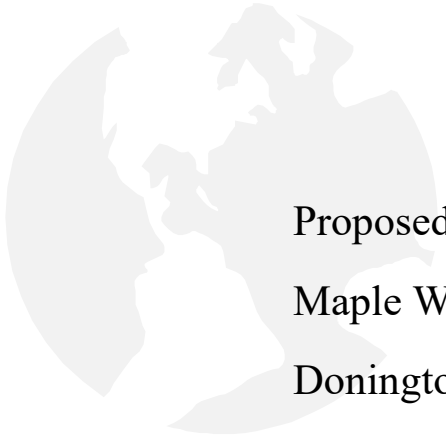


T. L. P. Ground Investigations.

Phase 2 – Intrusive Ground Investigation Report



Proposed Residential Development,
Maple Way,
Donington,
South Holland,
Lincolnshire

6th January 2022

T. L. P. Ground Investigations.

Proposed Residential Development, Maple Way, Donington, South Holland, Lincolnshire

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Phase 2 – Intrusive Ground Investigation Report

Site: Proposed Residential Development, Maple Way, Donington, South Holland, Lincolnshire.

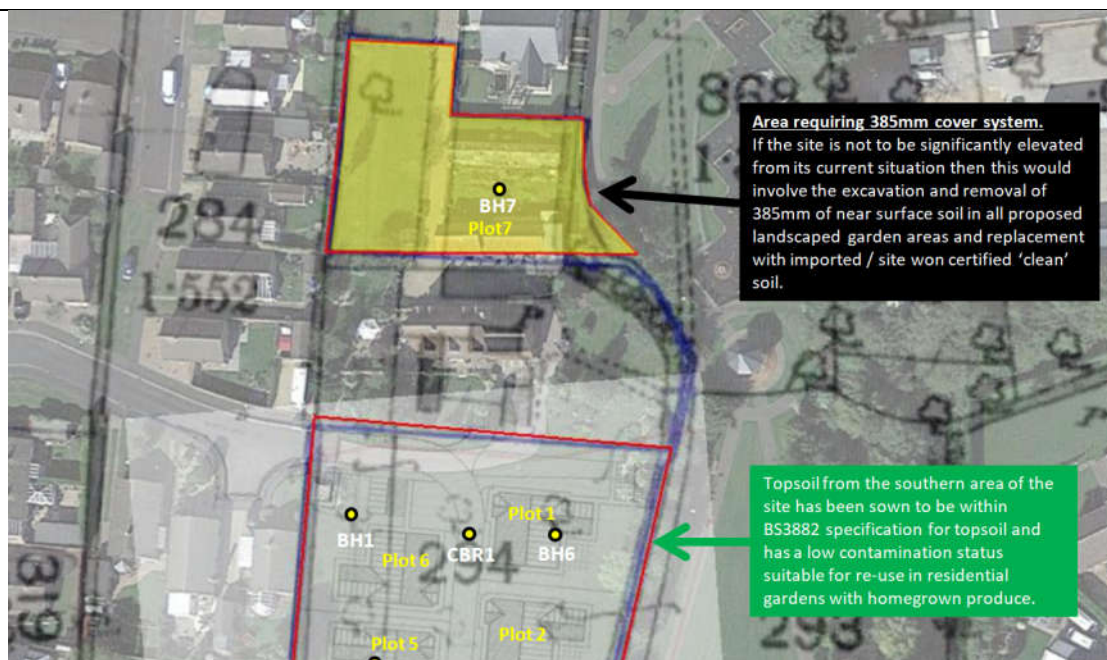
Client: Brown Builders Ltd.

Contact: Adam Mayer.

Date: 6th January 2022.

Executive Summary

Introduction	TLP Ground Investigations Ltd. were instructed by Brown Builders Ltd. to undertake a Phase II Intrusive Survey in connection with a Proposed Residential Development, Maple Way, Donington, South Holland, Lincolnshire.
Previous Desk Study - 6 th December 2021	A Phase I Desk Study undertaken by TLP on 6 th December 2021 entitled 'Phase I Desk Study - Proposed Residential Development, Maple Way, Donington, South Holland, Lincolnshire', identified pollution linkages at the site associated with its historical use and from potential contamination that may have migrated onto the site from off-site sources. <u>Potential</u> contamination perceived to be associated with these activities included metals, semi-metals, poly-aromatic hydrocarbons (PAH's), Total Petroleum Hydrocarbons (TPH), B-TEX, asbestos, PCB's and harmful TPH vapours.
Intrusive Survey	In accordance with the recommendations set out in the Desk Study, TLP carried out a Phase II Intrusive Investigation. The survey included the sinking of sampling boreholes / excavations followed up by chemical analysis of representative soil / groundwater samples.
Contamination Summary	Soil The intrusive survey and associated chemical analysis has demonstrated that generally across the site, the concentrations of potential contaminants are generally well within current guideline limits for a residential end use. However, an elevated concentration of Lead was identified at the location of BH7. Based on the current site layout, it is envisaged that all garden areas for Plot 7 will require remediation to ameliorate the risk posed by Lead. (See Remediation Strategy below). Any soil excavated from the area of Plot 7 should not be reused within any other sensitive gardens or landscaped areas within the proposed development. Areas of the future development which will be covered by foundation concrete and permanent hard surfacing will not however require remediation. Using the contamination test data obtained from the location of BH7 where 'slight' contamination was found to be present together with the procedures outlined in the BRE Publication 'Cover Systems For Land Regeneration' March 2004, it has been determined that <u>the maximum thickness of cover required to mitigate the risk from Lead contamination over the garden areas of Plot 7 should be approximately 385mm (see enclosed spread sheet)</u>. A 'clean' cover of this thickness will also serve to provide an effective media for healthy plant growth. The calculation assumes that the imported soils of the cover system contain similar low levels of contamination as those encountered in the southern part of the site as this material is likely to be used as the cover system soil.



Controlled Waters

The intrusive survey and associated chemical analysis has demonstrated that generally across the site, the concentrations of potential contaminants are well within current guideline limits for a residential end use with the consumption of home grown produce. Based on groundwater testing at location in BH7, the localised elevated concentrations of Lead are not considered to have had any significant effect on the groundwater beneath the site.

When the development is completed significant areas of the site will be covered with buildings and permanent hard surfacing. This will limit the amount of rainwater entering the near surface deposits and therefore reduce the potential for the generation of contaminated leachate. The Oxford Clay is classified as an unproductive aquifer and is therefore not considered to be highly sensitive. The site is not located within 500m of a groundwater SPZ and no groundwater abstractions have been identified within 2000m of the site.

The nearest active surface water abstraction is situated 1759m southeast of the site where water is obtained from the Marlode Drain for direct spray irrigation. At such a distance this receptor is unlikely to be considered at risk from the study site.

Topsoil Recycling

It is likely the developer will nominate to use site won topsoil from the southern area of the site for use in the cover system for area Plot 7 / BH7 as the near surface soil in the southern part of the site has been shown to be compliant with BS3882 topsoil specification and has a low contamination status suitable for residential home growing applications. Near surface topsoil from the southern part of the site can also be used in other landscaping areas of the site.

However topsoil from the smaller Northern site i.e. area Plot 7 / BH7 has been shown to have elevated levels of Lead contamination and should NOT be re-used as a topsoil in any residential garden areas. As the levels of Lead contamination from BH7 are only slight / moderate rather than severe, this material could potentially be recycled under areas of permanent hard cover or used as a topsoil in 'public open space' areas or in 'commercial landscaping' environments. It may however be the preference of the developer to simply remove this material from site. Near surface soil from the smaller northern site should not be mixed with stockpiled soil from any other area of the site or distributed or placed over any part of the southern site area.

	<u>Land Gasses and Vapours</u> The Groundsure Report has not identified any areas of in-filled ground within 250m of the study site, which may represent a credible potential generation source of harmful ground gasses such as methane and carbon dioxide. The absence of any significantly elevated TPH and B-TEX fractions within the soil samples submitted for testing suggests that the risk of hydrocarbon vapours entering the proposed new development is negligible. A TPH vapour survey is not considered necessary and no additional protection from hydrocarbon vapours is deemed to be required within the proposed development. The site is not located within a radon affected area as less than 1% of properties within the specified search area recorded above the action level. The Groundsure report indicates that no radon protection measures are required for new buildings or extensions to those already existing.
Geotechnical Summary	<u>Foundations for all units (Excluding Plot 3)</u> The recent borings have revealed that the site is initially overlain by a covering of topsoil comprising dark brown, silty, soil containing very occasional fine fragments of brick and other assorted stones. At depths of between 0.32m and 0.45m beneath the surface, this rests on deposits of silt and clayey silt which subsequently extended to the full depth of the sampling boreholes, some 2.55m beneath the surface. These deposits were generally soft or poorly compacted and judging from the results of the deeper dynamic penetration tests, these weak deposits extend to at least 5.00m depth. The near surface deposits of 'loose' silt/clayey silt cannot be considered an entirely reliable bearing strata for conventional strip foundations, as even modest loading could result in settlements in excess of 25mm. As an alternative, consideration could be given to employing reinforced surface raft foundations for most of the proposed new dwellings. Raft foundations have an inherent stiffness not available in strip footings and by virtue of their load spreading capability, are more resistant to differential settlements. As a preliminary guide to design it has been calculated that for a raft foundation constructed on a blanket of compacted granular material with a typical domestic loading of around 25kN/m², the long term settlement beneath the centre of the raft slab would be approximately 12mm. This would reduce to approximately half of this figure at the edges and 25% at the corners. <u>Foundations Plot No.3</u> At the location of BH4 (Plot No.3), 'very loose' deposits of made ground were encountered to a depth of 1.90m beneath the surface which were further underlain by deposits of soft, organic, silty clay and clayey silt to a depth of 3.55m beneath the surface. It is suspected that these deposits are associated with a former, narrow water course / drain, which on historical Ordnance Survey mapping, is shown to have passed through this part of the site and was then subsequently in-filled. As a consequence, the ground conditions beneath the dwelling on Plot 3 could be quite variable and <u>here on Plot 3 pile foundations may be a more appropriate bearing solution than a raft.</u> The carrying capacity of piles is fundamentally related to their method of installation therefore advice should be taken from experienced piling contractors in order to establish the most appropriate type and length of piles to adopt given the prevailing geological conditions. The results of the dynamic penetration test undertaken at the location of BH4 established the development of 'dense' strata at a depth of around 6.65m beneath the surface which should provide a satisfactory bearing horizon for piles. For preliminary design purposes it has been estimated that for say a 200mm to 220mm diameter, driven and cast in situ, steel cased mini pile driven to an appropriate 'set' within these 'dense' deposits, the carrying capacity of an individual pile would be of the order of 150kN to 200kN. Pile lengths are likely to be of the order 8.00m, however, this may need to be verified by taking a further deeper percussive cable tool boring on this plot to establish in more detail the nature of the deposits at depth. If piled foundations are to be employed then a fully suspended ground floor construction (i.e. block and beam) would be more appropriate than a ground bearing floor slab.

Shrink-ability

The near surface deposits essentially comprise silts, which have been found to be essentially non-plastic. As such these deposits would not be susceptible to significant volume change associated with fluctuations in soil moisture content that could be exacerbated by root action. Any trees and vegetation which may be located within influencing distance of proposed dwellings are therefore unlikely to have any significant on foundation design.

Groundwater

Groundwater seepages were encountered in all of the sampling borings at depths of between 1.50m and 1.70m beneath the surface. On completion, standing groundwater levels were measured at depths of between 1.21m and 1.53m beneath the surface. It is therefore possible that some slight to moderate groundwater infiltrations may be experienced in deeper excavations created for underground infrastructure.

Shallow excavations above the water are likely to be temporarily stable, however, deeper excavations which encounter groundwater ingress may become unstable and require the provision of temporary trench supports and dewatering facilities to ensure that construction can proceed under optimum conditions.

Pavement Design

California Bearing Ratio tests (CBR's) were performed at the 2 No. locations on the route of the proposed estate road in accordance with the TRL 587 CBR Tests DCP method. It was considered that the formation level of the new estate road would be at around 0.35m beneath the existing surface, i.e. below the layer of topsoil. The recorded resistances to penetration in the natural Tidal Flat Deposits indicate CBR values varying between 5% and 9%. This being the case, it may be prudent to **adopt the lower CBR value of 5% for preliminary design purposes.**

Drainage

At the locations of boreholes BH1, BH3, BH5 and BH7 'falling head' (variable head) permeability tests were performed in order to assess the relative permeability of the near surface stratum *in situ*. The tests were undertaken in open probe sampling boreholes within the natural Tidal Flat Deposits of silt. In order ensure the side walls of the boreholes remained stable throughout the tests, lengths of 50mm diameter slotted standpipe was inserted into the borings and the annulus surrounded by fine grained well screen gravel. The boreholes were then filled to the surface with water and the time taken for the water to dissipate was subsequently monitored.

The results of the tests have been presented on the enclosed data sheets and percolation graphs and indicate soil infiltration rates of between $1.03 \times 10^{-2} \text{mm/s}$ and $1.24 \times 10^{-1} \text{mm/s}$. These results indicate a fairly rapid rate of soil infiltration, suggesting that **the stratum underlying the site could be considered for the disposal of surface water generated by the proposed residential development.**

It should be noted that the standing groundwater levels were measured at depths of between 1.23m and 1.53m beneath the surface. This may restrict the storage capacity of underground 'soakaways' as the base of any 'soakaway' system will need to be above the level of the water table throughout its operation. In order to achieve the required storage capacity, **the use of shallower soakaway trenches may be more appropriate than deeper chambers.**

1.0 Brief

Following the instructions of Brown Builders Ltd, a geo-environmental assessment was carried out at a site located at Maple Way, Donington, Lincolnshire, where a new residential development is proposed. The site of the proposed new residential development currently

comprises a large residential garden area. The site is split into two areas to the north and south of an existing detached residential dwelling to the east of Maple Way.

The proposed new development will involve the construction of seven new residential bungalows. Six located to the south of the existing detached dwelling and one to the north over an area currently being used as a vegetable garden. The development will also include the construction of a new estate road together with the usual infrastructure associated with a development of this size and nature.

The scope of this intrusive investigation was designed in accordance with the recommendations of a Phase 1 Desk Study report issued by TLP Ground Investigations Ltd., entitled 'Phase 1 Desk Study - Proposed Residential Development, Gleneagles Park, Sutton on Hull.' the findings of which are summarised in Section 3.0 of this report.

The intrusive borehole investigation was carried out on 7th December 2021 and included the collection of undisturbed soil and groundwater samples from boreholes followed by chemical and geotechnical analysis of selected samples. This report presents the results and findings of this investigation and an assessment of the contamination constraints associated with the proposed development.

2.0 Site Description (from Phase 1 Desk Study)

The site is located on land to the east of Maple Way, Donington, South Holland, Lincolnshire. The proposed development site has an approximate area of 0.55 Ha and is centred at National Grid Reference 520917, 335457. The site is currently accessible through the driveway at the eastern end of Maple Way, which is secured with an electrically operated gate, or from Goxhill Avenue (a side road off High Street), which leads directly to the northern part of the site.

The area of proposed development is split into two separate areas. The larger southern part of the site where six, detached bungalows are to be constructed and a smaller area of ground in the northern part of the site where a single detached bungalow is proposed.

Southern Site Area

The southern part of the site comprises a large open lawn area, which has, for many years been used as a domestic garden. In the north western corner of the lawn is a small, pre-fabricated electricity sub-station, situated close to the site entrance on Maple Way. A number of semi-mature tree specimens are located along the eastern boundary of the site, the majority of which are beyond the boundary fence. A small number of semi-mature trees are also situated along the southern site boundary. The southern garden is secured by a collection of timber fences and is located within a predominantly residential setting with residential properties located to the south and west of the site. Narrow footpaths extend around the southern and eastern site boundaries and to the east is a recreational park and play area.

Northern Site Area

The northern and southern areas of the site area separated by an existing detached, two-storey dwelling. To the north of the house is a parking area surfaced with gravel chippings and to the north is a medium sized older 'out building' of traditional brick construction with a pitched roof surfaced with clay tiles which is to be demolished in order to make way for the proposed new residential development. To the north of the outbuilding is a medium sized vegetable garden and poly tunnel. This part of the garden can be accessed via a gravel track leading southwards from Goxhill Avenue.

At the time of the walkover inspection of the site and the immediate surrounding areas, no staining was observed on the site surface and there was no olfactory evidence of contamination.

3.0 Issues Arising from Phase 1 Assessment

- According to historical mapping, from the end of the nineteenth century the site was already in use as a possible small holding with a medium sized orchard occupying the southern part of the site. Narrow water courses flowed around the southern, eastern and part of the western site boundaries. The structures located between the two areas of proposed development were modified throughout the 20th Century and during the 1980's; these were demolished and replaced with a detached residential dwelling. During the 1950's an elongated out building was added to the northern development area. In recent years a small electricity sub-station has been added to the site adjacent to the entrance onto Maple Way.
- Historically, the areas surrounding the site were used primarily for agricultural purposes. However, even at the end of the 19th Century, a small Gas Works with small gasometer was present just to the north of the smaller 'Northern Site' site. Further north a number of commercial premises were also present along the main High Street including breweries, Inns and a Police Station. During the 1930's, the Gas Works appears to have been decommissioned. During the latter half of the 20th Century, the areas surrounding the site were primarily developed for residential housing with a store / depot located to the east and school to the south. An area of recreational park is now located to the east of the site.
- The shallow drainage ditches that once flowed along the site boundaries are no longer present and the former pond located a short distance to the west was overbuilt with residential housing. The larger pond located approximately 200m east of the site is still present today.

Table 1

Table 1 - Summarises the potential contaminative land uses on and in the vicinity of the site showing potential sources with associated contaminants.

Sources							
Sources Description	Contaminants Associated with Source						
	Metals	PAH	TPH/BTEX	Asbestos	PCB	Landfill Gas	TPH Vapours
<u>On Site</u>							
Contamination resulting from the use of the site as agricultural land and residential garden and the use of agricultural plant and equipment. Contamination that may have been generated through the construction and historical demolition of structures that occupy the site and the areas between the sites of proposed development. Possible contamination created during the installation of the electricity sub-station located on the site. Contamination that may have migrated onto the site from the drainage ditches that once flowed along the various site boundaries.	✓	✓	✓	✓	✓		✓
The possible presence of deposits of made ground that may exist beneath parts of the site surface.	✓	✓	✓	✓			✓
Burning processes that have taken place within the site boundaries.	✓	✓					
Residual contamination from natural weathering of geological strata.	✓						
						✓	
<u>Off Site</u>							
Possible contamination that has migrated onto the site from the nearby commercial areas (Gas Works) and possible 'fall out' from construction and demolition of the structures that surround parts of the site (Residential).	✓	✓	✓	✓			✓
Contamination that may have migrated onto the site via the shallow water course, which once extended along the various site boundaries.	✓	✓					

Table 1 - Summarises the potential contaminative land uses on and in the vicinity of the site showing potential sources with associated contaminants.

Key for Table 1

Metals

Includes - Metals and metalloids (Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Zinc, Arsenic, Boron, Selenium and inorganic chemicals such as Cyanide)

PAH

Includes – EA16 – Acenaphthene, Acenaphthylene, Anthracene, Benzo[a]anthracene, Benzo[a]pyrene, Benzo[b]fluoranthene, Benzo[g,h,i]perylene, Benzo[k]fluoranthene, Chrysene, Dibenzo[a,h]anthracene, Fluoranthene, Fluorene, Indeno[1,2,3-cd]pyrene, Naphthalene, Phenanthrene, Pyrene.

Table 2

Details the potential pathways with receptors identified for any contaminants that may be present in the ground at the site during and following the proposed development.

<u>Pathways</u>		<u>Receptors</u>	
<u>Human Health</u>		<u>Human Health</u>	
Dermal Contact with soil	✓	End users and construction workers	✓
Ingestion of soil	✓	End users and construction workers	✓
Inhalation of Contaminated Dust and Harmful Gasses	✓	End users and construction workers	✓
Ingestion of site grown vegetables	✓	End users	✓
Ingestion of water from affected service pipes	✓	End users	✓
<u>Buildings</u>		<u>Buildings</u>	
Mobile water soluble sulphates	✓	Concrete foundations	✓
<u>Controlled Waters</u>		<u>Controlled Waters</u>	
Lateral and vertical migration	✓	Surface water receptors & shallow / deeper groundwater regime	✓
Infiltration	✓	Surface water receptors & shallow / deeper groundwater regime	✓

Table 2 - details the potential pathways with receptors identified for any contaminants that may be present in the ground at the site during and following the proposed development.

4.0 Intrusive Investigation

4.1 Sampling Strategy

In order to quantify the potential contamination risk, an intrusive borehole investigation was undertaken in general accordance with the Model procedures for the Management of Land Contamination (CLR11), the relevant planning practice guidance (Land Affected by Contamination) and the Development of Land Affected by Contamination (Yorkshire and Lincolnshire Pollution Advisory Group) and the requirements of BS10175(2011)-Code of Practice for the Investigation of Potentially Contaminated Sites. This borehole investigation was undertaken on 7th December 2021. The sampling strategy was designed on the basis of the fundamental objectives of the Phase 1 Intrusive Investigation which were to:-

- Obtain representative samples of soil, groundwater (where possible) and groundwater from strategic areas for subsequent analysis.
- Gather further information on contaminated land conditions to assist in the design and construction of the proposed new buildings and infrastructure.
- Re-evaluate the preliminary conceptual site model and undertake a qualitative contamination risk assessment.
- Determine whether mitigation measures or remediation is required in areas where soil / groundwater / vapours contamination may exist, in order to render the site suitable for the proposed end use.

The historical extracts have indicated that the entire site was once used as a small holding with orchard and is currently used as a residential garden. Other than the presence of a recently constructed small electrical sub-station structure located in the north western part of the ‘Southern

site', no specific potential or visual contamination hotspots were identified during the site walkover inspection. Consequently, for analytical purposes, the site has been provisionally considered as one 'averaging area' for the vast majority of contaminants. Targeted PCB Contamination testing was undertaken adjacent to the sub-station.

The boreholes were located in order to provide an overview of the ground conditions prevailing beneath the site whilst ensuring a number of the borings were located within the areas of the site where private gardens and areas of soft landscaping are envisaged. These landscaped /garden areas are considered to be the most sensitive areas of the development where future users of the site could come into contact with potentially contaminated soils. The locations of the borings have been indicated on the enclosed site layout drawing / aerial photograph and details of the strata encountered have been provided on the enclosed borehole record sheets.

One of the borings was located adjacent to the existing electricity sub-station in the southern part of the site in order to establish the presence or otherwise of PCB contamination in this part of the site.

4.2 Fieldwork

The recent intrusive fieldwork included the following:-

- The sinking of 7 No. shallow sampling boreholes using windowless sampling equipment to depths of between 2.55m and 3.50m beneath the ground surface. At the borehole locations, soil samples were recovered as continuous cores reducing in size from 100mm to 63mm in diameter within rigid PVC core liner.
- Fragmental samples were obtained from the soil cores and hand auger boring using appropriate tools (e.g. stainless steel trowel) and placed in appropriate containers, sealed, labelled and stored in cool boxes at low temperatures. The samples selected for analysis were subsequently transferred under chain of custody to an analytical laboratory.
- Where possible, groundwater samples were obtained from the windowless sampling boreholes and selected samples were subsequently transferred under chain of custody to an analytical laboratory for testing.
- Percolation tests were performed in four of the probe sampling borings at the locations of BH1, BH3, BH5 & BH7 in order to establish the relative permeability of the near surface deposits *in situ*. The results of the percolation [soakaway] tests are discussed in the Geotechnical Testing section 6.0 below.
- *In situ* CBR testing of the near surface sub-grade using TRL 587 method at 2 No. locations along the line of the proposed new access road.

4.3 Soil Sample Acquisition

A number of near surface samples were retained from each location and from these, a total of 11 No. soil samples were selected for chemical (contamination) analysis. The majority of the selected samples were obtained from the near surface soils as these were considered to represent the most likely soils to be contaminated and most likely to come into contact with construction workers and end users of the site. These near surface soils were also deemed to represent a potential source of contaminated leachate which could potentially enter any underlying sensitive groundwater regime.

Three of the samples obtained from slightly greater depth were selected for a suite of tests often requested by water companies (UKWIR) in order to assess the most appropriate grade of protection for underground potable water supply pipes (BH1 0.90-1.00m, BH4 0.90-1.00m & BH7 0.90-1.00m).

A sample of the near surface soil obtained from BH1 (0.30-0.50m) (located close to the existing electricity sub-station), was analysed for PCB congeners, which can often be associated with electrical transformers.

BS3882 topsoil analysis was undertaken on three samples of topsoil from the locations of BH1 0.30-0.50m, BH4 (0.20m-0.40m) and BH7 (0.20-0.40m).

Two of the near surface samples were selected for WAC analysis (BH4 0.90-1.00m and BH7 0.90-1.00m) in order to establish the waste classification of the materials, should it be necessary to export any excavated materials 'off site'.

Groundwater samples from BH4 (1.29m) and BH7 (1.23m) were selected for a general suite of contamination tests which included metals, semi metals, PAH's and speciated TPH analysis.

5.0 Ground Conditions

5.1 Anticipated Geology

Maps published by British Geological Survey indicated that the superficial deposits beneath the site would comprise Tidal Flat Deposits of clay and silt. The solid geology beneath the site is represented by the Oxford Clay Formation, which is of Callovian age. The maximum permeability of the superficial deposits is designated as 'low' and that of the underlying bedrock also as 'low'. No geological faults or linear features have been identified within 250m of the site.

The Groundsure data report indicates that the only surface ground workings within 250m of the site is a pond situated 184m to 191m east of the site, which is still present. The historical extracts also indicate that a small pond was once situated a short distance to the west of the site. Historical extracts indicate that this pond was subsequently in-filled during the 1970's. In the wider areas, the Donington Brick & Tile Works situated 376m southeast of the site was also excavated for clay and shale.

Ground Conditions Encountered on Site

Topsoil

At the surface, each of the borings penetrated deposits of topsoil extending to depths of between 0.32m to 0.55m beneath the surface. This generally comprised, dark brown, silty soil containing occasional fine fragments of brick and other assorted stones.

Made Ground

Made ground was only encountered at location BH4. At the location of BH4, the deposits of topsoil were underlain by deposits of made ground extending to a depth of 1.90m beneath the surface. This initially comprised 'very loose', mid brown, silty, slightly clayey soil containing occasional fine fragments of stone. At 1.10m depth, this rested on deposits of 'soft', brown, mottled rust brown, silty clay containing occasional fine stone fragments.

It is suspected that these deposits were used to in-fill the narrow watercourse that is indicated on the historical records once passing to this area of the site. (see Borehole Location Plan / Historical Overlay)

Natural Deposits

Beneath the deposits of topsoil / made ground, each of the borings penetrated Tidal Flat Deposits initially comprising a 'crust' of 'loose', brown, mottled rust brown and grey, slightly clayey silt. In some of the sampling boreholes, these upper deposits were either slightly more silty or clayey in composition and extended to depths of between 0.65m and 1.30m beneath the surface. The underlying deposits comprised a sequence of generally 'loose', mid brown, mottled grey, silt.

Generally, these deposits of silt extended to the full depth of borehole penetration, some 2.55m beneath the surface. Only at the location of BH1, at a depth of 2.30m beneath the surface, were deposits of 'loose', mid brown, silty, medium sand were encountered.

At the location of BH4, near to where the former in-filled drain was suspected to be located, the underlying natural deposits were initially represented by deposits of 'soft', mid grey, organic, silty clay. At 2.10m depth, this rested on deposits of 'very loose', mid grey, organic, slightly clayey silt.

5.2 Groundwater

Moderate groundwater seepages were encountered in all of the sampling boreholes with initial seepages encountered at depths of between 1.50m and 1.70m beneath the surface. On completion of the borings, the groundwater levels in the open holes were measured at depths of between 1.21m and 1.55m beneath the surface.

6.0 Geotechnical Considerations

- As the deposits underlying the site were predominantly non cohesive in nature, Standard Penetration Tests (SPT's) were performed at regular intervals in order to establish the relative compactness of the stratum *in situ*. The results of the tests have been interpreted as 'N values', (blows for 300mm penetration) and these have been included on the enclosed borehole record sheets. Within the upper deposits of clayey silt, SPT 'N' values ranged between 4 and 10, indicating a 'loose' to 'medium dense' state of compaction for the deposit. Within the underlying deposits of mid brown silt, SPT 'N' values of between 4 and 8 were recorded, indicating a generally 'loose' state of compaction for the deposit.
- In order to establish the relative compactness of the stratum at greater depth, two of the borings (BH1 & BH4) were extended using dynamic penetration techniques. The results of the tests have also been interpreted as 'N values' and these have been indicated on the enclosed borehole record sheets. The results of the tests indicate a gradual increase in resistance to penetration with 'N values' increasing from between 4 and 6 at the base of the borings to between 38 and 44 at depths of between 7.10m and 7.35m beneath the surface indicating the development of a 'very dense' state of compaction for the deposit at greater depth. No clayey residue was noted on the probe tip following extraction from the boreholes suggesting that the deposits probably remained predominantly granular to the full depth of penetration
- Hand vane tests were performed on the more cohesive (clayey) material recovered in the undisturbed soil cores from BH4 and BH7 in order to establish the cohesive strength of these materials. The results of the tests have been noted on the enclosed borehole record sheets. Tests performed on samples of the near surface Tidal Flat Deposits in BH7 (i.e. silty clay / clayey silt) and clayey made ground in BH4 recorded hand vane values between 26kN/m² and 33kN/m² indicating a generally 'soft' consistency for these deposits.
- Although Atterberg Limit determinations were attempted on samples of the natural silty substrate, the samples were generally found to be 'non plastic'. These deposits would not

be particularly susceptible to volume change associated in fluctuations in soil moisture content.

- At the locations of boreholes BH1, BH3, BH5 and BH7 ‘falling head’ (variable head) permeability tests were performed in order to assess the relative permeability of the near surface stratum *in situ*. The tests were undertaken in open probe sampling boreholes within the natural Tidal Flat Deposits of silt. In order ensure the side walls of the boreholes remained stable throughout the tests, lengths of 50mm diameter slotted standpipe was inserted into the borings and the annulus surrounded by fine grained well screen gravel. The boreholes were then filled to the surface and the time taken for the water level to drop was subsequently monitored. The results of the tests have been presented on the enclosed data sheets and percolation graphs and indicate soil infiltration rates of between 1.03×10^{-2} mm/s and 1.24×10^{-1} mm/s. These results indicate a fairly rapid rate of soil infiltration, suggesting that these deposits could provide a suitable media for the dissipation of surface water generated by the proposed residential development. The presence of groundwater at relatively shallow depth will limit the depth of any buried soakaway storage chambers.
- In order to assist with the design of roads and paved areas, CBR tests were performed at two locations (CBR1 & CBR2) in accordance with the method TRL 587 CBR Tests DCP (Dynamic Cone Penetration). The results of the tests have been provided on the accompanying spreadsheets and graphs. The tests were performed within the deposits of topsoil and natural Tidal Flat Deposits which were encountered at shallow depth at each of these locations. At an anticipated formation level of approximately 0.35m beneath the existing surface, the lower of the recorded CBR values (to the nearest 1%) ranged between 5% and 9%. This being the case, it may be prudent to adopt the lower value of 5% for preliminary design purposes.
- Chemical tests performed on representative samples of the near surface soils and made up / disturbed ground as part of the environmental screening, recorded water-soluble sulphate concentrations between 27mg/l and 76mg/l (2:1 water / soil extract) with pH between 7.7 and 8.9. Tests performed samples of ‘perched’ groundwater recovered from BH4 and BH7 recorded sulphate concentrations of 68mg/kg with pH values of between 7.5 and 7.7.
- In order to establish the suitability of the surface topsoil for re-use, three samples of the existing near surface topsoil from BH1 (0.30-0.50m), BH4 (0.20-0.40m) and BH7 (0.20m-0.40m) were tested for compliance in accordance with BS3882:2015. The results of the tests have been presented on the declaration of compliance numbered 103661(1)- 5, 10 and 6. The results of the tests indicate that all of the determinands included in the testing schedule are compliant with multi-purpose topsoil. This would indicate that the near surface soil could potentially be reused as a multipurpose topsoil subject contamination testing (which is discussed later in this document)

7.0 Contamination

7.1 Preliminary Conceptual Site Model

The preliminary Conceptual Site Model (PCSM) detailed in the Phase 1 Assessment Report provides information regarding the potential ‘source-pathway- receptor’ linkages that may be present at the site.

- From an examination of the sites history, sources of ‘on site’ contamination would appear to be limited. Minor contamination could possibly associated with the former use of the site as agricultural land and its use as a residential garden. It is also possible that some minor contamination was deposited on the site during the construction / demolition of the structures that have occupied the area between the two proposed

development sites, the activities which may have taken place in the elongated structure in the northern part of the site and the small (but modern) electricity sub-station in the western part of the site. Burning processes may also have taken place in certain parts of the site. A number of drainage ditches have flowed along various site boundaries in the historical past, which may represent potential sources of mobile contamination.

- The areas surrounding the site have been used predominantly as agricultural land / orchards. However the small Gas Works once located just to the north of the 'Northern site' may constitute a potential source of contamination that could possibly have migrated onto the site. A small pond, once situated a short distance to the west of the site was overbuilt with residential houses in the late 1980's and is of insufficient size to be considered a credible sustained source of harmful ground gas emissions that could feasibly impact on the study site.
- The Groundsure Report identified shallow drainage ditches along the southern, eastern and western site boundaries with part of a drain passing through the southern part of the site. Whilst these are no longer present, given the predominantly agriculture nature of the land use in the surrounding area during their existence they are unlikely to have been a significant source of mobile contamination that could have impacted on the study site.
- Weathering of the natural geological stratum can occasionally cause enrichment of certain metals in the near surface strata, however, this is considered unlikely bearing in mind the information given in the 'Groundsure' report which in 'Section 20' (Estimated Background Soil Chemistry) shows very low anticipated levels of Arsenic, Cadmium, Chromium, Nickel and Lead.

The contaminants that might be associated with the past activities at the site and the surrounding areas could include, but are not necessarily limited to the following:-

- **Metals, metalloids and asbestos** associated with the construction and demolition of structures which have occupied parts of the site and the possible presence of 'disturbed/made ground' that may be present over parts of the site surface. It is possible that some minor contamination may have been released from the structures located between the areas of proposed development. The possible migration of contamination from commercial activities that have taken place nearby, in particular the small Gas Works once located just to the north of the site.
- **Polycyclic Aromatic Hydrocarbons (PAH's)** derived from the incomplete combustion of organic materials, i.e. from bonfires or stubble burning that may have taken place at the site in the historical past.
- **Possible Total Petroleum Hydrocarbon (TPH's)** contamination emanating from accidental leaks or spillages from the use of agricultural equipment, plant and equipment.
- **Possible release of PCB's** associated with the small electricity sub-station in the western part of the site.

7.2 Contamination Testing and Assessment Strategy

In accordance with the recommendations of Phase 1 Desk Study, a programme of chemical analysis was adopted that would target certain contaminants present in the soil that might be associated with the past and current activities at the site and in the immediate surrounding area.

From the 7 No. boreholes, a total of 11 No. soil samples were selected for chemical (contamination) analysis. The majority of the selected samples were obtained from the near surface soils as these were considered to represent the most likely soils to be contaminated and most likely to come into contact with construction workers and end users of the site. These near surface soils were also deemed to represent a possible source of contaminated leachate which could potentially enter any underlying sensitive groundwater regime.

Three of the samples obtained from slightly greater depth (BH1 0.90-1.00m, BH4 0.90-1.00m and BH7 0.90- 1.00m) were selected for a suite of tests often requested by water companies (UKWIR) in order to assess the most appropriate grade of protection for underground potable water supply pipes.

A sample of the near surface soil obtained from BH1 0.30-0.50m (located close to the existing electricity sub-station), was analysed for PCB congeners, which can often be associated with electrical transformers.

BS3882 topsoil analysis was undertaken on three samples of topsoil from the locations of BH1 0.30-0.50m, BH4 0.20-0.40m and BH7 0.20-0.40m.

Two of the near surface samples BH4 0.90-1.00m and BH7 0.90-1.00m were selected for WAC analysis in order to establish the waste classification of the materials, should it be required to export any excavated materials 'off site'.

Groundwater samples from BH4 (1.29m) and BH7 (1.23m) were selected for a general suite of contamination tests which included metals, semi metals, PAH's and speciated TPH analysis.

All soil and groundwater samples were placed in approved containers and cool boxes and despatched under a chain of custody to an accredited laboratory (Chemtech Environmental Ltd) for the range of tests outlined above. The results of the analyses have been provided on the enclosed laboratory certificates with contract number 103661 – Maple Way, Donington.

7.3 Assessment of Data

For the assessment of human health, the dataset has been compared to Soil Screening Values (SSV's) developed by ATRISK^{SOIL}. Atkins soil screening values (SSV's) have been derived in line with the EA 2009 guidance (SR2, SR3, SR4, and SR7) using the CLEA v1.071 software. The modelling inputs were made compliant with the SR3 residential, commercial and other conceptual site models and follow the guidance provided within SR3 where possible. The SSV's currently available include values for a range of metals and semi metals, speciated PAH's, characterized TPH, BETX and other organic contaminants.

The C4SL project methodology released by DEFRA in December 2014 was a step-change in the approach to the assessment of land contamination in the UK. The C4SLs introduced a change to toxicological appraisal that defined 'low risk', updated exposure parameters for the standard SR3 land uses and, following a review of relevant literature and Atkins own SSV approach, introduced the Public Open Space (Residential) and Public Open Space (Parks) land uses. These changes in exposure and land use were formalised in an update to the CLEA software with the release of CLEA v1.071 in September 2015.

Atkins have updated the SSVs using CLEA v1.071 to incorporate the following changes:

- Updated exposure assumptions for the standard residential, commercial land uses as set out in the C4SL project methodology for 1% SOM sand and 6% SOM sandy loam soil types;

- Updated exposure assumptions for the standard allotments land use as set out in the C4SL project methodology for the 6% SOM sandy loam soil type;
- Derivation of the ‘top two’ produce for all contaminants for the residential and allotments land uses and inclusion of this method in the consumption of home grown produce pathway; and
- Inclusion of SSVs derived for the Public Open Space (residential) and Public Open Space (parks) land uses as set out in the C4SL project methodology at 1% SOM sand and 6% SOM sandy loam soil types.

As part of their routine updates they have updated the toxicological assessment of ten contaminants (based on minimal risks as set out in Environment Agency SR2 Guidance).

Further C4SLs based on ‘Low Levels of Toxicological Concern’ are to be derived by an industry led initiative in the future.

Certain organic contaminants can be compared to the EIC/AGS/CL:AIRE Soil Generic Assessment Criteria for Human Health Risk Assessment 2010 for a residential or commercial end use. They provide an indication of the chemical concentration in soil below which the long-term human health risks for site occupants (for various generic land-use scenarios) are considered to be tolerable or minimal.

Once the development is completed, large parts of the site surface will be covered with either foundation concrete or areas of permanent hard surfacing including driveway / parking areas, patio and other areas of permanent paving. However, the development will also include individual private garden areas where future users could potentially grow produce for human consumption. With this in mind, **the proposed land use has been considered as a residential development with the potential that ‘produce’ could be grown within residential gardens for human consumption, i.e. ‘residential with the consumption of home grown produce’ (res-with) end use scenario.** The current contamination guideline values applicable to this end use have been adopted for the assessment of the contamination test data. The dataset has been compared to 6% soil organic matter (SOM) ‘res-with’ values as the majority of the recorded OMC concentrations were generally above 3% so this approach was considered appropriate.

BRE Digests Special Digest 1 can be reference to assess the risk from sulphate and acid attack on buried concrete.

Guidance issued by UKWIR Publication 2010 ‘Guidance for the selection of water supply pipes to be used in Brownfield sites can be used to assess the risk to underground water supply pipes.

7.3.1 Analysis of Dataset

If / when appropriate, statistical analysis of datasets can be carried out in accordance with the methodology outlined in ‘Professional Guidance: Comparing Soil Contamination Data with Critical Concentration’, CL: AIRE, Buckinghamshire, ISBN 978 -1-905046-35-5.

The above publication indicates that for a planning scenario, the developer should consider the following key question:

‘Can we confidently say that the mean level of contamination on this land is low relative to some appropriate measure of risk?’

However the statistical approach outlined in the above document is only applicable to situations where a relatively large number of soil samples are included within the dataset. A general rule of thumb outlined in the above document suggests a minimum sample size of

between 20 and 50, and in certain circumstances, (such as when using log-symmetric data) this is still unlikely to be sufficient.

In the context of the current site, the area of proposed development is small in size and the risk posed to human health is generally considered to be low. There remains a ‘low/ moderate’ and ‘moderate’ risk to other environmental receptors, such as aquifers within the superficial deposits and bedrock, therefore in keeping with the constraints of the allocated budget and in the absence of any specific, identified source of contamination at the study site, a smaller sample size was considered appropriate.

For the assessment of human health, each determinand within the dataset has been compared directly to Soil Screening Values (SSV's) developed by ATRISK^{SOIL}. Atkins soil screening values (SSV's) have been derived in line with the EA 2009 guidance (SR2, SR3, SR4, and SR7) using the CLEA v1.071 software. The modelling inputs were made compliant with the SR3 residential, commercial and other conceptual site models and follow the guidance provided within SR3 where possible. The SSV's currently available include values for a range of metals and semi metals, speciated PAH's, characterized TPH, BETX and other organic contaminants.

7.4 Contamination Results

7.4.1 Soils

7.4.1.1 Metals and Semi metals and General Contaminants

Ten of the eleven soil samples submitted for testing were analysed for a general metals and semi-metals suite that might be associated with contamination resulting from the past uses of the site and the surrounding area. The results indicate that apart from one sample from BH7, all of the determinands included in the testing schedule were in concentrations well below the current Atrisk SSV's for a ‘res-with’ end use scenario and a soil organic matter (SOM content of 6%).

In the sample obtained from BH7 (0.20m-0.40m) a Lead concentration of 445mg/kg was recorded, which exceeds the Atrisk SSV of 200mg/kg. As a consequence, some form of remediation will be required in this area of the site in order to render the site appropriate for its proposed residential end use with the consumption of home grown produce. Fortunately this part of the site is separate from the remainder of the site and can be treated separately.

Within the main larger ‘Southern’ part of the development site, in terms of metals contaminants it is considered that concentrations in the near surface soils are generally low relative to their critical concentration and that the land is generally suitable for the proposed ‘res-with’ end use without prior remediation.

However, due to the elevated concentration of lead at the location of BH7 in the smaller ‘Northern’ part of the site, the garden and landscaped areas of this individual plot (Plot 7) will require remediation.

7.4.1.2 Polycyclic Aromatic Hydrocarbons

Eight of the eleven soil samples submitted for testing were analysed for speciated PAH's (EPA16) and the results compared to current Atrisk SSV's. On comparing the recorded values with current Atrisk SSV's, all of the samples recorded PAH concentrations within current Atrisk SSV's for a ‘res-with’ end use scenario (SOM 6%). It is noted that the majority of the recorded concentrations were below the analytical limit of detection.

In terms of PAH contaminants it is considered that concentrations in the near surface soils across the site are low relative to their critical concentration and that the land is suitable for the proposed ‘res-with’ end use without prior remediation.

7.4.1.3 **Total Petroleum Hydrocarbons and BTEX**

Eight of the eleven soil samples submitted for testing were analysed for characterised TPH and B-TEx compounds and the results compared to current SSV's. On comparing the recorded values with current guideline values, **none** of the determinands included in the suite of tests were found to be in concentrations which exceed the current At-risk SSV's for a 'res-with' end use scenario (SOM 6%). Indeed all of the determinands were found to be in concentrations which were below the limit of analytical detection and **with respect to TPH contaminants, the site can be considered suitable for its proposed end use without the need for any specific remediation.**

The absence of any significantly elevated TPH or B-TEx fractions within the soil samples submitted for testing suggests that the risk of hydrocarbon vapours entering the proposed new buildings is very low. A TPH vapour survey is not considered necessary at this stage and no specific protection from hydrocarbon vapours is considered to be warranted for the proposed new development.

7.4.1.4 **Asbestos**

Eight of the eleven soil samples were submitted for examination for the presence of asbestos in soil using polarised light microscopy. No traces of asbestos were detected in any of the samples submitted for testing.

7.4.1.5 **Sulphate**

Chemical tests performed on representative samples of the near surface soils and made up / disturbed ground as part of the environmental screening, recorded water-soluble sulphate concentrations between 27mg/l and 76mg/l (2:1 water / soil extract) with pH between 7.7 and 8.9. Tests performed samples of 'perched' groundwater recovered from BH4 and BH7 recorded sulphate concentrations of 68mg/kg with pH values of between 7.5 and 7.7. In accordance with the guidelines contained in Part 1 of the Digest and taking into account the geology and specific soil and groundwater conditions (i.e. 'mobile water' condition) and the number of samples within the dataset (See section C5.1.1 of BRE Special Digest 1), the site can be assigned a Design Sulphate Class DS-1 and an ACEC (Aggressive Chemical Environment for Concrete) Class AC-1.

7.4.1.6 **PCB's**

One of the samples obtained from BH1 (0.30-0.50m), located adjacent to the small electrical sub-station was analysed for PCB's including ICES 7 and WHO 12 congeners. The results of the tests revealed that all PCB ICES 7 and WHO 12 congeners were found to be in concentrations below the analytical limit of detection for the method used. It is therefore concluded that no PCB contamination has occurred in the vicinity of the electrical sub-station.

7.4.1.7 **WIR Suite**

Three soil samples (BH1 0.90-1.00m, BH4 0.90-1.00m and BH7 0.90-1.00m) were obtained from slightly greater depth and submitted for a UKWIR suite of tests that are commonly used to assist in the materials selection for potable water supply pipes. The results of the tests would suggest that PVC could be suitable for underground potable water supply pipes, however, this should be confirmed at an early stage with the local water company.

7.4.1.8 **WAC Testing (Soil Waste Disposal)**

WAC Full suite testing was undertaken on two soil samples (BH4 0.90-1.00m) and BH7 (0.90-1.00m) obtained from the near surface soils that may need to be excavated as part of the development proposals. Comparing the recorded 10:1 leachate results with BS EN 12457-3 Limit Values would suggest that the soil waste would fall within the **'inert' waste classification.**

7.4.2 Groundwater

Two samples of the groundwater from boreholes BH4 (1.29m) and BH7 (1.23m) were analysed for a similar range of contaminants as the soil samples.

The results of the analysis have been compared to current ATRISK WSV's for a residential end use, EQS for fresh and salt water and also UK Drinking water standards.

All of the determinands were recorded either below their respective limit of analytical detection or well below current ATRISK WSV's, EQS freshwater / saltwater standards or UK DWS for consumers taps.

It is interesting to note that despite slightly elevated concentration of Lead recorded within the near surface soil sample at the location of BH7, the sample of groundwater obtained from the same borehole did not contain an elevated concentration of dissolved Lead. This demonstrates that the observed Lead contamination within the near soil sample is not readily mobile and has not affected the quality of the perched groundwater or indeed the sample obtained from slightly greater depth.

8.0 Contamination Summary, Revised Conceptual Site Model & Risk Assessment

Using the information gathered in this ground investigation and preliminary contamination risk assessment developed in the Phase 1 Desk Study, the principal potential contaminants of concern were considered to be metals, semi-metals, PAH's, TPH, BTEX, PCB's, asbestos and potential toxic gasses and vapours.

The principal receptors of potential contamination from soil and groundwater were identified as current and future end users of the site, ground workers, controlled waters / aquifers, landscaping plants, structures and buried concrete. The risk classification afforded to these possible pollution linkages was perceived to range between 'Moderate to Low' and 'Very Low'.

Using the results of the environmental screening from the recent Intrusive Phase II Investigation, it has been established that the concentrations of contaminants recorded in **the majority of samples** obtained from the site are within current guideline limits for a 'residential development with the consumption of home grown produce' scenario (res-with SOM 6%).

In the sample obtained from BH7 (0.20-0.40m), a Lead concentration of 445mg/kg was recorded. This exceeds the current Atrisk SSV of 200mg/kg and as a consequence, some form of remediation will be required in these parts of the site in order for this **localised area** to be deemed suitable for the proposed residential end use with the consumption of home grown produce.

Groundwater

All determinands were recorded either below their respective limit of analytical detection or well below current ATRISK WSV's, EQS freshwater / saltwater standards or UK DWS for consumers taps or WHO Guidelines for Drinking Water Quality.

Remediation (brief)

Following completion of the development, the parts of the site surfaced with either foundation concrete, structures or permanent hard pavements such as driveways / parking areas and footpaths **will not** require any specific remediation, as an effective barrier will be established between potential soil contamination and end users of the site. However, **the proposed garden areas in the vicinity of BH7 where a slightly elevated concentration of Lead was recorded will require some form of remediation in order to render it suitable for their proposed residential 'res-with' end use. This will most likely take the form of a 'simple soil cover system'.** Fortunately, this part of the site comprises a single residential plot (Plot 7), remote from the majority of the larger development area and as such, can easily be treated independently from the main site.

To minimise soil waste disposal it may be possible to reuse the slightly contaminated soils removed from this garden areas in less sensitive areas of the site, such as beneath permanently paved areas. If however, this cannot be accommodated or the material is deemed to be not suitable then any removed near surface soils from this northern part of the site could be exported off site to an appropriate facility and should not be mixed with stockpiled soil from any other area of the site or distributed or placed over any part of the southern site area.

Site Workers and Operations

On the basis of the information which has now become available in this Phase II Intrusive Investigation, a revised conceptual site model and risk assessment has been developed for the site which is outlined in the matrix below. The temporary risk to construction / ground workers from identified Lead contamination and potential contamination which may be encountered during site development is minimal and could be mitigated through the use of adequate PPE and the provision of suitable welfare facilities. However, basic dust suppression measures should still be adopted for the duration of any earth works as a precaution, particularly if undertaken during dry and / or windy conditions. Haulage vehicles removing any excavated soils from site should be provided with a cover sheet to reduce the possibility of release of potentially contaminated airborne particulates during transportation

Existing Natural Protection of the Underlying Aquifer and Leachate Results

Percolation trials in the near surface silty soils, have demonstrated that these materials are modestly permeable and as such, these soils may not be providing an effective barrier to the vertical and lateral migration of any potentially mobile surface generated contamination that may be present. However, in the only area of the site where Lead contamination was identified, a groundwater sample from the same borehole did not contain elevated concentrations of dissolved Lead. Moreover, the Lead concentration within a sample obtained from slightly greater depth from the same borehole did not contain elevated concentrations of Lead. This demonstrates that the observed Lead contamination at this location is contained within the near surface soil and is not readily leachable. The underlying solid geology i.e. Oxford Clay is designated as an Unproductive Aquifer and would not be considered particularly sensitive to any contamination that is ultimately revealed.

Samples of the ‘perched’ groundwater were analysed for a similar range of contaminants as the soil samples. The results of the analysis have been compared to current ATRISK WSV’s for a residential end use, EQS for fresh and salt water and also UK Drinking water standards. All determinands were recorded either below their respective limit of analytical detection or well below current ATRISK WSV’s, EQS freshwater / saltwater standards, WHO standards or UK DWS for consumers taps.

Revised Conceptual Site Model Based on available information gathered in Phase 2 Intrusive Investigation

On the basis of the information which has now become available in the Phase 2 Investigation, a revised conceptual site model and risk assessment has been developed which is outlined in the matrix below.

Source	Pathway	Receptor	Any significant contamination present Y/N	Previous Risk Class Phase 1 Desk study	New Risk Class Based on Phase 2 Investigation
Contamination resulting from the use of the site as agricultural land and residential garden and the use of agricultural plant and equipment. Contamination that may have been generated through the construction and historical demolition of structures that occupy the site and the areas between the sites of proposed development. Possible contamination created during the installation of the electricity sub-station located on the site. Contamination that may have migrated onto the site from the drainage ditches that once flowed along the various site boundaries. The possible presence of deposits of made ground that may exist beneath parts of the site surface. Burning processes that have taken place within the site boundaries. Residual contamination from natural weathering of geological strata. Possible contamination that has migrated onto the site from the nearby commercial areas (Gas Works) and possible 'fall out' from construction and demolition of the structures that surround parts of the site (Residential). Potential Contaminants Include	Ingestion, Inhalation (dust) and / or Dermal Contact and Migration of Potentially Contaminated Leachate	Construction / Maintenance Workers / General Public during Excavations	Yes Localised	Moderate / Low	Low (with PPE) – The intrusive survey and associated chemical analysis has demonstrated that generally across the site, the concentrations of potential contaminants are well within current guideline limits for a residential end use. However, a localised elevated concentration of Lead was identified in the near surface soil at the location of BH7. Whilst the risk is minimal, site / ground workers should be made aware of the minor risks in this area of the site only and be equipped with appropriate PPE (overalls, gloves, dust masks, eye protection) during the earth works. Sufficient welfare facilities such as hand washing facilities should also be provided. Exposure to the contamination discovered within this survey would only be temporary and if the above precautions are adopted then the risk could be reduced to Low. If earthworks are carried out during very dry and dusty conditions, dust suppression measures should be put in place and all haulage vehicles removing soils from site should be covered to limit the release of airborne particulates.
		Future Site Users	Yes Localised	Moderate / Low	Low (provided cover system is introduced in affected area). The intrusive survey and associated chemical analysis has demonstrated that generally across the site, the concentrations of potential contaminants are well within current guideline limits for a residential end use. However, an elevated concentration of Lead was identified at the location of BH7. Based on the current site layout, it is envisaged that all garden areas for Plot 7 will require remediation to ameliorate the risk posed by Lead. (See Remediation Strategy below). <u>Any soil excavated from the area of Plot 7 should not be reused within any other sensitive gardens or landscaped areas within the proposed development.</u> Areas of the future development which will be covered by foundation concrete and permanent hard surfacing will not require remediation.
		Landscaping Plants	Yes Localised	Very Low	Very Low (provided cover system is introduced in affected area). The intrusive survey and associated chemical analysis has demonstrated that generally across the site, the concentrations of potential contaminants are well within current guideline limits for a residential end use. However, elevated concentrations of Lead were identified at the location of BH7. Based on the current site layout, it is envisaged that all garden areas for Plot 7 will require remediation to ameliorate the risk posed by Lead. (See Remediation Strategy below). <u>Any soil excavated from the area of Plot</u>

– PAH, TPH, B-TEX, metals, semi-metals, PCB, asbestos and TPH vapours.				<u>7. should not be reused within any other sensitive garden or landscaped areas within the proposed development.</u> In order to establish the suitability of the surface topsoil for re-use, three samples of the existing near surface topsoil from BH1 (0.30-0.50m), BH4 (0.20-0.40m) and BH7 (0.20m-0.40m) were tested for compliance in accordance with BS3882:2015. The results of the tests have been presented on the declaration of compliance numbered 103661(1)- 5, 10 and 6. The results of the tests indicate that all of the determinands included in the testing schedule are compliant with multi-purpose topsoil. This would indicate that the near surface soil Outside the area of BH7 / Plot 7 could potentially be reused as a multipurpose topsoil. Near surface soil obtained from the larger Southern site could be considered for re-use within proposed landscaped areas of the development or could be exported to other residential development sites. Care should be taken to ensure that any stockpiled certified ‘clean’ topsoil obtained from the southern part of the site is not cross contaminated with any other material and any stockpile should not be added to with any other material. Whilst, no particularly stony soils were encountered within the near surface soils, it should nevertheless be noted that it is a requirement of the NHBC that any coarse stone or other obstructions will need to be removed from the upper 300mm of soil in any garden or landscaped areas. As per requirements of NHBC Ch. 9.2. Any imported material / topsoil should have appropriate documentation to confirm that it is contamination free fit for purpose (ref. YALPAG Guidance).
	Water supply Pipes	No	Low	Very Low – The intrusive survey and associated chemical analysis has demonstrated that generally across the site, the concentrations of potential contaminants are well within current guideline limits for a residential end use with the consumption of home grown produce. Nevertheless, the local Water Authority may need to be contacted to ascertain the most appropriate materials for use in potable water supply pipes. Three soil samples (BH1 0.90-1.00m, BH4 0.90-1.00m and BH7 0.90-1.00m) were obtained from slightly greater depth and submitted for a UKWIR suite of tests that are commonly used to assist in the materials selection for potable water supply pipes. The results of the tests would suggest that PVC could be suitable for underground potable water supply pipes, <u>however, this should be confirmed at an early stage with the local water company.</u> Provided the correct procedures are implemented to protect water pipes from any observed contamination, then the risk class attributed to future site users would be Low.
	Underground Structures	No – sulphate does not exceed DS-1	Low	Very Low – Analysis of soil and groundwater samples, has recorded water-soluble sulphate concentrations within the design sulphate class DS-1 of the BRE Digest Special Digest 1 classification ‘Concrete in Aggressive Ground’. In accordance with the guidelines contained in Part 1 of the Digest and taking into consideration the specific soil and

					groundwater conditions (pH), the site can be assigned an ACEC Class AC-1.
		Controlled waters (Surface / Groundwater / Off Site Drains)	No	Low	Low – The intrusive survey and associated chemical analysis has demonstrated that generally across the site, the concentrations of potential contaminants are well within current guideline limits for a residential end use with the consumption of home grown produce. Based on groundwater testing at location in BH7, the localised elevated concentrations of Lead are not considered to have had any significant effect on the groundwater beneath the site. When the development is completed significant areas of the site will be covered with buildings and permanent hard surfacing. This will limit the amount of rainwater entering the near surface deposits and therefore reduce the potential for the generation of contaminated leachate. The Oxford Clay is classified as an unproductive aquifer and is therefore not considered to be highly sensitive. The site is not located within 500m of a groundwater SPZ and no groundwater abstractions have been identified within 2000m of the site. The nearest active surface water abstraction is situated 1759m southeast of the site where water is obtained from the Marlode Drain for direct spray irrigation. At such a distance this receptor is unlikely to be considered at risk from the study site.
	Migration of harmful ground gasses / vapours through permeable made ground and natural strata and accumulation in confined spaces.	Construction / Maintenance Workers	No	Moderate / Low	Low – The Groundsure Report has <u>not</u> identified any areas of in-filled ground within 250m of the study site, which may represent a credible potential generation source of harmful ground gasses such as methane and carbon dioxide. The absence of any significantly elevated TPH and B-TEX fractions within the soil samples submitted for testing suggests that the risk of hydrocarbon vapours entering the proposed new development is negligible. A TPH vapour survey is not considered necessary and no additional protection from hydrocarbon vapours is deemed to be required within the proposed development. The site is not located within a radon affected area as less than 1% of properties within the specified search area recorded above the action level. The Groundsure report indicates that <u>no radon protection measures are required</u> for new buildings or extensions to those already existing.
		Current and Future Site Users	No	Moderate / Low	Low – The Groundsure Report has not identified any areas of in-filled ground within 250m of the study site, which may represent a credible potential generation source of harmful ground gasses such as methane and carbon dioxide. The absence of any significantly elevated TPH and B-TEX fractions within the soil samples submitted for testing suggests that the risk of hydrocarbon vapours entering the proposed new development is negligible. A TPH vapour survey is not considered necessary and no additional protection from hydrocarbon vapours is deemed to be required within the proposed development. The site is not located within a radon affected area as less than 1% of properties

					within the specified search area recorded above the action level. The Groundsure report indicates that <u>no radon protection measures are required</u> for new buildings or extensions to those already existing.
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8.1 Cover System Design Remediation Strategy

In the proposed garden areas of Plot 7 where slightly elevated concentrations of Lead were recorded, will require some form of remediation in order to render these areas suitable for their proposed residential ‘res-with’ end use. This will most likely take the form of a ‘simple soil cover system’.

As the severity of the contamination in near surface soils was found to be slight, rather than severe, the most feasible remedial strategy would be the provision of a **simple cover system** of appropriate thickness over the garden areas identified above. This could be achieved by:-

- Removal of the surface soil / made ground in the garden areas to a depth equivalent to the design thickness of the cover system, and replacing it with the material of the cover system. This option would not result in any increase site surface level following completion of the development.
- The provision of a cover system of appropriate design and thickness over the existing ground surface in intended garden / landscaped areas. This option would result in an increase in the site surface level equivalent to that of the cover system thickness, the implications of which should be considered in the context of the specific nature and setting of the development as a whole.
- A compromise between the above, i.e. removal of a nominal thickness of the surface soil in garden and landscaped areas prior to the placing of the full cover system thickness.

Bearing in mind the current environmental pressures on waste disposal sites and the availability of natural replacement materials, economy in design, without compromising safety, is crucial at the present time, in order to limit the impact of remediation on the environment. Consequently if the layout of the development permits, it may be possible to dispose of some of the slightly contaminated material beneath less sensitive areas of the site, i.e. areas of permanent hard cover, or areas of proposed *Public Open Space* thereby reducing the volumes of soil which would otherwise need to be exported to landfill. Any soil excavated from the area of Plot 7 should not be reused within any other sensitive private garden or landscaped areas within the proposed development.

The principal exposure pathways at this site are considered to be the possibility of direct contact with, and the ingestion of contaminated material and the inhalation of contaminated dust. In this scenario, it is considered that the principal requirement would be the provision of a cover system of appropriate design and thickness to reduce the potential long-term exposure to contaminants by end users of the site to acceptable levels and to provide a suitable media for plant growth.

8.2 Cover System Design

The design of a simple cover system should take into consideration the methodology outlined in the BRE Publication ‘Cover Systems for Land Regeneration’ March 2004. The methodology assumes that intermixing of the cover system with the underlying material will occur over time and provides a means to determine a sufficient thickness of cover (given the nature and severity of the contamination) such that even with complete intermixing in the long-term, the concentrations of contaminants within the mixed zone remain within target guideline values.

Using the contamination test data obtained from the location of BH7 where ‘slight’ contamination was found to be present together with the procedures outlined in the BRE Publication ‘Cover Systems For Land Regeneration’ March 2004, it has been determined that the maximum thickness of cover required to mitigate the risk from Lead contamination over the garden areas identified above should be approximately 385mm (see enclosed spread sheet). A ‘clean’ cover of this thickness will also serve to provide an effective media for healthy plant growth. The calculation assumes that the imported soils of the cover system contain similar low levels of contamination as those encountered in the southern part of the site as this material is likely to be used as the cover system soil.

The BRE publication does not specify materials, which should be used for a cover system other than it should be of ‘good quality’ and should incorporate a topsoil layer, ideally at least 150mm in thickness or 30% of the cover thickness, whichever is the greater. Reference should be made to Specification for Topsoil BS 3882 2007. Natural soil including sands and gravels and low plasticity clays or mixtures of various soils should be acceptable, provided it has been certified ‘clean’ at source and has the appropriate documentation demonstrating it is relatively contamination free and suitable for use within a residential setting (see YALPAG - Verification Requirements for Cover Systems guidance). The provision of a layer of granular material within the cover system may also serve to act as a capillary break particularly if the underlying sub-soils are clayey. The existing ground should be suitably compacted prior to placement of the cover system (as set out in CIRIA SP 105). This will inhibit root penetration, infiltration, burrowing animals and instability but should not be compacted to such an extent that it will induce water logging.

Depending on the preferred method of placement (see cover system design above), the provision of a cover system may elevate the general site level and the implications of this should be considered in the light of the proposed development and also within the context of the existing residential setting and the other areas of the site.

According to NHBC Guidance chapter 9.2, ‘the top 300mm of any soil cover in garden and landscaped areas should be free from obstruction of which, at least, the top 100mm must be topsoil’.

Where soil remediation has been undertaken, **a validation report may be required to verify that the works have been completed to a satisfactory standard in compliance with the above remediation recommendations.**

It is recommended that if imported topsoil and sub-soils are to be considered for use in the designated garden areas then appropriate documentation should be acquired and inspected by ourselves or similar consultants **prior** to its importation to site.

It is likely the developer will nominate to use site won topsoil from the **southern area of the site** for use in the cover system for area Plot 7 / BH7 as the near surface soil in the southern part of the site has been shown to be compliant with BS3882 topsoil specification and has a low contamination status suitable for residential home growing applications. **However topsoil from the smaller Northern site i.e. area Plot 7 / BH7 has been shown to have elevated levels of Lead contamination and should NOT be re-used as a topsoil in any residential garden areas.** As the levels of Lead contamination from BH7 are only slight / moderate, this material could potentially be recycled under areas of permanent hard cover or used as a topsoil in ‘public open space areas’ or in ‘commercial landscaping’ environments. It may however be the preference of the developer to simply remove this material from site.

9.0 **Precautionary Measures**

Some precautionary measures are recommended and these are listed:-

- Ground workers involved in the development should be provided with appropriate personal protective equipment in order to mitigate the risk of temporary exposure to the slight soil contamination identified at the site.
- If materials suspected of being significantly contaminated are revealed during site preparation, then it will be necessary to take representative samples and carry out additional analysis. All such occurrences should be photographed, carefully logged and the extent shown on a copy of the site plan. Remediation work should not take place until this potential ‘new’ contamination has been fully identified and a remediation strategy approved by the local authority. Any soils suspected of being contaminated, which are stockpiled, should be placed on sheeted areas and representative samples submitted for analysis. Upon receipt of the results, these materials will be either available for re-use or exported to an authorized landfill.
- **If it is necessary to export excavated soil from the site, this should be to an appropriate receiving facility. Any documentation relating to the export of soils from site should be retained for possible future inspection by the local authority Environmental Protection Unit.** Changes in legislation concerning hazardous waste may have an effect on the disposal costs of any materials from the site. Compliance testing may be required in order to classify materials within the Waste Acceptance Criteria (WAC).
- The risk to site users, neighbouring occupants, and ‘general’ public and to construction workers from airborne pollution is considered to be generally ‘low’ provided basic dust suppression measures are adopted for the duration of any earth works particularly during dry and dusty conditions. Haulage vehicles removing any excavated soils from site should be provided with a cover sheet to reduce the possibility of release of potentially contaminated airborne particulates during transportation.
- If potable water supply pipes are to be placed within the surface soils, these are likely to necessitate protection. A soil sample was submitted for a UKWIR suite of tests that are commonly used to assist in the materials selection for potable water supply pipes. The results of the test would suggest that PVC or PE would be suitable for underground potable water supply pipes, however, this should be confirmed at an early stage with the local water company who may wish to review all available contamination test data.

Provided the measures detailed above are implemented, then the long term risk to human health and other environmental receptors is considered to be generally Low.

10.0 Engineering Comments – Geotechnical

Foundations for all units (Excluding Plot 3)

The recent borings have revealed that the site is initially overlain by a covering of topsoil comprising dark brown, silty, soil containing very occasional fine fragments of brick and other assorted stones. At depths of between 0.32m and 0.45m beneath the surface, this rests on deposits of silt and clayey silt which subsequently extended to the full depth of the sampling boreholes, some 2.55m beneath the surface. These deposits were generally soft or poorly compacted and judging from the results of the deeper dynamic penetration tests, these weak deposits extend to at least 5.00m depth.

The near surface deposits of ‘loose’ silt/clayey silt cannot be considered an entirely reliable bearing strata for conventional strip foundations, as even modest loading could result in settlements in excess of 25mm. As an alternative, **consideration could be given to employing reinforced surface raft foundations for most of the proposed new dwellings.** Raft foundations

have an inherent stiffness not available in strip footings and by virtue of their load spreading capability, are more resistant to differential settlements.

As a preliminary guide to design it has been calculated that for a raft foundation constructed on a blanket of compacted granular material with a typical domestic loading of around 25kN/m², the long term settlement beneath the centre of the raft slab would be approximately 12mm. This would reduce to approximately half of this figure at the edges and 25% at the corners.

Foundations Plot No.3

At the location of BH4 (Plot No.3), 'very loose' deposits of **made ground** were encountered to a depth of 1.90m beneath the surface which were further underlain by deposits of **soft, organic, silty clay and clayey silt to a depth of 3.55m beneath the surface**. It is suspected that these deposits are associated with a former, narrow water course / drain, which on historical Ordnance Survey mapping, is shown to have passed through this part of the site and was then subsequently in-filled. As a consequence, the ground conditions beneath the dwelling on Plot 3 could be quite variable and **here on Plot 3 pile foundations may be a more appropriate bearing solution than a raft.**

The carrying capacity of piles is fundamentally related to their method of installation therefore advice should be taken from experienced piling contractors in order to establish the most appropriate type and length of piles to adopt given the prevailing geological conditions. The results of the dynamic penetration test undertaken at the location of BH4 established the development of 'dense' strata at a depth of around 6.65m beneath the surface which should provide a satisfactory bearing horizon for piles.

For preliminary design purposes it has been estimated that for say a 200mm to 220mm diameter, driven and cast in situ, steel cased **mini pile** driven to an appropriate 'set' within these 'dense' deposits, the carrying capacity of an individual pile would be of the order of 150kN to 200kN. Pile lengths are likely to be of the order 8.00m, however, this may need to be verified by taking a further deeper percussive cable tool boring on this plot to establish in more detail the nature of the deposits at depth.

If piled foundations are to be employed then a fully suspended ground floor construction (i.e. block and beam) would be more appropriate than a ground bearing floor slab.

Shrink-ability

The near surface deposits essentially comprise silts, which have been found to be essentially non-plastic. As such these deposits would not be susceptible to significant volume change associated with fluctuations in soil moisture content that could be exacerbated by root action. Any trees and vegetation which may be located within influencing distance of proposed dwellings are therefore unlikely to have any significant on foundation design.

Groundwater

Groundwater seepages were encountered in all of the sampling borings at depths of between 1.50m and 1.70m beneath the surface. On completion, standing groundwater levels were measured at depths of between 1.21m and 1.53m beneath the surface. It is therefore possible that some slight to moderate groundwater infiltrations may be experienced in deeper excavations created for underground infrastructure.

Shallow excavations above the water are likely to be temporarily stable, however, deeper excavations which encounter groundwater ingress may become unstable and require the provision of temporary trench supports and dewatering facilities to ensure that construction can proceed under optimum conditions.

Pavement Design

California Bearing Ratio tests (CBR's) were performed at the 2 No. locations on the route of the proposed estate road in accordance with the TRL 587 CBR Tests DCP method. It was considered that the formation level of the new estate road would be at around 0.35m beneath the existing surface, i.e. below the layer of topsoil. The recorded resistances to penetration in the natural Tidal Flat Deposits indicate CBR values varying between 5% and 9%. This being the case, it may be prudent to **adopt the lower CBR value of 5% for preliminary design purposes.**

Drainage

At the locations of boreholes BH1, BH3, BH5 and BH7 'falling head' (variable head) permeability tests were performed in order to assess the relative permeability of the near surface stratum *in situ*. The tests were undertaken in open probe sampling boreholes within the natural Tidal Flat Deposits of silt. In order ensure the side walls of the boreholes remained stable throughout the tests, lengths of 50mm diameter slotted standpipe was inserted into the borings and the annulus surrounded by fine grained well screen gravel. The boreholes were then filled to the surface with water and the time taken for the water to dissipate was subsequently monitored.

The results of the tests have been presented on the enclosed data sheets and percolation graphs and indicate soil infiltration rates of between **1.03×10^{-2} mm/s and 1.24×10^{-1} mm/s.** These results indicate a fairly rapid rate of soil infiltration, suggesting that **the stratum underlying the site could be considered for the disposal of surface water generated by the proposed residential development.**

It should be noted that the standing groundwater levels were measured at depths of between 1.23m and 1.53m beneath the surface. This may restrict the storage capacity of underground 'soakaways' as the base of any 'soakaway' system will need to be above the level of the water table throughout its operation. In order to achieve the required storage capacity, **the use of shallower soakaway trenches may be more appropriate than deeper chambers.**

The opinions expressed in this Report are consistent with guideline standards available at the time of its preparation and assume that the ground conditions do not vary significantly beyond the range revealed within the agreed scope and budget for the investigation. There may, however, be conditions at the site, which have not been identified by the investigation and therefore will not have been considered in the report. Accordingly a careful watch should be maintained during any future ground works at the site and the report and its conclusions reviewed and / or modified accordingly within the context of the nature any development intended at the site.

Prepared by:

.....**R. L. Trattles** (Director)

Reviewed by:

.....**S. P. Trattles** (Director)

TLP Ground Investigation Ltd.

RT/BBL/AM /MWD/01/22

Site Location Plan

Residential Development, Maple Way, Donington



Site Location Plan

Residential Development, Maple Way, Donington



Borehole Location Plan

Residential Development, Maple Way, Donington



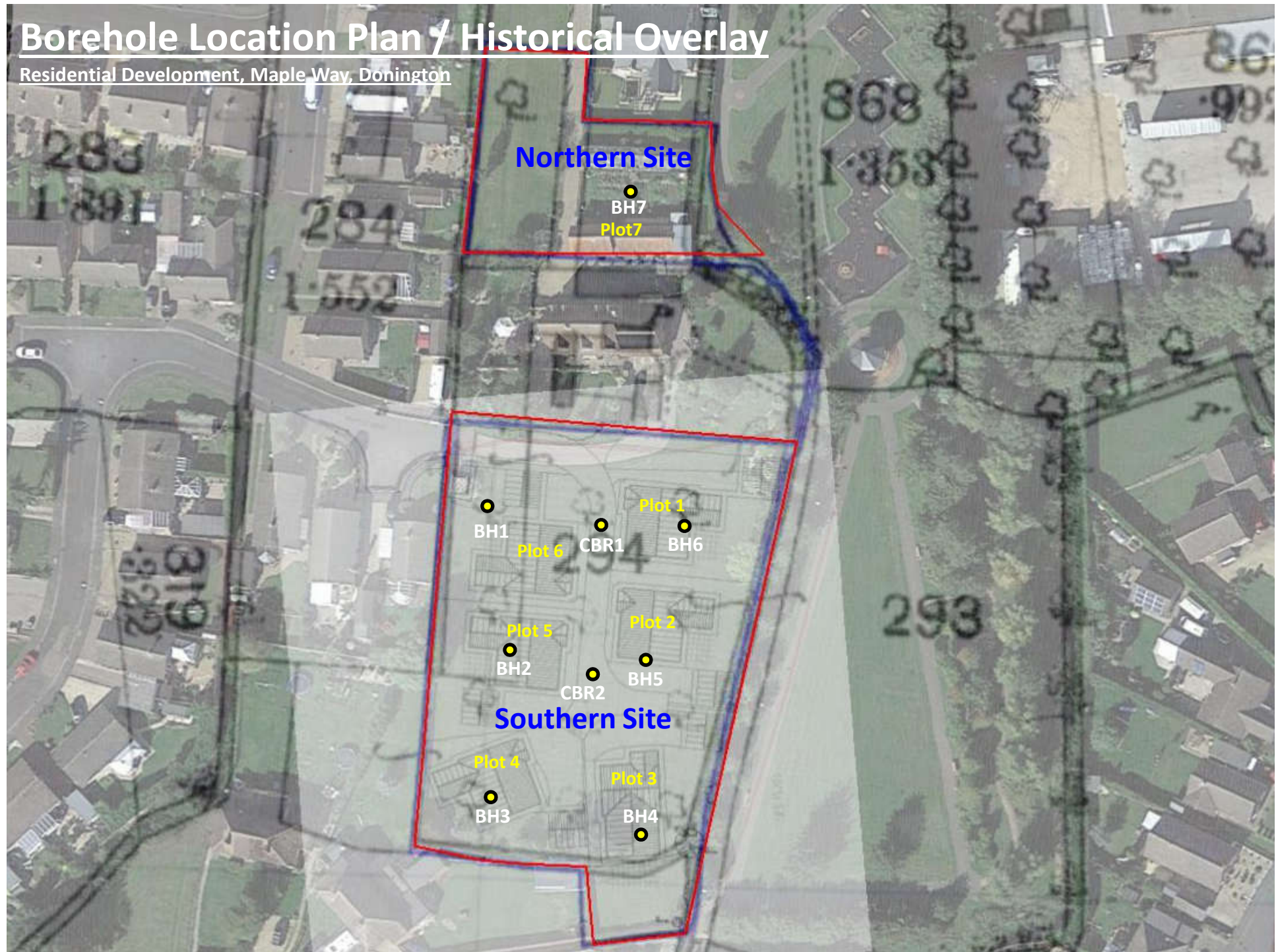
Borehole Location Plan

Residential Development, Maple Way, Donington



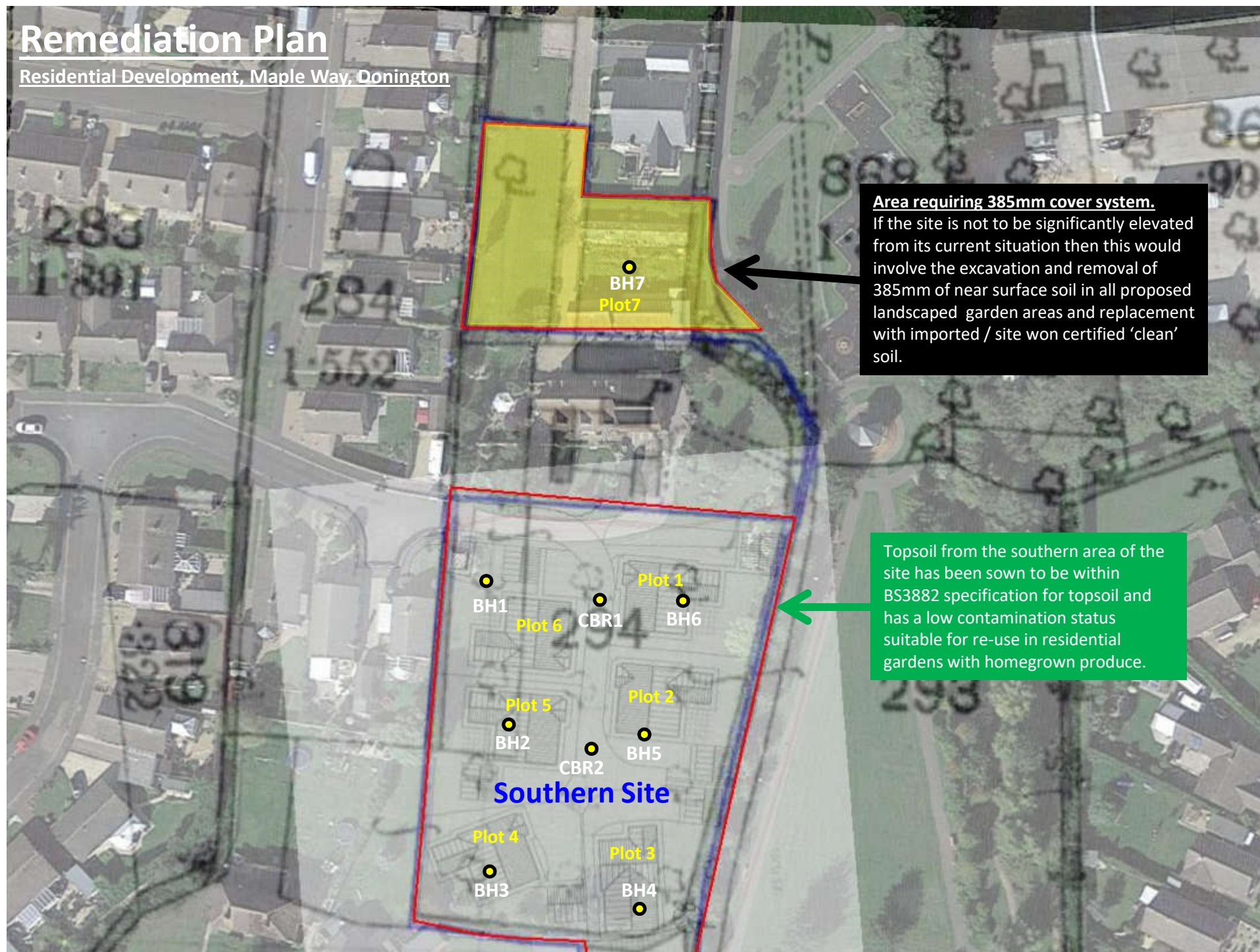
Borehole Location Plan / Historical Overlay

Residential Development, Maple Way, Donington



Remediation Plan

Residential Development, Maple Way, Donington



T.L.P. Ground Investigations Ltd.		Borehole Record Dynamic Probe / Sampler.		Location : Proposed Residential Development, Maple Way, Donington.		Borehole No. BH1.		
Carried out For Brown Builders Ltd.		Ground Level		Co-ordinates		Date : 07.12.21.		
Description		Reduced Level	Legend	Depth & Thickness	Samples/Tests			Field Records
					Depth	samples Type No.	Test	
Loose, dark brown, silty Topsoil containing very occasional fine fragments of brick. Topsoil				(0.45)	0.30 - 1.05	U 1	S N4	
Loose, mid brown, mottled rust brown and grey, slightly clayey Silt.				0.45 (0.25) 0.70				
Loose, mid brown, mottled grey Silt.					1.05 - 2.10	U 2	S N4	
Tidal Flat Deposits				(1.60)				
Loose, mid brown, silty, fine Sand.				2.10 2.30 2.40 2.55		D 1	S N5 DCSH N3	
Observations At 2.55m depth, the borehole was extended using dynamic penetration techniques (DCSH). The results of the tests have been interpreted as 'N values' and these are indicated on the enclosed borehole record sheets opposite and overleaf.					2.85		DCSH N4	
					3.30		DCSH N2	
					3.75		DCSH N9	
					4.20		DCSH N5	
					4.65		DCSH N7	
					5.10		DCSH N15	
S.P.T. : Where full penetration has not been achieved the number of blows for the quoted penetration is given (Not 'N' value) Depths: All depths and reduce levels in metres. Thickness given in brackets in depth column.		Samples/Test Key. D Disturbed Sample B Bulk Sample W Water Sample U Undisturbed Core sample S Standard Penetration Test V Vane Test		Remarks				Logged by S. P. T. / J. T.
								Scale 1 : 25
								Fig.

T.L.P. Ground Investigations Ltd.		Borehole Record Dynamic Probe / Sampler.		Location : Proposed Residential Development, Maple Way, Donington.		Borehole No. BH1.			
Carried out For Brown Builders Ltd.		Ground Level		Co-ordinates		Date : 07.12.21.			
Description		Reduced Level	Legend	Depth & Thickness	Samples/Tests			Field Records	
					Depth	samples			Test
			Type	No.					
					5.55			DCSH N23	
					6.00			DCSH N21	
					6.45			DCSH N25	
					6.90			DCSH N35	
					7.35			DCSH N38	
Observations Groundwater seepages were encountered at a depth of around 1.70m b.g.l. On completion the groundwater level in the open hole was subsequently measured at 1.53m beneath the surface. In order to assess the relative permeability of the near surface stratum <i>in situ</i> , a 'falling head' (variable head) permeability test was performed within the completed borehole. The results of the tests are presented on the enclosed data sheets.					7.80				
		End of Borehole							
S.P.T. : Where full penetration has not been achieved the number of blows for the quoted penetration is given (Not 'N' value) Depths: All depths and reduce levels in metres. Thickness given in brackets in depth column.		Samples/Test Key. D Disturbed Sample B Bulk Sample W Water Sample U Undisturbed Core sample S Standard Penetration Test V Vane Test		Remarks				Logged by S. P. T. / J. T.	
				Scale 1 : 25					
				Fig.					

T.L.P. Ground Investigations Ltd.		Borehole Record Dynamic Probe / Sampler.		Location : Proposed Residential Development, Maple Way, Donington.		Borehole No. BH2.	
Carried out For Brown Builders Ltd.		Ground Level		Co-ordinates		Date : 07.12.21.	
Description		Reduced Level	Legend	Depth & Thickness	Samples/Tests		Field Records
					Depth	samples Type No.	Test
Loose, dark brown, silty, slightly clayey Topsoil containing very occasional fine fragments of brick. Topsoil				(0.48)	0.30 - 1.05	U 1	S N6
Loose, mid brown, mottled rust brown and grey, slightly clayey Silt.				0.48 (0.27)			
Loose, mid brown, mottled grey Silt.				0.75	1.05 - 2.10	U 2	S N6
Tidal Flat Deposits					2.10	D 1	S N8
Observations Groundwater seepages were encountered at a depth of 1.50m beneath the surface and on completion the groundwater level in the open hole was subsequently measured at 1.21m beneath the surface.				2.55 End of Borehole			
S.P.T. : Where full penetration has not been achieved the number of blows for the quoted penetration is given (Not 'N' value) Depths: All depths and reduce levels in metres. Thickness given in brackets in depth column.		Samples/Test Key. D Disturbed Sample B Bulk Sample W Water Sample U Undisturbed Core sample S Standard Penetration Test V Vane Test		Remarks			Logged by S. P. T. / J. T.
							Scale 1 : 25
							Fig.

T.L.P. Ground Investigations Ltd.		Borehole Record Dynamic Probe / Sampler.		Location : Proposed Residential Development, Maple Way, Donington.		Borehole No. BH3.	
Carried out For Brown Builders Ltd.		Ground Level		Co-ordinates		Date : 07.12.21.	
Description		Reduced Level	Legend	Depth & Thickness	Samples/Tests		Field Records
					Depth	samples Type No.	Test
Loose, dark brown, silty, slightly clayey Topsoil containing very occasional fine fragments of brick.				(0.43)	0.35 - 0.95	U 1	S N8
Loose, mid brown, mottled rust brown and grey, slightly clayey Silt.				0.43 (0.22) 0.65			
Loose, mid brown, mottled grey Silt.					0.95 - 2.10	U 2	S N4
Tidal Flat Deposits							
Observations Groundwater seepages were encountered at a depth of 1.60m beneath the surface and on completion the groundwater level in the open hole was subsequently measured at 1.35m beneath the surface. In order to assess the relative permeability of the near surface stratum, a 'falling head' (variable head) permeability test was performed in the completed borehole. The results of the test are presented on the enclosed data sheets.				2.10 End of Borehole			
S.P.T. : Where full penetration has not been achieved the number of blows for the quoted penetration is given (Not 'N' value) Depths: All depths and reduce levels in metres. Thickness given in brackets in depth column.		Samples/Test Key. D Disturbed Sample B Bulk Sample W Water Sample U Undisturbed Core sample S Standard Penetration Test V Vane Test		Remarks			Logged by S. P. T. / J. T.
							Scale 1 : 25
							Fig.

T.L.P. Ground Investigations Ltd.		Borehole Record Dynamic Probe / Sampler.		Location : Proposed Residential Development, Maple Way, Donington.			Borehole No. BH4.				
Carried out For Brown Builders Ltd.				Ground Level		Co-ordinates		Date : 07.12.21.			
Description				Reduced Level	Legend	Depth & Thickness	Samples/Tests			Field Records	
							Depth	samples			Test
Type	No.										
Loose, dark brown, silty, slightly clayey Topsoil containing very occasional fine fragments of stone. Topsoil / Disturbed Ground Loose, mid brown, silty, slightly clayey soil containing occasional fine fragments of stone. Soft, brown, mottled rust brown, silty clay containing occasional fine fragments of stone.						(0.45)	0.20 - 1.05	U	1	S N10	26kN/m²
						0.45					
						(0.65)					
						1.10	1.05 - 2.10	U	2	S N0 Vane	
						1.40	1.10			Vane	
Soft, mid grey, organic, silty Clay. Tidal Flat Deposits Very loose, mid grey, organic, slightly clayey Silt. <u>Observations</u> Groundwater seepages were encountered at a depth of 1.50m beneath the surface and on completion the groundwater level in the open hole was subsequently measured at 1.29m beneath the surface. At 3.50m the borehole was extended using dynamic penetration techniques. The results of the test are interpreted as 'N values' (blows for 300mm penetration) and these are presented opposite and overleaf.						(0.80)	1.40			Vane	28kN/m²
						1.70				Vane	27kN/m²
						1.90					
						(0.20)	2.00			Vane	27kN/m²
						2.10	2.10 - 3.10	U	3	S N2	
S.P.T. : Where full penetration has not been achieved the number of blows for the quoted penetration is given (Not 'N' value) Depths: All depths and reduce levels in metres. Thickness given in brackets in depth column.				Samples/Test Key. D Disturbed Sample B Bulk Sample W Water Sample U Undisturbed Core sample S Standard Penetration Test V Vane Test		Remarks				Logged by S. P. T. / J. T.	
										Scale 1 : 25	
										Fig.	

T.L.P. Ground Investigations Ltd.		Borehole Record Dynamic Probe / Sampler.		Location : Proposed Residential Development, Maple Way, Donington.			Borehole No. BH4.		
Carried out For Brown Builders Ltd.				Ground Level		Co-ordinates		Date : 07.12.21.	
Description				Reduced Level	Legend	Depth & Thickness	Samples/Tests		Field Records
							Depth	samples	
		Type	No.						
Observations Groundwater seepages were encountered at a depth of around 1.50m and on completion the groundwater level in the open hole was subsequently measured at 1.29m beneath the surface.					5.30			DCSH N15	
					5.75			DCSH N14	
					6.20			DCSH N18	
					6.65			DCSH N32	
					7.10			DCSH N44	
					7.55				
S.P.T. : Where full penetration has not been achieved the number of blows for the quoted penetration is given (Not 'N' value) Depths: All depths and reduce levels in metres. Thickness given in brackets in depth column.				Samples/Test Key. D Disturbed Sample B Bulk Sample W Water Sample U Undisturbed Core sample S Standard Penetration Test V Vane Test		Remarks		Logged by S. P. T. / J. T.	
		Scale 1 : 25							
		Fig.							

T.L.P. Ground Investigations Ltd.		Borehole Record Dynamic Probe / Sampler.		Location : Proposed Residential Development, Maple Way, Donington.			Borehole No. BH5.				
Carried out For Brown Builders Ltd.				Ground Level		Co-ordinates		Date : 07.12.21.			
Description				Reduced Level	Legend	Depth & Thickness	Samples/Tests			Field Records	
							Depth	samples			Test
Type	No.										
Loose, dark brown, silty, slightly clayey Topsoil containing very occasional fine fragments of brick. Topsoil						(0.32)	0.20 - 0.90	U	1	S N7	
Loose, buff brown Silt .						0.32	(0.13)				
Loose, brown, mottled light grey, silty Clay .						0.45					
						(0.22)					
						0.67	0.90 - 2.10	U	2	S N5	
Loose, buff brown, mottled rust brown Silt .											

T.L.P. Ground Investigations Ltd.		Borehole Record Dynamic Probe / Sampler.		Location : Proposed Residential Development, Maple Way, Donington.		Borehole No. BH6.		
Carried out For Brown Builders Ltd.		Ground Level		Co-ordinates		Date : 07.12.21.		
Description		Reduced Level	Legend	Depth & Thickness	Samples/Tests			Field Records
					Depth	samples Type No.	Test	
Loose, dark brown, silty, slightly clayey Topsoil containing very occasional fine fragments of brick. Topsoil				(0.45) 0.35 - 0.95	U	1	S N7	
Loose, buff brown Silt. Loose, buff brown, mottled rust brown Silt. Tidal Flat Deposits				0.45 (0.25) 0.70 0.95 - 2.10	U	2	S N6	
Observations Groundwater seepages were encountered at a depth of 1.60m beneath the surface and on completion the groundwater level in the open hole was subsequently measured at 1.31m beneath the surface. In order to establish the relative permeability of the near surface stratum, a 'falling head' (variable head) permeability test was performed in the completed borehole. The results of the test are presented on the enclosed data sheets.				2.10 2.55 End of Borehole	D	1	S N5	
S.P.T. : Where full penetration has not been achieved the number of blows for the quoted penetration is given (Not 'N' value) Depths: All depths and reduce levels in metres. Thickness given in brackets in depth column.		Samples/Test Key. D Disturbed Sample B Bulk Sample W Water Sample U Undisturbed Core sample S Standard Penetration Test V Vane Test		Remarks			Logged by S. P. T. / J. T.	
							Scale 1 : 25	
							Fig.	

T.L.P. Ground Investigations Ltd.		Borehole Record Dynamic Probe / Sampler.		Location : Proposed Residential Development, Maple Way, Donington.			Borehole No. BH7.				
Carried out For Brown Builders Ltd.				Ground Level		Co-ordinates		Date : 07.12.21.			
Description				Reduced Level	Legend	Depth & Thickness	Samples/Tests			Field Records	
							Depth	samples			Test
Type	No.										
Loose, dark brown, silty, slightly clayey Topsoil containing very occasional fine fragments of brick. Topsoil Loose, mixed, brown and dark brown, silty, slightly clayey Topsoil containing very occasional fine assorted stone fragments.						(0.35)	0.00 - 1.00	U	1	S N4	
Soft/loose, brown, mottled rust brown, very silty Clay /clayey Silt . Tidal Flat Deposits						0.35 (0.20)	0.50			Vane	30kN/m²
						(0.75)	0.80			Vane	33kN/m²
						1.00 - 2.10	1.10	U	2	S N10	32kN/m²
						1.30					
											
											
											
											
											
											
											
											
											
											
											
											
											
											
											
											
											
											

TRL 587 CBR Analysis

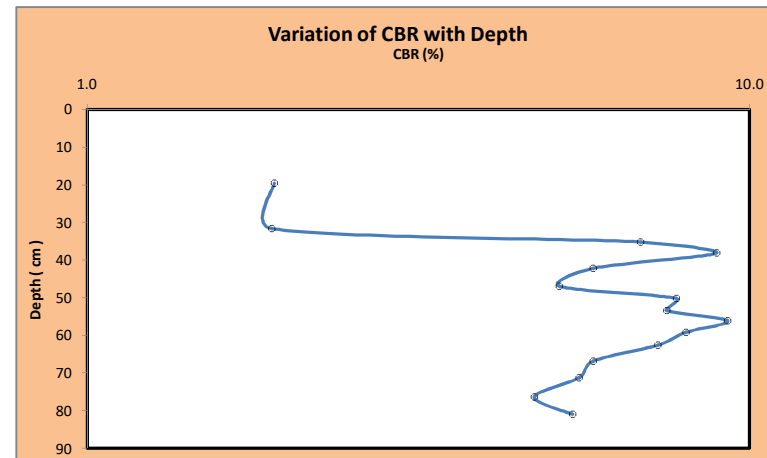
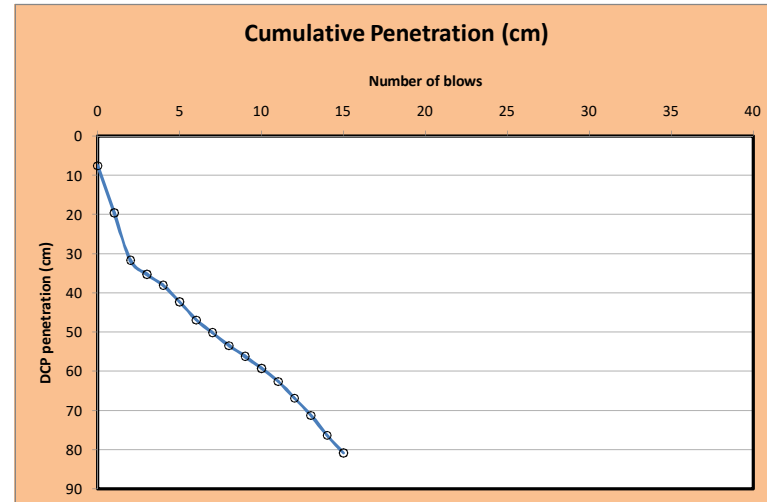
Site	Development Site - Maple Way, Donington
Sample Location	CBR 1
Date of Test	07/12/2021

ANALYSIS OF DYNAMIC CONE PENETRATION TEST RESULT

[illegible]

Assumed Topsoil

Tidal Flat



TRL 587 CBR Analysis

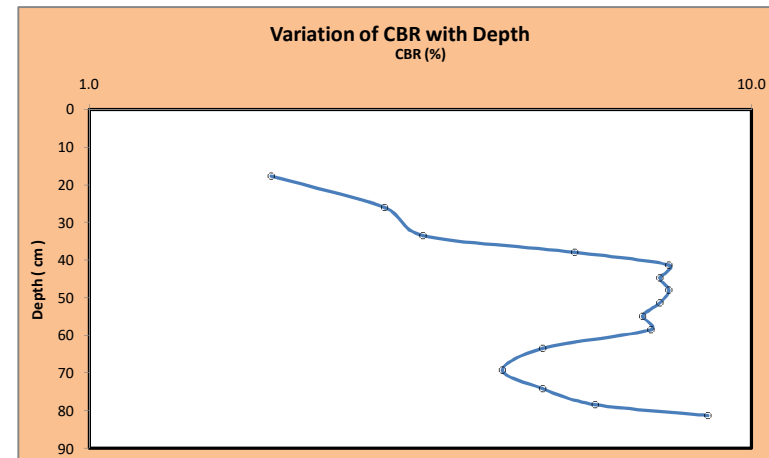
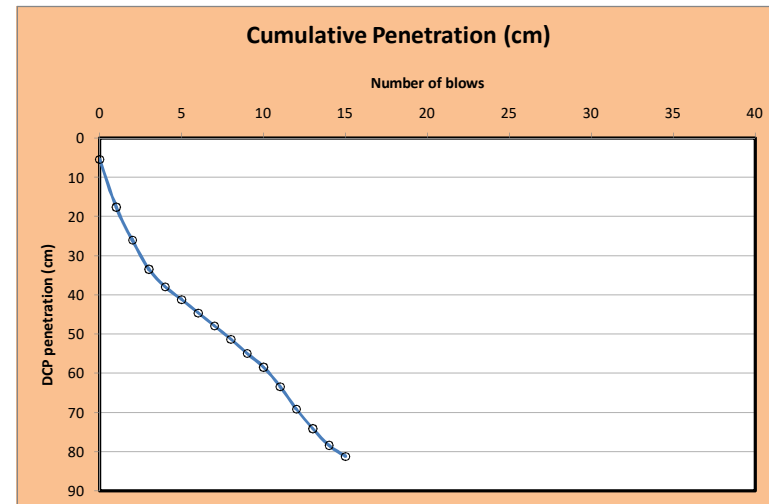
Site	Development Site - Maple Way, Donington
Sample Location	CBR 2
Date of Test	07/12/2021

ANALYSIS OF DYNAMIC CONE PENETRATION TEST RESULT

[illegible]

Assumed Topsoil

Tidal Flat

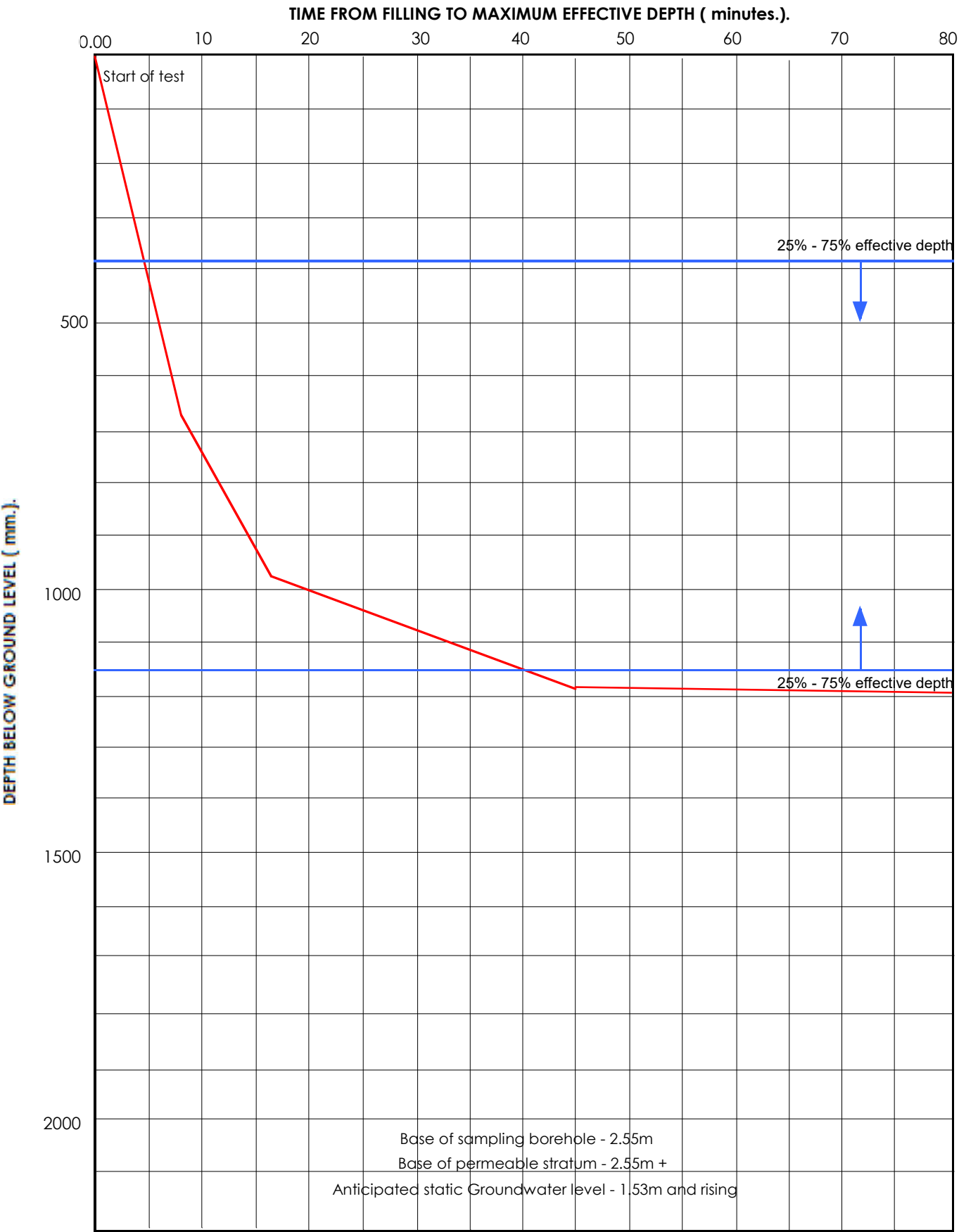


Percolation Graph

Falling Head Test

Soak BH 1

Project Location : Maple Way Donington, Lincolnshire.
Client : Brown Builders Ltd.
Date of SI : 07/12/2021

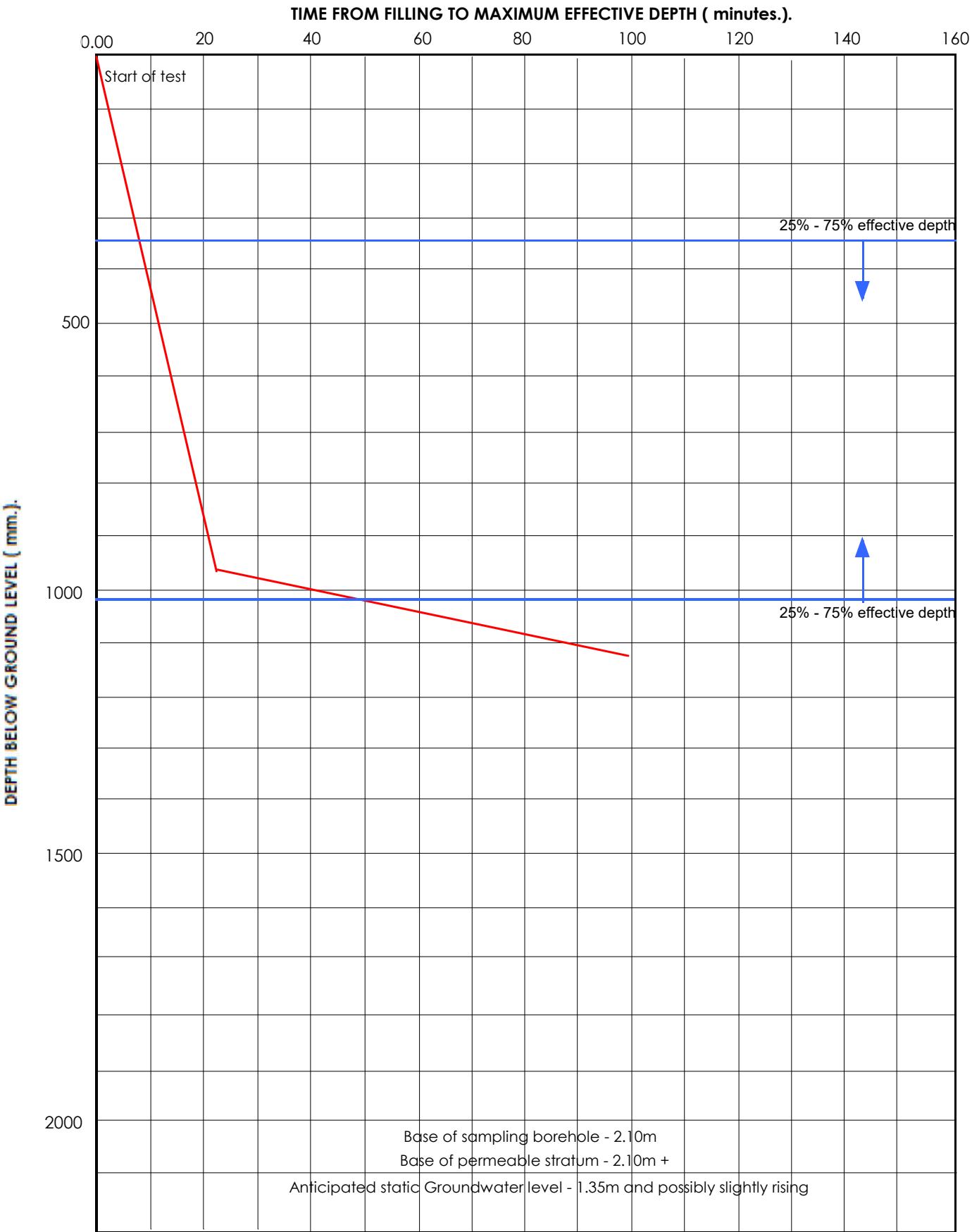


Percolation Graph

Falling Head Test

Soak BH 3

Project Location : Maple Way Donington, Lincolnshire.
Client : Brown Builders Ltd.
Date of SI : 07/12/2021

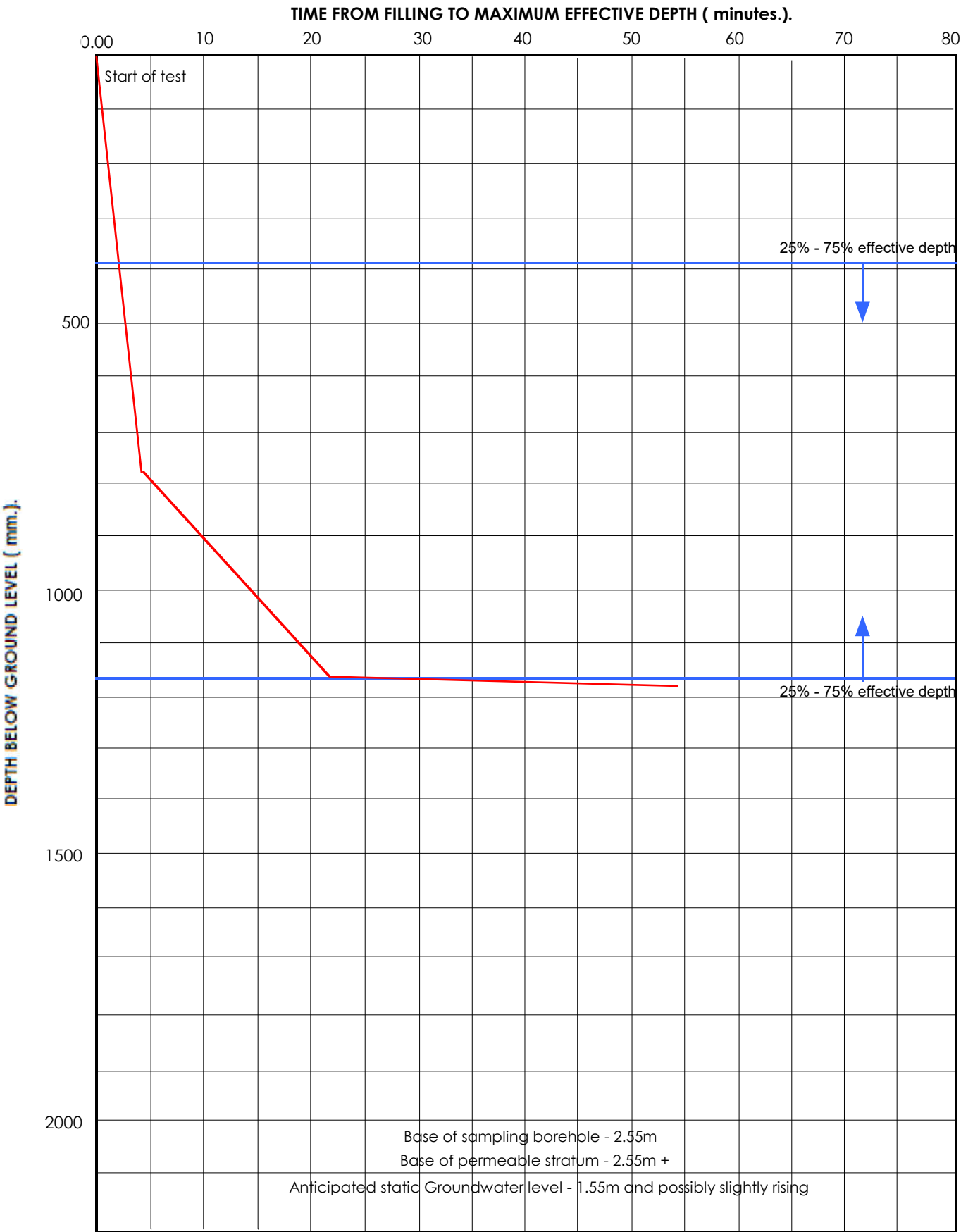


Percolation Graph

Falling Head Test

Soak BH 5

Project Location : Maple Way Donington, Lincolnshire.
Client : Brown Builders Ltd.
Date of SI : 07/12/2021

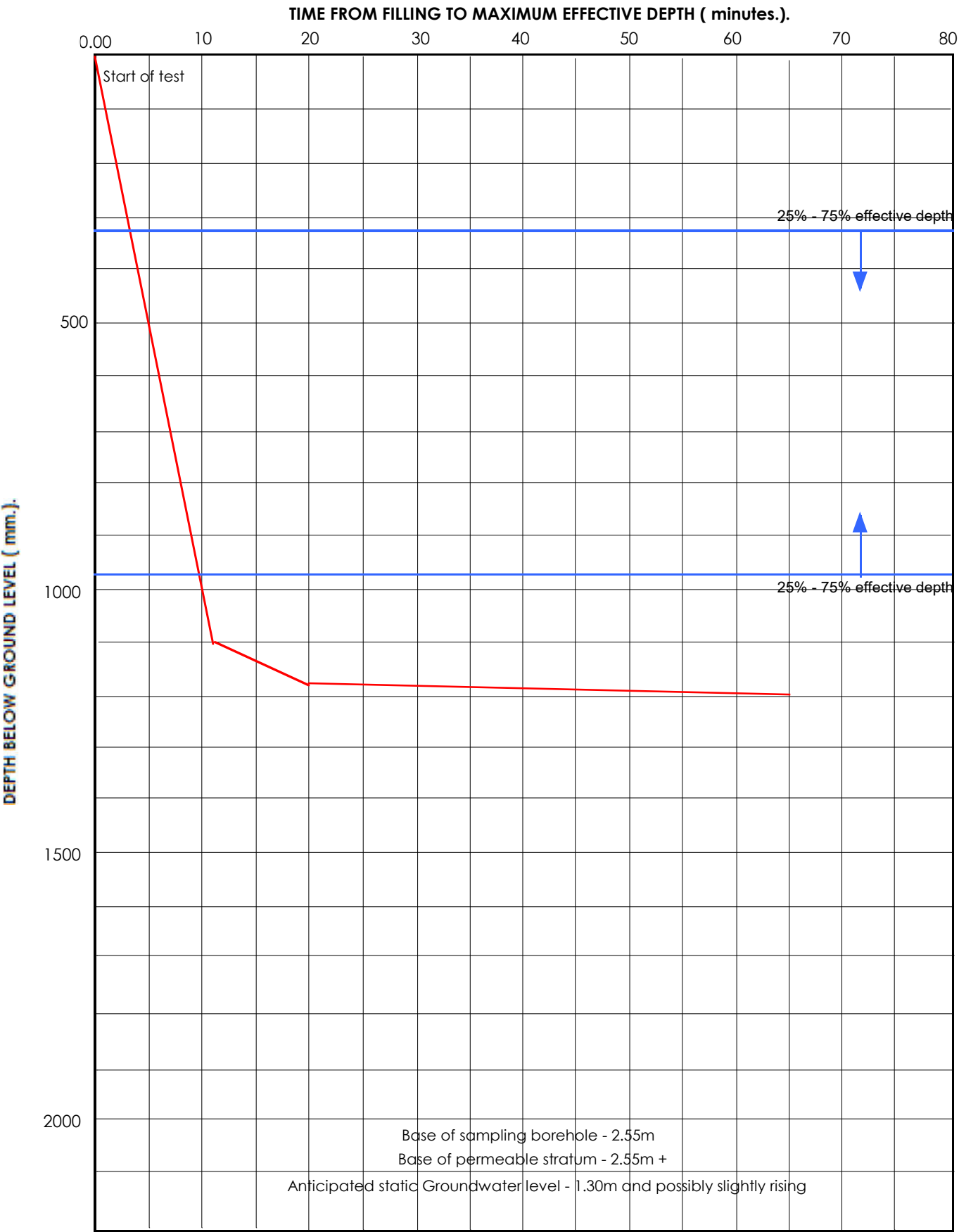


Percolation Graph

Falling Head Test

Soak BH 7

Project Location : Maple Way Donington, Lincolnshire.
Client : Brown Builders Ltd.
Date of SI : 07/12/2021



Calculation of Soil Infiltration Rate
Maple Way, Donington

Parameter	BH1	BH3	BH5	BH7			
diameter of borehole	0.105	0.105	0.105	0.105			
Height of water at start of considered zone (m) H1	1.147	1.0125	1.1625	97.5			
Height of water at end of considered zone (m) H2	0.382	0.3375	0.3875	0.325			
Considered depth change (m) = H1 - H2	0.765	0.675	0.775	97.175			
Volume out flowing within considered depth	0.006624146	0.005844835	0.006710737	0.841439771			
Mean effective depth during outflow	0.7645	0.675	0.775	48.9125			
Mean surface area during outflow	0.260842515	0.231319397	0.264306121	16.14329007			
Time of considered outflow (mins)	36	41	21	7			
Soil infiltration rate m/s	1.18E-05	1.03E-05	2.02E-05	1.24E-04			
Soil infiltration rate mm/s	1.18E-02	1.03E-02	2.02E-02	1.24E-01			
Soil infiltration rate m/hour	0.0423	0.0370	0.0725	0.4468			

Calculations from BRE 365 1991

Typical Percolation Values	Value mm/s
Gravels	>10
Sands	1 to 1 x 10E-2
Fine Sands / Coarse Silts	1x10E-2 to 1 x 10E-4
Silts	1x10E-4 to 1 x 10E-6
Clays	< 1 x 10E-6

Table from - Elements of Soil Mechanics for Civil & Mining Engineers (G .N. Smith 1974)



ANALYTICAL TEST REPORT

Contract no: 103661

Contract name: Maple Way, Donington

Client reference: 8122021

Clients name: TLP Ground Investigations

Clients address: 64 Wentworth Road
South Park Industrial Estate
Scunthorpe
DN17 2AZ

Samples received: 09 December 2021

Analysis started: 09 December 2021

Analysis completed: 21 December 2021

Report issued: 21 December 2021

Key

U	UKAS accredited test
M	MCERTS & UKAS accredited test
\$	Test carried out by an approved subcontractor
I/S	Insufficient sample to carry out test
N/S	Sample not suitable for testing
NAD	No Asbestos Detected

Approved by:

John Campbell
Director

Chemtech Environmental Limited

SAMPLE INFORMATION

MCERTS (Soils):

Soil descriptions are only intended to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions. MCERTS accreditation applies for sand, clay and loam/topsoil, or combinations of these whether these are derived from naturally occurring soils or from made ground, as long as these materials constitute the major part of the sample. Other materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

Lab ref	Sample id	Depth (m)	Sample description	Material removed	% Removed	% Moisture
103661-1	BH1	0.30-0.50	Sandy Loamy Clay with Roots	-	-	19.5
103661-2	BH1	0.90-1.00	Sandy Clay	-	-	21.3
103661-3	BH2	0.30-0.50	Sandy Loamy Clay	-	-	20.4
103661-4	BH3	0.30-0.50	Sandy Loamy Clay with Roots	-	-	22.8
103661-5	BH4	0.20-0.40	Sandy Clay Loam with Roots	-	-	18.7
103661-6	BH4	0.90-1.00	Sandy Loamy Clay	-	-	23.3
103661-7	BH5	0.20-0.40	Sandy Loamy Clay with Roots	-	-	19.6
103661-8	BH6	0.20-0.40	Sandy Clay Loam with Roots	-	-	17.9
103661-9	BH6	0.90-1.00	Sandy Clay	-	-	20.3
103661-10	BH7	0.20-0.40	Sandy Loamy Clay	-	-	22.2
103661-11	BH7	0.90-1.00	Sandy Loamy Clay	-	-	23.1

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SOILS

Lab number Sample id Depth (m) Date sampled			103661-1 BH1 0.30-0.50 08/12/2021	103661-3 BH2 0.30-0.50 08/12/2021	103661-4 BH3 0.30-0.50 08/12/2021	103661-5 BH4 0.20-0.40 08/12/2021	103661-6 BH4 0.90-1.00 08/12/2021	103661-7 BH5 0.20-0.40 08/12/2021
Test	Method	Units						
Antimony (total)	CE127 ^U	mg/kg Sb	-	-	-	-	0.2	-
Arsenic (total)	CE127 ^M	mg/kg As	11	9.9	11	9.7	7.3	8.9
Barium (total)	CE127 ^M	mg/kg Ba	-	-	-	-	104	-
Boron (water soluble)	CE063 ^M	mg/kg B	1.4	2.0	2.1	2.1	-	1.6
Cadmium (total)	CE127 ^M	mg/kg Cd	0.2	<0.2	<0.2	0.2	<0.2	<0.2
Chromium (total)	CE127 ^M	mg/kg Cr	53	56	66	78	110	73
Chromium (VI)	CE146	mg/kg CrVI	<1	<1	<1	<1	-	<1
Copper (total)	CE127 ^M	mg/kg Cu	25	20	20	23	32	16
Lead (total)	CE127 ^M	mg/kg Pb	60	50	39	63	38	38
Mercury (total)	CE127 ^M	mg/kg Hg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Molybdenum (total)	CE127 ^M	mg/kg Mo	-	-	-	-	5.5	-
Nickel (total)	CE127 ^M	mg/kg Ni	20	17	20	21	19	18
Selenium (total)	CE127 ^M	mg/kg Se	1.1	1.0	1.1	1.2	1.0	1.1
Zinc (total)	CE127 ^M	mg/kg Zn	90	67	71	91	69	53
pH	CE004 ^M	units	8.0	8.3	8.4	8.2	-	8.4
Sulphate (2:1 water soluble)	CE061 ^U	mg/l SO ₄	76	42	40	41	-	33
Sulphate (total)	CE062 ^M	mg/kg SO ₄	606	511	507	450	-	594
Sulphide	CE079	mg/kg S ²⁻	<10	<10	<10	<10	-	<10
Cyanide (free)	CE077	mg/kg CN	<1	<1	<1	<1	-	<1
Cyanide (total)	CE077	mg/kg CN	<1	<1	<1	<1	-	<1
Thiocyanate	CE145 ^M	mg/kg SCN	5.8	<1	8.0	2.7	-	2.8
Phenols (total)	CE078	mg/kg PhOH	<0.5	<0.5	<0.5	<0.5	-	<0.5
Total Organic Carbon (TOC)	CE197	% w/w C	2.3	2.4	2.3	2.6	-	1.9
Estimate of OMC (calculated from TOC)	CE197	% w/w	3.9	4.2	3.9	4.4	-	3.2
Loss On Ignition at 440°C	CE006 ^U	% w/w	5.4	4.2	7.2	5.9	-	3.3
PAH								
Naphthalene	CE087 ^M	mg/kg	<0.02	<0.02	<0.02	<0.02	-	<0.02
Acenaphthylene	CE087 ^M	mg/kg	<0.02	<0.02	<0.02	<0.02	-	<0.02
Acenaphthene	CE087 ^M	mg/kg	<0.02	<0.02	<0.02	<0.02	-	<0.02
Fluorene	CE087 ^U	mg/kg	<0.02	<0.02	<0.02	<0.02	-	<0.02
Phenanthrene	CE087 ^M	mg/kg	0.06	0.05	0.05	0.05	-	0.07
Anthracene	CE087 ^U	mg/kg	<0.02	<0.02	<0.02	<0.02	-	<0.02
Fluoranthene	CE087 ^M	mg/kg	0.10	0.08	0.10	0.11	-	0.12
Pyrene	CE087 ^M	mg/kg	0.09	0.07	0.08	0.11	-	0.11
Benzo(a)anthracene	CE087 ^U	mg/kg	0.03	0.04	0.03	0.04	-	0.04
Chrysene	CE087 ^M	mg/kg	0.07	0.08	0.06	0.09	-	0.08
Benzo(b)fluoranthene	CE087 ^M	mg/kg	0.06	<0.02	<0.02	0.08	-	0.05
Benzo(k)fluoranthene	CE087 ^M	mg/kg	<0.03	<0.03	<0.03	<0.03	-	<0.03
Benzo(a)pyrene	CE087 ^U	mg/kg	0.04	0.03	<0.02	0.05	-	0.04
Indeno(123cd)pyrene	CE087 ^M	mg/kg	<0.02	<0.02	<0.02	<0.02	-	<0.02
Dibenz(ah)anthracene	CE087 ^M	mg/kg	<0.02	<0.02	<0.02	<0.02	-	<0.02

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SOILS

Lab number Sample id Depth (m) Date sampled			103661-1 BH1 0.30-0.50 08/12/2021	103661-3 BH2 0.30-0.50 08/12/2021	103661-4 BH3 0.30-0.50 08/12/2021	103661-5 BH4 0.20-0.40 08/12/2021	103661-6 BH4 0.90-1.00 08/12/2021	103661-7 BH5 0.20-0.40 08/12/2021
Test	Method	Units						
Benzo(ghi)perylene	CE087 ^M	mg/kg	<0.02	<0.02	<0.02	<0.02	-	<0.02
PAH (total of USEPA 16)	CE087	mg/kg	0.46	0.34	<0.34	0.54	-	0.51
BTEX & TPH								
Benzene	CE192 ^U	mg/kg	<0.01	<0.01	<0.01	<0.01	-	<0.01
Toluene	CE192 ^U	mg/kg	<0.01	<0.01	<0.01	<0.01	-	<0.01
Ethylbenzene	CE192 ^U	mg/kg	<0.01	<0.01	<0.01	<0.01	-	<0.01
m & p-Xylene	CE192 ^U	mg/kg	<0.02	<0.02	<0.02	<0.02	-	<0.02
o-Xylene	CE192 ^U	mg/kg	<0.01	<0.01	<0.01	<0.01	-	<0.01
VPH Aromatic (>EC5-EC7)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	-	<0.01
VPH Aromatic (>EC7-EC8)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	-	<0.01
VPH Aromatic (>EC8-EC10)	CE067	mg/kg	<0.01	<0.01	<0.01	<0.01	-	<0.01
EPH Aromatic (>EC10-EC12)	CE068	mg/kg	<1	<1	<1	<1	-	<1
EPH Aromatic (>EC12-EC16)	CE068	mg/kg	<1	<1	<1	<1	-	<1
EPH Aromatic (>EC16-EC21)	CE068	mg/kg	<1	<1	<1	<1	-	<1
EPH Aromatic (>EC21-EC35)	CE068	mg/kg	<1	<1	<1	<1	-	<1
EPH Aromatic (>EC35-EC44)	CE068	mg/kg	<1	<1	<1	<1	-	<1
VPH Aliphatic (>C5-C6)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	-	<0.1
VPH Aliphatic (>C6-C8)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	-	<0.1
VPH Aliphatic (>C8-C10)	CE067	mg/kg	<0.1	<0.1	<0.1	<0.1	-	<0.1
EPH Aliphatic (>C10-C12)	CE068	mg/kg	<4	<4	<4	<4	-	<4
EPH Aliphatic (>C12-C16)	CE068	mg/kg	<4	<4	<4	<4	-	<4
EPH Aliphatic (>C16-C35)	CE068	mg/kg	<4	<4	<4	<4	-	<4
EPH Aliphatic (>C35-C44)	CE068	mg/kg	<10	<10	<10	<10	-	<10
PCB								
PCB Congener 28	CE137 ^M	mg/kg	<0.004	-	-	-	-	-
PCB Congener 52	CE137 ^M	mg/kg	<0.004	-	-	-	-	-
PCB Congener 101	CE137 ^M	mg/kg	<0.008	-	-	-	-	-
PCB Congener 118	CE137 ^M	mg/kg	<0.006	-	-	-	-	-
PCB Congener 138	CE137 ^M	mg/kg	<0.006	-	-	-	-	-
PCB Congener 153	CE137 ^M	mg/kg	<0.009	-	-	-	-	-
PCB Congener 180	CE137 ^M	mg/kg	<0.008	-	-	-	-	-
PCB (total of ICES 7)	CE137 ^M	mg/kg	<0.045	-	-	-	-	-
PCB								
PCB Congener 77	CE181	mg/kg	<0.006	-	-	-	-	-
PCB Congener 81	CE181	mg/kg	<0.006	-	-	-	-	-
PCB Congener 105	CE181	mg/kg	<0.006	-	-	-	-	-
PCB Congener 114	CE181	mg/kg	<0.006	-	-	-	-	-
PCB Congener 118	CE181	mg/kg	<0.006	-	-	-	-	-
PCB Congener 123	CE181	mg/kg	<0.006	-	-	-	-	-
PCB Congener 126	CE181	mg/kg	<0.006	-	-	-	-	-
PCB Congener 156	CE181	mg/kg	<0.006	-	-	-	-	-

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SOILS

Lab number			103661-1	103661-3	103661-4	103661-5	103661-6	103661-7
Sample id			BH1	BH2	BH3	BH4	BH4	BH5
Depth (m)			0.30-0.50	0.30-0.50	0.30-0.50	0.20-0.40	0.90-1.00	0.20-0.40
Date sampled			08/12/2021	08/12/2021	08/12/2021	08/12/2021	08/12/2021	08/12/2021
Test	Method	Units						
PCB Congener 157	CE181	mg/kg	<0.006	-	-	-	-	-
PCB Congener 167	CE181	mg/kg	<0.006	-	-	-	-	-
PCB Congener 169	CE181	mg/kg	<0.006	-	-	-	-	-
PCB Congener 189	CE181	mg/kg	<0.006	-	-	-	-	-
PCB (total of WHO 12)	CE181	mg/kg	<0.061	-	-	-	-	-
Subcontracted analysis								
Asbestos (qualitative)	\$	-	NAD	NAD	NAD	NAD	-	NAD

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SOILS

Lab number Sample id Depth (m) Date sampled			103661-8 BH6 0.20-0.40 08/12/2021	103661-9 BH6 0.90-1.00 08/12/2021	103661-10 BH7 0.20-0.40 08/12/2021	103661-11 BH7 0.90-1.00 08/12/2021
Test	Method	Units				
Antimony (total)	CE127 ^U	mg/kg Sb	-	-	-	0.6
Arsenic (total)	CE127 ^M	mg/kg As	10	6.7	11	8.9
Barium (total)	CE127 ^M	mg/kg Ba	-	-	-	96
Boron (water soluble)	CE063 ^M	mg/kg B	2.0	1.0	3.2	-
Cadmium (total)	CE127 ^M	mg/kg Cd	<0.2	<0.2	0.9	<0.2
Chromium (total)	CE127 ^M	mg/kg Cr	80	72	88	94
Chromium (VI)	CE146	mg/kg CrVI	<1	<1	<1	-
Copper (total)	CE127 ^M	mg/kg Cu	18	5.5	50	11
Lead (total)	CE127 ^M	mg/kg Pb	45	6.7	445	27
Mercury (total)	CE127 ^M	mg/kg Hg	1.5	<0.5	1.0	<0.5
Molybdenum (total)	CE127 ^M	mg/kg Mo	-	-	-	6.0
Nickel (total)	CE127 ^M	mg/kg Ni	20	15	22	17
Selenium (total)	CE127 ^M	mg/kg Se	1.2	0.9	1.3	0.9
Zinc (total)	CE127 ^M	mg/kg Zn	65	28	192	41
pH	CE004 ^M	units	8.6	8.9	7.7	-
Sulphate (2:1 water soluble)	CE061 ^U	mg/l SO ₄	36	27	49	-
Sulphate (total)	CE062 ^M	mg/kg SO ₄	468	494	237	-
Sulphide	CE079	mg/kg S ²⁻	<10	<10	<10	-
Cyanide (free)	CE077	mg/kg CN	<1	<1	<1	-
Cyanide (total)	CE077	mg/kg CN	<1	<1	<1	-
Thiocyanate	CE145 ^M	mg/kg SCN	3.6	1.2	5.2	-
Phenols (total)	CE078	mg/kg PhOH	<0.5	<0.5	<0.5	-
Total Organic Carbon (TOC)	CE197	% w/w C	1.9	0.6	2.9	-
Estimate of OMC (calculated from TOC)	CE197	% w/w	3.3	1.1	5.0	-
Loss On Ignition at 440°C	CE006 ^U	% w/w	3.5	1.0	5.5	-
PAH						
Naphthalene	CE087 ^M	mg/kg	<0.02	<0.02	<0.02	-
Acenaphthylene	CE087 ^M	mg/kg	<0.02	<0.02	<0.02	-
Acenaphthene	CE087 ^M	mg/kg	<0.02	<0.02	<0.02	-
Fluorene	CE087 ^U	mg/kg	<0.02	<0.02	<0.02	-
Phenanthrene	CE087 ^M	mg/kg	0.05	<0.02	0.08	-
Anthracene	CE087 ^U	mg/kg	<0.02	<0.02	<0.02	-
Fluoranthene	CE087 ^M	mg/kg	0.16	0.04	0.28	-
Pyrene	CE087 ^M	mg/kg	0.16	0.04	0.26	-
Benzo(a)anthracene	CE087 ^U	mg/kg	0.07	<0.02	0.12	-
Chrysene	CE087 ^M	mg/kg	0.07	<0.03	0.15	-
Benzo(b)fluoranthene	CE087 ^M	mg/kg	0.11	<0.02	0.24	-
Benzo(k)fluoranthene	CE087 ^M	mg/kg	<0.03	<0.03	0.10	-
Benzo(a)pyrene	CE087 ^U	mg/kg	0.08	<0.02	0.19	-
Indeno(123cd)pyrene	CE087 ^M	mg/kg	<0.02	<0.02	0.04	-
Dibenz(ah)anthracene	CE087 ^M	mg/kg	<0.02	<0.02	<0.02	-

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SOILS

Lab number Sample id Depth (m) Date sampled			103661-8 BH6 0.20-0.40 08/12/2021	103661-9 BH6 0.90-1.00 08/12/2021	103661-10 BH7 0.20-0.40 08/12/2021	103661-11 BH7 0.90-1.00 08/12/2021
Test	Method	Units				
Benzo(ghi)perylene	CE087 ^M	mg/kg	<0.02	<0.02	<0.02	-
PAH (total of USEPA 16)	CE087	mg/kg	0.70	<0.34	1.44	-
BTEX & TPH						
Benzene	CE192 ^U	mg/kg	<0.01	<0.01	<0.01	-
Toluene	CE192 ^U	mg/kg	<0.01	<0.01	<0.01	-
Ethylbenzene	CE192 ^U	mg/kg	<0.01	<0.01	<0.01	-
m & p-Xylene	CE192 ^U	mg/kg	<0.02	<0.02	<0.02	-
o-Xylene	CE192 ^U	mg/kg	<0.01	<0.01	<0.01	-
VPH Aromatic (>EC5-EC7)	CE067	mg/kg	<0.01	<0.01	<0.01	-
VPH Aromatic (>EC7-EC8)	CE067	mg/kg	<0.01	<0.01	<0.01	-
VPH Aromatic (>EC8-EC10)	CE067	mg/kg	<0.01	<0.01	<0.01	-
EPH Aromatic (>EC10-EC12)	CE068	mg/kg	<1	<1	<1	-
EPH Aromatic (>EC12-EC16)	CE068	mg/kg	<1	<1	<1	-
EPH Aromatic (>EC16-EC21)	CE068	mg/kg	<1	<1	<1	-
EPH Aromatic (>EC21-EC35)	CE068	mg/kg	<1	<1	<1	-
EPH Aromatic (>EC35-EC44)	CE068	mg/kg	<1	<1	<1	-
VPH Aliphatic (>C5-C6)	CE067	mg/kg	<0.1	<0.1	<0.1	-
VPH Aliphatic (>C6-C8)	CE067	mg/kg	<0.1	<0.1	<0.1	-
VPH Aliphatic (>C8-C10)	CE067	mg/kg	<0.1	<0.1	<0.1	-
EPH Aliphatic (>C10-C12)	CE068	mg/kg	<4	<4	<4	-
EPH Aliphatic (>C12-C16)	CE068	mg/kg	<4	<4	<4	-
EPH Aliphatic (>C16-C35)	CE068	mg/kg	<4	<4	<4	-
EPH Aliphatic (>C35-C44)	CE068	mg/kg	<10	<10	<10	-
PCB						
PCB Congener 28	CE137 ^M	mg/kg	-	-	-	-
PCB Congener 52	CE137 ^M	mg/kg	-	-	-	-
PCB Congener 101	CE137 ^M	mg/kg	-	-	-	-
PCB Congener 118	CE137 ^M	mg/kg	-	-	-	-
PCB Congener 138	CE137 ^M	mg/kg	-	-	-	-
PCB Congener 153	CE137 ^M	mg/kg	-	-	-	-
PCB Congener 180	CE137 ^M	mg/kg	-	-	-	-
PCB (total of ICES 7)	CE137 ^M	mg/kg	-	-	-	-
PCB						
PCB Congener 77	CE181	mg/kg	-	-	-	-
PCB Congener 81	CE181	mg/kg	-	-	-	-
PCB Congener 105	CE181	mg/kg	-	-	-	-
PCB Congener 114	CE181	mg/kg	-	-	-	-
PCB Congener 118	CE181	mg/kg	-	-	-	-
PCB Congener 123	CE181	mg/kg	-	-	-	-
PCB Congener 126	CE181	mg/kg	-	-	-	-
PCB Congener 156	CE181	mg/kg	-	-	-	-

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SOILS

Lab number			103661-8	103661-9	103661-10	103661-11
Sample id			BH6	BH6	BH7	BH7
Depth (m)			0.20-0.40	0.90-1.00	0.20-0.40	0.90-1.00
Date sampled			08/12/2021	08/12/2021	08/12/2021	08/12/2021
Test	Method	Units				
PCB Congener 157	CE181	mg/kg	-	-	-	-
PCB Congener 167	CE181	mg/kg	-	-	-	-
PCB Congener 169	CE181	mg/kg	-	-	-	-
PCB Congener 189	CE181	mg/kg	-	-	-	-
PCB (total of WHO 12)	CE181	mg/kg	-	-	-	-
Subcontracted analysis						
Asbestos (qualitative)	\$	-	NAD	NAD	NAD	-

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SOILS

Lab number			103661-2	103661-6	103661-11
Sample id			BH1	BH4	BH7
Depth (m)			0.90-1.00	0.90-1.00	0.90-1.00
Date sampled			08/12/2021	08/12/2021	08/12/2021
Test	Method	Units			
VPH (>C5-C10)	CE067	mg/kg	0.1	0.1	0.1
EPH (>C10-C16)	CE033	mg/kg	<10	<10	17
EPH (>C16-C40)	CE033	mg/kg	32	<10	62
VOC (total) inc TICs	CE174 ^{1,2}	mg/kg	<0.01	<0.01	<0.01
BTEX & MTBE (total)	CE057 ²	mg/kg	<0.02	<0.02	<0.02
SVOC (total) inc TICs	CE189 ^{2,3}	mg/kg	<0.1	<0.1	<0.1
Phenols (total)	CE189 ²	mg/kg	<0.1	<0.1	<0.1
Cresols & chlorinated phenols (total)	CE189 ²	mg/kg	<0.01	<0.01	<0.01
Ethers*	CE189 ²	mg/kg	<0.1	<0.1	<0.1
Nitrobenzene*	CE189 ²	mg/kg	<0.1	<0.1	<0.1
Ketones*	CE189 ²	mg/kg	<0.01	<0.01	<0.01
Aldehydes*	CE189 ²	mg/kg	<0.01	<0.01	<0.01
Amines*	CE189 ²	mg/kg	<0.1	<0.1	<0.1
pH	CE004 ^M	units	8.7	8.6	8.3
Electrical conductivity	CE007 ^U	µS/cm	78	64	160
Redox potential	CE082	mV	135	179	172

Notes

- 1:** Total VOCs (excluding BTEX & MTBE)
2: LOD applies to each compound
3: Total SVOCs (excluding PAHs, ethers, nitrobenzene, ketones, aldehydes, and amines)

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GROUNDWATERS

Lab number			103661-12	103661-13
Sample id			BH4	BH7
Depth (m)			1.29	1.23
Date sampled			08/12/2021	08/12/2021
Time sampled			-	-
Test	Method	Units		
Arsenic (dissolved)	CE128 ^U	µg/l As	2.14	3.01
Boron (dissolved)	CE128 ^U	µg/l B	477	96
Cadmium (dissolved)	CE128 ^U	µg/l Cd	<0.07	<0.07
Chromium (dissolved)	CE128 ^U	µg/l Cr	<0.2	<0.2
Chromium VI (dissolved)	CE050 ^U	µg/l CrVI	<10	<10
Copper (dissolved)	CE128 ^U	µg/l Cu	2.1	3.9
Lead (dissolved)	CE128 ^U	µg/l Pb	<0.2	<0.2
Mercury (dissolved)	CE128 ^U	µg/l Hg	<0.008	<0.008
Nickel (dissolved)	CE128 ^U	µg/l Ni	2.6	<0.5
Selenium (dissolved)	CE128 ^U	µg/l Se	0.68	0.65
Zinc (dissolved)	CE128 ^U	µg/l Zn	<1	<1
pH	CE213 ^U	units	7.5	7.7
Sulphate	CE049 ^U	mg/l SO ₄	68	68
Sulphide	CE079	µg/l S ²⁻	<100	<100
Cyanide (free)	CE147	µg/l CN	<20	<20
Cyanide (total)	CE147	µg/l CN	<20	<20
Thiocyanate	CE014 ^U	µg/l SCN	795	<100
Phenols (total)	CE148	µg/l PhOH	25	<10
Total Organic Carbon	CE247	mg/l C	116	57
PAH				
Naphthalene	CE051	µg/l	<0.1	<0.1
Acenaphthylene	CE051	µg/l	<0.1	<0.1
Acenaphthene	CE051	µg/l	<0.1	<0.1
Fluorene	CE051	µg/l	<0.1	<0.1
Phenanthrene	CE051	µg/l	<0.1	<0.1
Anthracene	CE051	µg/l	<0.1	<0.1
Fluoranthene	CE051	µg/l	<0.1	<0.1
Pyrene	CE051	µg/l	<0.1	<0.1
Benzo(a)anthracene	CE051	µg/l	<0.1	<0.1
Chrysene	CE051	µg/l	<0.1	<0.1
Benzo(b)fluoranthene	CE051	µg/l	<0.1	<0.1
Benzo(k)fluoranthene	CE051	µg/l	<0.1	<0.1
Benzo(a)pyrene	CE051	µg/l	<0.1	<0.1
Indeno(123cd)pyrene	CE051	µg/l	<0.1	<0.1
Dibenz(ah)anthracene	CE051	µg/l	<0.1	<0.1
Benzo(ghi)perylene	CE051	µg/l	<0.1	<0.1
PAH (total of USEPA 16)	CE051	µg/l	<1.6	<1.6

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GROUNDWATERS

Lab number			103661-12	103661-13
Sample id			BH4	BH7
Depth (m)			1.29	1.23
Date sampled			08/12/2021	08/12/2021
Time sampled			-	-
Test	Method	Units		
BTEX & TPH				
Benzene	CE057 ^u	µg/l	<1	<1
Toluene	CE057 ^u	µg/l	<1	<1
Ethylbenzene	CE057 ^u	µg/l	<1	<1
m & p-Xylene	CE057 ^u	µg/l	<2	<2
o-Xylene	CE057 ^u	µg/l	<1	<1
VPH Aromatic (>EC5-EC7)	CE175	µg/l	<1	<1
VPH Aromatic (>EC7-EC8)	CE175	µg/l	<1	<1
VPH Aromatic (>EC8-EC10)	CE175	µg/l	<1	<1
EPH Aromatic (>EC10-EC12)	CE161	µg/l	<1	<1
EPH Aromatic (>EC12-EC16)	CE161	µg/l	<1	<1
EPH Aromatic (>EC16-EC21)	CE161	µg/l	<1	<1
EPH Aromatic (>EC21-EC35)	CE161	µg/l	<1	<1
EPH Aromatic (>EC35-EC44)	CE161	µg/l	<1	<1
VPH Aliphatic (>C5-C6)	CE175	µg/l	<1	<1
VPH Aliphatic (>C6-C8)	CE175	µg/l	<1	<1
VPH Aliphatic (>C8-C10)	CE175	µg/l	<1	<1
EPH Aliphatic (>C10-C12)	CE161	µg/l	<1	<1
EPH Aliphatic (>C12-C16)	CE161	µg/l	2	3
EPH Aliphatic (>C16-C35)	CE161	µg/l	41	67
EPH Aliphatic (>C35-C44)	CE161	µg/l	<1	3

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE127	Antimony (total)	Aqua regia digest, ICP-MS	Dry	U	0.2	mg/kg Sb
CE127	Arsenic (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg As
CE127	Barium (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Ba
CE063	Boron (water soluble)	Hot water extract, ICP-OES	Dry	M	0.5	mg/kg B
CE127	Cadmium (total)	Aqua regia digest, ICP-MS	Dry	M	0.2	mg/kg Cd
CE127	Chromium (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cr
CE146	Chromium (VI)	Acid extraction, Colorimetry	Dry		1	mg/kg CrVI
CE127	Copper (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Cu
CE127	Lead (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Pb
CE127	Mercury (total)	Aqua regia digest, ICP-MS	Dry	M	0.5	mg/kg Hg
CE127	Molybdenum (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Mo
CE127	Nickel (total)	Aqua regia digest, ICP-MS	Dry	M	1	mg/kg Ni
CE127	Selenium (total)	Aqua regia digest, ICP-MS	Dry	M	0.3	mg/kg Se
CE127	Zinc (total)	Aqua regia digest, ICP-MS	Dry	M	5	mg/kg Zn
CE004	pH	Based on BS 1377, pH Meter	As received	M	-	units
CE061	Sulphate (2:1 water soluble)	Aqueous extraction, ICP-OES	Dry	U	10	mg/l SO ₄
CE062	Sulphate (total)	Acid extraction, ICP-OES	Dry	M	100	mg/kg SO ₄
CE079	Sulphide	Extraction, Continuous Flow Colorimetry	As received		10	mg/kg S ²⁻
CE077	Cyanide (free)	Extraction, Continuous Flow Colorimetry	As received		1	mg/kg CN
CE077	Cyanide (total)	Extraction, Continuous Flow Colorimetry	As received		1	mg/kg CN
CE145	Thiocyanate	Weak acid extraction, Colorimetry	Dry	M	1	mg/kg SCN
CE078	Phenols (total)	Extraction, Continuous Flow Colorimetry	As received		0.5	mg/kg PhOH
CE197	Total Organic Carbon (TOC)	Carbon Analyser	Dry		0.1	% w/w C
CE197	Estimate of OMC (calculated from TOC)	Calculation from Total Organic Carbon	Dry		0.1	% w/w
CE006	Loss On Ignition at 440°C	Based on BS 1377, Gravimetry	Dry	U	0.1	% w/w
CE087	Naphthalene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Acenaphthylene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Acenaphthene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Fluorene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Phenanthrene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Anthracene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Fluoranthene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Pyrene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Benzo(a)anthracene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Chrysene	Solvent extraction, GC-MS	As received	M	0.03	mg/kg
CE087	Benzo(b)fluoranthene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Benzo(k)fluoranthene	Solvent extraction, GC-MS	As received	M	0.03	mg/kg
CE087	Benzo(a)pyrene	Solvent extraction, GC-MS	As received	U	0.02	mg/kg
CE087	Indeno(123cd)pyrene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Dibenz(ah)anthracene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	Benzo(ghi)perylene	Solvent extraction, GC-MS	As received	M	0.02	mg/kg
CE087	PAH (total of USEPA 16)	Solvent extraction, GC-MS	As received		0.34	mg/kg
CE192	Benzene	Headspace GC-FID	As received	U	0.01	mg/kg
CE192	Toluene	Headspace GC-FID	As received	U	0.01	mg/kg

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE192	Ethylbenzene	Headspace GC-FID	As received	U	0.01	mg/kg
CE192	m & p-Xylene	Headspace GC-FID	As received	U	0.02	mg/kg
CE192	o-Xylene	Headspace GC-FID	As received	U	0.01	mg/kg
CE067	VPH Aromatic (>EC5-EC7)	Headspace GC-FID	As received		0.01	mg/kg
CE067	VPH Aromatic (>EC7-EC8)	Headspace GC-FID	As received		0.01	mg/kg
CE067	VPH Aromatic (>EC8-EC10)	Headspace GC-FID	As received		0.01	mg/kg
CE068	EPH Aromatic (>EC10-EC12)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromatic (>EC12-EC16)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromatic (>EC16-EC21)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromatic (>EC21-EC35)	Solvent extraction, GC-FID	As received		1	mg/kg
CE068	EPH Aromatic (>EC35-EC44)	Solvent extraction, GC-FID	As received		1	mg/kg
CE067	VPH Aliphatic (>C5-C6)	Headspace GC-FID	As received		0.1	mg/kg
CE067	VPH Aliphatic (>C6-C8)	Headspace GC-FID	As received		0.1	mg/kg
CE067	VPH Aliphatic (>C8-C10)	Headspace GC-FID	As received		0.1	mg/kg
CE068	EPH Aliphatic (>C10-C12)	Solvent extraction, GC-FID	As received		6	mg/kg
CE068	EPH Aliphatic (>C12-C16)	Solvent extraction, GC-FID	As received		6	mg/kg
CE068	EPH Aliphatic (>C16-C35)	Solvent extraction, GC-FID	As received		15	mg/kg
CE068	EPH Aliphatic (>C35-C44)	Solvent extraction, GC-FID	As received		10	mg/kg
CE137	PCB Congener 28	Solvent extraction, GC-MS	As received	M	0.004	mg/kg
CE137	PCB Congener 52	Solvent extraction, GC-MS	As received	M	0.004	mg/kg
CE137	PCB Congener 101	Solvent extraction, GC-MS	As received	M	0.008	mg/kg
CE137	PCB Congener 118	Solvent extraction, GC-MS	As received	M	0.006	mg/kg
CE137	PCB Congener 138	Solvent extraction, GC-MS	As received	M	0.006	mg/kg
CE137	PCB Congener 153	Solvent extraction, GC-MS	As received	M	0.009	mg/kg
CE137	PCB Congener 180	Solvent extraction, GC-MS	As received	M	0.008	mg/kg
CE137	PCB (total of ICES 7)	Solvent extraction, GC-MS	As received	M	0.045	mg/kg
CE181	PCB Congener 77	Solvent extraction, GC-MS	As received		0.006	mg/kg
CE181	PCB Congener 81	Solvent extraction, GC-MS	As received		0.006	mg/kg
CE181	PCB Congener 105	Solvent extraction, GC-MS	As received		0.006	mg/kg
CE181	PCB Congener 114	Solvent extraction, GC-MS	As received		0.006	mg/kg
CE181	PCB Congener 118	Solvent extraction, GC-MS	As received		0.006	mg/kg
CE181	PCB Congener 123	Solvent extraction, GC-MS	As received		0.006	mg/kg
CE181	PCB Congener 126	Solvent extraction, GC-MS	As received		0.006	mg/kg
CE181	PCB Congener 156	Solvent extraction, GC-MS	As received		0.006	mg/kg
CE181	PCB Congener 157	Solvent extraction, GC-MS	As received		0.006	mg/kg
CE181	PCB Congener 167	Solvent extraction, GC-MS	As received		0.006	mg/kg
CE181	PCB Congener 169	Solvent extraction, GC-MS	As received		0.006	mg/kg
CE181	PCB Congener 189	Solvent extraction, GC-MS	As received		0.006	mg/kg
CE181	PCB (WHO 12)	Solvent extraction, GC-MS	As received		0.072	mg/kg
\$	Asbestos (qualitative)	HSG 248, Microscopy	Dry	U	-	-

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METHOD DETAILS

METHOD	SOILS	METHOD SUMMARY	SAMPLE	STATUS	LOD	UNITS
CE067	VPH (>C5-C10)	Headspace GC-FID	As received		0.1	mg/kg
CE033	EPH (>C10-C16)	Solvent extraction, GC-FID	As received		10	mg/kg
CE033	EPH (>C16-C40)	Solvent extraction, GC-FID	As received		10	mg/kg
CE174	Volatile Organic Compounds	Headspace GC-MS	As received		0.01	mg/kg
CE174	VOC Tentatively Identified Compounds	Headspace GC-MS	As received		-	-
CE057	BTEX & MTBE (total)	Headspace GC-FID	As received		0.02	mg/kg
CE189	Semi-volatile Organic Compounds	Solvent extraction, GC-MS	As received		0.01-0.1	mg/kg
CE189	SVOC Tentatively Identified Compounds	Solvent extraction, GC-MS	As received		-	-
CE004	pH	Based on BS 1377, pH Meter	As received	M	-	units
CE007	Electrical conductivity	Conductivity Meter	As received	U	10	µS/cm
CE082	Redox potential	ORP meter	As received		±1	mV

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METHOD DETAILS

METHOD	GROUNDWATERS	METHOD SUMMARY	STATUS	LOD	UNITS
CE128	Arsenic (dissolved)	ICP-MS	U	0.06	µg/l As
CE128	Boron (dissolved)	ICP-MS	U	8	µg/l B
CE128	Cadmium (dissolved)	ICP-MS	U	0.07	µg/l Cd
CE128	Chromium (dissolved)	ICP-MS	U	0.2	µg/l Cr
CE050	Chromium VI (dissolved)	Colorimetry	U	10	µg/l CrVI
CE128	Copper (dissolved)	ICP-MS	U	0.4	µg/l Cu
CE128	Lead (dissolved)	ICP-MS	U	0.2	µg/l Pb
CE128	Mercury (dissolved)	ICP-MS	U	0.008	µg/l Hg
CE128	Nickel (dissolved)	ICP-MS	U	0.5	µg/l Ni
CE128	Selenium (dissolved)	ICP-MS	U	0.07	µg/l Se
CE128	Zinc (dissolved)	ICP-MS	U	1	µg/l Zn
CE213	pH	Based on BS 1377, pH Meter	U	-	units
CE049	Sulphate	Ion Chromatography	U	1.7	mg/l SO ₄
CE079	Sulphide	Continuous Flow Colorimetry		100	µg/l S ²⁻
CE147	Cyanide (free)	Continuous Flow Colorimetry		20	µg/l CN
CE147	Cyanide (total)	Continuous Flow Colorimetry		20	µg/l CN
CE014	Thiocyanate	Colorimetry	U	200	µg/l SCN
CE148	Phenols (total)	Continuous Flow Colorimetry		10	µg/l PhOH
CE247	Total Organic Carbon	Combustion TOC analyser		5	mg/l C
CE051	Naphthalene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Acenaphthylene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Acenaphthene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Fluorene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Phenanthrene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Anthracene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Fluoranthene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Pyrene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Benzo(a)anthracene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Chrysene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Benzo(b)fluoranthene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Benzo(k)fluoranthene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Benzo(a)pyrene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Indeno(123cd)pyrene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Dibenz(ah)anthracene	Solvent extraction, GC-MS		0.1	µg/l
CE051	Benzo(ghi)perylene	Solvent extraction, GC-MS		0.1	µg/l
CE051	PAH (total of USEPA 16)	Solvent extraction, GC-MS		1.6	µg/l
CE057	Benzene	Headspace GC-FID	U	1	µg/l
CE057	Toluene	Headspace GC-FID	U	1	µg/l
CE057	Ethylbenzene	Headspace GC-FID	U	1	µg/l
CE057	m & p-Xylene	Headspace GC-FID	U	2	µg/l
CE057	o-Xylene	Headspace GC-FID	U	1	µg/l
CE175	VPH Aromatic (>EC5-EC7)	Headspace GC-FID		1	µg/l
CE175	VPH Aromatic (>EC7-EC8)	Headspace GC-FID		1	µg/l
CE175	VPH Aromatic (>EC8-EC10)	Headspace GC-FID		1	µg/l

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METHOD DETAILS

METHOD	GROUNDWATERS	METHOD SUMMARY	STATUS	LOD	UNITS
CE161	EPH Aromatic (>EC10-EC12)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aromatic (>EC12-EC16)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aromatic (>EC16-EC21)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aromatic (>EC21-EC35)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aromatic (>EC35-EC44)	Solvent extraction, GC-FID		1	µg/l
CE175	VPH Aliphatic (>C5-C6)	Headspace GC-FID		1	µg/l
CE175	VPH Aliphatic (>C6-C8)	Headspace GC-FID		1	µg/l
CE175	VPH Aliphatic (>C8-C10)	Headspace GC-FID		1	µg/l
CE161	EPH Aliphatic (>C10-C12)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aliphatic (>C12-C16)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aliphatic (>C16-C35)	Solvent extraction, GC-FID		1	µg/l
CE161	EPH Aliphatic (>C35-C44)	Solvent extraction, GC-FID		1	µg/l

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DEVIATING SAMPLE INFORMATION

Comments

Sample deviation is determined in accordance with the UKAS note "Guidance on Deviating Samples" and based on reference standards and laboratory trials.

For samples identified as deviating, test result(s) may be compromised and may not be representative of the sample at the time of sampling.

Chemtech Environmental Ltd cannot be held responsible for the integrity of sample(s) received if Chemtech Environmental Ltd did not undertake the sampling. Such samples may be deviating.

Key

N	No (not deviating sample)
Y	Yes (deviating sample)
NSD	Sampling date not provided
NST	Sampling time not provided (waters only)
EHT	Sample exceeded holding time(s)
IC	Sample not received in appropriate containers
HP	Headspace present in sample container
NCF	Sample not chemically fixed (where appropriate)
OR	Other (specify)

Lab ref	Sample id	Depth (m)	Deviating	Tests (Reason for deviation)
103661-1	BH1	0.30-0.50	N	
103661-2	BH1	0.90-1.00	N	
103661-3	BH2	0.30-0.50	N	
103661-4	BH3	0.30-0.50	N	
103661-5	BH4	0.20-0.40	N	
103661-6	BH4	0.90-1.00	N	
103661-7	BH5	0.20-0.40	N	
103661-8	BH6	0.20-0.40	N	
103661-9	BH6	0.90-1.00	N	
103661-10	BH7	0.20-0.40	N	
103661-11	BH7	0.90-1.00	N	
103661-12	BH4	1.29	Y	Cyanide, TOC, Sulphide (NCF)
103661-13	BH7	1.23	Y	Cyanide, TOC, Sulphide (NCF)

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ADDITIONAL INFORMATION

Notes

Opinions and interpretations expressed herein are outside the UKAS accreditation scope.

Unless otherwise stated, Chemtech Environmental Ltd was not responsible for sampling.

All testing carried out at Unit 6 Parkhead, Stanley, DH9 7YB, except for subcontracted testing.

Methods, procedures and performance data are available on request.

Results reported herein relate only to the material supplied to the laboratory.

This report shall not be reproduced except in full, without prior written approval.

Samples will be disposed of 6 weeks from initial receipt unless otherwise instructed.

BTEX compounds are identified by retention time only and may include interference from co-eluting compounds.

For soils and solids, all results are reported on a dry basis. Samples dried at no more than 30°C in a drying cabinet.

For soils and solids, analytical results are inclusive of stones, where applicable.

Calculations based on mixed zone (M)							600	mm		
Maple Way, Donington										
Contaminant	Site Data				Expressed as a Factor of Target Guideline Value				Cover Thickness Required for Compliance to Specified Target Guideline Value	
	Contamination of Ground (Cg)	Contamination of Cover (Cc)	Target Guideline Value 1 RESIDENTIAL WITH PLANT	Target Guideline Value 2 REESIDENTIAL RES WITHOUT	Target Guideline Value Soil / 1 RESIDENTIAL WITH PLANT	Target Guideline Value Cover / 1 RESIDENTIAL WITH PLANT	Target Guideline Value Soil / 2 REESIDENTIAL RES WITHOUT	Target Guideline Value Cover / 2 REESIDENTIAL RES WITHOUT	Target Guideline Value 1 RESIDENTIAL WITH PLANT	Target Guideline Value 2 REESIDENTIAL RES WITHOUT
Units		Units		Fraction				(mm)		
Arsenic	11	10	37	39.9	0.3	0.3	0.3	0.3	None	None
Cadmium	0.6	0.3	22.1	149	0.0	0.0	0.0	0.0	None	None
Chromium	110	8	14300	16700	0.0	0.0	0.0	0.0	None	None
Chromium (VI)	1	0.5	3.62	3.62	0.3	0.1	0.3	0.1	None	None
Mercury	0.5	0.8	8.81	10	0.1	0.1	0.1	0.1	None	None
Selenium	1.2	0.3	375	595	0.0	0.0	0.0	0.0	None	None
Copper	50	25	4730	9060	0.0	0.0	0.0	0.0	None	None
Nickel	21	20	136	188	0.2	0.1	0.1	0.1	None	None
Zinc	91	60	20000	47000	0.0	0.0	0.0	0.0	None	None
Lead	445	62	200	313	2.2	0.3	1.4	0.2	384	207
Boron (Water sol)	3.2	0.7			No TV	No TV	No TV	No TV	No TV	No TV
Sulphate (total)		0.1	0.2	1	No Cg	0.5	No Cg	0.1	No Cg	No Cg
Phenols	0.5	0.1	267	570	0.0	0.0	0.0	0.0	None	None
Sulphide	10	5	250	500	0.0	0.0	0.0	0.0	None	None
Cyanide	1	0.4	34	34	0.0	0.0	0.0	0.0	None	None
Chrysene	0.15	8			No TV	No TV	No TV	No TV	No TV	No TV
dibenzo(a,h)anthracene	0.02	0.1			No TV	No TV	No TV	No TV	No TV	No TV
benzo(a)pyrene	0.19	0.17	4.95	5.34	0.0	0.0	0.0	0.0	None	None
benzo(a)anthracene	0.12	0.5			No TV	No TV	No TV	No TV	No TV	No TV
indeno(1,2,3,cd)pyrene	0.04	0.45			No TV	No TV	No TV	No TV	No TV	No TV
benzo(b)fluoranthene	0.1	0.8			No TV	No TV	No TV	No TV	No TV	No TV
napthalene	0.02	0.1	2.3	2.3	0.0	0.0	0.0	0.0	None	None
TPH ALI C10 - C12	4	1	81.7	81.8	0.0	0.0	0.0	0.0	None	None
TPH ALI C12 - C16	4	1	385	385	0.0	0.0	0.0	0.0	None	None
TPH ARO C5 - C7	0.01	0.02	0.137	0.31	0.1	0.1	0.0	0.1	None	None
Barium	104	4	110	1340	0.9	0.0	0.1	0.0	None	None

Summary		
	Target Guideline Value 1 RESIDENTIAL WITH PLANT	Target Guideline Value 2 REESIDENTIAL RES WITHOUT
Number of contaminants	26	26
Number of contaminants with no thickness calculation	7	7
Breakdown - Number for which no TV specified	6	6
Breakdown - Number for which no soil specified	1	1
Breakdown - Number for which no cover specified	0	0
Breakdown - Number for which cover > TV	0	0
Number of contaminants with thickness calculation	19	19
Breakdown - Number for which no cover required	18	18
Breakdown - Number for which cover required	1	1

Overall thickness of cover required	384	0
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DECLARATION OF COMPLIANCE (BS3882:2015)



Lab ref 103661(1)-1
Contract name Maple Way, Donington
Sample ID BH1 0.30-0.50m
OS Grid reference Not supplied
Date sampled 08 December 2021

Date received 09 December 2021
Analysis started 09 December 2021
Analysis completed 21 December 2021
Report issued 06 January 2022

Test	Units	Result	Compliant with Multipurpose? (Y/N)	Compliant with specific purpose? (Y/N)				
				Acidic	Calcareous	Low Fertility	Low F Acidic	Low F Calcareous
Texture								
Clay content	% w/w	35	Y	Y	Y	Y	Y	Y
Silt content	% w/w	28	Y	Y	Y	Y	Y	Y
Sand content	% w/w	37	Y	Y	Y	Y	Y	Y
Soil texture	class	CLAY LOAM						

Stone content								
>2mm	% w/w	3	Y	Y	Y	Y	Y	Y
>20mm	% w/w	0	Y	Y	Y	Y	Y	Y
>50mm	% w/w	0	Y	Y	Y	Y	Y	Y

Mass loss on ignition								
Clay 5-20%	% w/w	-	-	-	-	-	-	-
Clay 20-35%	% w/w	5.4	Y	Y	N	Y	Y	Y
pH	pH units	8.0	Y	N	Y	Y	N	Y
Carbonate (calcareous only)	% w/w CaCO ₃	2.6			Y			Y
Nitrogen (total)	% w/w N	0.16	Y	Y	Y			
Carbon:Nitrogen ratio	-	14.3	Y	Y	Y	Y	Y	Y
Phosphorus (extractable)	mg/l P	116	Y	Y	Y	N	N	N
Potassium (extractable)	mg/l K	574	Y	Y	Y			
Magnesium (extractable)	mg/l Mg	281	Y	Y	Y			
Electrical conductivity	µS/cm	148	Y					

Phytotoxic contaminants (by soil pH)								
Copper (Nitric acid extract)	mg/kg Cu	24	Y	Y	Y	Y	Y	Y
Nickel (Nitric acid extract)	mg/kg Ni	20	Y	Y	Y	Y	Y	Y
Zinc (Nitric acid extract)	mg/kg Zn	88	Y	Y	Y	Y	Y	Y

VISIBLE CONTAMINANTS								
(air-dried soil)	% w/w	<0.1	Y	Y	Y	Y	Y	Y
...of which plastics	% w/w	<0.1	Y	Y	Y	Y	Y	Y
Sharps	% w/w	None	Y	Y	Y	Y	Y	Y

DECLARATION

I certify that this sample has been analysed in accordance with BS3882:2015.

Signature

J. Campbell

Name

John Campbell

Position

Director

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DECLARATION OF COMPLIANCE (BS3882:2015)



Lab ref 103661(1)-5
Contract name Maple Way, Donington
Sample ID BH4 0.20-0.40m
OS Grid reference Not supplied
Date sampled 08 December 2021

Date received 09 December 2021
Analysis started 09 December 2021
Analysis completed 21 December 2021
Report issued 06 January 2022

Test	Units	Result	Compliant with Multipurpose? (Y/N)	Compliant with specific purpose? (Y/N)				
				Acidic	Calcareous	Low Fertility	Low F Acidic	Low F Calcareous
Texture								
Clay content	% w/w	25	Y	Y	Y	Y	Y	Y
Silt content	% w/w	27	Y	Y	Y	Y	Y	Y
Sand content	% w/w	48	Y	Y	Y	Y	Y	Y
Soil texture	class	CLAY LOAM						

Stone content								
>2mm	% w/w	4	Y	Y	Y	Y	Y	Y
>20mm	% w/w	0	Y	Y	Y	Y	Y	Y
>50mm	% w/w	0	Y	Y	Y	Y	Y	Y

Mass loss on ignition								
Clay 5-20%	% w/w	-	-	-	-	-	-	-
Clay 20-35%	% w/w	5.9	Y	Y	Y	Y	Y	Y
pH	pH units	8.2	Y	N	Y	Y	N	Y
Carbonate (calcareous only)	% w/w CaCO ₃	0.3			N			N
Nitrogen (total)	% w/w N	0.18	Y	Y	Y			
Carbon:Nitrogen ratio	-	14.2	Y	Y	Y	Y	Y	Y
Phosphorus (extractable)	mg/l P	90	Y	Y	Y	N	N	N
Potassium (extractable)	mg/l K	462	Y	Y	Y			
Magnesium (extractable)	mg/l Mg	163	Y	Y	Y			
Electrical conductivity	µS/cm	85	Y					

Phytotoxic contaminants (by soil pH)								
Copper (Nitric acid extract)	mg/kg Cu	20	Y	Y	Y	Y	Y	Y
Nickel (Nitric acid extract)	mg/kg Ni	18	Y	Y	Y	Y	Y	Y
Zinc (Nitric acid extract)	mg/kg Zn	79	Y	Y	Y	Y	Y	Y

VISIBLE CONTAMINANTS								
(air-dried soil)	% w/w	<0.1	Y	Y	Y	Y	Y	Y
...of which plastics	% w/w	<0.1	Y	Y	Y	Y	Y	Y
Sharps	% w/w	None	Y	Y	Y	Y	Y	Y

DECLARATION

I certify that this sample has been analysed in accordance with BS3882:2015.

Signature

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DECLARATION OF COMPLIANCE (BS3882:2015)



Lab ref 103661(1)-10
Contract name Maple Way, Donington
Sample ID BH7 0.20-0.40m
OS Grid reference Not supplied
Date sampled 08 December 2021

Date received 09 December 2021
Analysis started 09 December 2021
Analysis completed 21 December 2021
Report issued 06 January 2022

Test	Units	Result	Compliant with Multipurpose? (Y/N)	Compliant with specific purpose? (Y/N)				
				Acidic	Calcareous	Low Fertility	Low F Acidic	Low F Calcareous
Texture								
Clay content	% w/w	35	Y	Y	Y	Y	Y	Y
Silt content	% w/w	26	Y	Y	Y	Y	Y	Y
Sand content	% w/w	39	Y	Y	Y	Y	Y	Y
Soil texture	class	CLAY LOAM						

Stone content								
>2mm	% w/w	4	Y	Y	Y	Y	Y	Y
>20mm	% w/w	0	Y	Y	Y	Y	Y	Y
>50mm	% w/w	0	Y	Y	Y	Y	Y	Y

Mass loss on ignition								
Clay 5-20%	% w/w	-	-	-	-	-	-	-
Clay 20-35%	% w/w	5.5	Y	Y	N	Y	Y	Y
pH	pH units	7.7	Y	N	Y	Y	N	Y
Carbonate (calcareous only)	% w/w CaCO ₃	1.3			Y			Y
Nitrogen (total)	% w/w N	0.17	Y	Y	Y			
Carbon:Nitrogen ratio	-	16.9	Y	Y	Y	Y	Y	Y
Phosphorus (extractable)	mg/l P	95	Y	Y	Y	N	N	N
Potassium (extractable)	mg/l K	462	Y	Y	Y			
Magnesium (extractable)	mg/l Mg	317	Y	Y	Y			
Electrical conductivity	µS/cm	219	Y					

Phytotoxic contaminants (by soil pH)								
Copper (Nitric acid extract)	mg/kg Cu	35	Y	Y	Y	Y	Y	Y
Nickel (Nitric acid extract)	mg/kg Ni	16	Y	Y	Y	Y	Y	Y
Zinc (Nitric acid extract)	mg/kg Zn	133	Y	Y	Y	Y	Y	Y

VISIBLE CONTAMINANTS								
(air-dried soil)	% w/w	<0.1	Y	Y	Y	Y	Y	Y
...of which plastics	% w/w	<0.1	Y	Y	Y	Y	Y	Y
Sharps	% w/w	None	Y	Y	Y	Y	Y	Y

DECLARATION

I certify that this sample has been analysed in accordance with BS3882:2015.

Signature

J. Campbell

Name

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Position

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Waste Acceptance Criteria Testing BS EN 12457-Part 3, 2 Stage Process



Sample Details

Contract Name Maple Way, Donington
Lab Number 103661-6
Sample ID BH4 0.90-1.00m
Date Sampled 8 December 2021
Date Received 9 December 2021
Particle Size (<4mm) -
Method of size reduction N/A
Non-crushable matter N/A

Test Values

Mass of Raw Test Portion (MW) kg 0.228
Mass of Dried Test Portion (MD) kg 0.175
Moisture Content Ratio (MC) % 30.30
Dry Matter Content Ratio (DR) % 76.74
Leachant Volume (1) (L2) Litre 0.297
Leachant Volume (2) (L8) Litre 1.400
Eluate Volume (1) (VE1) Litre 0.070
Eluate Volume (2) (VE2) Litre 1.060

Eluate Analysis	Conc in Eluate	
Liquid : Waste Ratio	2:1	8:1
pH (units)	8.1	8.2
Temperature (°C)	20	20
Conductivity (µS/cm)	102	71
Antimony (µg/l Sb)	2.91	0.30
Arsenic (µg/l As)	1.34	2.24
Barium (µg/l Ba)	22.2	7.4
Cadmium (µg/l Cd)	<0.07	<0.07
Chromium (µg/l Cr)	<0.2	<0.2
Copper (µg/l Cu)	11.0	6.6
Lead (µg/l Pb)	19.5	2.4
Mercury (µg/l Hg)	<0.008	<0.008
Molybdenum (µg/l Mo)	2.8	1.9
Nickel (µg/l Ni)	0.9	<0.5
Selenium (µg/l Se)	0.91	0.07
Zinc (µg/l Zn)	3	<1
Chloride (mg/l Cl)	6.1	6.7
Fluoride (mg/l F)	0.6	0.2
Sulphate (mg/l SO ₄)	8.0	12
Total Dissolved Solids (mg/l TDS)	80	55
Phenol Index (µg/l PhOH)	<10	2199
Dissolved Organic Carbon (mg/l C)	35	35

Amount Leached		BS EN 12457-3 Limit Values mg/kg at L:S 10:1		
2:1 mg/kg	10:1 mg/kg	Inert Waste	Non-reactive Hazardous Waste	Hazardous Waste
0.006	0.004	0.06	0.7	5
0.003	0.022	0.5	2	25
0.044	0.080	20	100	300
<0.0002	<0.0007	0.04	1	5
<0.0004	<0.002	0.5	10	70
0.022	0.068	2	50	100
0.039	0.031	0.5	10	50
<0.00002	<0.00008	0.01	0.2	2
0.006	0.019	0.5	10	30
0.002	<0.005	0.4	10	40
0.002	0.001	0.1	0.5	7
0.006	<0.011	4	50	200
12	67	800	15000	25000
1.1	1.8	10	150	500
16	115	1000	20000	50000
160	560	4000	60000	100000
<0.02	<21.11	1		
70	347	500	800	1000

Waste Analysis	Units	Result			
Total Organic Carbon	% w/w	1.7	3%	5%	6%
Loss on Ignition	% w/w	51.2			10%
BTEX	mg/kg	<0.06	6		
PCBs (7 congeners)	mg/kg	<0.045	1		
TPH (C10 - C40)	mg/kg	<19	500		
PAH (total)	mg/kg	<0.36	100		
pH	pH units	8.6		>6	
Acid Neutralisation Capacity (pH4)	mol/kg	0.18		To be evaluated	
Acid Neutralisation Capacity (pH7)	mol/kg	0.06		To be evaluated	

Disclaimer : The Landfill Waste Acceptance Criteria limits in this report are provided for guidance only.
Chemtech Environmental Ltd does not take responsibility for any errors or omissions. Data is correct as of 01/09/2005.
Samples will be disposed of 6 weeks from initial receipt unless written instructions are received and further storage is agreed.
Waste Acceptance Criteria testing is outside the scope of the laboratory's UKAS accreditation.

Comments

Authorised by:

J. Campbell

Name:

John Campbell

Report date:

21 December 2021

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Director

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Waste Acceptance Criteria Testing BS EN 12457-Part 3, 2 Stage Process



Sample Details

Contract Name Maple Way, Donington
Lab Number 103661-11
Sample ID BH7 0.90-1.00m
Date Sampled 8 December 2021
Date Received 9 December 2021
Particle Size (<4mm) -
Method of size reduction N/A
Non-crushable matter N/A

Test Values

Mass of Raw Test Portion (MW) kg 0.227
Mass of Dried Test Portion (MD) kg 0.175
Moisture Content Ratio (MC) % 29.97
Dry Matter Content Ratio (DR) % 76.94
Leachant Volume (1) (L2) Litre 0.298
Leachant Volume (2) (L8) Litre 1.400
Eluate Volume (1) (VE1) Litre 0.065
Eluate Volume (2) (VE2) Litre 1.080

Eluate Analysis	Conc in Eluate	
Liquid : Waste Ratio	2:1	8:1
pH (units)	8.1	8.1
Temperature (°C)	20	20
Conductivity (µS/cm)	65	72
Antimony (µg/l Sb)	1.98	0.45
Arsenic (µg/l As)	9.90	7.11
Barium (µg/l Ba)	26.1	6.3
Cadmium (µg/l Cd)	<0.07	<0.07
Chromium (µg/l Cr)	2.4	<0.2
Copper (µg/l Cu)	7.4	1.6
Lead (µg/l Pb)	8.3	<0.2
Mercury (µg/l Hg)	<0.008	<0.008
Molybdenum (µg/l Mo)	19.1	3.0
Nickel (µg/l Ni)	2.4	<0.5
Selenium (µg/l Se)	0.50	<0.07
Zinc (µg/l Zn)	4	<1
Chloride (mg/l Cl)	2.6	0.9
Fluoride (mg/l F)	0.2	<0.1
Sulphate (mg/l SO ₄)	10	<1.7
Total Dissolved Solids (mg/l TDS)	50	55
Phenol Index (µg/l PhOH)	<10	<10
Dissolved Organic Carbon (mg/l C)	24	25

Amount Leached		BS EN 12457-3 Limit Values mg/kg at L:S 10:1		
2:1 mg/kg	10:1 mg/kg	Inert Waste	Non-reactive Hazardous Waste	Hazardous Waste
0.004	0.005	0.06	0.7	5
0.020	0.072	0.5	2	25
0.052	0.070	20	100	300
<0.0002	<0.0007	0.04	1	5
0.005	<0.003	0.5	10	70
0.015	0.018	2	50	100
0.017	<0.005	0.5	10	50
<0.00002	<0.00008	0.01	0.2	2
0.038	0.036	0.5	10	30
0.005	<0.006	0.4	10	40
0.001	<0.0009	0.1	0.5	7
0.007	<0.011	4	50	200
5.3	9.8	800	15000	25000
0.3	<1.0	10	150	500
20	<20	1000	20000	50000
100	548	4000	60000	100000
<0.02	<0.1	1		
48	246	500	800	1000

Waste Analysis	Units	Result			
Total Organic Carbon	% w/w	2.8	3%	5%	6%
Loss on Ignition	% w/w	2.1			10%
BTEX	mg/kg	<0.06	6		
PCBs (7 congeners)	mg/kg	<0.045	1		
TPH (C10 - C40)	mg/kg	79	500		
PAH (total)	mg/kg	<0.36	100		
pH	pH units	8.3		>6	
Acid Neutralisation Capacity (pH4)	mol/kg	0.17		To be evaluated	
Acid Neutralisation Capacity (pH7)	mol/kg	0.05		To be evaluated	

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