Phase 1 Geoenvironmental Risk Assessment and Phase 2 Ground Investigation

NAYLOR CONCRETE
WHALEY ROAD
BARNSLEY

for

Naylor Concrete Products Limited

Report Number 4387

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NAYLOR CONCRETE, WHALEY ROAD, BARNSLEY

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1 INTRODUCTION

1.1 On behalf of Naylor Concrete Products Limited, a Phase I Geoenvironmental and Geotechnical Assessment (Desk Study) and a Phase II Intrusive Investigation have been carried out at its premises on Whaley Road in Barnsley. It is proposed to extend the existing slab, as shown on figures 1 and 2.

1.2 The purpose of the desk study was to review and assess published information on the site including geological, mining and hydrogeological data. It was also to review the past history of the site and its environmental setting. The intrusive investigation has comprised trial pitting and window sampling with associated in-situ and laboratory testing.

1.3 The study has not included checks on services on or adjacent to the site, and no structural or asbestos surveys have been carried out. Reference should be made to the Procedure Notes in respect of any limitations to this report.

2 THE SITE

2.1 The site of the existing batching plant lies to the east of Whaley Road, approximately 2km northwest of the centre of Barnsley. The site is flat-lying at around 72 mAOD. It comprises a concrete slab, over which there is a semi-rigid structure. Figure 2 shows the area of the proposed extension batching plant which is attached. The Ordnance Survey Grid Reference is E432240, N408110.

View of northwestern elevation of building

View of southeastern elevation of building

3 STRATA PROFILE

3.1 The full exploratory borehole and trial pit records are presented in Appendices 1 and 2 respectively. These give full strata descriptions based on visual examination and are in accordance with the requirements of BS5930: 2015 + A1 2020 "Code of Practice for Ground Investigations" and BS EN ISO 14688-1:2018 "Geotechnical Investigation and Testing - Identification and Classification of Soil - Part 1" and BS EN ISO 14688-2:2018 "Geotechnical Investigation and Testing - Identification and Classification of Soil - Part 2". BS EN ISO 14689-1:2018 "Geotechnical Investigation and Testing - Identification and Classification of Rock - Part 1" has been withdrawn.

3.2 The site is underlain by between 0.90m and 2.10m of Made Ground, with the thickness generally increasing in an easterly and southeasterly direction.

3.3 The Made Ground typically comprises a brown sandy gravelly clay containing stone and brick. It also contains occasional pieces of plastic ducting and sheeting, and limestone sub-base gravel.

3.4 Trial pits TP1 to TP3 also contained broken pieces of reinforced concrete, which it is understood originated from filling carried out by Naylors, prior to construction of the existing slab. According to Naylors' staff, the area was raised and that the infill Made Ground was compacted in layers. Visually, the Made Ground was well compacted.

3.5 The Made Ground along the northwestern elevation has also been topped by a thin layer (300mm thick) of geotextile matting, overlain by limestone sub-base material.

3.6 The Made Ground is underlain by natural ground comprising a firm becoming stiff brown and grey mottled silty clay. A thin band of poor quality coal was also encountered in trial pit TP5, between 1.10m and 1.35m depth.

3.7 The trial pits were generally dry during excavation, although a slight seepage of surface water occurred from the Made Ground in several of the pits.

3.8 There was no unusual colouration or odours to any of the soils encountered during the investigation and no obvious visual evidence of contamination, such as asbestos, was found during the investigation. This does not mean that asbestos containing materials or asbestos fibres are not present.

3.9 It should be noted that lateral and vertical changes can occur between exploratory points and care is needed when extrapolation is used. This is particularly true of the Made Ground which, by its nature, can be very variable in its physical and chemical composition.

Trial Pit TP1

Trial Pit TP5

4 SITE HISTORY

4.1 The following archival Ordnance Survey maps have been examined to trace the past development of the site. These are reproduced in Appendix 6 with the current site boundary superimposed on them. The apparent displacement on the older maps is due to a change in Ordnance Survey co-ordinates.

Scale and Year of Publication			
6" to 1 mile	1854	1:2500	1893
	1891		1906
	1909		1959
	1930		1961
	1938		1989
	1948		
	1956		
	1966		
1:10,000	1973	1:1250	1959
	1982		1975
	1993		1990
	2001		1991
	2010		1993
	2024		2003

4.2 The earliest map dates from 1854, and records the site to be undeveloped agricultural land, although by 1906 it had become a golf course.

4.3 The map of 1930 no longer refers to a golf course. A chemical works is recorded approximately 160m to the west, whilst to the northwest there is "Barugh Coke and By-Products Works". A "Coalite Works" is also recorded, approximately 200m to the north.

4.4 By 1966, the chemical and coalite works had essentially been demolished. The Coke Works had also closed, although the extensive railway sidings remained. The site appears to have remained undeveloped, although spoil heaps are recorded immediately to the south and west of the site.

4.5 The map of 1973 refers to these soil heaps as "tip (disused)".

4.6 Zenith Park to the south and east of the site had been constructed by 2003, with the present structure first appearing on the map of 2024.

4.7 Due to time and cost constraints, it has not been possible to consult with local history journals and newspapers. This can be carried out if requested at additional cost, but is unlikely to provide any significant additional information.

5 GEOLOGY AND MINING

5.1 Geology

5.1.1 Maps of the British Geological Survey (BGS), show the site to be underlain by Undifferentiated mudstones, siltstones and sandstones of the Carboniferous Middle Coal Measures. An unnamed sandstone may underlie the northeasternmost part of the site. The dip of the strata in the area is to the east.

5.1.2 There are no drift deposits shown on the geological maps, which also show the site to be free of faulting.

5.2 Mining

Coal Seams

5.2.1 The geological maps record the Dunsil (also known as the Harley) Coal seam outcropping approximately 150m to the west of the site, and to dip below it.

5.2.2 According to the geological memoir "Geology of the Country around Barnsley", published in 1947, the Dunsil Coal was recorded as being 1.67m thick at the nearby former Wharncliffe Woodmoor Colliery. The seam comprises interbedded coal and dirt. The memoir also states that the Dunsil Coal was a house coal, *"though little worked in this area"* in reference to the Barnsley area.

5.2.3 Below the Dunsil, the next seams of economic value were the Upper and Low Haigh Moor Coal seams. However, the shallower Upper Haigh Moor Coal lies approximately

52m below the Dunsil at the former Wharncliffe Woodmoor Colliery (No. 4 and 5). As such, it is too deep to affect surface stability, even if it has been worked.

5.2.4 The Barnsley Coal seam lies above the Dunsil. However, this outcrops to the east of the site, such that it does not underlie the property.

5.2.5 A Coal Authority Consultant's Mining Report has been obtained. It confirms that there are no probable unrecorded shallow workings, or spine roadway at shallow depth.

5.2.6 Deeper recorded mining has taken place in the Flockton Thin at 148m depth, the Top Fenton at 184m depth, the Silkstone at 284m depth, and the Whinmoor at between 335m and 339m depth. The last date of mining was in 1985, and as such subsidence should have already taken place by now under normal circumstances.

Mine Entries

5.2.7 According to the report, there are no recorded mine entries on, or within 100m of the site. It should be noted that the presence of unrecorded mine entries cannot be entirely precluded, but are considered unlikely.

Opencast Mines

5.2.8 The Coal Authority report records an opencast mine immediately to the southeast of the site. The southeastern boundary of the site more or less coincides with the northwestern boundary of the opencast. It should be noted that the boundary of the opencast is usually the top of the former high wall, but may be in approximation

depending upon how well it was surveyed at the time. The Zenith Park development has subsequently been built over the opencast.

5.2.9 It is due to the opencast that this area lies within a "Development High Risk Area" (DHRA). However, most, if not all of the study site lies outside a DHRA.

5.2.10 The full Coal Mining Risk Assessment is reproduced in Appendix 7.

Others

5.2.11 According to the Coal Authority report, none of the following which may affect the site are recorded;

- Outcrops
- Geological faults, fissures and breaklines
- Coal Authority managed tips
- Site Investigations
- Remediated Sites
- Coal mining subsidence
- Mine Gas
- Mine Water Treatment Schemes
- Future underground mining
- Coal mining licensing
- Court Orders
- Section 46 notices
- Withdrawal of support notices
- Payment to owners of former copyhold land

5.3 GroundSure Geo-Insight

5.3.1 A GroundSure Geo-Insight Report has been obtained for the site and is reproduced in Appendix 5. The report is based on the British Geological Survey (BGS) geological maps, GroundSure data and miscellaneous other geological sources.

5.3.2 None of the following are recorded beneath the site.

Geology
Superficial geology Superficial permeability Landslip Landslip permeability

Mining, Ground Workings and Natural Cavities
Natural Cavities BritPits Underground workings Historical Mineral Planning Areas Mining cavities JPB mining areas Brine areas Gypsum areas Tin mining Clay mining

In respect of natural ground subsidence, the BGS reports the following maximum risk ratings.

Natural Ground Subsidence	**Risk**
Shrink-Swell Clay	Very Low
Running Sand	Very Low
Compressible Deposits	Very Low
Collapsible Deposits	Very Low
Landslide	Very Low
Ground Dissolution of Soluble Rocks	Negligible

6 HYDROGEOLOGY AND FLOODING

Hydrogeology

6.1 The Coal Measures occur throughout the heavily industrialised areas of West and South Yorkshire. They comprise a thick sequence of faulted rocks characterised by the repeated sequence of mudstone, siltstone, sandstone, seatearth and coal.

6.2 The Coal Measures, though classed as a minor aquifer, may provide good borehole yields from sandstones and many industrial supplies rely on them. However, groundwater flow is extensively affected by the faulting and fissuring of the rocks, and also by the results of coal mining and associated dewatering activities. Due to the complex, and often poorly understood hydrogeology, it is impossible to subdivide the Coal Measures into aquifers and non-aquifers except on a very detailed level and the whole sequence must therefore be considered in general terms as an aquifer.

6.3 Since April 2010, the Environment Agency's Groundwater Protection Policy has been using aquifer designations consistent with the Water Framework Directive.

6.4 The aquifer within the bedrock is designated as Secondary A. This is 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. These are generally aquifers formerly classified as minor aquifers.

6.5 Details provided by the Environment Agency in the GroundSure Enviro-Insight report, indicate there to be no licensed surface water or groundwater abstraction points within at least 2km of the site.

Flooding

6.6 There are no open watercourses in the immediate vicinity of the site, and according to data supplied by the Environment Agency in the GroundSure Enviro-Insight report, the site is not at risk from fluvial flooding. Further, the site is not at risk from surface water or groundwater flooding.

7 GROUNDSURE ENVIRO-INSIGHT REPORT

7.1 A GroundSure Enviro-Insight Report has also been commissioned for this site. The following features are recorded within 200m of the site and full details are given in Appendix 5.

7.2 Historical Landfill

The site and surrounding area have had various permits for the tipping and waste transfer of inert and excavation waste.

7.3 Records of Licensed Pollutant Release

Naylor Concrete Products Limited has a current licence for the use of bulk cement.

7.4 Radioactive Substance Authorisations

Static Solutions Limited (located 100m to the south) has an authorisation for the disposal of radioactive waste.

7.5 Contemporary Trade Entries

The GroundSure Enviro-Insight Report lists various trade entries in the vicinity of the site. It should be noted that these lists are rarely complete.

7.6 Others

None of the following are recorded within 250m of the centre of the study site.

Waste and Landfill
Active or recent landfill
Historical landfill (BGS records)
Historical landfill (LA/mapping records)

Current Industrial Land Use
Current or recent petrol stations
Electricity cables
Gas pipelines
Sites determined as Contaminated Land
Control of Major Accident Hazards (COMAH)
Regulated explosive sites
Hazardous substance storage/usage
Historical licensed industrial activities (IPC)
Licensed industrial activities (Part A(1))
Licensed Discharges to controlled waters
Pollutant release to surface waters (Red List)
Pollutant release to public sewer
List 1 Dangerous Substances
List 2 Dangerous Substances
Pollution Incidents (EA/NRW)
Pollution inventory substances
Pollution inventory waste transfers
Pollution inventory radioactive waste

Environmental Designations
Site of Special Scientific Interest (SSSI)
Conserved wetland sites (Ramsar sites)
Special Areas of Conservation (SAC)
Special Protection Areas (SPA)
National Nature Reserves (NNR)
Local Nature Reserves (LNR)
Designated Ancient Woodland
Biosphere Reserves
Forest Parks
Marine Conservation Zones
Proposed Ramsar sites
Possible Special Areas of Conservation (pSAC)
Potential Special Protection Areas (pSPA)
Nitrate Sensitive Areas
Nitrate Vulnerable Zones
SSSI Impact Risk Zones
SSSI Units

Visual and Cultural Designations
World Heritage Sites Areas of Outstanding Natural Beauty National Parks Listed Buildings Conservation Areas Scheduled Ancient Monuments Registered Parks and Gardens

Agricultural Designations
Open Access Land Tree Felling Licences Environmental Stewardship Schemes Countryside Stewardship Schemes

Habitat Designations
Habitat Networks Open Mosaic Habitat Limestone Pavement Orders

Railway Infrastructure and Projects
Underground railways (London) Underground railways (Non-London) Railway tunnels Royal Mail tunnels Crossrail 1 Crossrail 2 HS2

7.7 The GroundSure Enviro-Insight Report is based upon known, published information and may not comprise a complete record of all features of relevance. An explanation of the datasets is provided in the report in Appendix 1.

8 CONTAMINATED LAND AND INVASIVE PLANTS

8.1 There is no visibly contaminated material on the surface of the site, nor is there any distressed vegetation beyond the site boundary, suggestive of significant or serious contamination.

8.2 The inspection of the site did not indicate any obvious invasive plants. However, the identification of such is outside the expertise of this consultancy and appropriate advice should be sought, if considered necessary.

9 RADON

9.1 According to the GroundSure Geo-Insight report the site lies partly in an area where between 3% and 5% of properties are above the action level recommended by UK Health Security Agency (UKHSA).

9.2 According to BRE Report BR211 (2023): “Radon Guidance on protective measures for new buildings (including supplementary advice for extensions, conversions and refurbishment projects)”, basic protection measures will be required. Additional details are provided in BRE Report GG 75 “Radon Protection for New Large Buildings”.

9.3 It is understood that the building will be well ventilated, and as such it is recommended that the need for basic radon protection measures is discussed with Building Control.

10 THE INVESTIGATION

10.1 The investigation was designed to provide preliminary information on ground and groundwater conditions on the site, together with identifying potential areas of contamination. The investigation was undertaken in accordance with the principles of BS5930: 2015 + A1: 2020 and BS10175: 2011 + A2: 2017 Investigation of Potentially Contaminated Sites – Code of Practice and under the supervision of a Chartered Engineer from Michael D Joyce Associates LLP.

10.2 The ground investigation was carried out on 30th May 2024 and comprised trial pitting and window sampling. The exploratory positions are shown on figure 1.

10.3 The trial pitting consisted of excavating a number of trial holes using a mechanical excavator. On completion, the excavations were backfilled with the arisings.

10.4 The window sampling consisted of driving a series of 1m and 2m long tubes into the ground using a dropping weight. On completion of each run, the tube was withdrawn. The next tube was then inserted and the process repeated to provide a continuous profile of the ground. On each run the tube diameter was reduced in order to assist in its recovery.

10.5 It was also possible to carry out Standard Penetration Tests using the window sampling equipment, which has the same specification as a conventional cable percussive SPT. On completion, gas monitoring standpipes were installed.

11 IN-SITU AND LABORATORY TESTING

11.1 In-Situ Gas Monitoring

11.1.1 Methane is the dominant constituent of landfill gas, and can form an explosive mixture in air at concentrations of between 5% and 15%. Thus 5% methane in air is known as the Lower Explosive Limit (LEL). Concentrations less than this do not normally ignite. Carbon dioxide can also be a potential problem, especially where it occurs in concentrations greater than 1.5%.

11.1.2 In order to monitor over the longer term, gas monitoring standpipes were installed in the four window sample boreholes. These comprise slotted uPVC pipework surrounded by single sized gravel to between 2.75m and 3.00m depth. The top 1.0m of pipework is not slotted and is surrounded by bentonite pellets to seal the boreholes, and valves were fitted.

11.1.3 The risks associated with the gases have been considered in accordance with British Standard BS 8485:2015 "Code of Practice for the design and protective measures from methane and carbon dioxide ground gases for new buildings" and CIRIA report C665, "Assessing Risks Posed by Hazardous Ground Gases to Buildings" and NHBC Report No. 4 "Guidance on Evaluation of Development Proposals on Sites Where Methane and Carbon Dioxide are Present". Gas monitoring is currently on-going and the results will be reported separately. However, initial monitoring has recorded normal levels of ground gases (methane and carbon dioxide).

11.2 Geotechnical Laboratory Testing

The soil testing was carried out to BS1377:1990 Methods of Test for Soils for Civil Engineering Purposes. Testing was carried out by i2 Analytical Limited to UKAS accredited procedures. The full results are presented in Appendix 3.

11.2.1 Plasticity Test

An Atterberg Limits Classification test was carried out on a samples of the natural clay.

Borehole No.	Depth (m)	Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
WS2	1.70 - 1.80	25	55	24	31

The clays are of high plasticity. They can be expected to exhibit moderate swelling and shrinkage (volume change) properties, but are not potentially frost susceptible.

11.2.2 Sulphate and Acidity Tests

Chemical tests were carried out on representative samples of the Made Ground in order to determine its water soluble content and acidity.

Borehole No.	Depth (m)	Water Soluble Sulphate Content (g/l)	pH
Made Ground	0.10 - 0.35	0.07 - 0.96	7.4 - 9.5

Contamination testing recorded negligible to low water soluble sulphate contents and near neutral to alkaline pH values.

11.3 Contamination Testing

Rationale

11.3.1 The investigation and sampling was under the full time direction of a Chartered Engineer. All the recovered soil samples were screened on site for any visual or olfactory evidence of contamination including the presence of VOCs. Samples were selected from the trial pits and window sample boreholes on the basis of those which were most likely to be contaminated and those which gave the most appropriate indication of the spread of any contaminants. The samples were stored in both glass and plastic containers and kept in cooled conditions. Testing was carried out by i2 Analytical Limited to UKAS accredited procedures in accordance with MCERTS performance standards.

11.3.2 The aim of this was to make a preliminarily assessment of the level of any contamination on the site in order to determine if there was any significant risk associated with contaminants in respect of both human health and the environment, including controlled waters.

11.3.3 Standard Appendix B attached to this report discusses the methodology for the assessment of contamination and should be read in conjunction with the comments overleaf.

11.3.4 The Land Contamination Risk Management (LCRM) series of documents have been produced by the Environment Agency. It is to provide guidance to identify and assess if there is an unacceptable risk, assess suitable remediation options, and carry out and verify the remediation.

11.3.5 DEFRA previously issued "Outcome of the Way Forward Exercise on Soil Guideline Values". This document was intended to provide guidance to determine if there is a Significant Possibility of Significant Harm (SPOSH) i.e. whether land meets the legal trigger of being contaminated land.

11.3.6 In the context of Part 2A, a risk assessor using an SGV would conclude the following (DEFRA, 2008).

- At a representative average soil concentration at or below an SGV, it is very unlikely that there will be a *significant possibility of significant harm (SPOSH)*.
- At a representative average soil concentration above an SGV, there *might* be a *significant possibility of significant harm* with the significance linked to the margin of exceedance, the duration and frequency of exposure, and other site-specific factors that the enforcing authority may wish to take into account. Further investigation and/or detailed evaluation will usually be required.

11.3.7 It should be stressed that where there is any uncertainty as to whether or not there is a SPOSH, it was the policy of this practice to adopt a conservative approach,

particularly in the adoption of clean cover systems.

11.3.8 In April 2012, Defra published new Statutory Guidance which forms a major part of their contaminated land regimes under Part 2A of the Environment Protection Act 1990. The regime provides a means of dealing with contaminated land which poses a significant risk to human health or the environment where there is no alternative solution. It also works alongside planning rules and building regulations to help ensure that affected land is made suitable for use when it is redeveloped.

11.3.9 Since the regime was first introduced in 2000 there has been considerable uncertainty over how to decide when land is, and is not, contaminated land on grounds of the legal test of *significant possibility of significant harm to human health or the environment*.

11.3.10 To help address this, one of the main changes set out in the new Statutory Guidance, is the introduction of a new four category test to help decide when land is, and is not, contaminated land on grounds of *significant possibility of significant harm to human health*. Under the new four category test:

- Category 1 describes land that is clearly contaminated land, for example because similar land is known to have caused significant harm in the past.

- Categories 2 and 3 cover less straightforward land where more detailed consideration is needed before the regulator can decide either: (a) that there is a strong case for regulatory action, in which case the land would be in Category 2 and be classified as contaminated land under Part 2A; or (b) that such a case does not exist, in which case the land would be in Category 3 and not be classified as contaminated land under Part 2A.

- Category 4 describes land that is clearly not contaminated land, as discussed below.

11.3.11 One of the main purposes of including the Categories in the Statutory Guidance is to provide a legal framework against which new technical tools can be developed by the land contamination sector to describe the Categories in more detail with regard to specific substances and/or situations.

11.3.12 The new Category 4 test is particularly important in terms of reducing uncertainty over when land is definitely not caught by the regime.

11.3.13 The new Statutory Guidance makes clear what land should be placed into Category 4, for example:

(a) Land where no relevant contaminant linkage has been established.

(b) Land where there are only normal levels of contaminants in soil (as explained in Section 3 of the guidance), unless there is a particular reason to consider otherwise. In other words land with normal background concentrations in the soil.

(c) Land that has been excluded from the need for further inspection and assessment under Part 2A because contaminant levels do not exceed relevant generic assessment criteria in accordance with Section 3 of the guidance, or relevant technical tools or advice that may be developed in accordance with paragraph 3.30 of the guidance, e.g. Category 4 Screening Levels.

(d) Land where estimated levels of exposure to contaminants in soil are likely to form only a small proportion of what a receptor might be exposed to anyway through other sources of environmental exposure (e.g. in relation to average estimated national levels of exposure to substances commonly found in the

environment, to which receptors are likely to be exposed to in the normal course of their lives).

11.3.14 The guidance clarifies how generic assessment criteria should and should not be used. It states that:

3.27 It is common practice in contaminated land risk assessment to use "generic assessment criteria" (GACs) as screening tools in generic quantitative human health risk assessment to help assessors decide when land can be excluded from the need for further inspection and assessment, or when further work may be warranted.

3.28 Local authorities may use GACs and other technical tools to inform certain decisions under the Part 2A regime, provided: (i) they understand how they were derived and how they can be used appropriately; (ii) they have been produced in an objective, scientifically robust and expert manner by reputable organisations; and (iii) they are only used in a manner that is in accordance with Part 2A and this Guidance.

3.29 GACs relating to human health risk assessment represent cautious estimates of levels of contaminants in soil at which there is considered to be no risk to health or, at most, a minimal risk to health. With regard to such GACs:

(a) They may be used to indicate when land is very unlikely to pose a significant possibility of significant harm to human health. This is on the basis that they are designed to estimate levels of contamination at which risks are likely to be negligible or minimal and far from posing a significant possibility of significant harm to human health.

(b) They should not be used as direct indicators of whether a significant possibility of significant harm to human health may exist. Also, the local authority should not view the degree by which GACs are exceeded (in itself) as being particularly

relevant to this consideration, given that the degree of risk posed by land would normally depend on many factors other than simply the amount of contaminants in soil.

(c) They should not be seen as screening levels which describe the boundary between Categories 3 and 4 in terms of Section 4 (i.e. the two Categories in which land would not be contaminated land on grounds of risks to human health). In the very large majority of cases, these SGVs/GACs describe levels of contamination from which risks should be considered to be comfortably within Category 4.

(d) They should not be viewed as indicators of levels of contamination above which detailed risk assessment would automatically be required under Part 2A.

(e) They should not be used as generic remediation targets under the Part 2A regime. Nor should they be used in this way under the planning system, for example in relation to ensuring that land affected by contamination does not meet the Part 2A definition of contaminated land after it has been developed.

11.3.15 The way in which the new four category system is intended to operate and the place of the C4SLs within that system, was explained in detail in the Impact Assessment which accompanied the Statutory Guidance. Please note that although the detail of the Impact Assessment is included here to provide clarity on the job expected of C4SLs, the Statutory Guidance, itself, sets out the regime that needs to be delivered under Part 2A.

11.3.16 The C4SLs are intended as "*relevant technical tools*" provides to help local authorities and others when deciding to stop further assessment of a site, on the grounds that it falls within Category 4 (Human Health).

11.3.17 The Impact Assessment (IA), which accompanied the revised SG (Defra, 2012b) provides further information on the nature and potential role of the C4SLs. Paragraph 47(h) of the IA states that:

> *"The new statutory guidance with bring about a situation where the current SGVs/GACs are replaced with more pragmatic (but still strongly precautionary) Category 4 screening levels (C4SLs) which will provide a higher simple test for deciding that land is suitable for use and definitely not contaminated land".*

11.3.18 C4SLs, therefore, should not be viewed as "SPOSH levels" and they should not be used as a legal trigger for the determination of land under Part 2A.

11.3.19 In 2014 CL:AIRE (Contaminated Land: Application in Real Environments) published "*Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination*". In it a series of C4SLs were proposed as follows. Where C4SLs are not available, the LQM/CIEH "Generic Assessment Criteria for Human Health Risk" have been used.

Analyte	Residential (with home grown produce) (mg/kg)	Residential (without home grown produce) (mg/kg)	Allotments (mg/kg)	Commercial (mg/kg)	POS (mg/kg)
Arsenic	37	40	49	640	79
Benzene	0.87	3.3	0.18	98	140
Benzo(a)Pyrene	5.0	5.3	5.7	77	10
Cadmium	22	150	3.9	410	220
Chromium (vi)	21	21	170	49	21
Lead	200	310	80	2300	630

Results

11.3.20 The following range of results was obtained and the full results are presented in Appendix 4.

Table 1: Chemical testing thresholds and results for soils (for residential use)

	Contaminant	Threshold (mg/kg)			Range of Results
Metals	Arsenic	37			21 - 65
	Cadmium	11			<0.2 - 1.0
	Chromium (total)	910			--
	Chromium VI	6			<1.8
	Copper	2,400			29 - 40
	Lead	200			28 - 48
	Mercury	1.2			<0.3
	Nickel	130			20 - 31
	Selenium	250			<1.0 - 3.3
	Zinc	3,700			87 - 130
	Soil Organic Matter (SOM)	1%	2.5%	6%	
PAH USEPA 16	Naphthalene	2.3	5.6	13	0.20 - 4.70
	Acenaphthylene	170	420	920	<0.05 - 1.50
	Acenaphthene	210	510	1,100	0.15 - 1.10
	Fluorene	170	400	860	0.21 - 2.20
	Phenanthrene	95	220	440	1.50 - 12.0
	Anthracene	2,400	5,400	11,000	0.46 - 3.10
	Fluoranthene	280	560	890	2.60 - 11.0
	Pyrene	620	1,200	2,000	2.30 - 9.20
	Benzo(a) anthracene	7.2	11	13	1.50 - 5.30
	Chrysene	15	22	27	1.50 - 4.90
	Benzo(b) fluoranthene	2.6	3.3	3.7	1.50 - 5.70
	Benzo(k) fluoranthene	77	93	100	0.60 - 2.10
	Benzo(a) pyrene	2.2	2.7	3.0	1.40 - 4.70
	Indeno (123-cd) pyrene	27	36	41	0.63 - 1.70
	Dibenzo(a,h) anthracene	0.24	0.28	0.30	0.18 - 0.56
	Benzo(g,h,i) perylene	320	340	350	0.67 - 1.90
	Asbestos	None			None

(1) *Category 4 Screening Levels (C4SL)*

(2) *Suitable for Use Values (S4UL) derived by LQM/CIEH "S4ULS for Human Health Risk Assessment" 2015. For organics a SOM of 1.0% assumed.*

11.3.21 A total of 6 No. samples of Made Ground were tested.

11.3.22 Virtually all the results fell within the limit for residential end-use. In respect of some results for Arsenic, Naphthalene, Benzo (b) Fluoranthene and Dibenzo (a,h) anthracene, these results fell within the limit for a commercial/industrial end-use.

11.3.23 In addition, no asbestos was detected in any of the six samples tested.

11.3.24 The site can therefore be considered uncontaminated in respect of its continued commercial end-use.

12 GEOENVIRONMENTAL RISK ASSESSMENT

Conceptual Site Model

12.1 A quantitative health and environmental risk assessment has been carried out as part of this assessment. The process of risk assessment is set out in Contaminated Land Report 11 (2014) "Model Procedures for the Management of Land Contamination" and in Part IIA of the Environment Protection Act 1990 and amended in part by The Water Act 2003. This defines contaminated land as *"any land which appears to the local authority in whose area it is situated to be in such a condition by reason of substances in, on or under the land, that there is a significant possibility of significant harm being caused, or that significant pollution of controlled waters is being caused or there is a significant possibility of such pollution being caused".*

12.2 The Act introduces the concept of a pollution linkage. This linkage consists of a pollution (contaminative) source or hazard and a receptor, together with an established pathway between the two. For land to be contaminated, a pollution linkage (hazard-pathway-receptor) must exist. This forms a so-called 'conceptual model' of the site.

12.3 Examples of pathways and effects from land contamination (after PPS 23) are given below, and these are illustrated on figure 3.

12.4 Human Health (Pathways 1-5, Receptors A – C)

Uptake of contaminants by food plants grown in contaminated soil - Uptake will depend on the concentration of a contaminant in soil, its chemical form, soil pH, plant species and prominence in diet.

Ingestion and inhalation - Substances may be ingested directly by young children playing on contaminated soil, or by eating plants which have absorbed metals or are contaminated with soil or dust. Ingestion may also occur via contaminated water supplies. Metals and some organic material substances may be inhaled from dusts and soils. Land gas, radon and volatile organic compounds can be inhaled directly.

Skin contact - Soil containing tars, oils and corrosive substances may cause irritation to the skin through direct contact. Some substances (e.g. phenols) may be absorbed into the body through the skin or through cuts and abrasions.

Irradiation - As well as being inhaled and absorbed through the skin, radioactive materials emitting gamma rays can cause a radiation response.

Fire and explosion - Materials such as coal, coke particles, oil, tar, pitch, rubber, plastic and domestic waste are all combustible. Both underground fires and biodegradation of organic materials may produce toxic or flammable gases. Methane and other gases may explode if allowed to accumulate in confined spaces.

12.5 Buildings (Pathways 7 and 8)

Fire and explosion - Underground fires may cause ground subsidence and cause structural damage. Accumulations of flammable gases in confined space leads to a risk of explosion. Underground fires may damage services.

Chemical attack on building materials and services - Sulphates may attack concrete structures. Acids, oils and tarry substances may accelerate corrosion of metals or attack plastics, rubber and other polymeric materials used in pipework and service conduits or as jointing seals and protective coatings to concrete and metals.

Physical - Blast-furnace and steel-making slag (and some natural materials) may expand. Degradation of fills may cause settlement and voids in buried tanks and drums may collapse as corrosion occurs or under loading.

12.6 Natural Environment (Pathway 6, Receptors D - E)

Phytotoxicity (prevention/inhibition of plant growth) - Some metals essential for plant growth at low levels are phytotoxic at higher concentrations. Methane and other gases may give rise to phytotoxic effects.

Contamination of water resources - Soil has a limited capacity to absorb, degrade or attenuate the effects of pollutants. When this is exceeded, polluting substances may enter into surface and groundwaters.

Ecotoxological effects - Contaminants in soil may affect microbial, animal and plant populations. Ecosystems or individual species on the site, in surface waters or areas affected by migration from the site may be affected.

12.7 For any contaminant source identified, judgement is used regarding the probability of a pollution linkage occurring and the potential consequences of that linkage. Based on the probability and likely consequences, the overall risk (significance) can be established. The definitions that have been used for this purpose are given in Standard Appendix B. The probability of a hazard, combined with its consequences, can be used to assess risk. This forms the so-called Conceptual Site Model.

Sources

12.8 The site has had no previously recorded commercial or industrial use recorded on the historical maps prior to the creation of the industrial estate. As such no specific potential contaminants have been identified. However within Made Ground there is always the possibility of imported contaminants, as well as localised spillages of fuels, oils, lubricants etc, and materials associated with previous materials stored on the site.

Risk Assessment based on Conceptual Site Model

Summary of Hazards, Pathways and Receptors

Source	Potential Pollutant	Pathways	Receptor	Risk
Potential contaminated Made Ground. **Possible past minor spillages and metals.**	No specific contaminative sources identified. Oils, fuels, grease, hydraulic fluid, metals, asbestos.	1 - 5	A. Present Occupants.	**Low Risk.**
			B. Groundworkers.	**Low Risk** involved with excavation work, providing personnel adopt suitable precautions, together with washing facilities.
			C. Future Occupants.	**Low Risk** where site will be developed for commercial purposes.
		6	D. Controlled Waters.	**Low Risk.**
			E. Ecosystems.	**Low Risk.**
		7	F. Building Materials and Services.	**Low Risk.** Install pipes in clean bedding materials. Adequate precautions to be taken in respect of buried concrete.
Organic Material.	Landfill Gases, Radon, VOCs, SVOCs.	8	A - F	**Low to Moderate Risk.** Low values of ground gases present during the investigation. However, basic radon gas protection measures may be required.
Waste materials.				Any waste materials to be removed from site.

Pathways and Receptors

12.9 The principal receptors are groundworkers, future users and controlled waters (Receptors B, C and D). However, based on the past history of the site and the laboratory testing to date, the probability of soil contamination being present sufficient to affect the identified receptors is considered to be a low risk.

12.10 At this stage it is not considered that there is likely to be any significant risk and further intrusive investigation in respect of soil contamination is not considered to be necessary.

12.11 The site lies in an area where basic radon protection measures are required. Given the proposed nature of the development, it is recommended that this is discussed with Building Control of Barnsley Metropolitan Council.

12.12 With any site, the possibility of contaminants being present, sufficient to cause significant harm cannot be entirely precluded without extensive intrusive investigation, sampling and testing since it is not always possible to determine if contaminants have been tipped on the site, or have seeped into the ground, or have migrated below the ground onto the site from adjacent pieces of land. However, based on the investigation carried out to date, this is considered unlikely.

12.13 It is recommended that if during construction any suspicious or unusual odours, colours, liquids or soils are uncovered, these should be brought to the attention of Michael D Joyce Associates LLP and appropriate advice sought.

13 RECOMMENDATIONS

13.1 Foundation Criteria

13.1.1 It is proposed to extend the current ground bearing slab, primarily along the northeastern, southeastern and southwestern elevations, as shown on the exploratory trial pit and borehole plan in figure 2.

13.1.2 The slab is underlain by Made Ground varying in thickness from 0.30m at the northwestern corner of the present building, increasing to 2.10m at the southwestern corner.

13.1.3 At the exploratory locations, the Made Ground comprised well compacted primarily granular material, which according to employees at Naylors, was compacted by them in layers in order to raise groundlevels evenly.

13.1.4 Although trial pits TP1 to TP4 did not extend to the site boundary, the investigation did not find any evidence of a former opencast at these locations.

13.1.5 The most cost effective solution would be to assume that the Made Ground has been well compacted, as anecdotally reported. In this case, it would be unnecessary to re-excavate the Made Ground. However, it cannot be guaranteed that less compacted areas exist, in which case, some settlement may occur. It is therefore recommended that the Structural Engineer is consulted with regard to settlement tolerances for the slab and portal frame structure.

13.1.6 If this approach is to be adopted, all excavations must be inspected and proof rolled to ensure that the slab is not sited upon any weak Made Ground, softer clays or other such weak materials that would be incapable of safely sustaining the applied loads. This will be particularly important wherever any appreciable amounts of Made Ground occur. Wherever any suspect ground is encountered at proposed formation level, then the excavation must be deepened until a satisfactory bearing medium is obtained, and proof-rolled accordingly.

13.2 Landfill and Radon Gas

13.2.1 As discussed previously, the need for radon protection measures should be determined in consultation with Barnsley Metropolitan Borough Council's Building Control Department.

13.3 Existing Drains and Services

13.3.1 Drains and possible buried service channels may lie around the site. It will be necessary therefore to ensure that the slab for the new buildings is not sited directly over any of them, as they could eventually collapse and cause loss of strength to the foundation stratum.

13.3.2 Wherever any redundant drains and other services channels are likely to underlie the structure, they must be dug out and replaced by lean mix concrete, or compacted hardcore. Alternatively, long drainage runs can be grouted up, particularly where their alignments are uncertain but care is needed to ensure that no grout enters any live services.

13.4 Road Construction

13.4.1 No new road construction is envisaged.

13.5 Sustainable Surface Water Drainage

13.5.1 The site is underlain by clays and mudstone and will be unsuitable for soakaways. Consideration will have to be given to discharging all surface water to the existing piped system.

13.6 Excavations and Groundwater

13.6.1 Soft ground plant should prove suitable for most of the excavations.

13.6.2 For all deep excavations in excess of 1.2m where vertical sides are necessary, trench supports should be provided as the soils will not be self-supporting for any appreciable length of time. It would also be prudent to monitor excavations for the presence of explosive or asphyxiating gases.

13.7 Contamination

13.7.1 Laboratory testing to date has recorded no contamination in respect of the commercial end-use. As such, no special precautions are necessary.

13.8 Cement and Buried Concrete

13.8.1 The Made Ground has generally been found to contain low levels of water soluble sulphates.

13.8.2 In accordance therefore with the Building Research Establishment Special Digest 1 "Concrete in Aggressive Ground", a normal Portland cement in accordance with Group DS-1 Specification can be used for buried concrete, mortar and pre-cast concrete pipes.

13.9 Services

13.9.1 Flexible service connections will be necessary on this site, especially in the areas of deeper fill. In addition, adequate gradients should be provided for all drains and sewers so as not to create backfalls should any future ground movements take place in the deeper backfill. Compacting the bases of all such trenches will reduce settlement.

13.9.2 Wherever drains and mains services pass from natural to Made Ground strata, adequate flexibility should be provided so that breakages do not occur due to adverse settlements between materials of differing compressibility.

13.10 Further Monitoring and Inspection

13.10.1 Should any geotechnical or geoenvironmental problems arise on site or if ground conditions are different from those that we predicted, they should be referred back to Michael D Joyce Associates LLP.

A D Joyce

BSc MSc ARSM CEng CGeol CEnv MICE FGS SiLC SQP

June 2024

Procedure Notes

The desk study and/or ground investigation have been carried out using reasonable skill and care, primarily in accordance with the principles of BS5930: 2015 + A1: 2020: Code of Practice for Site Investigations and BS10175: 2011 + A1: 2017: Code of Practice for the Investigation of Potentially Contaminated Sites, and the terms of the client's brief. The report has been prepared for the specific purposes notified at the time of the initial enquiry.

By its very nature any ground investigation only encounters and samples a small percentage of the ground. Consequently changes in ground conditions, soil properties and contamination can occur between any two exploratory points, for example local features such as soft ground, pockets of contamination and faults. This is also true of the exploration of mineworkings and such features can extend beneath parts of the site not investigated. Unrecorded bell pits and shafts can also exist between exploratory points. The ground investigation is designed to minimize such risks with budgetary constraints.

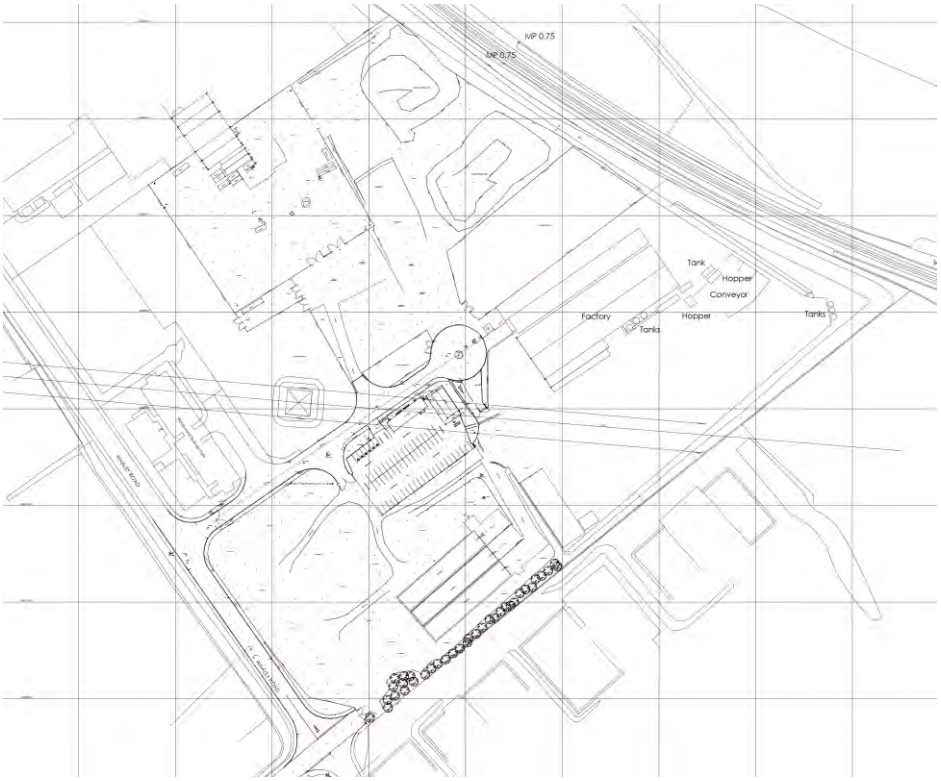
Conclusions and recommendations are based on the information presented in this report, but unforeseen features may exist. No liability can be accepted for ground conditions not revealed by the exploratory holes or for contamination not sampled or tested for. Therefore, actual ground conditions should be noted during construction and further advice sought if they differ from those predicted. Michael D. Joyce Associates LLP reserves the right to amend the conclusions and recommendations in the light of further information. Actual methods of construction or alternative designs should be notified to Michael D. Joyce Associates LLP, such that the recommendations made can be reconsidered in the light of any changes.

Further investigation can be carried out to reduce uncertainty further and risk but ultimately these risks cannot be eliminated. Similarly a desk study normally only considers readily available information and further information could be held by other sources. In commissioning further research or investigation the cost/benefit of doing so must be considered.

It is assumed that groundlevels will not change significantly from those at present. The groundwater conditions are based on observations made at the time of the investigation, unless stated otherwise. It should be noted that the observations are subject to the method of the boring or excavation, and that groundwater levels will vary due to seasonal or other effects.

Where buildings are present on a site, structural and asbestos surveys of the buildings have not been carried out, unless specifically stated. An Unexploded Ordnance (UXO) Survey has not been carried out unless specifically stated. Furthermore, the positive identification of intrusive plants is beyond the expertise of this practice. In relevant situations it would be prudent to commission surveys in respect of UXO and invasive plants.

Where information has been obtained from Third Parties, no liability can be accepted for the accuracy or completeness of this information. Where anecdotal evidence or speculations are presented, they must be treated as such and cannot be relied upon.

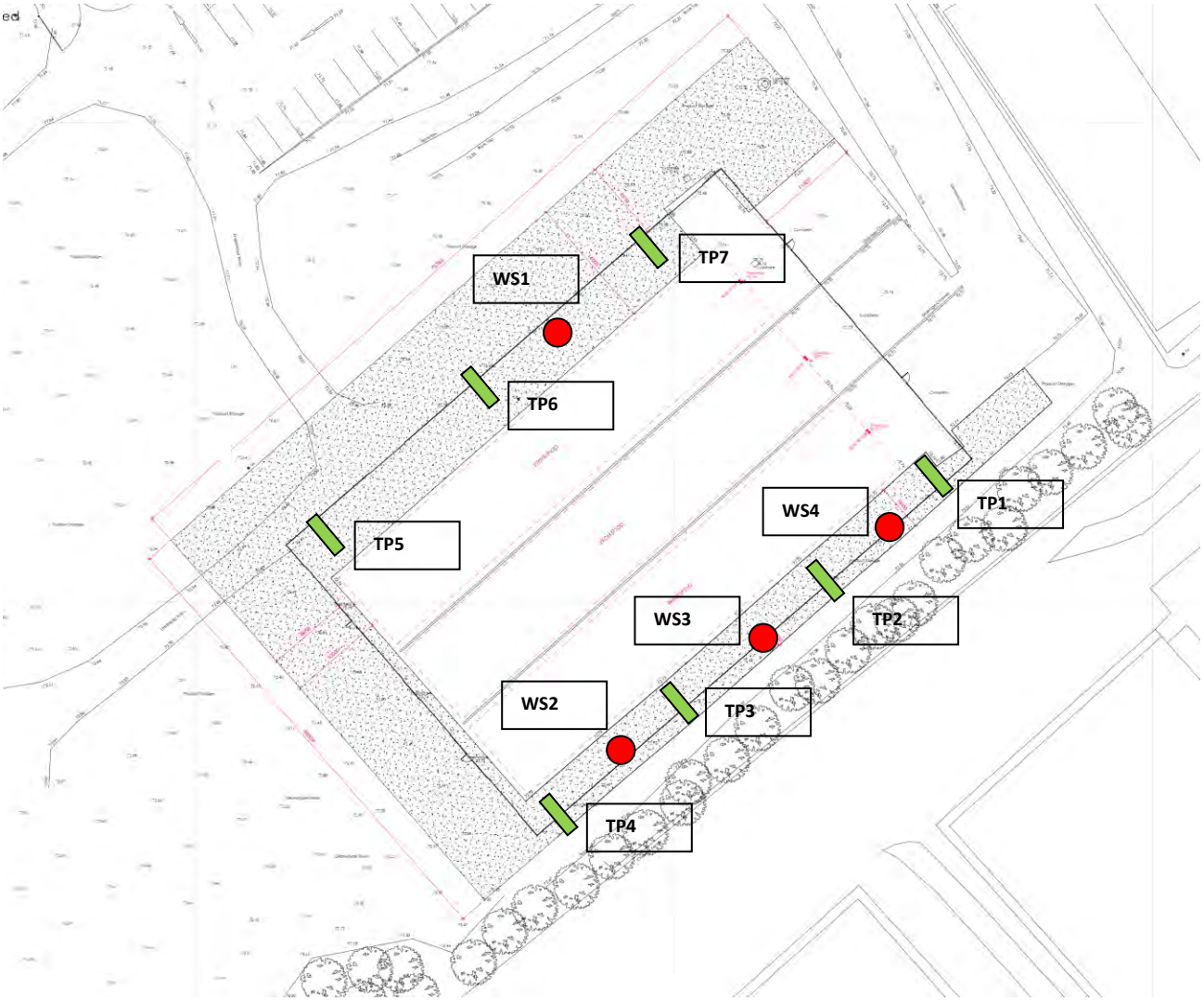


Whaley Road, Barugh Green, Barnsley
Site Location and Development Proposals

Michael D Joyce Associates LLP
Geotechnical and Geoenvironmental Consultants

Scale: NTS

Figure: 1



Whaley Road, Barnsley

Development Proposals (extended slab shaded) with Trial Pit and Borehole Locations

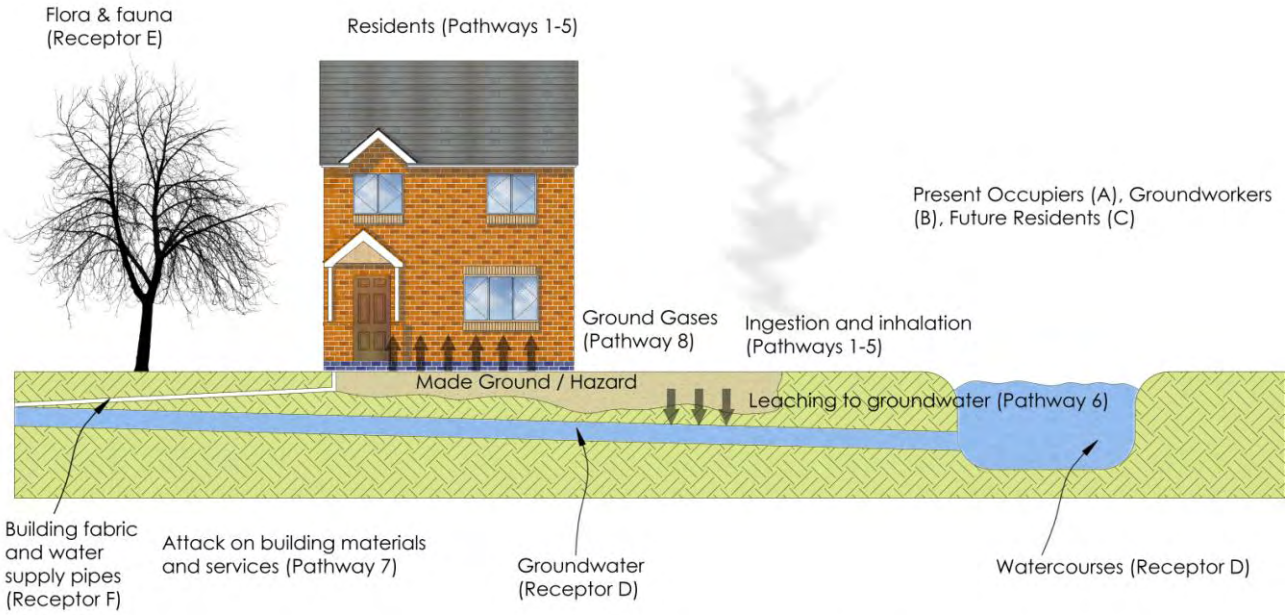
Michael D Joyce Associates LLP

Geotechnical and Geoenvironmental Consultants

Scale: NTS

Figure: 2

Industrial Units and Offices (Pathways 1 – 5)



Pathways

1. Ingestion of contaminated soil/dust
2. Ingestion of contaminated food
3. Ingestion of contaminated water
4. Inhalation of contaminated vapours
5. Dermal contact with contaminated soil/dust or water
6. Pollution of controlled water and off site migration
7. Attack on building materials and services
8. Migration of landfill gases and radon

Receptors

A. Present site occupiers
B. Site development personnel
C. Future residents
D. Controlled waters
E. Flora and fauna
F. Building and services

Schematic Representation of Conceptual Site Model

Schematic Representation of Conceptual Site Model

Michael D Joyce Associates LLP

Geotechnical and Geoenvironmental Consultants

Figure: 3

APPENDIX 1

Window Sampling Records

Site: WHALEY ROAD (4387)
Location: BARNSLEY
Method: JCB 3CX
Date: 30th May 2024
Client: Naylor Concrete

Window Sampling No: 1

Michael D Joyce Associates LLP

Depth (m)	Samples	Water Depth (m)	Field Records	Reduced Level (m)	Depth (m)	Description	Legend
				0	0	Ground Surface	
						MADE GROUND: Limestone hardcore over woven geotextile membrane.	
				-0.3			
0.35	D					MADE GROUND: Brown sandy gravelly clay containing stone hardcore and brick.	
1.00 - 1.45	SPT(C)		3,3,3,3,3,4 N=13		1		
				-1.2		Firm brown and grey mottled silty CLAY.	
				-1.9			
2.00 - 2.45	SPT(C)		4,5,6,7,10,10 N=33		2	Very weak grey and brown silty MUDSTONE, highly weathered.	
2.75	SPT(C)		N>50	-2.75			
				-2.8		Intact poor quality COAL.	
						End of Borehole	
					3		
					4		
					5		

General:
Groundwater: Dry on completion.
Remarks: Gas monitoring standpipe inst. to 2.75m

Site: WHALEY ROAD (4387)
Location: BARNSLEY
Method: JCB 3CX
Date: 30th May 2024
Client: Naylor Concrete

Window Sampling No: 2

Michael D Joyce Associates LLP

Depth (m)	Samples	Water Depth (m)	Field Records	Reduced Level (m)	Depth (m)	Description	Legend
				0	0	Ground Surface	
0.10	D					MADE GROUND: Brown sandy gravelly clay containing stone and brick, together with occasional pieces of plastic, limestone sub-base material, and chalky material.	
1.00 - 1.45	SPT(C)		7,6,5,3,4,4 N=16		1		
				-1.6			
						Firm becoming stiff brown and grey mottled silty CLAY.	
2.00 - 2.45	SPT(C)		2,4,3,3,5,6 N=17		2		
				-2.8			
				-3		Very weak grey and brown silty MUDSTONE, highly weathered.	
3.00 - 3.45	SPT(C)		3,7,10,12,15,13 N=50		3	End of Borehole	
					4		
					5		

General:
Groundwater: Dry on completion.
Remarks: Gas monitoring standpipe inst. to 3.0m.

Site: WHALEY ROAD (4387)
Location: BARNSLEY
Method: JCB 3CX
Date: 30th May 2024
Client: Naylor Concrete

Window Sampling No: 3

Michael D Joyce Associates LLP

Depth (m)	Samples	Water Depth (m)	Field Records	Reduced Level (m)	Depth (m)	Description	Legend
				0	0	Ground Surface	
0.10	D					MADE GROUND: Brown sandy gravelly clay containing stone, brick and broken pieces of concrete, together with limestone sub-base material.	
1.00 - 1.45	SPT(C)		2,4,7,16,12,11 N=46		1		
1.70 - 1.80	B			-1.7		Firm becoming stiff brown and grey mottled silty CLAY.	
2.00 - 2.45	SPT(C)		2,3,3,4,5,5 N=17		2	Carbonaceous band between 2.50m and 2.60m.	
3.00 - 3.45	SPT(C)		2,2,2,4,6,7 N=19	-3	3	End of Borehole	
					4		
					5		

General:
Groundwater: Dry on completion.
Remarks: Gas monitoring standpipe inst. to 3m.

Site: WHALEY ROAD (4387)
Location: BARNSLEY
Method: JCB 3CX
Date: 30th May 2024
Client: Naylor Concrete

Window Sampling No: 4

Michael D Joyce Associates LLP

Depth (m)	Samples	Water Depth (m)	Field Records	Reduced Level (m)	Depth (m)	Description	Legend
				0	0	Ground Surface	
0.05	D					MADE GROUND: Brown sandy gravelly clay containing stone and brick and pieces of reinforced concrete.	
1.00 - 1.45	SPT(C)		3,2,2,3,3,4 N=12		1		
				-2	2	Firm to stiff brown and grey mottled silty CLAY.	
2.00 - 2.45	SPT(C)		3,2,3,3,3,4 N=13				
				-3	3	End of Borehole	
3.00 - 3.45	SPT(C)		2,2,5,4,3,4 N=16		4		
					5		

General:
Groundwater: Dry on completion.
Remarks: Gas monitoring standpipe inst. to 3m.

APPENDIX 2

In-Situ Test Results

Site: WHALEY ROAD (4387)

Location: BARNSLEY

Excavated by: 360 Excavator

Date: 30th May 2024

Client: Naylor Concrete

Trial Pit No: 1

Michael D Joyce Associates LLP

Depth (m)	Samples	Water Depth (m)	Field Records	Depth (m)	Depth (m)	Description	Legend
				0	0	Ground Surface	
0.10	D					MADE GROUND: Brown sandy gravelly clay containing stone, brick and broken pieces of reinforced concrete (up to cobble size), together with occasional pieces of plastic ducting and sheeting and limestone sub-base material.	
					1		
					2		
				-2.1			
				-2.2		Firm brown silty CLAY/Very weak brown shaly mudstone.	
						End of Trial Pit	
					3		
					4		

Stability: Sides stable.

General:

Groundwater: Dry on completion.

Site: WHALEY ROAD (4387)

Location: BARNSLEY

Excavated by: 360 Excavator

Date: 30th May 2024

Client: Naylor Concrete

Trial Pit No: 2

Michael D Joyce Associates LLP

Depth (m)	Samples	Water Depth (m)	Field Records	Depth (m)	Description	Legend
				0	Ground Surface	
				0	MADE GROUND: Brown sandy gravelly clay containing stone, brick and some broken pieces of reinforced concrete (up to cobble size), together with occasional pieces of plastic sheeting and limestone sub-base material.	
				-1.8	Firm brown and grey mottled silty CLAY.	
				-2.1	End of Trial Pit	

Stability: Sides stable.

General:

Groundwater: Slight seepage from Made Ground.

Site: WHALEY ROAD (4387)

Location: BARNSLEY

Excavated by: 360 Excavator

Date: 30th May 2024

Client: Naylor Concrete

Trial Pit No: 3

Michael D Joyce Associates LLP

Depth (m)	Samples	Water Depth (m)	Field Records	Depth (m)	Depth (m)	Description	Legend
				0	0	Ground Surface	
						MADE GROUND: Brown sandy gravelly clay and clayey sand containing stone, brick and rare broken pieces of reinforced concrete (up to cobble size), together with pieces of plastic sheeting and limestone sub-base material.	
				-1.3	1		
						Firm brown and grey mottled silty CLAY.	
				-1.8			
						End of Trial Pit	
					2		
					3		
					4		

Stability: Sides stable.

General:

Groundwater: Slight seepage from Made Ground.

Site: WHALEY ROAD (4387)

Location: BARNSLEY

Excavated by: 360 Excavator

Date: 30th May 2024

Client: Naylor Concrete

Trial Pit No: 4

Michael D Joyce Associates LLP

Depth (m)	Samples	Water Depth (m)	Field Records	Depth (m)	Depth (m)	Description	Legend
				0	0	Ground Surface	
						MADE GROUND: Brown sandy gravelly clay containing stone and brick, together with occasional pieces of plastic sheeting and pockets of limestone sub-base material.	
				-0.9	1	Firm brown and grey mottled silty CLAY with bands of highly weathered shaly mudstone.	
				-1.8	2	End of Trial Pit	
					3		
					4		

Stability: Sides stable.

General:

Groundwater: Dry on completion.

Site: WHALEY ROAD (4387)

Location: BARNSLEY

Excavated by: 360 Excavator

Date: 30th May 2024

Client: Naylor Concrete

Trial Pit No: 5

Michael D Joyce Associates LLP

Depth (m)	Samples	Water Depth (m)	Field Records	Depth (m)	Depth (m)	Description	Legend
				0	0	Ground Surface	
				-0.3		MADE GROUND: Limestone hardcore over woven geotextile membrane.	
				-1.1	1	Firm brown and grey mottled silty CLAY.	
				-1.35		Intact poor quality COAL.	
				-1.6		Firm brown and grey mottled silty CLAY.	
						End of Trial Pit	
					2		
					3		
					4		

Stability: Sides stable.

General:

Groundwater: Dry on completion.

Site: WHALEY ROAD (4387)

Location: BARNSLEY

Excavated by: 360 Excavator

Date: 30th May 2024

Client: Naylor Concrete

Trial Pit No: 6

Michael D Joyce Associates LLP

Depth (m)	Samples	Water Depth (m)	Field Records	Depth (m)	Depth (m)	Description	Legend
				0	0	Ground Surface	
0.15	D			-0.3		MADE GROUND: Limestone hardcore over woven geotextile membrane.	
				-0.75		MADE GROUND: Brown sandy gravelly clay containing stone and brick, together with thin layers of limestone sub-base material.	
				-0.95		MADE GROUND: Reddish-brown clayey sand with many brick fragments.	
				-1.4	1	Firm brown and grey mottled silty CLAY.	
						End of Trial Pit	
					2		
					3		
					4		

Stability: Sides stable.

General:

Groundwater: Slight seepage from Made Ground.

Site: WHALEY ROAD (4387)

Location: BARNSLEY

Excavated by: 360 Excavator

Date: 30th May 2024

Client: Naylor Concrete

Trial Pit No: 7

Michael D Joyce Associates LLP

Depth (m)	Samples	Water Depth (m)	Field Records	Depth (m)	Depth (m)	Description	Legend
				0	0	Ground Surface	
						MADE GROUND: Limestone hardcore over woven geotextile membrane.	
				-0.3			
						MADE GROUND: Brown sandy gravelly clay containing stone and brick and broken pieces of concrete, together with occasional pieces of plastic and limestone sub-base material.	
					1		
						Contractor reports natural ground at 1.50m.	
				-1.5			
						End of Trial Pit	
					2		
					3		
					4		

Stability: Sides stable.

General: Plastic duct at 0.70m.

Groundwater: Slight seepage from Made Ground.

APPENDIX 3

Geotechnical Laboratory Test Results

TEST CERTIFICATE

DETERMINATION OF LIQUID AND PLASTIC LIMITS

Tested in Accordance with: BS EN ISO 17892-12:2018+A2:2022, cl 5.3 and 5.5, Fall Cone Method, 4 Pt Test, BS 1377-2:2022, cl 5.2 and 6

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

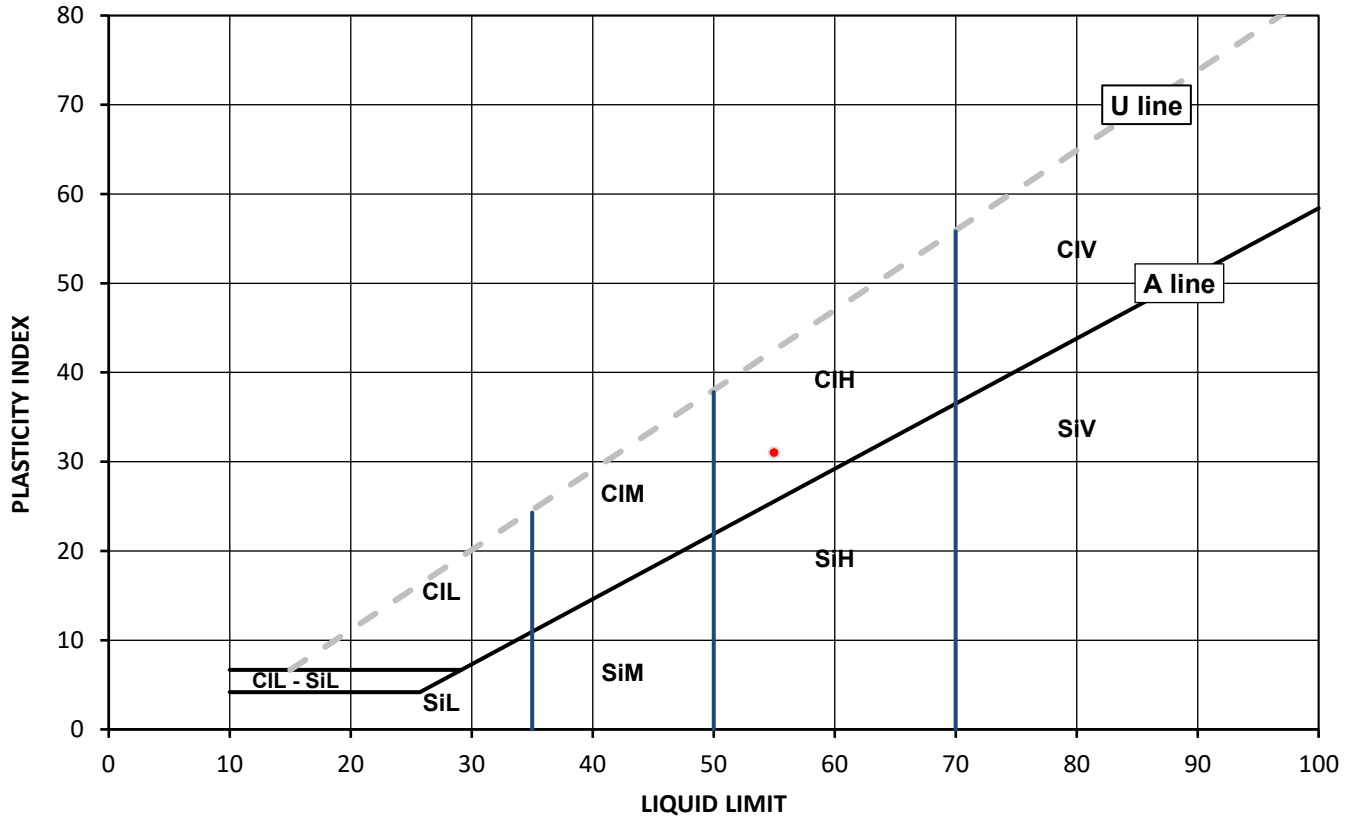
Client:	MIchael D Joyce Associates LLP	Client Reference:	Not Given
Client Address:	Not Given	Job Number:	24-022897-2
		Date Sampled:	30/05/2024
		Date Received:	31/05/2024
Contact:	Anthony Joyce	Date Tested:	07/06/2024
Site Address:	Naylors Concrete, Whaley Road, Barnsley	Sampled By:	Not Given

Testing carried out at i2 Analytical Limited, ul. Pionierow, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	216028	Depth Top [m]:	1.70
Hole No.:	WS2	Depth Base [m]:	1.80
Sample Reference:	Not Given	Sample Type:	D
Sample Description:	Brown mottled grey slightly gravelly slightly sandy CLAY		
Sample Preparation:	Tested after >0.425mm removed by hand; The water content in the sample was increased		
Cone Type:	80g/30deg		

As Received Water Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	Liquidity Index [IL] % #	Consistency Index [IC] % #	% Passing 425µm BS Test Sieve
24.7	55	24	31	0.03	0.97	91



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Water Content by BS EN 17892-1: 2014; # Non accredited

Remarks: Replaces Analytical Report Number 24-022897, issue no 1; Site Address amended

Signed: Katarzyna Banys

Katarzyna Banys
Reporting Specialist
for and on behalf of i2 Analytical Ltd

Date Reported: 25/06/2024

GF 337.13

APPENDIX 4

Contamination Laboratory Test Results

MIchael D Joyce Associates LLP

e: mdja@geoenvironmental.co.uk

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 24-022610

Project / Site name:	Naylors Concrete, Whaley Road, Barnsley	**Samples received on:**	31/05/2024
Your job number:		**Samples instructed on/ Analysis started on:**	31/05/2024
Your order number:		**Analysis completed by:**	06/06/2024
Report Issue Number:	1	**Report issued on:**	06/06/2024
Samples Analysed:	6 soil samples		

Signed: JSzwagrak

Joanna Szwagrzak
Reporting Specialist
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 24-022610

Project / Site name: Naylors Concrete, Whaley Road, Barnsley

Lab Sample Number				214951	214952	214953	214954	214955
Sample Reference				TP1	TP6	WS1	WS2	WS3
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.10	0.15	0.35	0.10	0.10
Date Sampled				30/05/2024	30/05/2024	30/05/2024	30/05/2024	30/05/2024
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	7.9	10	15	14	15
Total mass of sample received	kg	0.1	NONE	0.9	0.8	0.9	0.9	0.8
Asbestos								
Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	MJN	MJN	MJN	MJN	MJN
General Inorganics								
pH (L099)	pH Units	N/A	MCERTS	9.5	9.5	7.6	8.5	7.4
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	140	680	1100	220	1900
Water Soluble SO_4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	71.8	339	535	108	959
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	4.7	0.56	0.2	0.45	0.65
Acenaphthylene	mg/kg	0.05	MCERTS	1.5	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	1.1	0.91	0.15	0.25	0.28
Fluorene	mg/kg	0.05	MCERTS	2.2	0.94	0.21	0.43	0.35
Phenanthrene	mg/kg	0.05	MCERTS	12	7.9	1.8	2.7	3.4
Anthracene	mg/kg	0.05	MCERTS	3.1	2.1	0.46	0.98	0.88
Fluoranthene	mg/kg	0.05	MCERTS	11	11	2.6	3.5	6.6
Pyrene	mg/kg	0.05	MCERTS	9.2	9.2	2.3	3.3	5.9
Benzo(a)anthracene	mg/kg	0.05	MCERTS	5.3	5.3	1.5	1.9	3.9
Chrysene	mg/kg	0.05	MCERTS	4.9	4.5	1.5	2	3.7
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	5.4	5.7	1.8	2.3	4
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	2	1.9	0.6	0.7	2.1
Benzo(a)pyrene	mg/kg	0.05	MCERTS	4.7	4.7	1.4	1.9	3.7
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	1.7	1.9	0.63	0.78	1.5
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.56	0.54	0.18	0.2	0.48
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	1.8	1.9	0.63	0.75	1.6
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	70.6	58.5	16	22	38.9

Analytical Report Number: 24-022610

Project / Site name: Naylors Concrete, Whaley Road, Barnsley

Lab Sample Number				214951	214952	214953	214954	214955
Sample Reference				TP1	TP6	WS1	WS2	WS3
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.10	0.15	0.35	0.10	0.10
Date Sampled				30/05/2024	30/05/2024	30/05/2024	30/05/2024	30/05/2024
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	30	23	29	21	65
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	120	31	21	25	22
Copper (aqua regia extractable)	mg/kg	1	MCERTS	33	29	29	37	40
Lead (aqua regia extractable)	mg/kg	1	MCERTS	48	42	28	32	35
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	31	20	24	30	20
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	3.3	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	97	93	87	120	95

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number: 24-022610

Project / Site name: Naylors Concrete, Whaley Road, Barnsley

Lab Sample Number				214956
Sample Reference				WS4
Sample Number				None Supplied
Depth (m)				0.05
Date Sampled				30/05/2024
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Stone Content	%	0.1	NONE	< 0.1
Moisture Content	%	0.01	NONE	13
Total mass of sample received	kg	0.1	NONE	0.9
Asbestos				
Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	MJN
General Inorganics				
pH (L099)	pH Units	N/A	MCERTS	8.8
Total Cyanide	mg/kg	1	MCERTS	< 1.0
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	850
Water Soluble SO_4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	426
Total Phenols				
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0
Speciated PAHs				
Naphthalene	mg/kg	0.05	MCERTS	0.85
Acenaphthylene	mg/kg	0.05	MCERTS	0.31
Acenaphthene	mg/kg	0.05	MCERTS	0.5
Fluorene	mg/kg	0.05	MCERTS	0.64
Phenanthrene	mg/kg	0.05	MCERTS	5.3
Anthracene	mg/kg	0.05	MCERTS	1.2
Fluoranthene	mg/kg	0.05	MCERTS	6.7
Pyrene	mg/kg	0.05	MCERTS	5.8
Benzo(a)anthracene	mg/kg	0.05	MCERTS	3.3
Chrysene	mg/kg	0.05	MCERTS	3.5
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	3.5
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	1.4
Benzo(a)pyrene	mg/kg	0.05	MCERTS	3.1
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	1.4
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.39
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	1.4
Total PAH				
Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	39.2

Analytical Report Number: 24-022610
Project / Site name: Naylors Concrete, Whaley Road, Barnsley

Lab Sample Number				214956
Sample Reference				WS4
Sample Number				None Supplied
Depth (m)				0.05
Date Sampled				30/05/2024
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**	
Heavy Metals / Metalloids				
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	21
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	1
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	55
Copper (aqua regia extractable)	mg/kg	1	MCERTS	33
Lead (aqua regia extractable)	mg/kg	1	MCERTS	32
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	27
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	130

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number : 24-022610
Project / Site name: Naylors Concrete, Whaley Road, Barnsley

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
214951	TP1	None Supplied	0.1	Brown clay and sand with gravel and vegetation
214952	TP6	None Supplied	0.15	Brown clay and sand with gravel and vegetation
214953	WS1	None Supplied	0.35	Brown clay and sand with gravel and vegetation
214954	WS2	None Supplied	0.1	Brown clay and sand with gravel and vegetation
214955	WS3	None Supplied	0.1	Brown clay and sand with gravel
214956	WS4	None Supplied	0.05	Brown clay and sand with gravel and vegetation

Analytical Report Number : 24-022610
Project / Site name: Naylors Concrete, Whaley Road, Barnsley

Water matrix abbreviations:
Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in Soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques	In-house method based on HSG 248, 2021	A001B	D	ISO 17025
Moisture Content	Moisture content, determined gravimetrically (up to 30°C)	In-house method	L019B	W	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight	In-house method based on British Standard Methods and MCERTS requirements.	L019B	D	NONE
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L038B	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Sulphate, water soluble, in soil (16hr extraction)	In-house method	L038B	D	MCERTS
Speciated PAHs and/or Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds (including PAH) in soil by extraction in dichloromethane and hexane followed by GC-MS	In-house method based on USEPA 8270	L064B	D	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry	In-house method	L080	W	MCERTS
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080	W	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080	W	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement	In-house method	L099	D	MCERTS

For method numbers ending in 'UK' or 'A' analysis have been carried out in our laboratory in the United Kingdom (Watford).
For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).
For method numbers ending in 'PL' or 'B' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.
Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

APPENDIX 5

GroundSure Geo-Insight and Enviro-Insight Reports

Groundsure LOCATION INTELLIGENCE

Enviro+Geo Insight

Whaley Road, Barnsley

Order Details

Date: 29/05/2024

Your ref: Whaley Road, Barnsley

Our Ref: GS-UCV-NE9-XV2-9J4

Site Details

Location: 432241 408116

Area: 0.53 ha

Authority: Barnsley Metropolitan Borough Council ↗

Contact us with any questions at:
info@groundsure.com ↗
01273 257 755

Certified B Corporation

Summary of findings

Page	Section	Past land use >	On site	0-50m	50-250m	250-500m	500-2000m
15 >	1.1 >	Historical industrial land uses >	3	4	37	91	-
20 >	1.2 >	Historical tanks >	0	0	0	10	-
21 >	1.3 >	Historical energy features >	0	0	1	7	-
22	1.4	Historical petrol stations	0	0	0	0	-
22 >	1.5 >	Historical garages >	0	0	9	12	-
23	1.6	Historical military land	0	0	0	0	-
Page	Section	Past land use - un-grouped >	On site	0-50m	50-250m	250-500m	500-2000m
24 >	2.1 >	Historical industrial land uses >	4	5	46	108	-
30 >	2.2 >	Historical tanks >	0	0	0	23	-
32 >	2.3 >	Historical energy features >	0	0	1	18	-
33	2.4	Historical petrol stations	0	0	0	0	-
33 >	2.5 >	Historical garages >	0	0	17	22	-
Page	Section	Waste and landfill >	On site	0-50m	50-250m	250-500m	500-2000m
35	3.1	Active or recent landfill	0	0	0	0	-
35	3.2	Historical landfill (BGS records)	0	0	0	0	-
36 >	3.3 >	Historical landfill (LA/mapping records) >	0	0	0	3	-
36 >	3.4 >	Historical landfill (EA/NRW records) >	1	3	2	5	-
38 >	3.5 >	Historical waste sites >	0	1	1	0	-
39 >	3.6 >	Licensed waste sites >	0	0	2	0	-
40 >	3.7 >	Waste exemptions >	0	10	4	10	-
Page	Section	Current industrial land use >	On site	0-50m	50-250m	250-500m	500-2000m
43 >	4.1 >	Recent industrial land uses >	0	2	26	-	-
45 >	4.2 >	Current or recent petrol stations >	0	0	0	2	-
46	4.3	Electricity cables	0	0	0	0	-
46	4.4	Gas pipelines	0	0	0	0	-
46	4.5	Sites determined as Contaminated Land	0	0	0	0	-