					
10	10 - 10.45	SPT (S) N=7	1,2/2,1,2,2					10
		B = 10-10.45 m						
11	11 - 11.45	SPT (S) N=8	2,2/1,3,2,2					11
12								12
	12.5 - 12.95	SPT (S) N=9	1,2/3,2,2,2					
13								13
14	14 - 14.45	SPT (S) N=9	1,2/2,3,2,2					14
15								15
	15.5 - 15.95	SPT (S) N=7	2,2/2,1,2,2				Firm to stiff brown clay with silt and sand lenses	
16								16
17	17 - 17.45	SPT (S) N=17	1,4/7,4,3,3					17
18								18
	18.5 - 18.95	SPT (S) N=40	6,9/10,10,9,11					
19							Brown fine to coarse sand and gravels with large cobbles and boulders	19
20	20 - 20.45	SPT (S) N=36	7,12/8,9,10,9					20
21								21
	21.5 - 21.95	SPT (S) N=37	6,11/9,9,11,8					
22								22
23	23 - 23.45	SPT (S) N=43	6,9/12,8,15,8					23
24								24
	24.5 - 24.95	SPT (S) N=45	7,9/12,12,10,11					
25							Termination depth at: 24.95	25
26								26

GEO-ENVIRONMENTAL CONSULTANTS

GEO-ENVIROMENTAL CONSULTING ENGINEERS

PROJECT NUMBER 19545
PROJECT NAME Accrington Road, Whalley
CLIENT Oakmere Homes North West

DATE 1st & 2nd July 2019
DRILLING METHOD Cable & Percussive
BOREHOLE NO CP8
SHEET 5/11

COMPLETION

COMMENTS

Depth (m)	Depth (m)	Samples/ Test	Field Records	Water	Well Instal.	Graphic Log	Material Description	Elevation (m)
1	0.4	D = 0.4 m					Grass onto black/brown fine to coarse clayey sand with rootlets (Topsoil)	1
	1- 1.5	B = 1 - 1.5 m						
	1.2 - 1.65	SPT (S) N=4	1,1/1,1,1,1				Grey sandy silt	
2	2 - 2.45	SPT (S) N=24	2,7/7,5,6,6				Brown fine to coarse sand and gravels with occasional large boulder	2
3	3 - 3.45	SPT (S) N=35	3,5/10,9,8,8					3
4	3.5	B = 3.5 m						4
	4 - 4.45	SPT (S) N=7	3,4/2,2,1,2					
5	5 - 5.45	SPT (S) N=7	1,2/2,2,1,2				Soft to firm brown/grey silty clay with gravels (becoming stiff from 8 m)	5
6								6
7	6.5 - 6.95	SPT (S) N=7	2,2/1,2,2,2					7
8	8 - 8.45	SPT (S) N=9	1,2/2,3,2,2					8
9	9.5 - 9.9	B=9.5 - 9.9 m						9
10	9.5 - 9.95	SPT (S) N=9	1,1/2,2,3,2					10
11	11 - 11.45	SPT (S) N=9	2,1/3,2,2,2					11
12								12
13	12.5 - 12.95	SPT (S) N=13	2,1/4,3,3,3					13
14	14 - 14.45	SPT (S) N=15	2,3/4,4,4,3					14
15		SPT (S) N=15						15
16	15.5 - 15.95	B=15-15.95 m	2,3,4,4,3,4				Brown fine to coarse sand and gravels with occasional boulders	16
17	17 - 17.45	SPT (S) N=23	3,4/5,6,6,6					17
18								18
19	18.5 - 18.95	SPT (S) N=27	4,6/7,6,7,7					19
20	20 - 20.45	SPT (S) N=34	6,7/6,9,9,10					20
21								21
22	21.5 - 21.95	SPT (S) N=34	5,7/6,8,10,10					22
23	23 - 23.45	SPT (S) N=36	7,10/7,9,11,9					23
24								24
25	24.5 - 24.95	SPT (S) N=36	6,12/12,7,8,9					25
26							Termination depth at: 25 m	26

GEO-ENVIRONMENTAL CONSULTANTS

GEO-ENVIRONMENTAL CONSULTING ENGINEERS

PROJECT NUMBER 19545
PROJECT NAME Accrington Road, Whalley
CLIENT Oakmere Homes North West

DATE 28 June 2019
DRILLING METHOD Cable & Percussive
BOREHOLE NO CP9
SHEET 6/11

COMPLETION

COMMENTS Chiselling from 1.4 to 4.4 m for 2 hours.

Depth (m)	Depth (m)	Samples/ Test	Field Records	Water	Well Instal.	Graphic Log	Material Description	Elevation (m)
0	0.2	D = 0.2 m					Grass onto black/brown fine to coarse clayey sand with rootlets (Topsoil)	0
0.5								0.5
1	1 - 1.45	SPT (S) N=4	1,1/1,1,1,1				Soft sandy clay with gravels	1
1.5	1.5	D = 1.5 m						1.5
2	2 - 2.45	SPT (S) N=31	5,6/6,7,10,8	▽			Dense brown gravels	2
2.5								2.5
3	3 - 3.45	SPT (S) N=31	6,7/7,9,8,7					3
3.5								3.5
4	4 - 4.45	SPT (S) N=29	6,6/7,7,8,7					4
4.5							Silty grey sand	4.5
5	5 - 5.45	SPT (S) N=10	2,2/3,2,2,3					5
5.5								5.5
6								6
6.5	6.3 - 6.8	B=6.3-6.8 m					Stiff silty grey clay	6.5
	6.5 - 6.95	SPT (S) N=15	2,2/3,3,4,5					
7								7
7.5								7.5
8	8 - 8.45	SPT (S) N=11	2,2/2,3,3,3					8
8.5								8.5
9								9
9.5	9.5 - 9.95	SPT (S) N=10	3,3/3,2,3,2					9.5
10							Termination depth at: 10 m	10

GEO-ENVIROMENTAL CONSULTING ENGINEERS

GEO-ENVIRONMENTAL CONSULTANTS

PROJECT NUMBER 19545
PROJECT NAME Accrington Road, Whalley
CLIENT Oakmere Homes North West

DATE 27 June 2019
DRILLING METHOD Cable & Percussive
BOREHOLE NO CP10
SHEET 10/11

COMPLETION

COMMENTS Chiselling from 2.0 to 3.5 m. Water added from 2.0 to 5.0 m.

Depth (m)	Depth (m)	Samples/ Test	Field Records	Water	Well Instal.	Graphic Log	Material Description	Elevation (m)
0.5	0.3	D = 0.3 m					Grass onto black/brown fine to coarse clayey sand with rootlets (Topsoil)	0.5
1	1.0 1 - 1.45	D = 1 m SPT (S) N=4	1,1/1,1,1,1				Soft silty grey clay	1
1.5								1.5
2	2 - 2.45	SPT (S) N=31	4,5/6,8,9,8				Dense fine to coarse gravels	2
2.5	2.5 - 3.0	B=2.5-3.0 m						2.5
3	3 - 3.45	SPT (S) N=31	6,6/7,8,8,9					3
3.5							Grey coarse sand with fine gravels	3.5
4	4 - 4.45	SPT (S) N=12	2,3/3,2,3,4					4
4.5								4.5
5	5 - 5.45	SPT (S) N=5	1,2/1,1,2,1				Firm silty grey clay	5
5.5								5.5
6								6
6.5	6.5 - 6.95	SPT (S) N=5	2,1/1,2,1,1					6.5
7								7
7.5							Stiff grey clay with sand bands	7.5
8	8 - 8.45	SPT (S) N=10	2,3/3,2,2,3					8
8.5								8.5
9								9
9.5	9.5 - 9.95	SPT (S) N=13	3,4/3,3,3,4					9.5
10							Termination depth at: 10 m	10

GEO-ENVIRONMENTAL CONSULTANTS

GEO-ENVIROMENTAL CONSULTING ENGINEERS

PROJECT NUMBER 19545
PROJECT NAME Accrington Road, Whalley
CLIENT Oakmere Homes North West

DATE 3 July 2019
DRILLING METHOD Cable & Percussive
BOREHOLE NO CP11
SHEET 11/11

COMPLETION

COMMENTS Chiselling from 3 - 4.8 m for 1 hour. Water added from 1 to 4.0 m

Depth (m)	Depth (m)	Samples/ Test	Field Records	Water	Well Instal.	Graphic Log	Material Description	Elevation (m)
0	0.2	D = 0.2 m		▽			Grass onto black/brown fine to coarse clayey sand with rootlets (Topsoil)	0
0.5								0.5
1	1 - 1.45	SPT (S) N=4	1,1/1,1,1,1					1
1.5	1.5	D = 1.5 m B = 1.5 m					Brown coarse sand and gravels	1.5
2								2
2.5								2.5
3	3.0 3 - 3.45	B = 3 m SPT (S) N=25	5,7/7,6,6,6				Dense fine to coarse gravels	3
3.5								3.5
4	4 - 4.45	SPT (S) N=8	7,6/2,2,2,2					4
4.5								4.5
5	4.8 - 5.3	B = 4.8 - 5.3 m					Grey silt	5
	5 - 5.45	SPT (S) N=4	1,1/1,1,1,1					
5.5								5.5
6	6.3	B = 6.3 m						6
6.5	6.5 - 6.95	SPT (S) N=21	3,3/6,6,3,6				Stiff silty laminated grey clay	6.5
7								7
7.5								7.5
8	8 - 8.45	SPT (S) N=11	1,2/3,3,3,2					8
8.5								8.5
9								9
9.5	9.5 - 9.95	SPT (S) N=8	1,2/1,2,2,3					9.5
10							Termination depth at: 10 m	10

APPENDIX B

Chemical Test Results

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 19/06516
Issue Number: 1 **Date:** 17 July, 2019

Client:
BEK Enviro Ltd
Suite One
No 3 Mitton Road Business Park
Mitton Road
Whalley
Lancashire
BB7 9YE

Project Manager: Mick Buckley
Project Name: Accrington Road, Whalley
Project Ref: N/A
Order No: 3542/19545
Date Samples Received: 08/07/19
Date Instructions Received: 09/07/19
Date Analysis Completed: 17/07/19

Prepared by:
Melanie Marshall
Laboratory Coordinator

Approved by:
John Gustafson
Managing Director

mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME
UKAS TESTING 1247

envirolab

Envirolab Job Number: 19/06516

Client Project Name: Accrington Road, Whalley

Client Project Ref: N/A

Lab Sample ID	19/06516/1	19/06516/2	19/06516/3	19/06516/4	19/06516/5	19/06516/6	19/06516/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP1	CP2	CP3	CP4	CP5	CP6	CP11			
Depth to Top	0.20	0.20	0.20	0.20	0.30	0.20	0.200			
Depth To Bottom										
Date Sampled	05-Jul-19	05-Jul-19	05-Jul-19	05-Jul-19	05-Jul-19	05-Jul-19	05-Jul-19			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code	4AE	4AE	4ABE	4AE	4AE	4AE	4AE			
% Stones >10mm$_A$	1.2	<0.1	11.0	2.1	0.6	1.4	<0.1	% w/w	0.1	A-T-044
pH$_D$$^{M\#}$	8.00	7.61	7.90	7.16	7.30	6.76	6.73	pH	0.01	A-T-031s
Sulphate (water sol 2:1)$_D$$^{M\#}$	<0.01	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	g/l	0.01	A-T-026s
Sulphate (acid soluble)$_D$$^{M\#}$	660	480	500	1500	1300	880	820	mg/kg	200	A-T-026s
Cyanide (total)$_A$$^{M\#}$	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC$_A$	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	0.2	A-T-050s
Organic matter$_D$$^{M\#}$	5.9	5.2	5.8	19.0	12.1	9.3	10.1	% w/w	0.1	A-T-032 OM
Arsenic$_D$$^{M\#}$	<1	7	6	11	8	8	10	mg/kg	1	A-T-024s
Boron (water soluble)$_D$$^{M\#}$	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	mg/kg	1	A-T-027s
Cadmium$_D$$^{M\#}$	<0.5	0.7	0.6	0.7	1.0	1.0	1.0	mg/kg	0.5	A-T-024s
Copper$_D$$^{M\#}$	27	32	26	33	31	26	30	mg/kg	1	A-T-024s
Chromium$_D$$^{M\#}$	49	13	13	15	18	21	19	mg/kg	1	A-T-024s
Chromium (hexavalent)$_D$	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-040s
Lead$_D$$^{M\#}$	20	111	45	123	84	70	71	mg/kg	1	A-T-024s
Mercury$_D$	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	mg/kg	0.17	A-T-024s
Nickel$_D$$^{M\#}$	39	15	14	16	18	19	19	mg/kg	1	A-T-024s
Selenium$_D$$^{M\#}$	2	1	<1	<1	<1	2	1	mg/kg	1	A-T-024s
Zinc$_D$$^{M\#}$	50	114	62	77	113	90	89	mg/kg	5	A-T-024s

envirolab

Envirolab Job Number: 19/06516

Client Project Name: Accrington Road, Whalley

Client Project Ref: N/A

Lab Sample ID	19/06516/1	19/06516/2	19/06516/3	19/06516/4	19/06516/5	19/06516/6	19/06516/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP1	CP2	CP3	CP4	CP5	CP6	CP11			
Depth to Top	0.20	0.20	0.20	0.20	0.30	0.20	0.200			
Depth To Bottom										
Date Sampled	05-Jul-19	05-Jul-19	05-Jul-19	05-Jul-19	05-Jul-19	05-Jul-19	05-Jul-19			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code	4AE	4AE	4ABE	4AE	4AE	4AE	4AE			
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_D^{\#}$	NAD	NAD	NAD	NAD	NAD	NAD	NAD			A-T-045
Asbestos ACM - Suitable for Water Absorption Test?	N/A	N/A	N/A	N/A	N/A	N/A	N/A			

envirolab

Envirolab Job Number: 19/06516

Client Project Name: Accrington Road, Whalley

Client Project Ref: N/A

Lab Sample ID	19/06516/1	19/06516/2	19/06516/3	19/06516/4	19/06516/5	19/06516/6	19/06516/7	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP1	CP2	CP3	CP4	CP5	CP6	CP11			
Depth to Top	0.20	0.20	0.20	0.20	0.30	0.20	0.200			
Depth To Bottom										
Date Sampled	05-Jul-19	05-Jul-19	05-Jul-19	05-Jul-19	05-Jul-19	05-Jul-19	05-Jul-19			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Sample Matrix Code	4AE	4AE	4ABE	4AE	4AE	4AE	4AE			
PAH-16MS										
Acenaphthene$_A^{M\#}$	1.97	0.01	0.01	0.43	0.08	0.04	0.06	mg/kg	0.01	A-T-019s
Acenaphthylene$_A^{M\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	0.01	A-T-019s
Anthracene$_A^{M\#}$	1.07	0.03	0.02	0.34	0.12	0.07	0.07	mg/kg	0.02	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	4.30	0.10	0.12	2.85	0.71	0.33	0.39	mg/kg	0.04	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	3.06	0.10	0.15	2.29	0.66	0.29	0.33	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	3.73	0.11	0.17	3.28	0.79	0.37	0.42	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	1.62	<0.05	0.09	1.14	0.39	0.14	0.17	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	1.33	<0.07	<0.07	1.09	0.30	0.11	0.14	mg/kg	0.07	A-T-019s
Chrysene$_A^{M\#}$	4.08	0.13	0.16	3.34	0.84	0.42	0.47	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	0.37	<0.04	<0.04	0.37	0.08	<0.04	<0.04	mg/kg	0.04	A-T-019s
Fluoranthene$_A^{M\#}$	10	0.21	0.24	5.97	1.35	0.63	0.75	mg/kg	0.08	A-T-019s
Fluorene$_A^{M\#}$	1.50	<0.01	<0.01	0.30	0.05	0.04	0.04	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	1.88	0.06	0.09	1.35	0.42	0.17	0.20	mg/kg	0.03	A-T-019s
Naphthalene $_A^{M\#}$	0.62	<0.03	<0.03	0.09	<0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Phenanthrene$_A^{M\#}$	9.82	0.14	0.12	2.99	0.68	0.39	0.42	mg/kg	0.03	A-T-019s
Pyrene$_A^{M\#}$	7.35	0.18	0.21	4.44	1.16	0.53	0.63	mg/kg	0.07	A-T-019s
Total PAH-16MS$_A^{M\#}$	52.7	1.07	1.38	30.3	7.63	3.53	4.09	mg/kg	0.01	A-T-019s

envirolab

Envirolab Job Number: 19/06516

Client Project Name: Accrington Road, Whalley

Client Project Ref: N/A

Lab Sample ID	19/06516/8	19/06516/9	19/06516/10					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP7	CP8	CP10							
Depth to Top	0.20	0.40	0.30							
Depth To Bottom										
Date Sampled	05-Jul-19	05-Jul-19	05-Jul-19							
Sample Type	Soil	Soil	Soil							
Sample Matrix Code	4AE	4AE	4AE							
% Stones >10mm$_A$	<0.1	1.6	<0.1					% w/w	0.1	A-T-044
pH$_D$ M#	7.24	7.13	7.76					pH	0.01	A-T-031s
Sulphate (water sol 2:1)$_D$ M#	0.03	0.07	<0.01					g/l	0.01	A-T-026s
Sulphate (acid soluble)$_D$ M#	250	1200	990					mg/kg	200	A-T-028s
Cyanide (total)$_A$ M#	<1	<1	<1					mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC$_A$	<0.2	<0.2	<0.2					mg/kg	0.2	A-T-050s
Organic matter$_D$ M#	2.7	13.2	20.4					% w/w	0.1	A-T-032 OM
Arsenic$_D$ M#	<1	8	10					mg/kg	1	A-T-024s
Boron (water soluble)$_D$ M#	<1.0	<1.0	<1.0					mg/kg	1	A-T-027s
Cadmium$_D$ M#	0.7	1.2	0.8					mg/kg	0.5	A-T-024s
Copper$_D$ M#	13	23	32					mg/kg	1	A-T-024s
Chromium$_D$ M#	19	17	13					mg/kg	1	A-T-024s
Chromium (hexavalent)$_D$	<1	<1	<1					mg/kg	1	A-T-040s
Lead$_D$ M#	21	39	75					mg/kg	1	A-T-024s
Mercury$_D$	<0.17	<0.17	<0.17					mg/kg	0.17	A-T-024s
Nickel$_D$ M#	21	17	18					mg/kg	1	A-T-024s
Selenium$_D$ M#	1	3	1					mg/kg	1	A-T-024s
Zinc$_D$ M#	91	55	84					mg/kg	5	A-T-024s

envirolab

Envirolab Job Number: 19/06516

Client Project Name: Accrington Road, Whalley

Client Project Ref: N/A

Lab Sample ID	19/06516/8	19/06516/9	19/06516/10					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP7	CP8	CP10							
Depth to Top	0.20	0.40	0.30							
Depth To Bottom										
Date Sampled	05-Jul-19	05-Jul-19	05-Jul-19							
Sample Type	Soil	Soil	Soil							
Sample Matrix Code	4AE	4AE	4AE							
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_D$*	NAD	NAD	NAD							A-T-045
Asbestos ACM - Suitable for Water Absorption Test?	N/A	N/A	N/A							

Envirolab Job Number: 19/06516

Client Project Name: Accrington Road, Whalley

Client Project Ref: N/A

Lab Sample ID	19/06516/8	19/06516/9	19/06516/10					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP7	CP8	CP10							
Depth to Top	0.20	0.40	0.30							
Depth To Bottom										
Date Sampled	05-Jul-19	05-Jul-19	05-Jul-19							
Sample Type	Soil	Soil	Soil							
Sample Matrix Code	4AE	4AE	4AE							
PAH-16MS										
Acenaphthene$_A^{M\#}$	0.28	0.27	0.05					mg/kg	0.01	A-T-019s
Acenaphthylene$_A^{M\#}$	<0.01	<0.01	<0.01					mg/kg	0.01	A-T-019s
Anthracene$_A^{M\#}$	0.21	0.34	0.06					mg/kg	0.02	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	3.51	1.47	0.30					mg/kg	0.04	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	3.13	1.35	0.24					mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	5.46	1.62	0.30					mg/kg	0.05	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	1.47	0.69	0.13					mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	1.80	0.59	0.12					mg/kg	0.07	A-T-019s
Chrysene$_A^{M\#}$	4.59	1.75	0.35					mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	0.56	0.17	<0.04					mg/kg	0.04	A-T-019s
Fluoranthene$_A^{M\#}$	5.29	3.12	0.59					mg/kg	0.08	A-T-019s
Fluorene$_A^{M\#}$	0.15	0.15	0.04					mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	1.73	0.78	0.14					mg/kg	0.03	A-T-019s
Naphthalene $_A^{M\#}$	0.26	<0.03	<0.03					mg/kg	0.03	A-T-019s
Phenanthrene$_A^{M\#}$	2.21	1.83	0.36					mg/kg	0.03	A-T-019s
Pyrene$_A^{M\#}$	4.27	2.63	0.49					mg/kg	0.07	A-T-019s
Total PAH-16MS$_A^{M\#}$	34.9	16.8	3.17					mg/kg	0.01	A-T-019s

envirolab

Envirolab Job Number: 19/06516

Client Project Name: Accrington Road, Whalley

Client Project Ref: N/A

Lab Sample ID	19/06516/8	19/06516/9	19/06516/10					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP7	CP8	CP10							
Depth to Top	0.20	0.40	0.30							
Depth To Bottom										
Date Sampled	05-Jul-19	05-Jul-19	05-Jul-19							
Sample Type	Soil	Soil	Soil							
Sample Matrix Code	4AE	4AE	4AE							
SVOC										
Hexachlorobenzene$_A$	<100	<100	<100					µg/kg	100	A-T-052a
Diethyl phthalate$_A$	<100	<100	<100					µg/kg	100	A-T-052a
Dimethyl phthalate$_A$	<100	<100	<100					µg/kg	100	A-T-052a
Dibenzofuran$_A$	746	<100	533					µg/kg	100	A-T-052a
Carbazole$_A$	1060	<100	255					µg/kg	100	A-T-052a
Butylbenzyl phthalate$_A$	<100	<100	<100					µg/kg	100	A-T-052a
Bis(2-ethylhexyl)phthalate$_A$	<500	<500	<500					µg/kg	500	A-T-052a
Bis(2-chloroethoxy)methane$_A$	<100	<100	<100					µg/kg	100	A-T-052a
Bis(2-chloroethyl)ether$_A$	<100	<100	<100					µg/kg	100	A-T-052a
4-Nitrophenol$_A$	<200	<200	<200					µg/kg	100	A-T-052a
3+4-Methylphenol$_A$	140	<100	<100					µg/kg	100	A-T-052a
4-Chloro-3-methylphenol$_A$	<100	<100	<100					µg/kg	100	A-T-052a
2-Nitrophenol$_A$	<100	<100	<100					µg/kg	100	A-T-052a
2-Methylphenol$_A$	<100	<100	<100					µg/kg	100	A-T-052a
2-Chlorophenol$_A$	<100	<100	<100					µg/kg	100	A-T-052a
2,6-Dinitrotoluene$_A$	<100	<100	<100					µg/kg	100	A-T-052a
2,4-Dinitrotoluene$_A$	<100	<100	<100					µg/kg	100	A-T-052a
2,4-Dimethylphenol$_A$	<100	<100	<100					µg/kg	100	A-T-052a
2,4-Dichlorophenol$_A$	<100	<100	<100					µg/kg	100	A-T-052a
2,4,6-Trichlorophenol$_A$	<100	<100	<100					µg/kg	100	A-T-052a
2,4,5-Trichlorophenol$_A$	<100	<100	<100					µg/kg	100	A-T-052a
2-Chloronaphthalene$_A$	<100	<100	<100					µg/kg	100	A-T-052a
2-Methylnaphthalene$_A$	397	<100	1010					µg/kg	100	A-T-052a
Bis(2-chloroisopropyl)ether$_A$	<100	<100	<100					µg/kg	100	A-T-052a
Phenol$_A$	<100	<100	<100					µg/kg	100	A-T-052a
Pentachlorophenol (SVOC)$_A$	<100	<100	<100					µg/kg	100	A-T-052a
n-Nitroso-n-dipropylamine$_A$	<100	<100	<100					µg/kg	100	A-T-052a
n-Dioctylphthalate$_A$	<500	<500	<500					µg/kg	500	A-T-052a
n-Dibutylphthalate$_A$	<100	<100	<100					µg/kg	100	A-T-052a
Nitrobenzene$_A$	<100	<100	<100					µg/kg	100	A-T-052a
Isophorone$_A$	<100	<100	<100					µg/kg	100	A-T-052a
Hexachloroethane$_A$	<100	<100	<100					µg/kg	100	A-T-052a

Envirolab Job Number: 19/06516

Client Project Name: Accrington Road, Whalley

Client Project Ref: N/A

Lab Sample ID	19/06516/8	19/06516/9	19/06516/10					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP7	CP8	CP10							
Depth to Top	0.20	0.40	0.30							
Depth To Bottom										
Date Sampled	05-Jul-19	05-Jul-19	05-Jul-19							
Sample Type	Soil	Soil	Soil							
Sample Matrix Code	4AE	4AE	4AE							
Hexachlorocyclopentadiene$_A$	<100	<100	<100					µg/kg	100	A-T-052s
Perylene$_A$	995	453	811					µg/kg	100	A-T-052s

envirolab

Envirolab Job Number: 19/06516

Client Project Name: Accrington Road, Whalley

Client Project Ref: N/A

Lab Sample ID	19/06516/8	19/06516/9	19/06516/10					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP7	CP8	CP10							
Depth to Top	0.20	0.40	0.30							
Depth To Bottom										
Date Sampled	05-Jul-19	05-Jul-19	05-Jul-19							
Sample Type	Soil	Soil	Soil							
Sample Matrix Code	4AE	4AE	4AE							
VOC										
Dichlorodifluoromethane$_A$	<1	<1	<1					µg/kg	1	A-T-006s
Chloromethane$_A$	<10	<10	<10					µg/kg	10	A-T-006s
Vinyl Chloride (Chloroethene)$_A^\#$	<1	<1	<1					µg/kg	1	A-T-006s
Bromomethane$_A^\#$	<1	<1	<1					µg/kg	1	A-T-006s
Chloroethane$_A^\#$	<1	<1	<1					µg/kg	1	A-T-006s
Trichlorofluoromethane$_A^\#$	<1	<1	<1					µg/kg	1	A-T-006s
1,1-Dichloroethene$_A^\#$	<1	<1	<1					µg/kg	1	A-T-006s
Carbon Disulphide$_A^\#$	<1	<1	<1					µg/kg	1	A-T-006s
Dichloromethane$_A$	<5	<5	<5					µg/kg	5	A-T-006s
trans 1,2-Dichloroethene$_A^\#$	<1	<1	<1					µg/kg	1	A-T-006s
1,1-Dichloroethane$_A^\#$	<1	<1	<1					µg/kg	1	A-T-006s
cis 1,2-Dichloroethene$_A^\#$	<1	<1	<1					µg/kg	1	A-T-006s
2,2-Dichloropropane$_A^\#$	<1	<1	<1					µg/kg	1	A-T-006s
Bromochloromethane$_A^\#$	<5	<5	<5					µg/kg	5	A-T-006s
Chloroform$_A^\#$	<1	<1	<1					µg/kg	1	A-T-006s
1,1,1-Trichloroethane$_A^\#$	<1	<1	<1					µg/kg	1	A-T-006s
1,1-Dichloropropene$_A^\#$	<1	<1	<1					µg/kg	1	A-T-006s
Carbon Tetrachloride$_A^\#$	<1	<1	<1					µg/kg	1	A-T-006s
1,2-Dichloroethane$_A^\#$	<2	<2	<2					µg/kg	2	A-T-006s
Benzene$_A^\#$	<1	<1	<1					µg/kg	1	A-T-006s
Trichloroethene$_A^\#$	<1	<1	<1					µg/kg	1	A-T-006s
1,2-Dichloropropane$_A^\#$	<1	<1	<1					µg/kg	1	A-T-006s
Dibromomethane$_A^\#$	<1	<1	<1					µg/kg	1	A-T-006s
Bromodichloromethane$_A^\#$	<10	<10	<10					µg/kg	10	A-T-006s
cis 1,3-Dichloropropene$_A^\#$	<1	<1	<1					µg/kg	1	A-T-006s
Toluene$_A^\#$	<1	<1	<1					µg/kg	1	A-T-006s
trans 1,3-Dichloropropene$_A^\#$	<1	<1	<1					µg/kg	1	A-T-006s
1,1,2-Trichloroethane$_A^\#$	<1	<1	<1					µg/kg	1	A-T-006s
1,3-Dichloropropane$_A^\#$	<1	<1	<1					µg/kg	1	A-T-006s
Tetrachloroethene$_A^\#$	<1	<1	<1					µg/kg	1	A-T-006s
Dibromochloromethane$_A^\#$	<3	<3	<3					µg/kg	3	A-T-006s
1,2-Dibromoethane$_A^\#$	<1	<1	<1					µg/kg	1	A-T-006s

Lab Sample ID	19/06516/8	19/06516/9	19/06516/10					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP7	CP8	CP10							
Depth to Top	0.20	0.40	0.30							
Depth To Bottom										
Date Sampled	05-Jul-19	05-Jul-19	05-Jul-19							
Sample Type	Soil	Soil	Soil							
Sample Matrix Code	4AE	4AE	4AE							
Chlorobenzene$_{A}^{\#}$	<1	<1	<1					µg/kg	1	A-T-006s
1,1,1,2-Tetrachloroethane$_{A}$	<1	<1	<1					µg/kg	1	A-T-006s
Ethylbenzene$_{A}^{\#}$	<1	<1	<1					µg/kg	1	A-T-006s
m & p Xylene$_{A}^{\#}$	<1	<1	<1					µg/kg	1	A-T-006s
o-Xylene$_{A}^{\#}$	<1	<1	<1					µg/kg	1	A-T-006s
Styrene$_{A}^{\#}$	<1	<1	<1					µg/kg	1	A-T-006s
Bromoform$_{A}^{\#}$	<1	<1	<1					µg/kg	1	A-T-006s
Isopropylbenzene$_{A}^{\#}$	<1	<1	<1					µg/kg	1	A-T-006s
1,1,2,2-Tetrachloroethane$_{A}$	<1	<1	<1					µg/kg	1	A-T-006s
1,2,3-Trichloropropane$_{A}^{\#}$	<1	<1	<1					µg/kg	1	A-T-006s
Bromobenzene$_{A}^{\#}$	<1	<1	<1					µg/kg	1	A-T-006s
n-Propylbenzene$_{A}^{\#}$	<1	<1	<1					µg/kg	1	A-T-006s
2-Chlorotoluene$_{A}^{\#}$	<1	<1	<1					µg/kg	1	A-T-006s
1,3,5-Trimethylbenzene$_{A}^{\#}$	<1	<1	<1					µg/kg	1	A-T-006s
4-Chlorotoluene$_{A}^{\#}$	<1	<1	<1					µg/kg	1	A-T-006s
tert-Butylbenzene$_{A}^{\#}$	<2	<2	<2					µg/kg	2	A-T-006s
1,2,4-Trimethylbenzene$_{A}^{\#}$	<1	<1	<1					µg/kg	1	A-T-006s
sec-Butylbenzene$_{A}^{\#}$	<1	<1	<1					µg/kg	1	A-T-006s
4-Isopropyltoluene$_{A}^{\#}$	<1	<1	<1					µg/kg	1	A-T-006s
1,3-Dichlorobenzene$_{A}$	<1	<1	<1					µg/kg	1	A-T-006s
1,4-Dichlorobenzene$_{A}^{\#}$	<1	<1	<1					µg/kg	1	A-T-006s
n-Butylbenzene$_{A}^{\#}$	<1	<1	<1					µg/kg	1	A-T-006s
1,2-Dichlorobenzene$_{A}^{\#}$	<1	<1	<1					µg/kg	1	A-T-006s
1,2-Dibromo-3-chloropropane (DCBP)$_{A}$	<2	<2	<2					µg/kg	2	A-T-006s
1,2,4-Trichlorobenzene$_{A}$	<3	<3	<3					µg/kg	3	A-T-006s
Hexachlorobutadiene$_{A}^{\#}$	<1	<1	<1					µg/kg	1	A-T-006s
1,2,3-Trichlorobenzene$_{A}$	<3	<3	<3					µg/kg	3	A-T-006s

Envirolab Job Number: 19/06516

Client Project Name: Accrington Road, Whalley

Client Project Ref: N/A

Lab Sample ID	19/06516/8	19/06516/9	19/06516/10					Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	CP7	CP8	CP10							
Depth to Top	0.20	0.40	0.30							
Depth To Bottom										
Date Sampled	05-Jul-19	05-Jul-19	05-Jul-19							
Sample Type	Soil	Soil	Soil							
Sample Matrix Code	4AE	4AE	4AE							
TPH CWG										
All >C5-C6$_A^{\#}$	<0.05	<0.05	<0.05					mg/kg	0.01	A-T-022s
All >C6-C8$_A^{\#}$	<0.05	<0.05	<0.05					mg/kg	0.01	A-T-022s
All >C8-C10$_A$	15	<1	<1					mg/kg	1	A-T-055s
All >C10-C12$_A^{M\#}$	9	<1	<1					mg/kg	1	A-T-055s
All >C12-C16$_A^{M\#}$	17	4	<1					mg/kg	1	A-T-055s
All >C16-C21$_A^{M\#}$	15	4	3					mg/kg	1	A-T-055s
All >C21-C35$_A$	20	19	13					mg/kg	1	A-T-055s
Total Aliphatics$_A$	75	29	15					mg/kg	1	A-T-055s
Aro >C5-C7$_A^{\#}$	<0.05	<0.05	<0.05					mg/kg	0.01	A-T-022s
Aro >C7-C8$_A^{\#}$	<0.05	<0.05	<0.05					mg/kg	0.01	A-T-022s
Aro >C8-C10$_A$	7	2	1					mg/kg	1	A-T-055s
Aro >C10-C12$_A^{M\#}$	8	<1	<1					mg/kg	1	A-T-055s
Aro >C12-C16$_A$	32	6	4					mg/kg	1	A-T-055s
Aro >C16-C21$_A^{M\#}$	61	11	6					mg/kg	1	A-T-055s
Aro >C21-C35$_A^{M\#}$	155	30	24					mg/kg	1	A-T-055s
Total Aromatics$_A$	261	49	35					mg/kg	1	A-T-055s
TPH (All & Aro >C5-C35)$_A$	336	78	50					mg/kg	1	A-T-055s
BTEX - Benzene$_A^{\#}$	<0.05	<0.05	<0.05					mg/kg	0.01	A-T-022s
BTEX - Toluene$_A^{\#}$	<0.05	<0.05	<0.05					mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene$_A^{\#}$	<0.05	<0.05	<0.05					mg/kg	0.01	A-T-022s
BTEX - m & p Xylene$_A^{\#}$	<0.05	<0.05	<0.05					mg/kg	0.01	A-T-022s
BTEX - o Xylene$_A^{\#}$	<0.05	<0.05	<0.05					mg/kg	0.01	A-T-022s
MTBE$_A^{\#}$	<0.05	<0.05	<0.05					mg/kg	0.01	A-T-022s

REPORT NOTES

General
This report shall not be reproduced, except in full, without written approval from Envirolab.
The results reported herein relate only to the material supplied to the laboratory.
The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any "A" subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal,
E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: BEK Enviro Ltd, Suite One , No 3 Mitton Road Business Park , Mitton Road , Whalley , Lancashire , BB7 9YE

Project: Accrington Road, Whalley

Clients Project No: N/A

Project No: 19/06516

Date Received: 09/07/2019 (am)

Cool Box Temperatures (°C): 16.0

NO DEVIATIONS IDENTIFIED

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

APPENDIX C

Geotechnical Test Results

James Fisher Testing Services Ltd
Ruby House, 40A Hardwick Grange
Warrington, WA1 4RF
Tel: 01925286880

James Fisher
Testing Services

LABORATORY TEST REPORT
PARTICLE SIZE DISTRIBUTION - BS 1377: Part 2: 1990 - WET SIEVING

Project:	Accrington Rd, Whalley	**Lab Ref No.:**	34790/27
		Date Received:	12/07/2019
Client:	Bek Enviro Ltd	**Date Tested:**	22/07/2019
		Date Reported:	23/07/2019
		Material:	Grey Sand, Gravel
Originator:	**Mick Buckley**	**Specification:**	Not Stated

Client Sample Ref : CP2 15.5m

Supplier: N/A

Location: Accrington Rd, Whalley

Ticket No.: N/A

Date Sampled : 05/07/2019

Sample Type: Bulk

Sampled By: Client

Sampling Cert.: Yes

Sample Preparation Method: Oven dried

Specification: Not Stated

SIEVE ANALYSIS		
Sieve size	% Passing	Specification
125mm	100	
90mm	100	
75mm	100	
37.5mm	100	
28mm	100	
20mm	99	
14mm	98	
10mm	96	
6.3mm	93	
5.0mm	91	
3.35mm	87	
2.0mm	77	
1.18mm	64	
600micron	41	
425micron	29	
300micron	21	
150micron	8.8	
63micron	4.7	

Particle Size Distribution tested in accordance with BS1377: Part 2: 1990
Sample preperation by Cone and Quarter

K.Monks
Approved Signature
James Fisher Testing Services Ltd
Karl Monks, Lab Team Leader

James Fisher Testing Services Ltd
Ruby House, 40A Hardwick Grange
Warrington, WA1 4RF
Tel: 01925286880

James Fisher
Testing Services

LABORATORY TEST REPORT
PARTICLE SIZE DISTRIBUTION - BS 1377: Part 2: 1990 - WET SIEVING

Project:	Accrington Rd, Whalley	**Lab Ref No.:**	34790/27
		Date Received:	12/07/2019
Client:	Bek Enviro Ltd	**Date Tested:**	22/07/2019
		Date Reported:	23/07/2019
		Material:	Grey Dark Clay
Originator:	**Mick Buckley**	**Specification:**	Not Stated

Client Sample Ref : CP4 5.2-5.5

Supplier: N/A

Location: Accrington Rd, Whalley

Ticket No.: N/A

Date Sampled : 05/07/2019

Sample Type: Bulk

Sampled By: Client

Sampling Cert.: Yes

Sample Preparation Method: Oven dried

Specification: Not Stated

SIEVE ANALYSIS		
Sieve size	% Passing	Specification
125mm	100	
90mm	100	
75mm	100	
37.5mm	100	
28mm	100	
20mm	99	
14mm	98	
10mm	97	
6.3mm	96	
5.0mm	96	
3.35mm	95	
2.0mm	94	
1.18mm	93	
600micron	92	
425micron	92	
300micron	91	
150micron	87	
63micron	83	

Particle Size Distribution tested in accordance with BS1377: Part 2: 1990
Sample preperation by Cone and Quarter

K.Monks

Approved Signature
James Fisher Testing Services Ltd
Karl Monks, Lab Team Leader

James Fisher Testing Services Ltd
Ruby House, 40A Hardwick Grange
Warrington, WA1 4RF
Tel: 01925286880

James Fisher
Testing Services

LABORATORY TEST REPORT
PARTICLE SIZE DISTRIBUTION - BS 1377: Part 2: 1990 - WET SIEVING

Project:	Accrington Rd, Whalley	**Lab Ref No.:**	34790/27
		Date Received:	12/07/2019
Client:	Bek Enviro Ltd	**Date Tested:**	22/07/2019
		Date Reported:	23/07/2019
		Material:	Grey Dark Clay
Originator:	**Mick Buckley**	**Specification:**	Not Stated

Client Sample Ref : CP5 5.0m

Supplier: N/A

Location: Accrington Rd, Whalley

Ticket No.: N/A

Date Sampled : 05/07/2019

Sample Type: Bulk

Sampled By: Client

Sampling Cert.: Yes

Sample Preparation Method: Oven dried

Specification: Not Stated

SIEVE ANALYSIS		
Sieve size	% Passing	Specification
125mm	100	
90mm	100	
75mm	100	
37.5mm	100	
28mm	100	
20mm	100	
14mm	99	
10mm	97	
6.3mm	97	
5.0mm	96	
3.35mm	96	
2.0mm	95	
1.18mm	95	
600micron	94	
425micron	92	
300micron	89	
150micron	77	
63micron	67	

Particle Size Distribution tested in accordance with BS1377: Part 2: 1990
Sample preperation by Cone and Quarter

K.Monks

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James Fisher
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LABORATORY TEST REPORT
PARTICLE SIZE DISTRIBUTION - BS 1377: Part 2: 1990 - WET SIEVING

Project:	Accrington Rd, Whalley	**Lab Ref No.:**	34790/27
		Date Received:	12/07/2019
Client:	Bek Enviro Ltd	**Date Tested:**	19/07/2019
		Date Reported:	23/07/2019
		Material:	Grey Dark Clay
Originator:	**Mick Buckley**	**Specification:**	Not Stated

Client Sample Ref : CP6 6.8m

Supplier: N/A

Location: Accrington Rd, Whalley

Ticket No.: N/A

Date Sampled : 05/07/2019

Sample Type: Bulk

Sampled By: Client

Sampling Cert.: Yes

Sample Preparation Method: Oven dried

Specification: Not Stated

SIEVE ANALYSIS		
Sieve size	% Passing	Specification
125mm	100	
90mm	100	
75mm	100	
37.5mm	100	
28mm	100	
20mm	100	
14mm	100	
10mm	99	
6.3mm	99	
5.0mm	98	
3.35mm	98	
2.0mm	97	
1.18mm	97	
600micron	96	
425micron	95	
300micron	95	
150micron	94	
63micron	92	

Particle Size Distribution tested in accordance with BS1377: Part 2: 1990
Sample preperation by Cone and Quarter

K.Monks

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Karl Monks, Lab Team Leader

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James Fisher Testing Services

LABORATORY TEST REPORT
PARTICLE SIZE DISTRIBUTION - BS 1377: Part 2: 1990 - WET SIEVING

Project:	Accrington Rd, Whalley	**Lab Ref No.:**	34790/27
		Date Received:	12/07/2019
Client:	Bek Enviro Ltd	**Date Tested:**	19/07/2019
		Date Reported:	23/07/2019
		Material:	Grey Dark Clay
Originator:	**Mick Buckley**	**Specification:**	Not Stated

Client Sample Ref : CP7 6.5-7.0m

Supplier: N/A

Location: Accrington Rd, Whalley

Ticket No.: N/A

Date Sampled : 05/07/2019

Sample Type: Bulk

Sampled By: Client

Sampling Cert.: Yes

Sample Preparation Method: Oven dried

Specification: Not Stated

SIEVE ANALYSIS		
Sieve size	% Passing	Specification
125mm	100	
90mm	100	
75mm	100	
37.5mm	100	
28mm	100	
20mm	98	
14mm	97	
10mm	96	
6.3mm	94	
5.0mm	94	
3.35mm	93	
2.0mm	91	
1.18mm	90	
600micron	89	
425micron	88	
300micron	87	
150micron	85	
63micron	80	

Particle Size Distribution tested in accordance with BS1377: Part 2: 1990
Sample preperation by Cone and Quarter

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LABORATORY TEST REPORT
PARTICLE SIZE DISTRIBUTION - BS 1377: Part 2: 1990 - WET SIEVING

Project:	Accrington Rd, Whalley	**Lab Ref No.:**	34790/27
		Date Received:	12/07/2019
Client:	Bek Enviro Ltd	**Date Tested:**	19/07/2019
		Date Reported:	23/07/2019
		Material:	Grey Dark Clay
Originator:	**Mick Buckley**	**Specification:**	Not Stated

Client Sample Ref : CP8 9.5-9.9m

Supplier: N/A

Location: Accrington Rd, Whalley

Ticket No.: N/A

Date Sampled : 05/07/2019

Sample Type: Bulk

Sampled By: Client

Sampling Cert.: Yes

Sample Preparation Method: Oven dried

Specification: Not Stated

SIEVE ANALYSIS		
Sieve size	% Passing	Specification
125mm	100	
90mm	100	
75mm	100	
37.5mm	100	
28mm	100	
20mm	97	
14mm	97	
10mm	97	
6.3mm	96	
5.0mm	95	
3.35mm	95	
2.0mm	94	
1.18mm	93	
600micron	91	
425micron	91	
300micron	90	
150micron	87	
63micron	83	

Particle Size Distribution tested in accordance with BS1377: Part 2: 1990
Sample preperation by Cone and Quarter

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James Fisher Testing Services

LABORATORY TEST REPORT
PARTICLE SIZE DISTRIBUTION - BS 1377: Part 2: 1990 - WET SIEVING

Project:	Accrington Rd, Whalley	**Lab Ref No.:**	34790/27
		Date Received:	12/07/2019
Client:	Bek Enviro Ltd	**Date Tested:**	19/07/2019
		Date Reported:	23/07/2019
		Material:	Grey Dark Clay
Originator:	**Mick Buckley**	**Specification:**	Not Stated

Client Sample Ref : CP9 6.3-6.8m

Supplier: N/A

Location: Accrington Rd, Whalley

Ticket No.: N/A

Date Sampled : 05/07/2019

Sample Type: Bulk

Sampled By: Client

Sampling Cert.: Yes

Sample Preparation Method: Oven dried

Specification: Not Stated

SIEVE ANALYSIS		
Sieve size	% Passing	Specification
125mm	100	
90mm	100	
75mm	100	
37.5mm	100	
28mm	100	
20mm	100	
14mm	100	
10mm	100	
6.3mm	100	
5.0mm	99	
3.35mm	99	
2.0mm	99	
1.18mm	99	
600micron	99	
425micron	98	
300micron	98	
150micron	95	
63micron	87	

Particle Size Distribution tested in accordance with BS1377: Part 2: 1990
Sample preperation by Cone and Quarter

K.Monks

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Karl Monks, Lab Team Leader

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Tel: 01925286880

James Fisher
Testing Services

LABORATORY TEST REPORT
PARTICLE SIZE DISTRIBUTION - BS 1377: Part 2: 1990 - WET SIEVING

Project:	Accrington Rd, Whalley	**Lab Ref No.:**	34790/27
		Date Received:	12/07/2019
Client:	Bek Enviro Ltd	**Date Tested:**	19/07/2019
		Date Reported:	23/07/2019
		Material:	Sand, Gravel
Originator:	**Mick Buckley**	**Specification:**	Not Stated

Client Sample Ref : CP10 2.5-3.0m

Supplier: N/A

Location: Accrington Rd, Whalley

Ticket No.: N/A

Date Sampled : 05/07/2019

Sample Type: Bulk

Sampled By: Client

Sampling Cert.: Yes

Sample Preparation Method: Oven dried

Specification: Not Stated

SIEVE ANALYSIS		
Sieve size	% Passing	Specification
125mm	100	
90mm	82	
75mm	82	
37.5mm	62	
28mm	52	
20mm	42	
14mm	31	
10mm	27	
6.3mm	24	
5.0mm	23	
3.35mm	21	
2.0mm	19	
1.18mm	18	
600micron	13	
425micron	11	
300micron	8.2	
150micron	3.9	
63micron	1.7	

Particle Size Distribution tested in accordance with BS1377: Part 2: 1990
Sample preperation by Cone and Quarter

K.Monks

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Karl Monks, Lab Team Leader

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Tel: 01925286880

James Fisher
Testing Services

LABORATORY TEST REPORT
PARTICLE SIZE DISTRIBUTION - BS 1377: Part 2: 1990 - WET SIEVING

Project:	Accrington Rd, Whalley	**Lab Ref No.:**	34790/27
		Date Received:	12/07/2019
Client:	Bek Enviro Ltd	**Date Tested:**	22/07/2019
		Date Reported:	23/07/2019
		Material:	Grey Clay
Originator:	**Mick Buckley**	**Specification:**	Not Stated

Client Sample Ref : CP11 4.8-5.3m

Supplier: N/A

Location: Accrington Rd, Whalley

Ticket No.: N/A

Date Sampled : 05/07/2019

Sample Type: Bulk

Sampled By: Client

Sampling Cert.: Yes

Sample Preparation Method: Oven dried

Specification: Not Stated

SIEVE ANALYSIS		
Sieve size	% Passing	Specification
125mm	100	
90mm	100	
75mm	100	
37.5mm	100	
28mm	100	
20mm	100	
14mm	100	
10mm	100	
6.3mm	100	
5.0mm	100	
3.35mm	100	
2.0mm	99	
1.18mm	99	
600micron	99	
425micron	98	
300micron	98	
150micron	94	
63micron	48	

Particle Size Distribution tested in accordance with BS1377: Part 2: 1990
Sample preperation by Cone and Quarter

K.Monks

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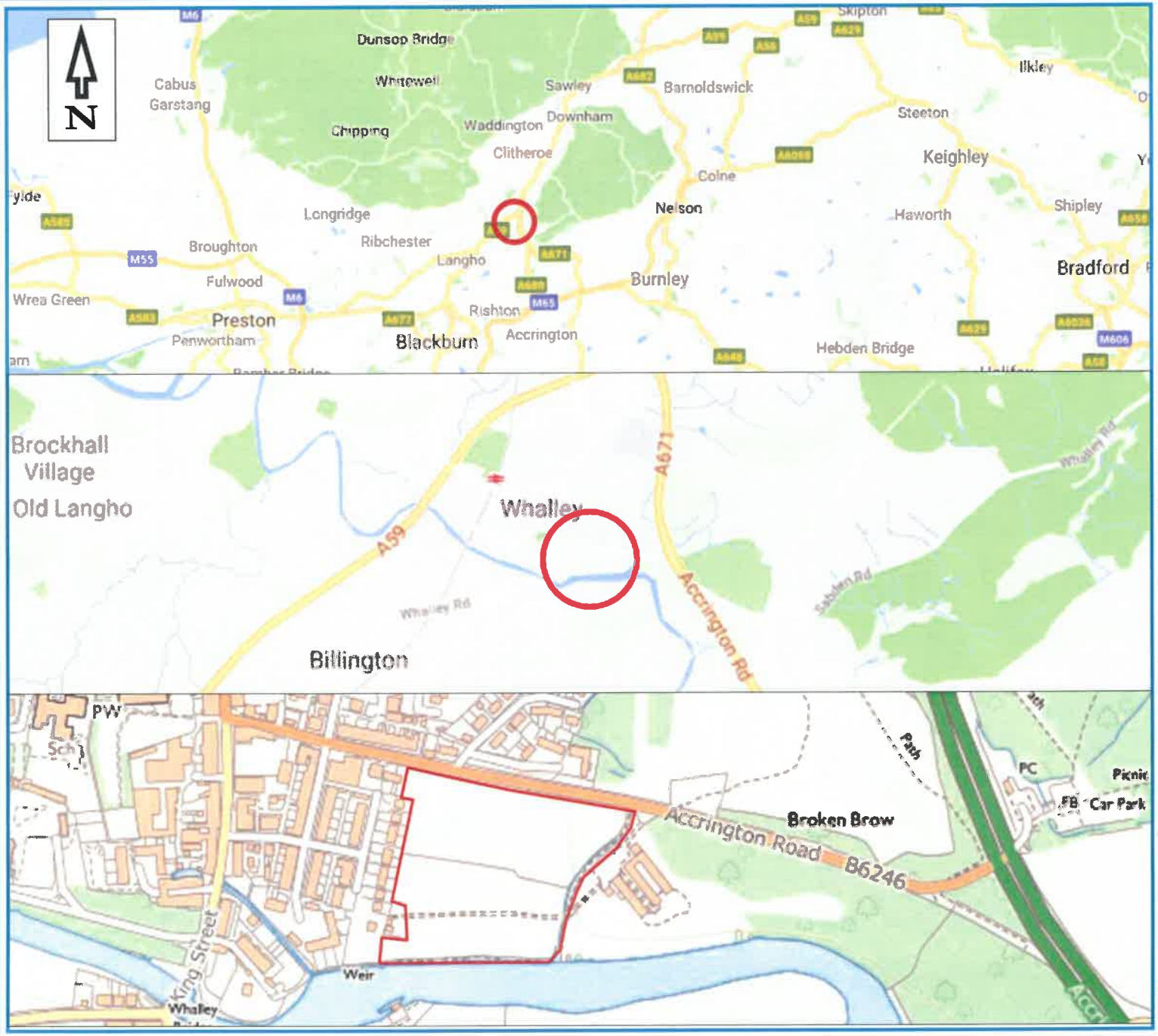
James Fisher Testing Services Ltd
Karl Monks, Lab Team Leader

APPENDIX D

Drawings



LEGEND

SITE LOCATION

REV	DESCRIPTION	DATE	BY

GEO-ENVIRONMENTAL CONSULTING ENGINEERS
Suite One, No 3 Mitton Road Business Park, Mitton Road,
Whalley, Lancashire BB7 9YE
Tel: 01254 377622 Mob: 07906753583
Email: mbuckley@bekenviro.co.uk
Web: www.bekenviro.co.uk

CLIENT.
OAKMERE

JOB TITLE.
ACCRINGTON ROAD,
WHALLEY

DRAWING TITLE.
SITE LOCATION PLAN

SCALE @ A3.	DRAWN BY.	APPROVED BY.	DATE.
NTS	D.E.	M.B.	05/04/19

DRAWING No.	REV.
19545-1	-

LEGEND

SITE FOOTPRINT

REV	DESCRIPTION	DATE	BY

GEO-ENVIRONMENTAL CONSULTING ENGINEERS
Suite One, No 3 Mitton Road Business Park, Mitton Road,
Whalley, Lancashire BB7 9YE
Tel: 01254 377622 Mob: 07906753583
Email: mbuckley@bekenviro.co.uk
Web: www.bekenviro.co.uk

CLIENT.
OAKMERE

JOB TITLE.
ACCRINGTON ROAD, WHALLEY

DRAWING TITLE.
SITE LAYOUT PLAN

SCALE @ A3.	DRAWN BY.	APPROVED BY.	DATE.
NTS	D.E.	M.B.	05/04/19

DRAWING No.	REV.
19545-2	-

LEGEND

- CABLE PERCUSSIVE BOREHOLE (25m)
- CABLE PERCUSSIVE BOREHOLE (10m)
- GAS/GROUNDWATER MONITORING PROBE

Note: Gas/groundwater monitoring probe installed in CP1, CP2, CP7 and CP10

REV	DESCRIPTION	DATE	BY

bek
GEO-ENVIRONMENTAL CONSULTING ENGINEERS
Suite One, No 3 Mitton Road Business Park, Mitton Road, Whalley, Lancashire BB7 9YE
Tel: 01254 377622 Mob: 07906753583
Email: mbuckley@bekenviro.co.uk
Web: www.bekenviro.co.uk

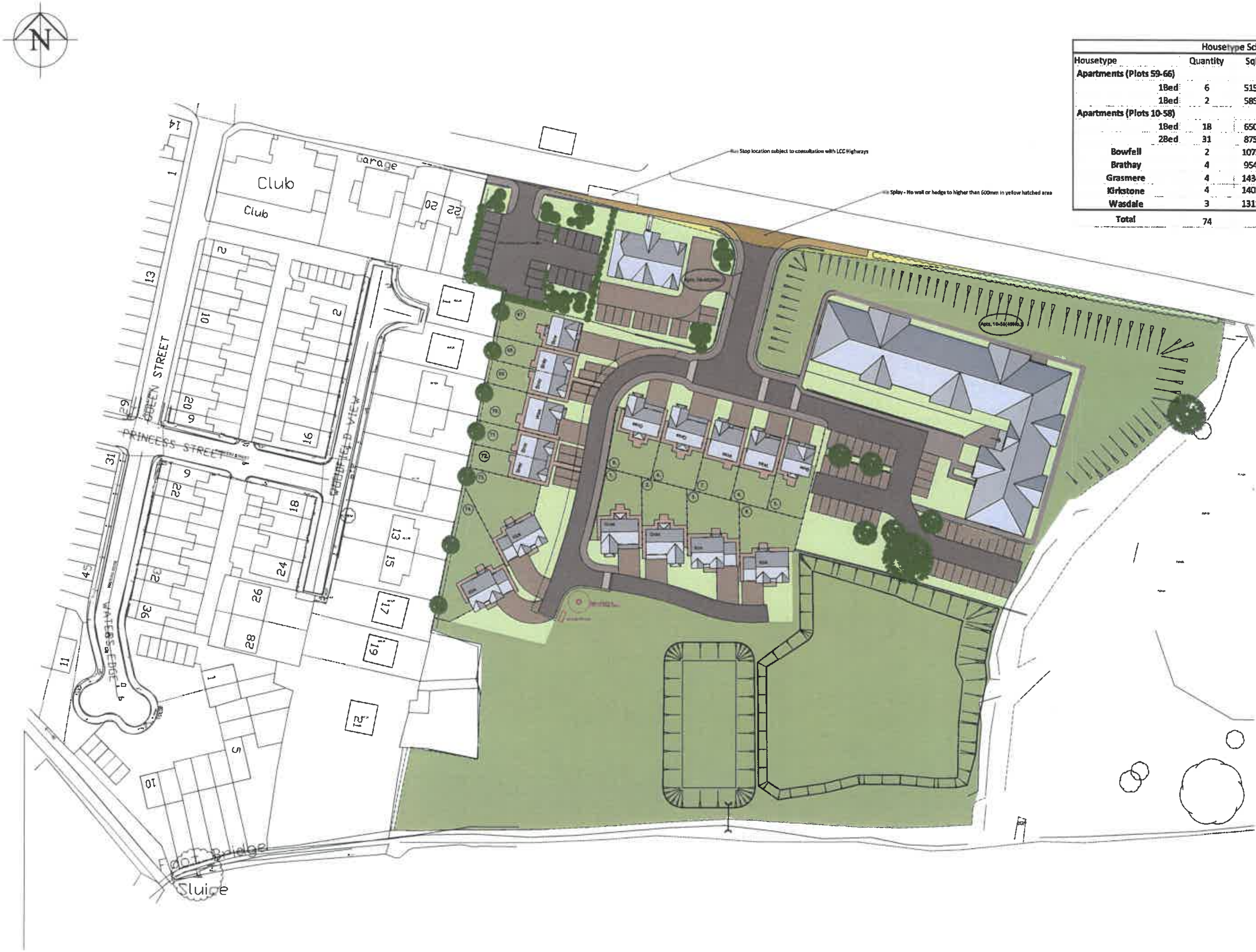
CLIENT.
Oakmere
CREATING QUALITY HOMES

JOB TITLE.
ACCRINGTON ROAD, WHALLEY

DRAWING TITLE.
CABLE PERCUSSIVE BOREHOLE LOCATION PLAN

SCALE @ A3.	DRAWN BY.	APPROVED BY.	DATE.
NTS	D.E.	M.B.	10/07/19

DRAWING No.	REV.
19545-3	-



Housetype Schedule					
Housetype	Quantity	SqFt	Total SqFt	Beds	People
Apartments (Plots 59-66)					
1Bed	6	515.5	3093	1	2
1Bed	2	585.5	1171	1	2
Apartments (Plots 10-58)					
1Bed	18	650.1	11701.8	1	2
2Bed	31	875.1	27128.1	2	4
Bowfell	2	1075.7	2151.4	4	6
Brathay	4	954.1	3816.4	3	5
Grasmere	4	1434.8	5739.2	4	7
Kirkstone	4	1402.1	5608.4	4	5
Wasdale	3	1311.4	3934.2	4	6
Total	74				

G 29/11/22 - Roof layouts on the apartments updated to match house type drawings.

F 31/10/22 - Pump station added and banking indicated around apartment.

E 18/10/22 - Layout completed following receipt of engineering data.

D 22/09/22 - Further redesign following internal discussion.

C 14/09/22 -Scheme redesigned following flood modelling

B 12/07/22 -Scheme redesigned as a single phase, -Public car park accessed off Accrington Road added.

A 06/10/20 -Apartments over Garages footprint amended -Housing schedule amended for GAR(APTS) -Parking and paths for GAR-(APTS) amended

PROJECT TITLE
Accrington Road
Whalley

DRAWING TITLE
Reduced Development Proposal

DRAWING NUMBER 015/R-OAK/01 — REVISION G

DATE 06/06/20 — SCALE 1:500 @A1

3/12/2021 11:58
6/12/2023

GEO-ENVIRONMENTAL CONSULTING ENGINEERS

smas worksafe consultant www.smasltd.com SSIP

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