400 Longwater Avenue, GreenPark, Reading

Updated Interpretative Report on Ground Conditions (Contamination) - 2016

On behalf of **Oxford Properties**

Project Ref: 27159/3504 | Rev: 01 | Date: February 2016

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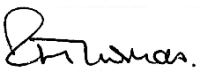
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Date: **01 March 2016**

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For and on behalf of Peter Brett Associates LLP				

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1 Introduction

1.1 Preamble

Peter Brett Associates LLP (PBA) has been commissioned by Oxford Properties (the Client) to provide geotechnical and geoenvironmental consultancy services in relation to the redevelopment of a site known as 400 Longwater Avenue at GreenPark (a commercial office park) in Reading.

A Site Location Plan is presented as **Figure 1** and a Site Layout Plan is presented as **Figure 2**.

This report presents a review of existing ground condition data in order to address regulatory and legislative changes that have been published since compilation of the original reports. In particular current guidance on the assessment of land contamination and ground gasses has been utilised.

Guidance on the context of this report and any general limitations or constraints on its content and usage are given in a separate guidance note included after the text of this report

1.2 Context

It is understood that Oxford Properties, the asset manager for Green Park Reading No.1 LLP, now intends to 'refresh' the design and planning information from the proposal prepared in 2013-14and submit a planning application for the office development at 400 Longwater Avenue, Green Park.

1.3 Site Location and Description

The commercial development known as GreenPark is located 2km North West of Junction 11 of the M4 Motorway and west of the A33 Basingstoke Road on the southern outskirts of Reading, Berkshire. GreenPark in total covers an area of approximately 30ha and the National Grid Reference for the centre of the site is approximately SU 699 698.

400 Longwater Avenue is located towards the western boundary of Green Park and covers an area of approximately 4.5ha. A plan of Green Park indicating the location of the subject site is presented as Figure 1.

1.4 Information Utilised

PBA have extensive knowledge of GreenPark, having been involved in its development for over 20 years. This has resulted in a significant library of ground condition information across the majority of the park, including 400 Longwater Avenue, (formerly known as Plot 3.2).

The following report has been used to prepare this report:-

- Updated Interpretative Report on Geotechnical and Geoenvironmental Investigation 400 Longwater Avenue, GreenPark Reading (PBA 2013) – comprising a desk based refresh and update of historical information and a further 6 ground gas monitoring rounds of the seven wells installed in 2008 between 18th October 2013 and the 18th November 2013.

A copy of PBA 2013 in presented in Appendix 1 and should be read in conjunction with this report because this contains the information and data used in this report. The reader should note the following:-

- PBA 2013 contains the detail on the environmental setting which is summarised in part in this report;

- Appendix 2 of PBA 2013 contains a report presenting the historical data entitled "Summary Geoenvironmental Report, Plot 3" (PBA 1998). PBA 1998 presents investigation data relevant to the whole of Plot 3 and the adjacent flood relief channel, some of which is not relevant/utilised in this report; and

- PBA 2013 contains the factual records (exploratory hole records, laboratory test certificates and monitoring results) for a report entitled "Interpretative Report on Combined Geotechnical and Geoenvironmental Investigation, Plot 3.2 Green Park, Reading" (PBA, 2008). The report presents a review of historical ground condition data, supplemented by a further intrusive investigation comprising seven boreholes, laboratory analysis of soils and groundwater samples and six ground gas monitoring rounds between 25th June 2008 and the 1st August 2008.

An updated third party database search is presented in

1.5 Background Information

- The subject site is currently unoccupied within an area of recently constructed commercial use (GreenPark Business Park).

- No on site point sources of contamination were identified based on historical land use.

- A waste transfer station operated on part of the former Small Mead Farm located approximately 100m to the north of the subject site boundary. Hydrocarbon contamination was identified in the groundwater (possibly compromised samples as taken from pits) but the farm has been redeveloped and is hydraulically down gradient of the subject site.

- The GreenPark flood relief channel forms the eastern boundary of 400 Longwater Avenue, flowing in a northerly direction. Both the Flood Relief channel and Foudry Brook (located approximately 300m further to the east) are connected to the River Kennet which is present approximately 1.5km to the north of the Plot, flowing in an easterly direction.

- The River Terrace Deposits and sand layers within the Lambeth Group are classified as Secondary A aquifers.

- 17 Exploratory Holes within or immediately adjacent to the subject site comprising:-

  - 1983 - two boreholes (BH3 and BH7) by Tarmac

  - 1985 – two trial pits (TP4 and TP5) by Southern Testing

  - 1988 – two boreholes (BH2 and 12) and three trial pits (TP46, TP53 and TP57) by FES

  - 1995 – one trial pit (TP95/27) by PBA

  - 2008 – seven boreholes (BH101 to BH105 and BH201 and BH202)

- Laboratory testing for contamination was undertaken on two soil samples in 1995 and 12 soil samples in 2008.

- Engineered Fill was placed across the site to provide a development platform above the 1:200 year flood level. The imported fill comprised Lambeth Group materials (sands, silts, clays) derived from the deepening of the Trout Lakes. We understand that a layer of hardcore was placed at the surface for weather protection purposes following the placement of the engineered fill. Details of the specified engineering criteria and Quality Control testing requirements are contained in Appendix 2 of PBA 2008. In 2008 Engineered Fill was encountered in all the exploratory hole locations and generally comprised brown clayey gravelly sand or brown clayey sand and gravel. All of the exploratory holes reported gravel of flint, concrete and brick with occasional fragments of wood (BH103) within the upper 0.85m. The thickness of the engineered fill varied from 1.15m to 1.70m.

- There are three authorised landfill sites in the vicinity of 400 Longwater Avenue, one of which is shown to be located within 250m (refer to Appendix 2) namely:

  Smallmead Farm Landfill approximately 600m to the north is believed to have been active is 1980s/1990s landfill under Waste Management License WML 86029 with the operator shown as RMC Logistics (south east) Ltd, receiving household, commercial and industrial waste and the status is shown as “closure”;

  Reading Football Club Landfill now occupied by the Madjeski Stadium development is approximately 380m to the east on the opposite side of the flood relief channel. The landfill is believed to have been active in the 1970s and is shown as being operated by Reading Football Club and receiving household, commercial and industrial waste under Waste Management License WML 86028 and the status is shown as “closure”; and

  Burghfield Landfill which received wastes “excluding inert”, which at the closest point is approximately 250m to the north west. The Waste Management License is WML 86028 and the status is shown as “effective”, with the operator shown as Cemex UK Materials Ltd. There is also a historical landfill record for the southern part of this landfill recorded as Burghfield Area D (there is no other information on this landfill). This area is in part shown as encompassing the current Trout Lakes.

- As well as Burghfield Area D there are other historical landfills within 1km including Island Road Tip, Smallmead Stadium and Smallmead Tip approximately 800m north east, Cottage Lane No1 and No2 600m North West and approximately 600m south west (south of the M4) are Pingewood Farm and Moores Farm landfills.

1.6 Summary of Strata Encountered

Table 1.1 summarises the strata encountered and depths to base of stratum in the shallow exploratory holes drilled in 2008.

Table 1.1 Table Summarising Depth to Base of Stratum in mbgl

Borehole	Depth to Base of Engineered Fill (mbgl)	Depth to Base of Alluvium (mbgl)	Depth to Base of RTD (mbgl)	Depth to Base of Lambeth Group (mbgl)
101	1.65	1.80	4.75	>5
102	1.40	Not encountered	4.65	>5
103	1.50	1.80	4.55	>5
104	1.70	2.40	4.60	>5
105	1.35	2.20	4.00	>5

2 Review of Ground Condition Data (2016)

2.1 Approach

In accordance with the PBA methodology for assessing ground conditions, presented in **Appendix 3**, site specific concentrations of potential contaminants have been compared to published / generic criteria for a defined end use and used to screen the data. If the concentration is below the screening criterion for the specified end use the parameter is not deemed to be a hazard. Exceedence of the criterion indicates that the parameter is a possible hazard and either that further assessment or risk management is required. The current rationale for selection of generic assessment criteria routinely used by PBA is presented in **Appendix 4**.

Guidance on the investigation and assessment of ground gases has been published and the criteria utilised for assessment of soils and groundwater have been withdrawn/ superseded since the issue of PBA 2013. The methodology and rationale appended to this report set out the current guidance /criteria used and the references.

2.1.1 Soils

For the protection of human health, soil screening criteria for a commercial/industrial end-use have been selected for the site specific end use. Where the criterion for a parameter is dependent on the soil organic matter (SOM) content, we have used the criteria for a SOM of 1% which is both the more conservative approach and the most appropriate given that none of the 7 results is above 1%.

Potential risks to plant life, such as landscape areas are assessed through BS 3882:2015 'Specification for topsoil and requirements for use'. The standard sets out the threshold values in soil above which phytotoxic effects can occur from copper, nickel and zinc.

At present there is no guidance in the UK for assessing the quality of soils and potential to impact groundwater.

2.1.2 Liquids

The groundwater geochemical concentrations have been compared to Environmental Quality Standards (EQS) for freshwater bodies.

2.2 Review of Chemical Testing – Soil Samples

Laboratory testing for contamination from exploratory holes on site was undertaken on two soil samples in 1995 and 12 soil samples in 2008.

2.2.1 Metals

- None of the9 sets of results exceeded the selected protection of human health criteria.
- None of 9 sets of results for copper, nickel and zinc exceed the criteria for phytotoxic effects

2.2.2 pH

- The soils are alkaline but 3 of the 7 samples record pH >11. All of these samples are from 0.25mbgl and therefore the very alkaline results are probably due to the crushed concrete cover believed to have been placed over the Engineered Fill.

2.2.3 Hydrocarbons

- Of the six samples tested, none recorded concentrations of BTEX (acronym that stands for benzene, toluene, ethylbenzene, and xylenes) /MTBE (Methyl tert-butyl ether) above the limit of detection of 10mg/kg which is below the relevant assessment criterion.

- The Extractable Petroleum Hydrocarbon (EPH) results are generally very low with only one concentration above 500mg/kg (560mg/kg from BH202@0.25mbgl) which is below the lowest criterion for any carbon band (3200mg/kg for aliphatic C5-6).

2.2.4 Polycyclic Aromatic Hydrocarbons (PAHs)

- The total concentration of the United States EPA (Environmental Protection Agency) listed 16 priority PAHs in 6No samples were less than the limit of detection (<10mg/kg). One sample recorded 16mg/kg. Whilst the total concentrations are less than the assessment criterion for benzo(a)pyrene they are above the criterion of 3.5mg/kg for Dibenzo(ah)anthracene

2.2.5 Asbestos

- There has been no asbestos testing undertaken.

2.3 Review of Chemical Testing – Groundwater Samples

Five water samples were analysed in 2008, three River Terrace Deposits (RTD) groundwater samples (BH102, BH104 and BH105) and two Lambeth Group groundwater samples (BH201 and BH202).

- Cadmium - Two samples marginally exceed the criterion of 0.25ug/l, the sample from BH102 recorded a concentration of 0.31ug/l and that from BH201 0.35ug/l.

- Chromium – One sample (BH105) recorded a total concentration of 7ug/l which exceeds the criterion of 3.4ug/l, but this is for hexavalent chromium.

- Iron – all samples exceed the criterion of 1ug/l, however, clarification is being sort by the professional community as to whether this is an error in the document.

- Manganese – the samples from the RTD record concentrations of between 610 and 840ug/l which exceed the criterion of 123ug/l which is for bioavailable manganese.

- Nickel – the sample from BH201 recorded a concentration of 4.8ug/l which marginally exceeds the criterion of 4ug/l for bioavailable nickel.

- Ammoniacal Nitrogen - the samples from the RTD recorded slightly high concentrations with a notable 5.5mg/l in BH102.

- Hydrocarbons – all the samples recorded EPH and PAH concentrations less than the limits of detection. However, the recently published EQS for PAH are very low and for some parameters the LOD is above the EQS.

2.4 Ground Gas Data Review and Assessment

2.4.1 Gas Generation Potential

The Conceptual Site Model (CSM) for the site and the gas generation potential is presented below:-

- Land Use On site – Very Low gas generation potential – historically the site was in agricultural use with no known gas generating activities. The imported materials used as Engineered Fill comprised inert natural material sourced and placed under a controlled earthworks specification. The 2008 exploratory hole records support this statement and indicate very little degradable matter is present (occasional fragments of wood in one location).

- Land Use Off site - Low gas generation potential – although there are a number of large landfills in the vicinity and the underlying RTD is permeable (migration pathway) it is considered unlikely that gas migration to the subject site is viable given the distance. Petroleum hydrocarbons can cause the gas monitoring equipment to give erroneously high flammable gas readings; however, the hydrocarbon impacted groundwater at Small Mead Farm is hydraulically down gradient of the subject site and therefore unlikely to migrate on to site.

- Geology – Low gas generation potential – naturally occurring alluvial deposits can generate permanent ground gases.

Overall the gas generation potential is considered to be Low and. BS 8576:2013 suggests that where a gas generation potential is not identified in the preliminary investigation no further action would be recommended.

2.4.2 General Commentary

- BS 8485:2015 (BSI 2015) does not specify a minimum number of monitoring rounds or the duration over which data should be collected. BS 8576:2013 (BSI 2013) states that monitoring should be sufficient to allow prediction of worst case conditions and that justification should be provided for the monitoring period and frequency that is adopted. CIRIA report C665 (CIRIA 2007) suggests that for a Low gas generation potential site and a low sensitivity development such as commercial property, six rounds over 2 months would be adequate. Increasing the gas generation potential to moderate suggests 6 rounds over 3 months would be needed.

- The results of the 12 gas monitoring events carried out in the summer of 2008 and the winter of 2013 have shown elevated concentrations of methane and carbon dioxide. The results are very variable with no discernible trends and unusually low oxygen levels, which from available records (i.e. not the complete data set) shows initial readings reducing by over half over a three minute period.

- The results of the gas monitoring are not typical of gas concentrations found elsewhere across GreenPark.

- All five of the shallow wells are installed with a response zone between 1 and 4.5mbgl and despite shallow groundwater it is considered that all wells offer a reasonable exposed slotted section.

- Atmospheric pressure for the monitoring rounds was between 999mb and 1023mb, which are generally considered to represent Moderate to High pressure conditions. To record “worst case” gas data should ideally be collected during Low and Falling atmospheric pressure. BS 8576:2013 states that gas monitoring does not necessarily need to be carried out under worst case conditions. It does not necessarily need to be at low or falling atmospheric pressure, but rather should be continued until it is unlikely that additional data will change the interpretation of the data, the outcome of the risk assessment and proposed remedial actions.

- The original gas monitoring records from 2008 (which provide additional information to the summary tables in the 2013 report) are presented in Appendix 4. Trend data is not available for all rounds but for the monitoring on 10th July 2008 atmospheric pressure

was recorded as 1003mb and falling in the 24hours before and after. The maximum methane concentrations and flow results for BH101, BH102, BH104 and BH105 in 2008 were recorded in this round.

- Negative flow rates were recorded on one or more occasions in all wells except BH104. Negative flow rates can be recorded because the atmospheric pressure is higher than the downhole pressures. This could simply be due to an increase in atmospheric pressure following a period of low atmospheric pressure where the near-surface materials retard the response in the monitoring well). Whilst not all the historical records have this detail it is noted that the original record for 10th July 2008 (Appendix 5) describes the ground as muddy with surface water ponding.

2.4.3 Risk Assessment

Using the empirical semi quantitative approach using gas monitoring data presented in BS 8485:2015 a borehole hazardous gas flow rate (Qhg) has been calculated using a combination of the maximum gas concentration and highest flow rate (ideally steady state) from any monitoring round . The Qhg is used to derive a gas screening value (GSV) for each location.

A table showing the maximum reading for methane, carbon dioxide and flow, the calculated borehole hazardous gas flow rate and Characteristic Situation (CS) by location and for each round in presented in Appendix 6.

The table shows that all of the calculated borehole hazardous gas flow rates that suggest CS 3 or higher are derived using methane concentrations. Of the 60 measured borehole hazardous gas flow rates for methane, five suggest CS 3 and only one CS4.

Guidance states that the dataset should only be considered representative and comprehensive if it captures temporal variation. BS8485:2015 advocates undertaking a worst case check to establish if a greater hazard could reasonably exist. To do this the maximum gas concentration is combined with the maximum flow rate from any location for any round. A Qhg of 16.5 L/hr is calculated that would equate to CS 5.

2.4.4 Discussion and Proposed Characteristic Situation

- Moderate to High hazard potential sites with CS 3 or 4 are typically those associated with post 1960s landfills or mine workings.

- No man made source for such elevated gas levels has been identified on site, either through desk study research or site specific intrusive ground investigation. It is considered unlikely that there is a significant unidentified source of gas.

- The calculated CS is not consistent with the Conceptual Site Model . The data is not considered typical for a site where the gas regime is believed to derive from natural strata.

- The monitoring record for 10th July 2008, when the maximum methane concentration was recorded, shows that the initial reading of 55% decreased to 21.5% over the 3 minutes. It is considered that, as the calculated borehole hazardous gas flow rate using the maximum reading is only just within the lower range limit for CS5 and the available data suggests a much lower steady state concentration is more likely, CS 5 should not be adopted as the characteristic situation for the site.

The adoption of a design criterion of CS 4 based on current guidance using mixed maximum readings is considered overly onerous given the above, and, in consideration of the more detailed breakdown that shows that only one of 60 combinations of methane concentration

and flow rate combinations actually generates CS4, a design criterion of CS 3 is proposed, subject to regulatory agreement.

2.4.5 Proposed Gas Protection

The proposed development is assigned as Type C Buildings being private commercial structures where there is full control of changes including structural alterations. The gas protection score (points) required for this building type for the given CS are presented below:-

- CS 3 (Moderate hazard potential) - 3 points
- CS 4 (Moderate to High hazard potential - 4.5 points
- CS 5 (High hazard potential) - 5.5 points

Gas protection measures will need to be included in the detailed design drawings. This can be secured through imposition of a suitably worded condition. Information regarding gas protection measure specification is provided below:-

- Tables in BS8485:2015 sets out how the gas protection score can be achieved through, venting, barriers and membranes. This could be accomplished by, for example, inclusion of passive ventilation below a floor slab, through incorporation of a geocomposite void former and ventilation air bricks, reinforced concrete raft foundation with limited service penetrations and a proprietary gas protection membrane, independently integrity tested.
- It should be noted that where the Characteristic Situation is CS 4 or higher, the site should have a comprehensive assessment done to support the adequacy of the proposed protection measures and not solely rely on the tables in BS 8485:2015 to select appropriate protection measures.

3 Conclusions

3.1 Data Gaps and Uncertainty

In the context of the CSM presented and a gas generation potential based on known current and previous land uses it is considered that-

- the number of exploratory holes and coverage of the site is reasonable and is sufficient to characterise the ground conditions,.
- the number of soil samples tested is not unreasonable and is sufficient to characterise the soil conditions for a less sensitive end use.
- the scope of the laboratory testing is not unreasonable however; crushed construction materials if imported today would be tested for asbestos.
- the number and duration of gas monitoring is reasonable, however, the information collected historically is not always compliant with current good practice.

However, the monitoring data indicates that the preliminary investigation may not have identified a localised gas generation source in which case the number of exploratory holes and/or data collected may not be adequate. In some instances professional judgement and experience of the GreenPark area has been used in the risk assessment and it is recognised it may be necessary to undertake additional data collection to confirm the assessment.

3.2 Potential Human Health Hazards

The chemical composition of the soil is not generally hazardous to human health in a commercial setting, with the note that the pH of the capping materials would preclude the material from being present at the surface of landscaped areas and there is no data on the possible presence of asbestos fibres in the capping materials (if these materials are retained at depth the possible presence is mitigated, however, consideration should be given to this matter in respect of materials handling during earthworks).

Human health hazards associated with ground gases are addressed in 3.4 below.

3.3 Potential Controlled Water Hazards

Although a number of actual and potential exceedances (based on comparison of total concentrations to bioavailable criteria) of the recently introduced EQS it is considered unlikely that the site is contributing to a deterioration of groundwater quality given the generally inert and naturally derived natural of the majority of the fill materials. In addition, the site is located in an area of known poor groundwater quality due to historical landfill activities and it is considered that there would be little benefit in requiring/undertaking isolated improvement.

3.4 Potential Building Hazards

Using guidance published in 2015 the gas data assessment now indicates the gas regime to be Characteristic Situation of CS 4 with a theoretical worst case Characteristic Situation of CS 5. We have presented a discussion where the adoption of CS 5 is overly conservative given the available information on likely peak rather than steady state readings and recommended that CS5 as a design criterion is unreasonably conservative.

No man made source for such elevated gas generation levels has been identified, either through desk study research or direct intrusive ground investigation. The CSM is not

consistent with the typical land use associated with a Characteristic Situation 4, (a completed landfill or mine workings) and the gas readings are not typical of those found elsewhere across Green Park.

On this basis, it is considered that a Characteristic Situation of 3 should be adopted for the site, subject to agreement with the regulator.

There are technically viable solutions for the proposed development to address CS 3 or CS 4.

4 Essential Guidance for Report Readers

This report has been prepared within an agreed timeframe and to an agreed budget that will necessarily apply some constraints on its content and usage. The remarks below are presented to assist the reader in understanding the context of this report and any general limitations or constraints. If there are any specific limitations and constraints they are described in the report text.

1 The opinions and recommendations expressed in this report are based on statute, guidance, and best practice current at the time of its publication. Peter Brett Associates LLP (PBA) does not accept any liability whatsoever for the consequences of any future legislative changes or the release of subsequent guidance documentation, etc. Such changes may render some of the opinions and advice in this report inappropriate or incorrect and we will be pleased to advise if any report requires revision due to changing circumstances, especially those over one year old. Following delivery of any report PBA has no obligation to advise the Client or any other party of such changes or their repercussions.

2 Some of the conclusions in this report may be based on third party data. No guarantee can be given for the accuracy or completeness of any of the third party data used. Historical maps and aerial photographs provide a “snap shot” in time about conditions or activities at the site and cannot be relied upon as indicators of any events or activities that may have taken place at other times.

3 The conclusions and recommendations made in this report and the opinions expressed are based on the information reviewed and/or the ground conditions encountered in exploratory holes and the results of any field or laboratory testing undertaken. There may be ground conditions at the site that have not been disclosed by the information reviewed or by the investigative work undertaken. Such undisclosed conditions cannot be taken into account in any analysis and reporting.

4 It should be noted that groundwater levels, groundwater chemistry, surface water levels, surface water chemistry, soil gas concentrations and soil gas flow rates can vary due to seasonal, climatic, tidal and man-made effects.

5 This report has been written for the sole use of the Client stated at the front of the report in relation to a specific development or scheme. The conclusions and recommendations presented herein are only relevant to the scheme or the phase of project under consideration. This report shall not be relied upon or transferred to any other party without the express written authorisation of PBA. Any such party relies upon the report at its own risk.

6 The interpretation carried out in this report is based on scientific and engineering appraisal carried out by suitably experienced and qualified technical consultants based on the scope of our engagement. We have not taken into account the perceptions of, for example, banks, insurers, other funders, lay people, etc, unless the report has been prepared specifically for that purpose. Advice from other specialists may be required such as the legal, planning and architecture professions, whether specifically recommended in our report or not.

7 Public or legal consultations or enquiries, or consultation with any Regulatory Bodies (such as the Environment Agency, Natural England or Local Authority) have taken place only as part of this work where specifically stated.



Site Grid Ref: SU 700 698

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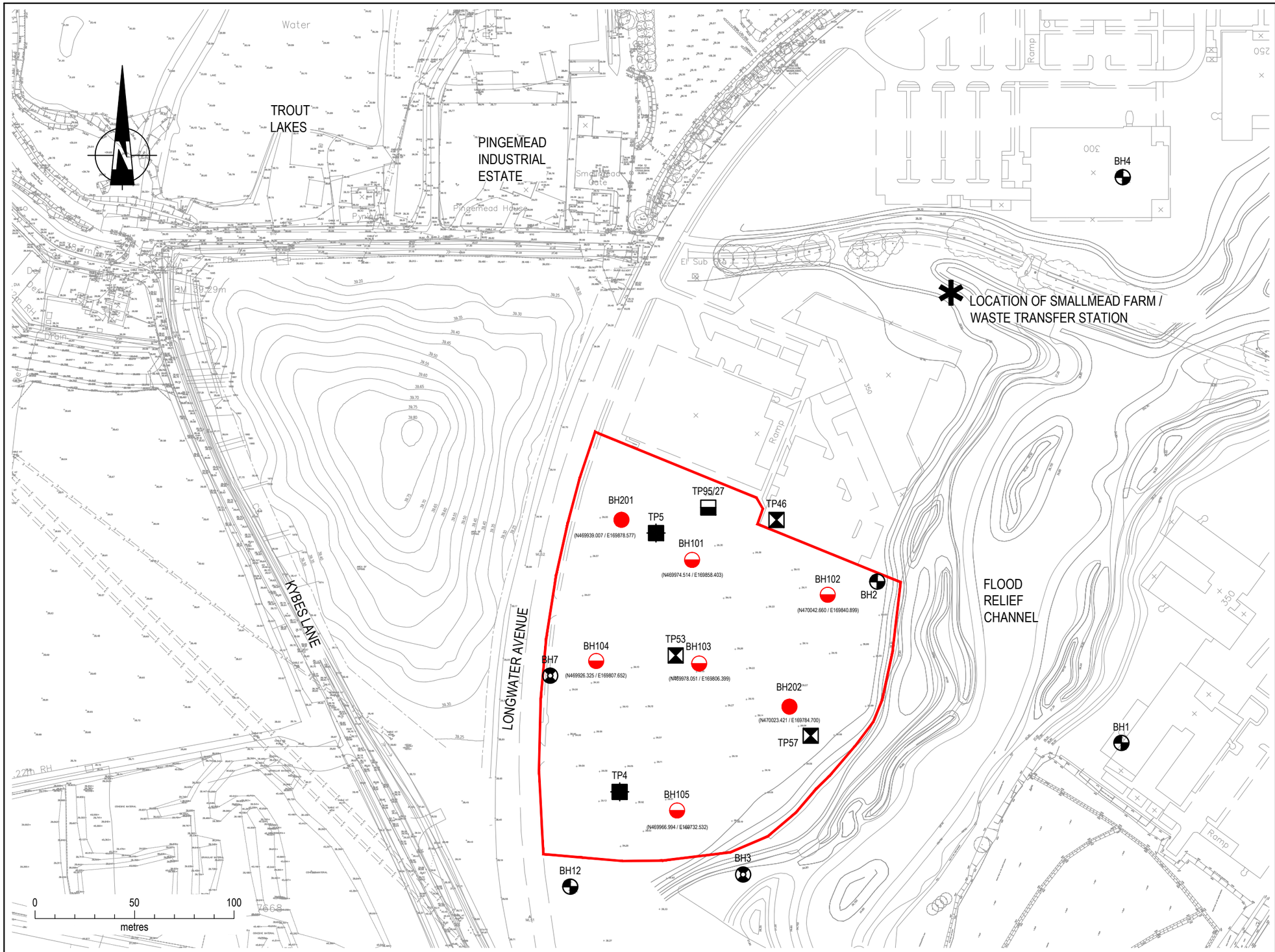
400 LONGWATER AVENUE,
GREEN PARK,
READING

SITE LOCATION PLAN

Date	22.02.2016
A4 Scale	1:25 000
Drawn by	davco
Checked by	CC
Revision	0

FIGURE 1

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KEY

- Cable Percussion Borehole 101 - 105 (5m)
- Cable Percussion Borehole 201 - 202 (15m)
- Borehole - Tarmac,1983
- Trial Pit - Southern Testing,1985
- Boreholes - FES ,1988
- Trial Pit - FES, 1988
- Trial Pit - PBA, 1995

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400 LONGWATER AVENUE, GREEN PARK, READING

SITE LAYOUT AND SCHEMATIC EXPLORATORY HOLE LOCATION PLAN

Date	13.12.2013
A3 Scale	1:2000
Drawn by	davco
Checked by	CC
Figure Number	2

Appendix A PBA 2013

400 Longwater Avenue, Green Park, Reading

Updated Interpretative Report on Geotechnical and Geoenvironmental Investigation

On behalf of **Oxford Properties**

Project Ref: 27159/007 | Rev: AA | Date: December 2013

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1 Introduction

1.1 Background

Peter Brett Associates LLP has been commissioned by Oxford Properties (the Client) to provide geotechnical and geoenvironmental consultancy services to assist in the further appraisal of a site known as 400 Longwater Avenue at Green Park, Reading, to support the pre-application process and planning submission of a new office building at the site.

PBA have extensive knowledge of the Green Park site, having been involved in its development for over 20 years. This has resulted in a significant library of background information across the majority of the park, including 400 Longwater Avenue, (formerly known as Plot 3.2). This information was reviewed and supplemented by a further investigation of the site in 2008 and subsequent production of an interpretive geoenvironmental and geotechnical report, (Interpretative Report on Combined Geotechnical and Geoenvironmental Investigation, Plot 3.2 Green Park, Reading, PBA, 2008).

PBA have undertaken a review of this information, completed a desk based refresh and update of the information contained therein, in order to address regulatory and legislative changes that have been published since its compilation, in particular contaminated ground and ground gasses.

The previous assessment undertaken in 2008 identified significant ground gas generation at the site. This was considered unusual at the time as this did not reflect either the site history, or findings elsewhere on the park. It was therefore recommended at the time that a further 6 rounds of ground gas monitoring be carried out, over a six month period, in order to gain further data and potentially resolve the discord, however, the monitoring was not subsequently completed.

Therefore, in addition to a desk based review and update of our report, we have undertaken 6 rounds of ground gas monitoring as proposed in 2008, but over a six week period. We are pleased to present our findings below.

2 The Site

2.1 Site Location and Description

Green Park is located 2km north west of Junction 11 of the M4 Motorway and west of the A33 Basingstoke Road on the southern outskirts of Reading, Berkshire. The National Grid Reference for the centre of the site is approximately SU 699 698. Green Park in total covers an area of approximately 30ha that formerly comprised mostly low lying meadow land. A layout plan of Green Park indicating 400 Longwater Avenue is presented as Figure 2.

400 Longwater Avenue currently lies vacant apart from a gravel stockpile approximately 1m to 2m high located in the centre of the site. The plot is located towards the western boundary of Green Park and covers an area of approximately 4.5ha.

2.2 Site History

The historical Ordnance Survey maps covering the period 1883 to 1995 have been reviewed. These maps indicate that during this time 400 Longwater Avenue remained as open fields with the Basingstoke to Reading Railway line located approximately 200m to the west. The M4 motorway was constructed around 1975.

The historical maps do not indicate any potentially contaminative land uses in the area immediately surrounding the site although the 1976 map indicates the presence of mineral workings (gravel pits) to the west of the Basingstoke to Reading Railway line. It is understood that these workings are now abandoned, flooded and are currently used for recreational water sports. The 1976 map also shows gravel workings (the Trout Lakes) located approximately 200m north west of the site. These gravel works were dewatered and used as a borrow pit to win material for the raising of the initial plots on Green Park. The Trout Lakes have recently been partially backfilled with inert materials to generate a landscaped flood balancing facility.

There are three former/current landfill sites in the vicinity of 400 Longwater Avenue namely:

- The former 1980s/1990s domestic/civil amenity landfill site operated by Halls, to the north of the Green Park development approximately 1.5km to the north east of the site, (see Figure 2).
- The former 1970s Smallmead domestic landfill site now occupied by the Madjeski Stadium development (now licensed) approximately 1.5km to the east of the site, (see Figure 2), and
- The current, licensed domestic landfill operated by Biffa, approximately 1.0km to the north west of the site, (see Figure 2).

As part of the Green Park development, the individual Plots have been raised using imported fill to provide level construction platforms above the predicted 1:200 year flood level. The imported fill comprised Lambeth Group materials (sands, silts, clays) derived from the deepening of the Trout Lakes. A flood relief channel was also constructed running approximately south west to north east through the centre of the Green Park development.

2.3 Geoenvironmental Setting

2.3.1 Geology

According to the records of the British Geological Survey (BGS, 2000, Sheet 268 of the 1:50,000 series, England and Wales, Solid and Drift Geology) the Plot is underlain by the following sequence of strata:

Recent and Pleistocene Deposits:	Alluvium (clays, silts, peat)
	River Terrace Deposits (sands and gravels)
Solid Deposits:	Lambeth Group (clays overlying silty, fine sands of Palaeocene Age)
	Upper Chalk Formation (of Cretaceous Age)

2.3.2 Hydrology

Foudry Brook is present approximately 300m to the east of the site, flowing to the north east. The Green Park flood relief channel forms the eastern boundary of 400 Longwater Avenue, flowing in a northerly direction. Both the Flood Relief channel and Foudry Brook are connected to the River Kennet which is present approximately 1.5km to the north of the Plot, flowing in an easterly direction.

2.3.3 Hydrogeology

The underlying Chalk forms the major aquifer in the region and is classed as a Principal aquifer (formerly major) by the Environment Agency. The River Terrace Deposits and sand layers within the Lambeth Group are classed as Secondary A aquifers (formerly minor). Flow direction within the River Terrace Deposits is likely to be to the north east towards the River Kennet/Green Park flood relief channel. Groundwater flow within the Chalk and Lambeth Group is to the east or south east.

2.3.4 Licensed Abstractions

Surface water abstractions from the Foudry Brook are present approximately 300m to the south east of the site.

A number of licensed abstractions from the River Terrace Deposits are also present within the Madjeski Stadium development area for remediation/environmental treatment purposes. There is a current licensed groundwater abstraction from the River Terrace Deposits within the Pingemead Industrial Estate approximately 500m north of the site. It is believed however that this abstraction is currently unused and, if it is currently in use, it will be abandoned following the redevelopment of the Estate by Green Park Village.

A major groundwater abstraction was present at the former Scottish and Newcastle Brewery, approximately 900m to the south east of the site where water was abstracted from the Chalk. 400 Longwater Avenue did lie within the inner source protection zone of the brewery abstraction as defined by the Environment Agency, up until the brewery closed in 2010. The site now does not lie within a source protection zone.

3 Site Work

3.1 Introduction

The objective of the PBA 2008 intrusive investigation was to provide greater understanding of the geoenvironmental conditions across the subject site and confirm the expected ground conditions in terms of contamination and geotechnical criteria. The majority of the site work was contracted to Fugro Engineering Services Ltd (FES) and was carried out between the 16th June 2008 and 24th June 2008. The first phase of gas and water monitoring was carried out by a PBA field technician between 25th June and the 1st August 2008.

A copy of FES's factual report on the ground investigation is contained in **Appendix 1**.

3.2 Previous Investigations

A number of ground investigations have been carried out historically for the whole of Green Park. Six of these investigations included trial pits and boreholes sunk within or adjacent to 400 Longwater Avenue. The results of the exploratory holes generally confirmed the published information and full details of the ground conditions encountered can be found within the Summary of Geoenvironmental Information Plot 3, contained within **Appendix 2.**

3.3 Rationale for Selection of Exploratory Hole Location

No specific targets for contamination were identified by the Summary of Geoenvironmental Information Report and the results of contamination testing from other areas of Green Park have indicated that no significant contamination is present in the wider area. The locations of the exploratory holes were therefore selected in order to provide a general coverage across the site.

The locations of all the exploratory holes carried out as part of the 2008 investigation are shown on **Figure 3.**

3.4 Rationale for Sample Selection

Soil samples for the purposes of contamination testing were primarily collected based on set sampling criteria that dictated contamination samples be recovered from varying levels within each distinguishable geological horizon. Specific samples can then be scheduled for laboratory testing based on visual and/or olfactory evidence of contamination. However no such evidence was noted in the exploratory holes carried out and the samples for testing were therefore scheduled based on the need to provide representative results for the site as a whole.

Soil samples for the purposes of geotechnical testing were varied in type so that a range of geotechnical tests could be preformed. Small disturbed samples were collected at 0.5m intervals or at changes of strata and bulk samples were collected over SPT test lengths. In cohesive soils, nominal 100mm diameter general purpose driven open tube (U100) samples were taken which are regarded as relatively undisturbed.

Groundwater samples were collected from selected borehole standpipes following completion of the field work and were scheduled for contamination testing based on the need for representative results for the site as a whole. Details on the groundwater sampling protocols are given in Section 4.1 of this report.

3.5 Boreholes

A total of seven boreholes (BH101 to BH105 and BH201 to BH202) were sunk across the site using cable percussion drilling techniques. Cable percussion boreholes allow the ground conditions to be

described to depths greater than that of trial pitting and allow in-situ tests to be carried out such as standard penetration tests (SPTs) and the recovery of U100 samples. Installations in the boreholes also allow for groundwater levels and ground gas concentrations to be measured and groundwater samples collected for laboratory testing.

Boreholes 101 to 105 were sunk to depths of 5m bgl and boreholes 201 and 202 were sunk to depths of 15m bgl. On completion of drilling, standpipe piezometers with gas valves were installed in all the boreholes with the standpipe sealed in the River Terrace Deposits (BH101 to BH105) or Lambeth Group (BH201 and BH202).

Details of the strata encountered in the boreholes, samples taken, in-situ test results, groundwater observations during drilling and standpipe installation details are given in **Appendix 1**. A plot of uncorrected SPT N value versus depth is presented as **Figure 4**.

3.6 Surveys

The position of all the boreholes was determined by FES relative to the National Grid and elevations to Ordnance Datum on completion of the field work.

3.7 Monitoring

3.7.1 2008 Monitoring

Ground gas monitoring rounds in the first phase were carried out weekly over a period of 6 weeks between 25th June 2008 and the 1st August 2008. Monitoring for methane, carbon dioxide, oxygen, flow, hydrogen sulphide and atmospheric pressure was carried out. The PBA monitoring protocol and detailed monitoring records are presented in **Appendix 3**.

Groundwater levels were also monitored and the results are summarised in the Tables below.

Table 3.1 – Summary of Groundwater Monitoring in the River Terrace Deposits

Borehole	25/06/2008		02/07/2008		10/07/2008		21/07/2008		28/07/2008		01/08/2008	
	Depth to water (m)	Elevation (mAOD)	Depth to water (m)	Elevation (mAOD)	Depth to water (m)	Elevation (mAOD)	Depth to water (m)	Elevation (mAOD)	Depth to water (m)	Elevation (mAOD)	Depth to water (m)	Elevation (mAOD)
101	2.16	37.39	2.20	37.35	2.01	37.54	2.23	37.32	2.53	37.02	2.48	37.07
102	2.00	37.35	2.04	37.31	1.87	37.48	2.11	37.24	2.37	36.98	2.13	37.22
103	2.08	37.37	2.15	37.30	1.92	37.53	2.23	37.22	2.51	36.94	2.48	36.97
104	2.23	37.32	2.28	37.27	2.08	37.47	2.32	37.23	2.36	37.19	2.34	37.21
105	2.20	37.55	2.24	37.51	1.84	37.91	2.30	37.45	2.13	37.62	2.33	37.42

Table 3.2 – Summary of Groundwater Monitoring in the Lambeth Group

Borehole	25/06/2008		02/07/2008		10/07/2008		21/07/2008		28/07/2008		01/08/2008	
	Depth to water (m)	Elevation (mAOD)	Depth to water (m)	Elevation (mAOD)	Depth to water (m)	Elevation (mAOD)	Depth to water (m)	Elevation (mAOD)	Depth to water (m)	Elevation (mAOD)	Depth to water (m)	Elevation (mAOD)
201	2.14	37.76	2.16	37.74	2.09	37.81	2.24	37.66	2.47	37.43	2.27	37.63
202	5.40	34.50	4.28	35.62	4.14	35.76	3.89	36.01	4.12	35.78	4.10	35.80

3.7.2 2013 Monitoring

The ground gas results recorded in 2008 were considered unusual as they did not reflect either the site history, or findings elsewhere on the park. As a result, a second phase including a further 6 ground gas monitoring rounds were carried out over a period of 4 weeks between 18th October 2013 and the 18th November 2013. Monitoring for methane, carbon dioxide, oxygen, flow, hydrogen sulphide and atmospheric pressure was carried out. The PBA monitoring protocol and detailed monitoring records are presented in **Appendix 3.**

Groundwater levels were also monitored and the results are summarised in the Tables below.

Table 3.3 – Summary of Groundwater Monitoring in the River Terrace Deposits

Borehole	18/10/2013		21/10/2013		01/11/2013		07/11/2013		14/11/2013		18/11/2013	
	Depth to water (m)	Elevation (mAOD)	Depth to water (m)	Elevation (mAOD)	Depth to water (m)	Elevation (mAOD)	Depth to water (m)	Elevation (mAOD)	Depth to water (m)	Elevation (mAOD)	Depth to water (m)	Elevation (mAOD)
101	2.86	36.69	2.86	36.69	2.25	37.30	2.14	37.41	2.06	37.49	2.32	37.23
102	2.64	36.71	2.64	36.71	2.12	37.23	2.00	37.35	2.08	37.27	2.17	37.18
103	2.40	37.05	2.40	37.05	2.21	37.24	2.07	37.38	1.82	37.63	2.27	37.18
104	2.47	37.08	2.47	37.08	2.29	37.26	2.25	37.30	2.28	37.27	2.38	37.17
105	2.43	37.32	2.42	37.33	1.15	38.60	1.13	38.62	2.31	37.44	2.39	37.36

Table 3.4 – Summary of Groundwater Monitoring in the Lambeth Group

Borehole	18/10/2013		21/10/2013		01/11/2013		07/11/2013		14/11/2013		18/11/2013	
	Depth to water (m)	Elevation (mAOD)	Depth to water (m)	Elevation (mAOD)	Depth to water (m)	Elevation (mAOD)	Depth to water (m)	Elevation (mAOD)	Depth to water (m)	Elevation (mAOD)	Depth to water (m)	Elevation (mAOD)
201	2.42	37.48	2.42	37.48	2.28	37.62	2.14	37.76	2.22	37.68	2.29	37.61
202	2.50	37.40	2.50	37.40	2.47	37.43	2.38	37.52	2.08	37.82	2.36	37.54

Note that groundwater levels recorded in BH201 and BH202 during the monitoring in 2008 were significantly different. A possible explanation for this is that the standpipe in BH202 was installed within a sand layer of the Lambeth Group whereas BH201 was installed entirely in the Lambeth Group Clays. The sand layers in the Lambeth Group were thought to have been being underdrained by the nearby Brewery abstraction from the Chalk which could explain the groundwater level differences noted in 2008. The Brewery ceased production in 2010 and therefore it is assumed that abstraction from the chalk also ceased, resulting in the groundwater levels in BH202 rising to similar levels to BH201.

4 Laboratory Testing

4.1 Contamination Testing

A representative range of soil and groundwater samples were taken and sent to the designated laboratory for testing. Both the soil and groundwater samples were tested for a suite of commonly occurring industrial, organic and non organic contaminants as specific pollutants were not expected to be present and the lack of visual/olfactory evidence of contamination during sampling.

Eleven soil samples and five groundwater samples were analysed by Alcontrol Geochem Ltd (Geochem). The soil test suites specified testing methods that are accredited by MCERTS where available. The laboratory result certificates are contained in **Appendix 4**.

The following measures and procedures were taken during the ground investigation and sampling on site as part of the Quality Assurance/Quality Control procedures:

- In order to prevent cross contamination during transportation to the site, all sampling equipment was stored in clean cooler boxes.
- Testing was undertaken by laboratories on the PBA approved suppliers list, which hold UKAS and MCERTS accreditation.
- The soil samples were taken by hand using protective latex gloves which were replaced with a fresh pair for every change in strata so to avoid cross contamination.
- Each soil sample comprised a plastic tub, 2 amber jars and 2 VOC containers. The soil samples were sent by overnight courier to the designated laboratory
- The standpipes were purged using 39mm disposable bailers or, for the deeper boreholes, an electric pump to remove a quantity of water equivalent to three well volumes. This was to ensure sampling of the groundwater was representative and not influenced by the drilling process.
- Each groundwater sample consisted of a one litre plastic bottle, a one litre glass jar and a glass vial. When samples were collected, contact time with the air was avoided and samples were sealed immediately with no headspace, labelled and stored in the cool box.

4.2 Geotechnical Testing

The following laboratory tests were carried out on samples recovered from the exploratory holes. The testing was carried out by FES in accordance with the recommendations given in BS 1377:1990: Method of Test for Soils for Civil Engineering Purposes where appropriate and the results are contained in Appendix 1.

▪ Natural Moisture Content	▪ Sulphate and pH
▪ Plasticity Index	▪ Unconsolidated Undrained Triaxial Compression Tests
▪ Particle Size Distribution	▪ One Dimensional Consolidation Tests
▪ Organic Content	

The results from the geotechnical laboratory testing are contained in **Appendix 1**. A plasticity chart is presented as **Figure 5**.

5 Ground Conditions

5.1 General

The results of the investigation generally confirm the published information and the findings of previous investigations carried out for 400 Longwater Avenue. A summary of the ground conditions encountered during the 2008 investigation beneath the site are presented below and details of these strata are given in the following sections.

Strata	Depth to Top (mbgl)	Elevation (mAoD)	Thickness (m)
Engineered Fill	From Ground Level	39.35 – 39.90	1.15 – 1.70
Alluvium	1.15 – 1.70	38.20 – 37.85	0.15 – 0.85
River Terrace Deposits	1.40 – 2.40	37.95 – 37.15	1.80 – 3.30
Lambeth Group	4.0 – 6.0	35.75 – 33.90	Not Proven

5.2 Topsoil

Topsoil was removed from the site prior to the placement of the Engineered Fill platform and is not discussed further in this report.

5.3 Engineered Fill

Engineered Fill was encountered in all the exploratory hole locations and generally comprised brown clayey gravelly sand or brown clayey sand and gravel. All of the exploratory holes reported gravel of flint, concrete and brick with occasional fragments of wood (BH103) within the upper 0.85m. We understand that a layer of hardcore was placed at the surface for weather protection purposes following the placement of the engineered fill. The thickness of the engineered fill varied from 1.15m to 1.70m.

The Engineered Fill was historically placed to provide development platforms above the 1:200 year flood level. In order to ensure the specified engineering criteria were achieved, an extensive quality control testing regime was established and carried out by the Contractor. Full details of the Quality Control testing requirements are contained within the Summary of Geoenvironmental Information Plot 3, contained within **Appendix 2**.

Standard penetration tests carried out in the Engineered Fill gave uncorrected N values of between 10 and 47 indicating the material to vary from medium dense to dense.

5.4 Alluvium

Alluvium deposits were encountered in all the boreholes and generally comprised dark grey/black slightly organic sandy gravelly clay. The alluvium was encountered at depths between 1.15m to 1.70m and varied in thickness from 0.15m to 0.85m.

Geotechnical testing was carried out on two of the alluvium samples. The results of the plasticity testing gave liquid limits of 32% and 38% with plasticity indices of 15% and 24% indicating the material to be a clay of low to intermediate plasticity (see **Figure 5**). It should be noted that with both samples tested approximately half the sample passed the 425µm sieve, indicating the alluvium contains a significant proportion of sand size material.

5.5 River Terrace Deposits

River Terrace Deposits were encountered in all of the exploratory holes beneath the alluvium, generally as a grey, white and brown sand and gravel. The sand is reported as fine to coarse with the gravel comprising sub-angular to rounded fine to coarse flint. The River Terrace Deposits were encountered at depths of between 1.40m and 2.4m and varied in thickness from 1.80m to 3.30m.

The results of particle size distribution tests indicate these deposits to be typically composed of:

- 0% cobbles
- 38 – 86% gravels
- 13 – 61% sands
- 0 – 1% fines (silt and clay)

Standard penetration tests carried out in the River Terrace Deposits gave uncorrected N values of between 13 and 37 (see **Figure 4**), indicating the material to be medium dense to dense.

5.6 Lambeth Group

Lambeth Group Deposits were encountered in all the boreholes, typically comprising green grey mottled red and brown, slightly gravelly, sandy clay and green grey, silty clay. A medium dense silty sand layer was encountered at 14.3m bgl in BH202 and continued to the base of the borehole at 15m depth. The Lambeth Group was encountered at depths of between 4.0m and 6.0m. The thickness of the Lambeth Group was not determined, but was proven to depths of at least 15m bgl.

The results of the plasticity testing on cohesive samples of the Lambeth Group gave liquid limits of between 28% and 56% with plasticity indices of between 15% and 38% indicating the material to be a clay of low to high plasticity (see **Figure 5**). Natural moisture contents of between 12% and 25% were recorded.

Standard penetration tests carried out in the Lambeth Group (see **Figure 4**) gave uncorrected N values of between 28 and 50. Using the recommendations given by Stroud and Butler and based on the results of the plasticity testing, the N values recorded in the Lambeth Group strata indicate undrained shear strengths of around 112kN/m^2 to 200kN/m^2 across the sequence.

Unconsolidated, undrained triaxial compression tests were carried out on 7 samples of the Lambeth Group and indicated undrained shear strengths of between 81kN/m^2 and 143kN/m^2 at the top of the sequence. Triaxial tests carried out on samples from depth indicate undrained shear strengths of between 119kN/m² to 413kN/m^2 (BH202 10.2m).

The triaxial testing indicates a typical bulk density of around 2.14Mg/m^3 for the samples tested.

The results of consolidation tests on samples of the Lambeth Group clay indicate coefficients of compressibility (m_v) values of around 0.03m^2/MN to 0.10m^2/MN over the pressure range overburden pressure to overburden pressure plus 100kN/m^2. This indicates that the strata are of very low to low compressibility.

5.7 Chalk

A ground investigation undertaken by FESL in May 1988 drilled thirteen boreholes across the whole Green Park site. Two of the thirteen boreholes encountered Chalk at depths between 19.45m bgl (BH4) and 21.4m (BH1). The recovered samples from the chalk consisted of a mixture of gravel sized fragments of intact and remoulded chalk. Much of the remoulded chalk present within the samples is likely to reflect the effect of disturbance through the drilling process.

Locations of BH1 and BH4 are shown on **Figure 3** and the borehole logs for BH1 and BH4 are included in **Appendix 8.**

5.8 Groundwater

Groundwater strikes during drilling/excavation were recorded at depths of between 2.50m to 2.70m bgl, typically at the top of the River Terrace Deposits, with the water level rising to between 2.10m and 2.55m bgl.

The groundwater monitoring of the standpipes installed in the River Terrace Deposits (BH101, BH102, BH103, BH104 and BH105) generally confirmed the expected groundwater flow direction across the site to the east, towards the Green Park flood relief channel. An average groundwater level of around 37.33mAOD was recorded during the 2008 monitoring period, (see Table 3.1) and an average groundwater level of around 37.29mAOD was recorded during the 2013 monitoring period, (see Table 3.3).

BH201 and BH202 were installed in the Lambeth Group clay and sands and recorded an average groundwater level of 37.67mAOD and 35.58mAOD respectively during the 2008 monitoring period, (see Table 3.2). An average groundwater level of around 37.56mAOD was recorded across both BH201 and BH202 during the 2013 monitoring period, (see Table 3.4).

It is considered that BH202 was installed within a sand layer within the Lambeth Group that was historically thought to have been being underdrained by the nearby Brewery abstraction from the Chalk. It is assumed that abstraction from the chalk ceased when the brewery closed in 2010 which subsequently resulted in the groundwater levels in BH202 rising to similar levels to BH201.

6 Hazard Identification and Assessment

6.1 Introduction

In accordance with the requirements of Part IIA of the Environmental Protection Act (1990), a qualitative source-pathway-receptor risk assessment has been carried out in order to establish various pollutant linkages and enable a Tier 2 Contaminative Risk Assessment to be undertaken.

In accordance with the PBA methodology for assessing ground conditions, as shown in **Appendix 5,** site specific concentrations of potential contaminants have been compared to published / generic criteria for a defined end use and used to screen the data. If the concentration is below the screening criterion for the specified end use the parameter is not deemed to be a hazard. Exceedence of the criterion indicates that the parameter is a possible hazard and either that further assessment or risk management is required.

6.2 Selection of Tier 2 Assessment Criteria

The rationale for selection of generic assessment criteria routinely used by PBA is presented in **Appendix 6**. For the protection of human health, soil screening criteria for a commercial/industrial end-use have been selected. The groundwater geochemical concentrations have been assessed against the selected assessment criteria for the protection of controlled waters. Previously the groundwater data was assessed against the UK Drinking Water Regulations (DoE 2001) however since the site is no longer located within an inner source protection zone the protection of controlled waters assessment criteria is now more applicable.

In order to fully assess the hazards we have reviewed and included all the historic data for the site available to us at the time of writing this report.

6.3 Review of Chemical Testing – Soil Samples

None of the samples tested exceeded the selected criteria for metals and are therefore deemed not to be present as a hazard to human health.

Although there are no specific criteria for comparison of the hydrocarbon laboratory test results, it is considered that the concentrations recorded do not pose a hazard to human health with 90% of the samples tested recording concentrations below the laboratory detection limits.

It is also considered that the inert, natural fill materials used in the construction of the engineered platform will further act as a barrier breaking the majority of the potential pathways between future end users and any contaminated soil that may be present.

6.4 Review of Chemical Testing – Groundwater Samples

The results of the testing on the River Terrace Deposits groundwater samples (BH102, BH104 and BH105) and Lambeth Group groundwater samples (BH201 and BH202) indicate good water quality with no exceedances recorded above the maximum prescribed concentrations given for the protection of controlled waters.

6.5 Ground Gas Data Review and Assessment

The results of the gas monitoring carried out in during both 2008 and 2013 have shown elevated concentrations of methane and carbon dioxide on occasion in all five of the shallow boreholes installed in the Engineered Fill, Alluvium and River Terrace Deposits. The table below summarises the maximum and minimum methane, carbon dioxide and flow recorded in all boreholes with their gas screening values (GSVs) in accordance with CIRIA Guidance C665.

Table 6.1 – Gas Monitoring Summary 2008

Borehole	CH_4 (%)		CO_2 (%)		Flow (l/hr)		GSV CH_4 (l/hr)	GSV CO_2 (l/hr)
	Max	Min	Max	Min	Max	Min		
BH101	6.5	<0.1	6.5	<0.1	>30	-9.5	1.95	1.95
BH102	27.5	<0.1	5.5	1.4	18.4	-2.7	5.06	1.012
BH103	11.5	<0.1	6.4	<0.1	4.2	-9.7	0.483	0.2688
BH104	55	<0.1	14	0.3	0.9	0.0	0.495	0.126
BH105	14	<0.1	11.7	<0.1	4.7	-2.1	0.658	0.5499
BH201*	<0.1	<0.1	0.3	<0.1	0.1	0.0	0.0001	0.0003
BH202*	<0.1	<0.1	<0.1	<0.1	0.1	-0.2	0.0001	0.0001

* Installed in Lambeth Group

Table 6.2 – Gas Monitoring Summary 2013

Borehole	CH_4 (%)		CO_2 (%)		Flow (l/hr)		GSV CH_4 (l/hr)	GSV CO_2 (l/hr)
	Max	Min	Max	Min	Max	Min		
BH101	7.0	4.3	3.6	1.8	>30	2.9	2.1	1.08
BH102	14.3	<0.1	4.4	<0.1	0.8	-0.6	0.114	0.035
BH103	31.5	16.5	13.0	6.8	4.2	-4.0	1.323	0.546
BH104	17.5	<0.1	12.0	1.1	10.0	0.0	1.75	1.20
BH105	10.0	<0.1	3.4	<0.1	4.7	-1.5	0.47	0.1598
BH201*	<0.1	<0.1	<0.1	<0.1	0.0	-0.2	0.00	0.00
BH202*	<0.1	<0.1	<0.1	<0.1	0.6	-1.8	0.0006	0.0006

* Installed in Lambeth Group

The gas monitoring was carried out during atmospheric pressures of between 999mb and 1023mb with the highest gas concentrations being recorded at lower atmospheric pressures. The results of the gas monitoring are not typical of gas concentrations found elsewhere across Green Park. It should be noted that elevated readings in most cases were recorded on occasional monitoring rounds, not all of them. The LMSxi multigas analyser used throughout the monitoring was calibrated before each monitoring round and is calibrated by Gas Data Ltd annually with the last calibration dated 21st March 2013.

The maximum GSV identified during 2008 was 5.06l/hr in BH102 which equates to a Characteristic Situation 4 (GSV <15) for a commercial end use based on the recommendations given in CIRIA report C665, requiring fairly onerous gas protection measures.

The additional rounds of gas monitoring completed in 2013 indicate that the site is still generating elevated levels of ground gases although reduced. For the 2013 round of gas monitoring the maximum GSV identified is 2.1 in BH101 which equates to a Characteristic Situation 3 (GSV <3.5) for a commercial end use based on the recommendations given in CIRIA report C665.

The geological model at the site is not consistent with the typical land use associated with a Characteristic Situation 4, (a completed landfill or mine workings) and the gas readings are not typical of those found elsewhere across Green Park. No man made source for such elevated gas generation levels has been identified, either through desk study research or direct intrusive ground investigation. On this basis, and as the levels of ground gases have reduced since 2008, it is considered that a Characteristic Situation of 3 can be adopted for the site.

In accordance with BS8485; Code of Practice for the characterisation and remediation from ground gas in affected developments, Table 2 outlines the required gas protection by gas situation and for the type of building. For a commercial building with a Gas Situation of 3 the gas protection score is 2. Table 3 sets out how this score can be achieved through, venting, barriers and membranes. This could be accomplished by, for example, inclusion of passive ventilation below a floor slab, through incorporation of a geocomposite void former and ventilation air bricks, reinforced concrete raft foundation with limited service penetrations and a proprietary gas protection membrane, independently integrity tested. Table 3 from BS8485 is partially reproduced below.

A) Ventilation/Dilution

Performance of ventilation should be in accordance with Annex A of BS8485.

- Passive sub floor ventilation – Very good performance – score 2.5
- Passive sub floor ventilation – Good performance – score 1
- Active sub floor ventilation, with active abstraction/pressurisation – score 2.5
- Ventilated car par (basement or undercroft) – score 4

B) Barriers

Floor Slabs It is good practice to install ventilation in all foundation systems to effect pressure relief as a minimum. Breaches in floor slabs such as joints have to be effectively sealed against gas ingress in order to maintain these performances.

- Block and beam floor slab – score 0
- Reinforced concrete ground bearing floor slab - score 0.5
- Reinforced concrete ground bearing foundation raft with limited service penetrations that are cast into slab – score 1.5
- Reinforced concrete cast in situ suspended slab with minimal service penetrations and water bars around all slab penetrations and at joints – score 1.5
- Fully tanked basement – score 2

C) Membranes

Membranes The performance of membranes is heavily dependent on the quality and design of the installation, resistance to damage after installation, and the integrity of joints.

- Taped and sealed membrane to reasonable levels of workmanship/in line with current good practice with validation - score 0.5
- Proprietary gas resistant membrane to reasonable levels of workmanship/in line with current good practice under independent inspection (CQA) - score 1
- Proprietary gas resistant membrane installed to reasonable levels of workmanship/in line with current good practice under CQA with integrity testing and independent validation – score 2

7 Geotechnical Considerations

7.1 General

It is understood that the development will be similar to other parts of Green Park and will comprise business / retail units with associated roads, parking and landscaped areas.

As previously stated the topsoil was removed across the site and the ground level has been raised by between 1.0 and 1.5m with an engineered fill platform above the 1 in 200 year flood level.

PBA have carried out preliminary assessments of the engineering characteristics of the soils and performance of the fill materials in order to provide outline design information for a business park type development as discussed in the following sections. It is recommended however that detailed assessments are carried out once specific information on the nature of the proposed development, layout and anticipated loading conditions are known.

7.2 Engineered Fill Platform

The material used to provide the engineered fill platform comprised the Lambeth Group which was obtained from the deepening of the Trout Lakes, a former gravel pit some 200m to the north west of the site (see **Figure 2**). The engineered fill platform was placed to an end product earthworks specification to provide a level development platform above the 1 in 200 year flood level.

Specific details on the placement of the engineered fill and the validation are given in the Summary of Geoenvironmental Information Plot 3, contained within **Appendix 2.**

7.3 Foundations

The type and capacity of foundations adopted for the site will be dependent on the soil structure interaction i.e. load, size and spacing of the footings, the stiffness of the soil and tolerances of the structure to settlement, particularly differential settlement. The differential settlement criteria relative to each structure will be dependent on the structure type i.e. flexible steel frames as opposed to more rigid reinforced concrete; the type of cladding adopted i.e. flexible steel sheeting compared to more rigid brickwork or glass; and the end use of the structure i.e. if sensitive equipment or plant are to be used or operated within the building. Differential settlement will also be controlled by the consistency in thickness and strength/density of the underlying fill and soil strata.

For lightly loaded structures that are not sensitive to significant differential settlement consideration could be given to adopting, shallow strip or pad type foundations. An assessment of the likely total settlements founded on spread footings 0.5m into the fill is given below. The assessment assumes that at least 1.5m of gravel is present and up to 0.9m of firm alluvium. As discussed in Section 5 the thickness of alluvium varies from 0.15m to 0.85m and the minimum thickness of River Terrace Deposits recorded was 1.80m.

The results of the preliminary assessment are given below for an isolated square pad foundation founded on Engineered Fill with a minimum drained modulus of deformation of 7000kN/m^2.

Pad Size	Net Loading Intensity (kN/m^2)	Maximum Total Settlement (mm)
1.0m x 1.0m	100 200	15 30
2.0m x 2.0m	100 200	25 45

It should be noted that pad footings larger than 2m by 2m even at low net loading intensities (say 100kN/m2) would experience large total settlements which may give rise to differential settlement.

Differential settlements of up to half the value of the total settlement may occur for the uniform ground conditions. Consideration should be given to the column spacings to ensure the maximum differential settlement between spans do not exceed allowable tolerances.

As an alternative to placing traditional footings on the fill material, consideration could be given to placing footings 0.3m into the River Terrace Deposits, although this will likely entail the placement of foundations just below the water table requiring dewatering. However, it is likely, that any proposed structure across the site is likely to impose significant column loads and hence it is recommended that piled foundations are adopted to support building frames. Piles will need to be installed into the Lambeth Group as the thickness of the River Terrace Deposits will not provide adequate load carrying capacity.

Driven piles can be considered but because of potential noise and vibration problems, they may only be suitable where adjacent developed structures are supported by piles and have flexible frame structures and insensitive cladding and finishes.

As an alternative, bored piles could also be considered, either traditional bored and cast in-situ piles or continuous flight auger (CFA) concrete injection piles. It should be noted that, due to the presence and permeability of the River Terrace Deposits, temporary casing is likely to be required for traditional bored piles.

Since pile are proprietary systems discussions should be held with specialist piling contractors to confirm the most appropriate pile type for the site, carry out detailed design and to provide cost estimates. As a guide however, a preliminary assessment of working loads for both driven and bored piles has been carried out as detailed below.

The preliminary working loads have been calculated using the design line indicated on Figure 6. Working loads were estimated for piles penetrating 5m and 10m into the Lambeth Clay (total length 9.5m and 14.0m). No benefit in terms of skin friction was assumed from the engineered fill or cohesive alluvium. Undrained shear strengths used in the assessment were based on the SPT N values, plasticity testing and recommendations given in Stroud and Butler (1975).

Preliminary Working Loads – Bored Pile

Diameter (mm)	Length	
	9.5m (5m into clay)	14.5 (10m into clay)
450	225KN	430KN
600	330KN	610KN

Preliminary Working Loads – Driven Piles

Size (mm)	Length	
	9.5 (5m into clay)	14.5 (10m into clay)
300 x 300	290KN	540KN
400 x 400	405KN	800KN

Pile loading and integrity testing should be carried out to confirm the design and workmanship.

7.4 Ground Slabs

Ground bearing slabs founded on the bulk fill materials may be adopted for the site. Settlements should be less than 20mm for a 20m x 20m ground slab with a net bearing pressure of 30kN/m^2, using a minimum drained modulus of elasticity of 7000kN/m^2 for the engineered fill material as was required by the end product earthworks specification and confirmed by the compliance testing. If a higher slab load is envisaged, it is recommended that further analyses are carried out to confirm the anticipated settlement and its acceptability or the need to provide suspended floor slabs.

The slab should be constructed to act independently of the foundations to allow for differential movement of the slab and frame and we recommend that it is cast after the building of the frame is completed.

7.5 Buried Concrete

The results of chemical analyses gave soluble sulphate (SO_4) concentrations of between 0.04g/l and 0.29g/l with pH values of between 8.4 and 11.6 for the samples of made ground/alluvium tested. Soluble sulphate concentrations of less than 0.06g/l with pH values of 9.1 and 9.2 were recorded for the two Lambeth Group samples tested.

The chemical testing on the groundwater samples gave soluble sulphate concentrations of between 0.09g/l and 0.3g/l with pH values of between 7.6 and 9.7.

The results of the testing therefore indicate that the site falls within Design Sulphate Class DS-1 and Aggressive Chemical Environment for Concrete (ACEC) Class AC-1^d and buried concrete should be designed for these classes in accordance with the recommendations given in BRE Special Digest 1 (BRE 2005).

7.6 Pavement Design and Trafficability

The specification for the bulk fill placement required a minimum in-situ CBR of 5% for the engineered fill and this value should be used for preliminary design purposes. However, recommendations given in TRRL 90 indicate that cohesionless materials are frost susceptible where the fines content (material less than 75µm in size) exceeds 10%. The engineered fill material is liable to have a fines content at or above 10% and should therefore be regarded as frost susceptible.

Design of the pavements should accommodate for this, with a minimum thickness of 450mm.

A flexible pavement construction is preferred since this can more easily accommodate any potential differential movement arising from the consolidation of the underlying fill and alluvial materials.

However, it is recommended that actual site conditions should be ascertained prior to construction with due regard to the proposed design, method of construction and any potential trafficability impacts since the engineered fill has been placed.

7.7 Radon

The Radon Guidance on Protective Measures for New Dwellings (BRE, 2007) presents a series of maps from which it can be determined whether a site is likely to be prone to radon exposure. This is based on statistical analysis of existing housing known to be affected by radon and an assessment of the geology of the area (maps of annex A of the 2007 report).

With reference to Annex A of the guidance, the site is located in an area where no radon protection measures are necessary in the construction of new dwellings or extensions.

A geological assessment was carried out by British Geological Survey as part of a previous survey for an adjacent Plot and is reproduced in **Appendix 6**. The geological assessment indicated that no radon protection measures are required. However, as discussed in **Section 6.5**, gas protection measures will be required for the methane/carbon dioxide concentrations recorded across the site.

8 Conclusions

8.1 Land Contamination Assessment

None of the soil samples tested exceeded the selected criteria for metals and are therefore deemed not to be present as a hazard to human health.

Although there are no specific criteria for comparison of the hydrocarbon laboratory test results, it is considered that the concentrations recorded do not pose a hazard to human health with 90% of the samples tested recording concentrations below the laboratory detection limits.

It is also considered that the inert, natural fill materials used in the construction of the engineered platform will further act as a barrier breaking the majority of the potential pathways between future end users and any contaminated soil that may be present

The results of the testing on the River Terrace Deposits groundwater samples (BH102, BH104 and BH105) and Lambeth Group groundwater samples (BH201 and BH202) indicate good water quality with no exceedances recorded above the maximum prescribed concentrations given for the protection of controlled waters.

8.2 Ground Gas Assessment

The maximum GSV identified during 2008 was 5.06l/hr in BH102 which equates to a Characteristic Situation 4 (GSV <15) for a commercial end use based on the recommendations given in CIRIA report C665, requiring fairly onerous gas protection measures. The geological model at the site is not consistent with the typical land use associated with a Characteristic Situation 4, (a completed landfill or mine workings) and the gas readings are not typical of those found elsewhere across Green Park. No man made source for such elevated gas generation levels has been identified, either through desk study research or direct intrusive ground investigation. On this basis, and as the levels of ground gases have reduced since 2008, it is considered that a Characteristic Situation of 3 can be adopted for the site.

8.3 Geotechnical Assessment

PBA have carried out preliminary assessments of the engineering characteristics of the soils beneath the site and performance of the Engineered Fill materials for the purposes of outline design. Detailed ground investigations may be required when specific information on the nature of any potential development are known.

An engineered fill platform was constructed using imported fill (Lambeth Group) obtained from the Trout Lakes that was placed to an end product earthworks specification to provide a level development platform above the 1 in 200 year flood level.

The type and capacity of foundations adopted for the site will be dependent on the load, size and spacing of the footings, the stiffness of the soil and tolerances of the structures to settlement, particularly differential settlement. Piled foundations are likely to be required based on the proposed end use and likely column loads. Ground bearing floor slabs placed on the engineered fill are likely to be acceptable subject to a detailed settlement analyses.

Test results indicate that the sub-surface concrete should be designed in accordance with the recommendations given in BRE Special Digest 1Class for DS-1 and ACEC-1d conditions. The pH testing indicates near neutral to alkaline conditions.

A minimum CBR value of 5% was specified for the Engineered fill. It is recommended however that the present day site conditions be ascertained to confirm any potential trafficability issues since the engineered fill was placed.

9 References

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This report has been prepared within an agreed timeframe and to an agreed budget that will necessarily apply some constraints on its content and usage. The remarks below are presented to assist the reader in understanding the context of this report and any general limitations or constraints. If there are any specific limitations and constraints they are described in the report text.

1 The opinions and recommendations expressed in this report are based on statute, guidance, and best practice current at the time of its publication. Peter Brett Associates LLP (PBA) does not accept any liability whatsoever for the consequences of any future legislative changes or the release of subsequent guidance documentation, etc. Such changes may render some of the opinions and advice in this report inappropriate or incorrect and we will be pleased to advise if any report requires revision due to changing circumstances, especially those over one year old. Following delivery of any report PBA has no obligation to advise the Client or any other party of such changes or their repercussions.

2 Some of the conclusions in this report may be based on third party data. No guarantee can be given for the accuracy or completeness of any of the third party data used. Historical maps and aerial photographs provide a “snap shot” in time about conditions or activities at the site and cannot be relied upon as indicators of any events or activities that may have taken place at other times.

3 The conclusions and recommendations made in this report and the opinions expressed are based on the information reviewed and/or the ground conditions encountered in exploratory holes and the results of any field or laboratory testing undertaken. There may be ground conditions at the site that have not been disclosed by the information reviewed or by the investigative work undertaken. Such undisclosed conditions cannot be taken into account in any analysis and reporting.

4 Unless specifically stated to the contrary, this report does not purport to be a “Geotechnical Design Report” as defined in Clause 2.8 of Eurocode 7 (Geotechnical Design BS EN 1997-1:2004). Some of the data contained herein and used to support any geotechnical assessment presented in this report may be historical or for other reasons not fully compliant with the requirements of that code.

5 It should be noted that groundwater levels, groundwater chemistry, surface water levels, surface water chemistry, soil gas concentrations and soil gas flow rates can vary due to seasonal, climatic, tidal and man made effects.

6 This report has been written for the sole use of the Client stated at the front of the report in relation to a specific development or scheme. The conclusions and recommendations presented herein are only relevant to the scheme or the phase of project under consideration. This report shall not be relied upon or transferred to any other party without the express written authorisation of PBA. Any such party relies upon the report at its own risk.

7 The interpretation carried out in this report is based on scientific and engineering appraisal carried out by suitably experienced and qualified technical consultants based on the scope of our engagement. We have not taken into account the perceptions of, for example, banks, insurers, other funders, lay people, etc, unless the report has been prepared specifically for that purpose. Advice from other specialists may be required such as the legal, planning and architecture professions, whether specifically recommended in our report or not.

8 Public or legal consultations or enquiries, or consultation with any Regulatory Bodies (such as the Environment Agency, Natural England or Local Authority) have taken place only as part of this work where specifically stated.

FIGURES



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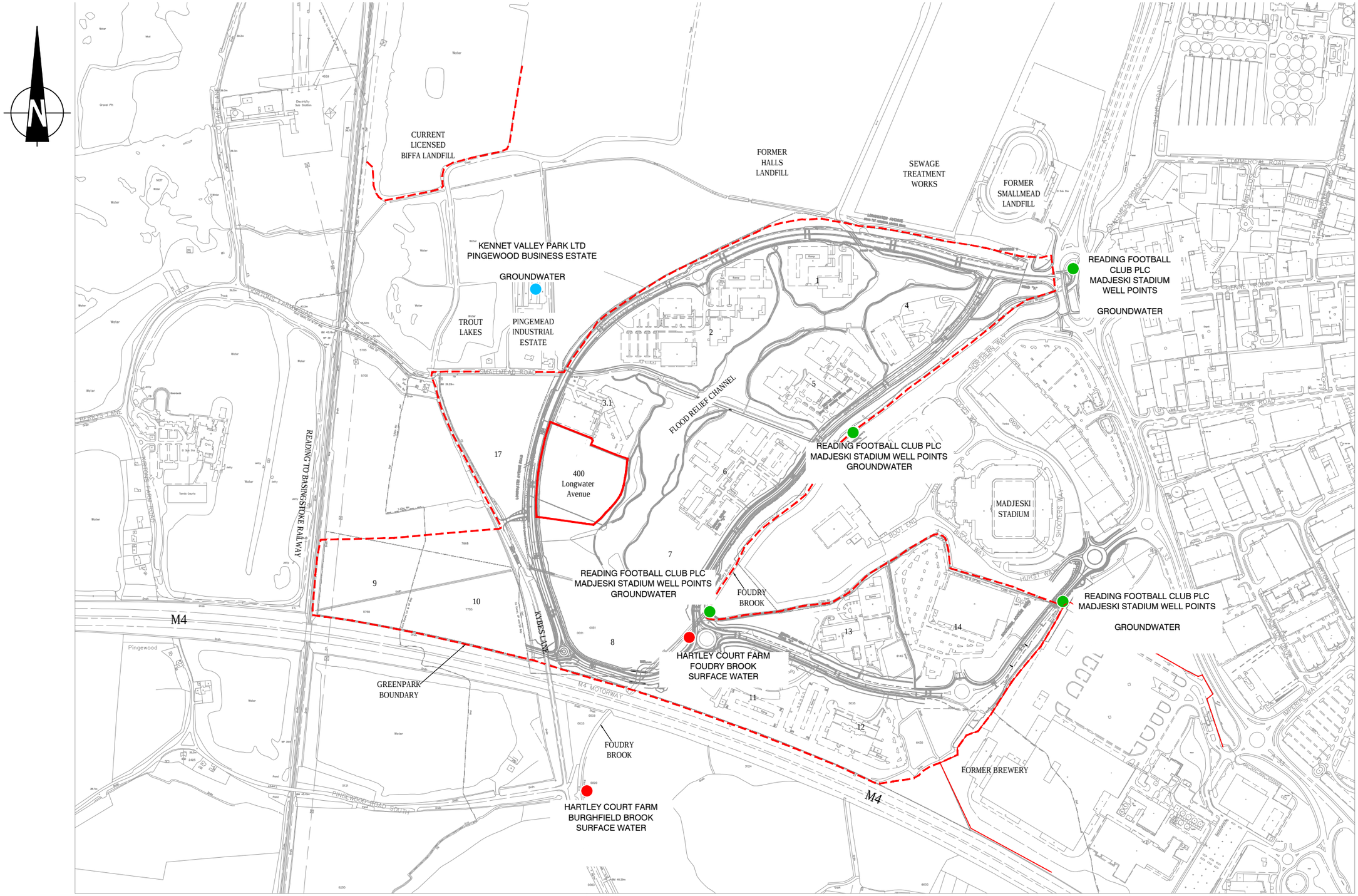
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SITE LOCATION PLAN

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FIGURE 1

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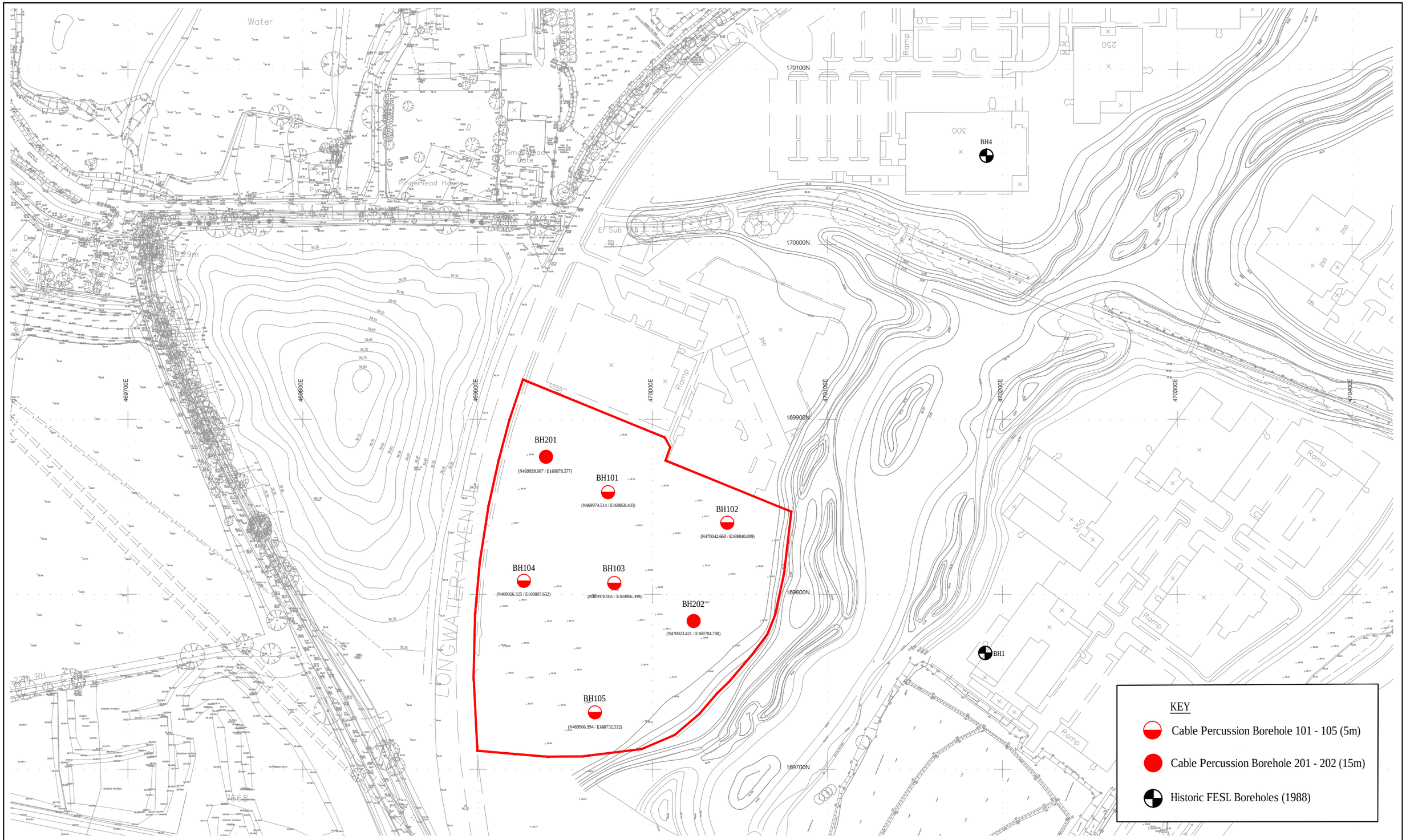
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SITE LAYOUT PLAN
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LICENSED WATER ABSTRACTION POINTS

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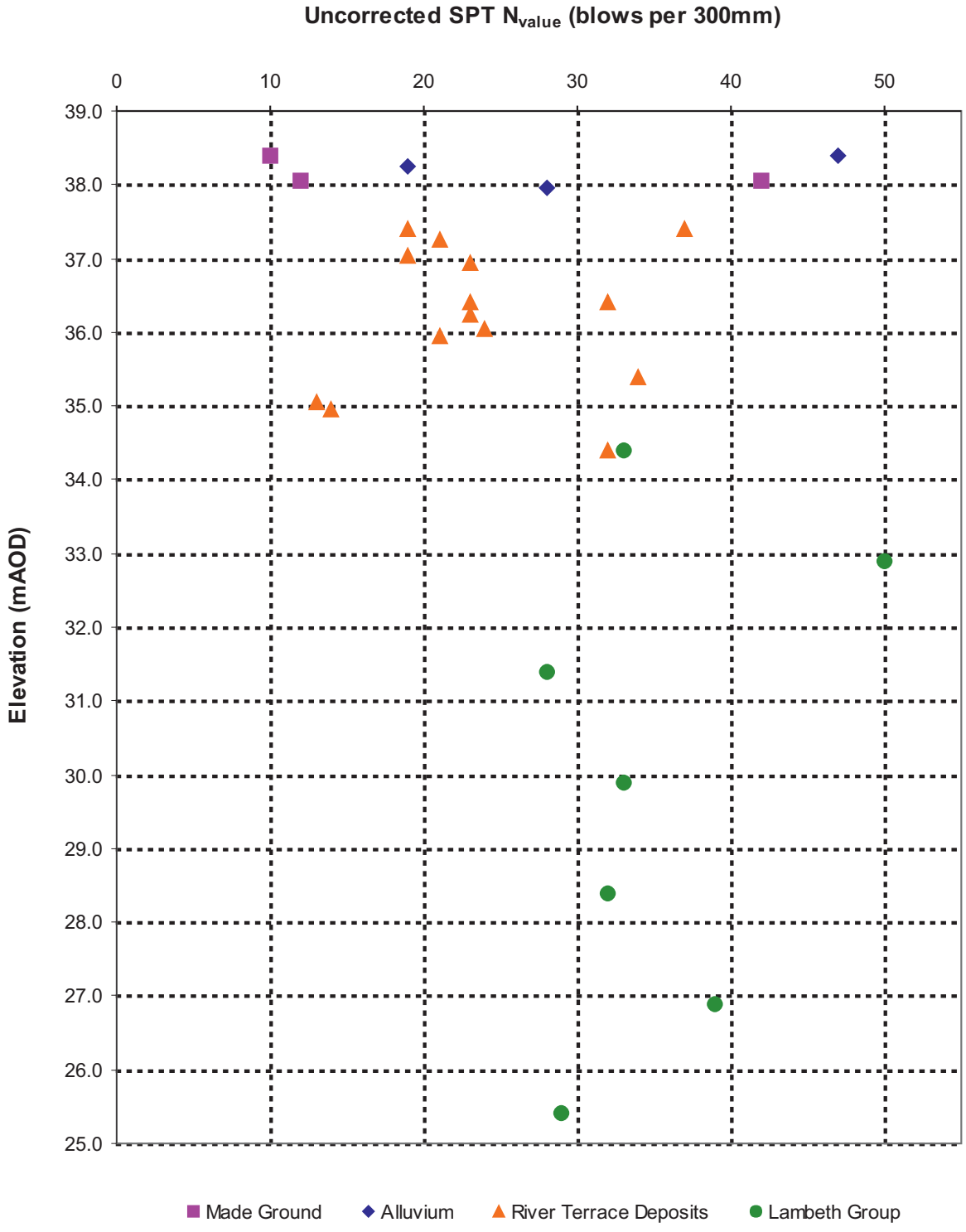
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EXPLORATORY HOLE LOCATION PLAN

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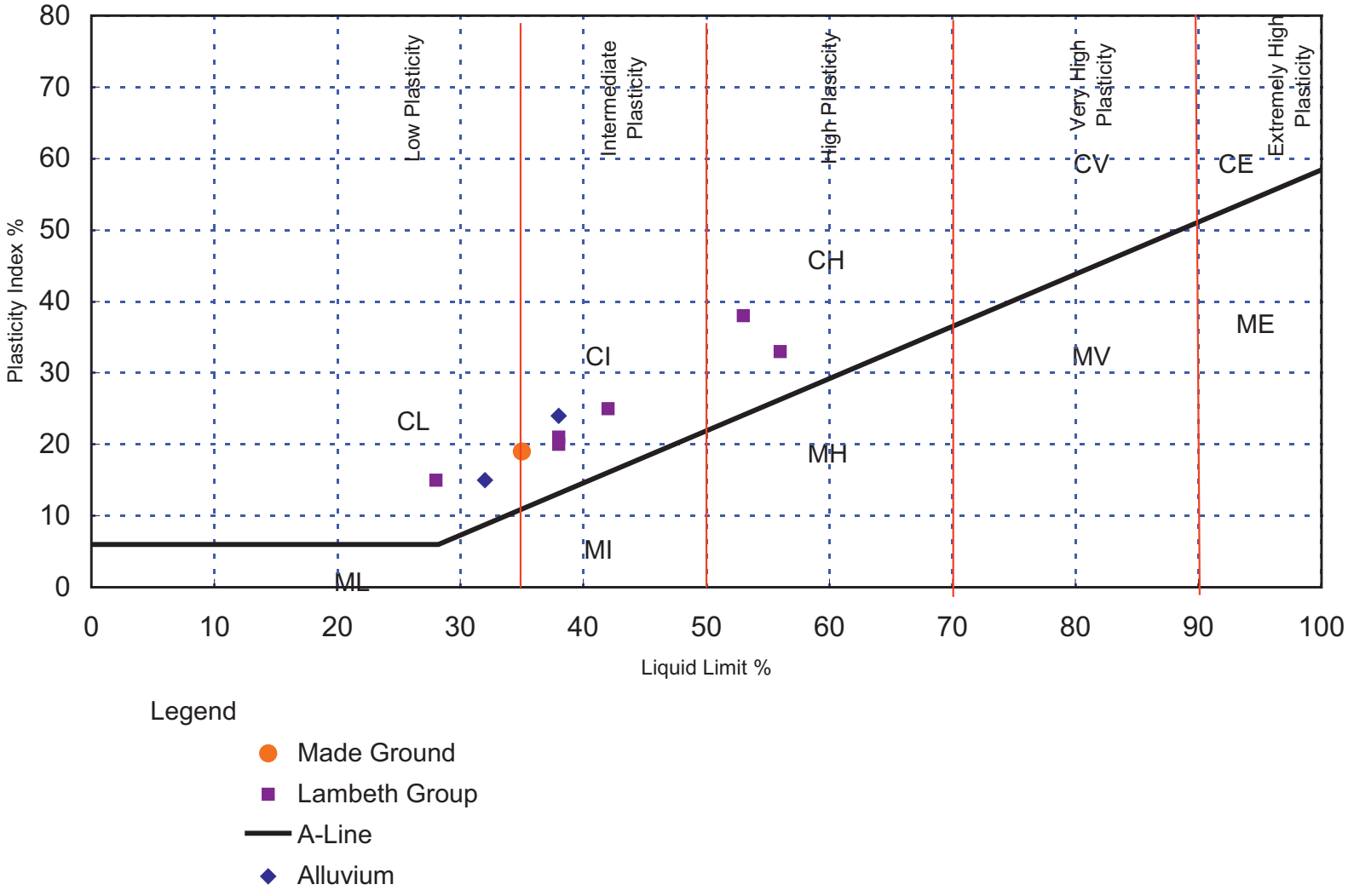
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FIGURE 4

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FIGURE 5

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APPENDIX 1

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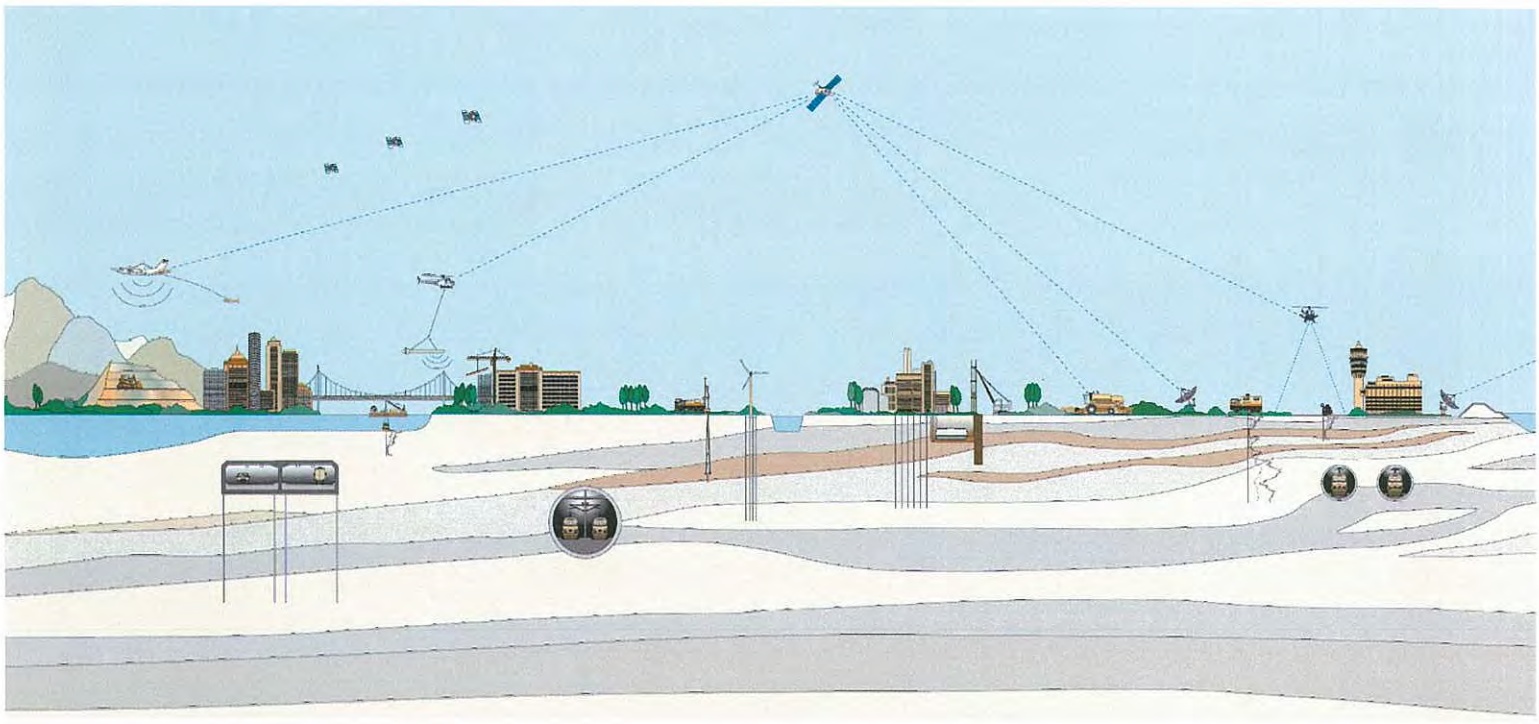
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Issue	Date	Description	Prepared	Checked	Approved (Printed)	Approved (Signature)
1	13/08/08	DRAFT FACTUAL	CC			
2	26/08/08	FINAL FACTUAL	EA	NHA	N. Armstrong	

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Date	Page no.	Para. no.	Change description	Doc. change request ID	Authorising signature

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APPENDIX A Exploratory Hole Records

APPENDIX B Geotechnical Laboratory Test Results

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1. INTRODUCTION

On the instructions and under the supervision of Peter Brett Associates (the Engineer), acting on behalf of Prudential Property Managers (the Employer) a site investigation has been carried out by Fugro Engineering Services Limited (FES) at Green Park, Plot 3.2, Reading, Berks where the construction of commercial properties as part of the Green Park development is proposed.

The objective of the investigation was to determine the ground conditions at the site and to provide information that would assist the Engineer in the geotechnical appraisal of the site and to collect samples for contamination testing. The scope of the investigation was determined by the Engineer.

A factual report was requested including exploratory hole and field testing records, laboratory test results and site plan, and the whole report has also been provided as digital data in AGS format and in portable document format (.pdf).

The site work, which comprised seven light cable tool percussion boreholes, to a maximum depth of 15.00m below ground level (bgl), was carried out between the 18th June 2008 and 24th June 2008.

2. THE SITE AND GEOLOGY

2.1 SITE LOCATION AND DESCRIPTION

Plot 3.2, Green Park is located approximately 5 miles to the south of the centre of Reading, Berkshire, 800m west of the Madejski Stadium. The site has an approximate area of 2.4 hectares.

The approximate National Grid reference of the site is SU 69697.

At the time of the investigation the site was unoccupied and largely laid to grass.

2.2 GEOLOGY

The records of the British Geological Survey (Sheet 268, Reading, of the 1:50,000 Series Geological Map, Drift (2000) Edition) indicates that the site is underlain by: Terrace Gravels (Flood Plain Deposits), which overlies London Clay, Lambeth Group, and Upper Chalk. Within 500m of the site to the North, South and West are areas of worked ground with adjacent zones of unfilled ground.

Further background research such as a desk study was not required within the terms of reference for the work.

3. METHOD OF INVESTIGATION

3.1 GENERAL

A Cable Avoidance Tool (CAT) survey was undertaken at all of the exploratory hole locations. Prior to the sinking of the boreholes, inspection pits were dug by hand at three locations, in order to identify the presence of any services. Services were not encountered.

Details of the in-situ sampling and testing carried out, together with the descriptions of the strata encountered, are given on the borehole records. An explanation of the symbols and abbreviations used on the records, together with the method of strata description utilised, is given in the Notes on Exploratory Hole Records (Figures KS/01 to KS/ 04) in Appendix A. The investigation was generally carried out in accordance with BS 5930:1999[i], BS EN ISO 14688-1:2002[ii] and BS EN ISO 14689-1:2003[iii] as appropriate.

All geotechnical samples were transported to the laboratories and offices of FES in Wallingford for examination and testing as scheduled by the Engineer. Contamination samples taken during the investigation were sent directly to the contamination testing laboratory for testing scheduled by the Engineer.

3.2 CONTAMINATED SITE

The site was designated to be in the Institution of Civil Engineers Site Investigation Steering Group[iv] 'Green' category and appropriate protection measures were undertaken.

Samples for chemical contamination testing were taken as appropriate for the intended analyses by the Engineer.

3.3 CABLE PERCUSSION BORING

Seven, 150mm minimum diameter, boreholes (BH101 to BH105 and BH201 to BH202) were sunk to depths below ground level of between 5.00m (BH101 to BH105) and 15.00m (BH201 and BH202) using light cable tool percussion boring techniques. The borehole records are given in Figures FR1 to FR7 in Appendix A.

Disturbed samples were taken at each change in soil type and at regular vertical intervals during boring in order to identify and give a record of the strata encountered.

In cohesive soils nominal 100mm diameter general purpose driven open tube (U100) samples were taken in BH105, BH201 and BH202 and subsequently sealed to preserve their natural moisture contents.

Standard penetration tests (SPT) using a split spoon (S) were carried out in the Made Ground/Engineered Fill and the naturally occurring deposits. The results are shown as S(N) values on the borehole records at the relevant depths.

During the course of boring attention was given to recording any evidence of water inflow in order that the groundwater level beneath the site could be established. Water levels at breaks in boring were recorded where appropriate. One water sample was taken in BH104 where sufficient water was encountered to allow sampling. Where water was added to facilitate penetration of the soil strata, or to maintain a positive hydrostatic head in the granular strata, this is noted on the borehole records.

3.4 INSTRUMENTATION

On completion of boring, a total of Seven slotted 50mm diameter standpipes were installed in each of the boreholes.

Details of the installations are given on the relevant borehole records.

3.5 SURVEY

The positions of the boreholes were set out by reference to features shown on the site plan by the Engineer.

The ground levels and grid co-ordinates at the borehole positions were determined using the Global Positioning System (GPS) technique. The ground levels have been quoted to the nearest 0.05m on the records. The grid co-ordinates are given to the nearest 0.01m.

4. RESULTS OF EXPLORATORY HOLES

4.1 GENERAL

The borehole records (Figures FR1 to FR7) giving details of the strata encountered are provided in Appendix A. A site plan showing the approximate positions of the boreholes provided by the Engineer is presented in Appendix C.

The strata descriptions given in the borehole records, unless otherwise noted, are compiled from an examination of the disturbed samples only, together with the results of any field and laboratory testing. Relative density descriptions are based on the results of the SPT and have not been amended to take into account any overburden effects. The consistency of cohesive strata is based on visual assessment together with any available in-situ and laboratory test results. Where there is a degree of uncertainty regarding the relative density or consistency of the soil, the terms are given in brackets

and "probably" or "possibly" have been used and the descriptions given should be treated with caution.

4.2 LIMITATIONS AND USE OF DATA

The scope of the investigation was determined by the Engineer for the particular project requirements set out in the Specification for the Contract. A factual report only was required, without interpretation of the data from the present investigation or consideration of data from other sources, except where noted. The data presented in this report reflects the site conditions encountered at the time the investigation was performed. The investigation has disclosed evidence of conditions at point locations across the site which provides information about discrete volumes of soil or rock. Accordingly, there may be ground conditions at the site which may not have been revealed by the investigation, and the passage of time may give rise to changes in the conditions encountered. Any interpolation or extrapolation of strata from the exploratory holes is subject to the interpretation of the reader. The records should be read in conjunction with the Notes on Exploratory Hole Records in Appendix A. ***Particular attention is drawn to the comments made on groundwater and interpretation which are given in these Notes.***

The investigation has been carried out by Fugro Engineering Services Limited and the report has been prepared for the sole internal use of Prudential Properties Managers. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Fugro Engineering Services Limited. If an unauthorised third party comes into possession of this report they rely upon it at their peril and the authors owe them no duty of care and skill.

It is Fugro Engineering Services Limited's understanding that this report is to be used for the purposes as described in the Specification for the investigation and as summarised in the text of the report. Should the purpose for which the report is used or the proposed use of the site change, this report may no longer be valid. Any further use or reliance upon the report in these circumstances by Prudential Property Managers without further review by and advice from Fugro Engineering Services Limited shall be at their sole and own risk.

5. GEOTECHNICAL LABORATORY TESTING

5.1 INTRODUCTION

The following laboratory tests were scheduled by the Engineer and carried out by FES in accordance with BS1377:1990[v] where applicable. The results are given in tabular and graphical form as appropriate in Appendix B. ***Attention is drawn to the comments on interpretation of the results of the investigation on page KS/01 of the Notes on***

Exploratory Hole Records. General Notes on Laboratory Test Results (Figure LKS/01) also precede the laboratory test results in Appendix B.

All tests with the exception of the chemical analyses were carried out in the Fugro in-house laboratory at Wallingford and the tests for which the laboratory has UKAS accreditation are detailed on the Schedules preceding the laboratory test results in Appendix B.

The chemical analyses were undertaken by Severn Trent Laboratories (STL), whose laboratory is accredited for the tests undertaken.

5.2 INDEX PROPERTIES

Liquid and plastic limit determinations were made on ten samples of the cohesive soils in order to classify the plasticity of the materials and the results are given on the Summary of Atterberg Limits Test Results (Fugro Test Certificate number 87613 in Appendix B). Natural moisture content determinations were made on a total of ten samples and these results are given on the Summary of Moisture Contents results in Appendix B.

5.3 PARTICLE SIZE ANALYSES

Particle size analyses were undertaken on a total of seven samples in order to classify the materials in respect to their grain size. Five particle size analyses were carried out by sieving only and two analyses carried by a combination of sieving and sedimentation. The results are given as particle size distribution curves (Fugro Test Certificate number 87613 in Appendix B).

5.4 CONSOLIDATION TESTS

Three consolidation tests were carried out on samples of the cohesive strata and the results, shown as voids ratio against log pressure (e - Log p) curves, together with values of the coefficients of compressibility (m_v) and consolidation (c_v). These results are given in Fugro Test Certificate number 87613 in Appendix B.

5.5 UNDRAINED (TOTAL STRESS) TRIAXIAL COMPRESSION TESTS

Unconsolidated undrained triaxial compression tests were scheduled on eight samples of the cohesive materials to determine their undrained shear strength. Seven samples were successfully extruded, however one sample, BH202/ U23 @ 13.00m was found to be heavily fissured both horizontally and diagonally upon extrusion and the scheduled testing was aborted.

The results including undrained shear strength, stress-strain plot, moisture content and bulk density are given on the Summary of Unconsolidated Undrained Triaxial

Compression Tests (Fugro Test Certificate number 87613 in Appendix B). The sample descriptions given on these figures are the technician's visual description.

The tests were carried out on single specimens nominally 200mm long and 100mm in diameter at single cell pressures ranging from 90kPa to 290kPa.

5.6 CHEMICAL ANALYSES

Chemical analyses have been made on six samples of soil.

The pH values and aqueous soluble sulphate contents were determined for five of the soil samples. The organic content of three soil samples was also determined.

These tests were undertaken by Severn Trent Laboratories (STL) and the results are presented as their test report reference numbers COV/534575/2008 at the end of Appendix B.

REFERENCES

[i] BS 5930:1999, Code of practice for site investigations. British Standards Institution.

[ii] BS EN ISO 14688-1:2002 Geotechnical investigation and testing – Identification and classification of soil – Part 1 Identification and description. British Standards Institution.

[iii] BS EN ISO 14689-1:2003 Geotechnical investigation and testing – Identification and classification of rock – Part 1 Identification and description. British Standards Institution.

[iv] Site Investigation In Construction - 4. Guidelines for the safe investigation by drilling of landfills and contaminated land. Site Investigation Steering Group. Thomas Telford. 1993.

[v] BS 1377:1990, Methods of tests for soils for civil engineering purposes. British Standards Institution

APPENDIX A Exploratory Hole Records

Notes and Key Sheets on Exploratory Hole Records	Figures KS/01 to KS/04
Borehole Records	Figures FR1 to FR7

NOTES ON EXPLORATORY HOLE RECORDS

GENERAL NOTES

1 OPERATING PROCEDURES

The procedure used for cable percussion boring, rotary drilling, trial pitting, sampling, in situ and laboratory testing and sample descriptions are generally in accordance with BS5930:1999 'Code of practice for site investigations', BS EN ISO 14688-1:2002 'Geotechnical investigation and testing – Identification and classification of soil – Part 1 Identification and description', BS EN ISO 14689-1:2003 'Geotechnical investigation and testing – Identification and classification of rock – Part 1 Identification and description' as appropriate, and BS1377:1990 'Methods of test for soils for civil engineering purposes', unless stated otherwise.

2 GROUNDWATER

Exploratory hole water levels are recorded together with the depths at which seepages or inflows of water are detected. These observations are noted on the Records, but may be misleading for the following reasons:

a) The exploratory hole is rarely left open at the relevant depth for a sufficient time for the water level to reach equilibrium.

b) A permeable stratum may have been sealed off by the borehole casing.

c) Water may have been added to the borehole to facilitate progress.

d) The permeability may have been altered by the excavation/boring/drilling process.

Standpipes or piezometers should be installed when an accurate record of groundwater level is required, however, it should be noted that groundwater levels may vary significantly due to seasonal, climatic or man made effects. Water levels recorded during the investigation and any advice or comment made accordingly may, therefore, not be appropriate to particular foundation, geotechnical design, or temporary works solutions. Long term monitoring of standpipes or piezometers is always recommended when water levels are likely to have a significant effect on design.

3 CHISELLING

The remarks in the Borehole Records contain information on the time spent advancing the borehole by 'Chiselling Techniques', and the depth of borehole over which it was required. Such information may be affected by a wide range of variable factors, unrelated to the geotechnical properties of the strata. Such factors include, but are not restricted to: plant, equipment and operator. The data should, therefore, only be used subjectively and with extreme caution.

4 IDENTIFICATION AND DESCRIPTION OF SOILS - SEE SEPARATE SHEET

The identification system follows the Company's Engineering: Geotechnical Procedures Manual which is based on BS EN ISO 14688-1:2002 and appropriate clarifications in the National Foreword, BS 5930:1999 and BS EN ISO 14689-1:2003

Relative density terms are given where supported by SPT N values, with the exception of Made Ground. The field assessment of compactness or relative density for coarse grained soils is only given on trial pit records where appropriate assessment of the soils has been undertaken.

Where the terms 'soft to firm', 'firm to stiff' etc. are used they indicate a strength which is close to the borderline between the two terms and cannot be precisely defined by inspection only, and/or which is indicated as borderline or ranging between the two terms after consideration also of in situ and laboratory test results. Consistencies may have been amended in the light of test results

Where 'to' links two terms, as in 'slightly sandy to sandy' this again represents a borderline case or a range, where the precise proportions cannot be determined as outlined previously.

The name of the geological formation is only given where this has been requested and can be determined with confidence (see Clause 41.5 of BS 5930:1999).

5 INTERPRETATION OF THE RESULTS OF THE INVESTIGATION

The description of ground conditions encountered and any engineering interpretation included in the report are based on the results of the boreholes and trial pits and the field and laboratory testing carried out. There may be ground conditions at the site which have not been revealed by the investigation and consequently have not been taken into account.

Any interpolation or extrapolation of strata between exploratory holes shown on any cross sections or site plans is an estimate only of the likely stratification based on general experience of the ground conditions and is subject to the interpretation of the reader.

The term "TOPSOIL" is used in this report to describe the surface, usually organic rich, layer including turf, subsoil and weathered material with roots. The use of this term may not imply that the soil satisfies the requirements of Clause 3 of BS 3882:1994, 'Specification for topsoil', or is suitable for general horticultural and agricultural purposes.

Laboratory test results in this report give the soil properties of individual specimens tested under specified conditions. Individual results or groups of results may not be appropriate for use as design parameters for some geotechnical analyses. The samples may be non-representative, disturbed internally, or prepared and tested under conditions suited for different geotechnical applications. Unless the selection of design parameters is discussed in this report, it is recommended that the advice of a Geotechnical Specialist is sought.

NOTES ON EXPLORATORY HOLE RECORDS

IN SITU TESTING AND SAMPLING

STANDARD PENETRATION TESTS

S( ) Standard Penetration Test (SPT). A 50mm diameter split barrel sampler is driven 450mm into the soil using a 63.6kg hammer with a 760mm drop. The penetration resistance (also known as the 'N' value) is expressed as the number of blows required to obtain 300mm penetration below an initial seating drive of 150mm which is taken through any ground which may be disturbed at the base of the borehole. The test is usually completed when the number of blows recorded during the test drive only reaches 50 in soils or 100 in weak rock. If a sample is not recovered in the sampler, a disturbed sample is taken on completion of the test and given the same depth as the top of the Standard Penetration Test drive.

C( ) Standard Penetration Test carried out with a 60 degree cone. The test is usually conducted in coarse granular soils or weak rock using the same procedure as for the SPT, but with a 50mm diameter, 60 degree apex, solid cone fitted to the split barrel. A bulk disturbed sample is taken and given the same depth as the top of the test drive.

The depth on the borehole record at the left hand side of the 'depth' column is that at the start of the normal 450mm penetration. Where the full penetration of 300mm for the test drive is obtained, the penetration resistance ('N' value) is reported in the 'SPT Blows/N' column. If the full penetration of 300mm in the test drive is not obtained, then the length of drive (test length in mm) and the penetration resistance (number of blows) are both reported. Blows through the initial seating drive (normally 150mm) are not reported.

* in the 'Test Length' column denotes that the blows and penetration were all in the initial Seating Drive section.

OTHER IN SITU TESTS

The following in situ tests are reported on the **Exploratory Hole Records**, in the 'Test' or 'Type' and 'Results' columns where appropriate.

k In situ Permeability Test - refer to detailed test results for permeability values

PMT Pressuremeter Test - refer to detailed test results for modulus values, etc.

VN/R( ) Borehole Shear Vane Test (undrained shear strength - c_u - in kPa) - refer also to detailed test results, N - 'Natural' or peak shear strength, R - Remoulded shear strength

VN/R( ) Hand Shear Vane Test (Direct reading of undrained shear strength in kPa). 'N' and 'R' as above. The values are indicative and should not be taken as being equivalent to laboratory test results. The Pilcon vane results have a factor varying from about a sixth for the 33mm vane to a third for the 19mm vane which reduces the BS1377 shear vane value. The values presented are therefore approximate and should be treated with great caution if used for design purposes

PP( ) Pocket Penetrometer. Unconfined Strength (UCS) reported in kg/cm^2 to the nearest 0.25 kg/cm^2. Equivalent c_u in kPa is very approximately UCS x 50. Pocket Penetrometers are an aid to logging of cohesive soils, the results are indicative and should not be relied upon. The equipment used is not calibrated

CBR( ) California Bearing Ratio Test (CBR%) - refer also to detailed test results

PID( ) Photo-Ionisation Detector Readings in headspace of small disturbed chemical samples. Result given in ppm by volume

SAMPLES

U General purpose open tube sample. Sample normally taken with open tube sampler approximately 0.1m diameter and 0.45m long and driven with 80kg sinker bar and 56kg sliding hammer, unless noted otherwise. "XX" in U100 blows column denotes the number of hammer blows. The height of hammer drop can be variable depending on operator technique. Depths are given to the top of the sample if full penetration and recovery are achieved, otherwise actual lengths of penetration and recovery are given in the appropriate columns.

U(X) General purpose open tube sample (X) mm diameter

TW(X) Thin wall (push) sample (X) mm diameter

P(X) Piston sample (X) mm diameter

CBR Sample taken in CBR Mould

D Small disturbed sample (jar with air tight lid)

B Bulk disturbed sample (polythene bag, tied at neck - size dependent on purpose)

W Water sample

Sample not recovered

C Core sample (CS – short core, generally about 100mm; CL – long core, generally 200mm to 300mm)

CD Sample for chemical analysis in a plastic tub

K Sample for chemical analysis in an amber glass jar

V Sample for chemical analysis in a glass vial

CDKV Set of samples for chemical analysis as above

WAC Sample for Waste Acceptance Criteria

NOTES ON EXPLORATORY HOLE RECORDS

KEY TO BOREHOLE AND TRIAL PIT RECORDS

Soil Types

Coarse grained, Non cohesive

- Boulders
- Cobbles
- Gravel
- Sand

Fine grained, Cohesive

- Silt
- Clay

Other Soil Types

- Topsoil
- Peat
- Made Ground

Note: Composite soil types may be signified by combined symbols.

Rock Types

Sedimentary

- Sandstone
- Siltstone
- Conglomerate
- Chalk
- Limestone
- Breccia
- Coal
- Mudstone/Claystone/Shale

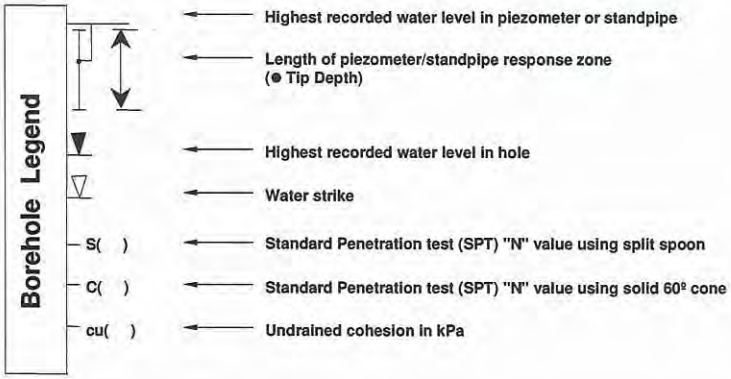
Metamorphic

- Coarse/Medium grained
- Fine grained

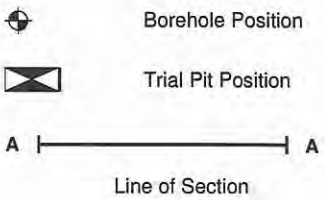
Igneous

- Coarse grained
- Medium grained
- Fine grained

KEY TO SITE PLANS AND CROSS SECTIONS



- Highest recorded water level in piezometer or standpipe
- Length of piezometer/standpipe response zone (● Tip Depth)
- Highest recorded water level in hole
- Water strike
- Standard Penetration test (SPT) "N" value using split spoon
- Standard Penetration test (SPT) "N" value using solid 60° cone
- Undrained cohesion in kPa



- Borehole Position
- Trial Pit Position
- Line of Section

NOTES ON EXPLORATORY HOLE RECORDS

IDENTIFICATION AND DESCRIPTION OF SOILS

	Basic Soil Type	Particle Size (mm)		Visual Identification
VERY COARSE SOILS	BOULDERS		200	Large Boulders >630mm. These soils only seen complete in pits or exposures. Often difficult to recover from boreholes.
	COBBLES		63	
COARSE SOILS (Typically over 65% Sand and Gravel Sizes)	GRAVEL	coarse	20	Easily visible to naked eye; particle shape can be described, grading can be described. Well graded: wide range of grain sizes, well distributed. Poorly graded: not well graded. (May be uniform: size of most particles lies between narrow limits; or gap graded; an intermediate size of particle is markedly under represented).
		medium	6.3	
		fine	2	
	SAND	coarse	0.63	Visible to naked eye; no cohesion when dry; grading can be described. Well graded and poorly graded: as above
		medium	0.2	
		fine	0.063	
FINE SOILS (Typically over 35% Silt and Clay Sizes)	SILT	coarse	0.02	Only coarse silt visible with hand lens; exhibits little plasticity and marked dilatancy; slightly granular or silky to touch. Disintegrates in water; lumps dry quickly; possesses cohesion but powders easily between fingers. Term "SILT" or "CLAY" must be used, "SILT/CLAY" not allowed. Dry lumps can be broken but not powdered between the fingers; they also disintegrate under water but more slowly than silt; smooth to the touch; exhibits plasticity but no dilatancy; sticks to the fingers and dries slowly; shrinks appreciably on drying usually showing cracks. Intermediate and high plasticity clays show these properties to a moderate and high degree, respectively.
		medium	0.0063	
		fine	0.002	
	CLAY			
ORGANIC SOILS	ORGANIC CLAY, SILT or SAND	Varies		Contains varying amounts of organic vegetable matter - defined by colour: grey - slightly organic; dark grey – organic; black – very organic.

Composite Soil Types (Mixtures of basic soil types)

Scale of secondary constituents with coarse and very coarse soils. Term before, description after principal

Term before (term in ' [ ] ' may be used for 2nd ry parts, matrix etc)	Principal Soil Type	Description after	Approx % 2nd ry soil type
Slightly (sandy*) [occasional / little]	SAND, GRAVEL; (COBBLES or BOULDERS See Notes)	Used to describe components of secondary constituents. e.g. Gravel is fine and medium subangular fine sandstone and mudstone.	<5
--(sandy*) [some]			5 – 20
Very (sandy*) [much / many]			20 to 40†
--		and (sand*) or and (cobbles+)	50†

* Fine or coarse soil type as appropriate
\+ Very coarse soil type – see Notes
† described as fine soil depending on behaviour

Scale of secondary constituents with fine soils. Terms before, description after principal constituent.

Term before	Principal Soil Type	Description after	Approx % 2nd ry soil type
Slightly (sandy*)	CLAY or SILT	Used to describe components of secondary constituents e.g. gravelly sandy CLAY. Gravel is coarse rounded quartzite	<35
-- (sandy*)			35 to 65†
Very (sandy*)			>65†

* Coarse soil type as appropriate
† or described as coarse soil depending on mass behaviour

EXAMPLES OF COMPOSITE TYPES
(indicating preferred order for description)

Loose brown very sandy subangular coarse GRAVEL with many pockets (<5mm across) of soft grey clay.

Firm thinly interlaminated brown SILT and CLAY.

Dense light brown clayey fine and medium SAND.

Density / Consistency / Peat Condition

For very coarse soils qualitative description by inspection of voids and particle packaging.

Standard Penetration Test in Boreholes for Coarse Soils

No of blows	Relative Density
<4	Very Loose
4-10	Loose
10-30	Medium Dense
30-50	Dense
>50	Very Dense
Slightly cemented	Visual Examination: pick removes soil in lumps which can be abraded.

Silty CLAY or clayey SILT – use prefix only when secondary constituent has significant affect on material characteristics. Terms 'slightly' or 'very' not applicable.

Consistency

Very soft	Finger easily pushed in up to 25mm. Exudes between fingers
Soft	Finger pushed in up to 10mm. Moulded by fingers
Firm	Thumb makes impression easily. Rolls to thread
Stiff	Can be indented slightly by thumb. Crumbles if rolled
Very Stiff	Indented by thumbnail. Cannot be moulded
Hard	Can be scratched by thumb nail
Firm Peat	Fibres compressed together
Spongy Peat	Very compressible, open
Plastic Peat	Moulded in hand, smears

Structure

Term	Field Identification
Homo-geneous	Deposit consists essentially of one type
Interbedded or interlaminated	Alternating layers of varying types. Pre-qualified by thickness term if in equal proportions. Otherwise thickness of, and spacing between, subordinate layers defined
Hetero-geneous	A mixture of types
Weathered (granular)	Particles may be weakened and may show concentric layering
Weathered (cohesive)	Usually has crumb or columnar structure
Fissured	Breaks into blocks along unpolished discontinuities
Sheared	Breaks into blocks along polished discontinuities
Intact	No fissures
Fibrous Peat	Plant remains recognisable and retain some strength. When squeezed only water, no solids
Pseudo-fibrous Peat	Plant remains recognisable, strength lost. Partial decomposition. Turbid water when squeezed, <50% solids
Amorphous Peat	Recognisable plant remains absent, full decomposition. When squeezed only paste with >50% solids
Gyttja	Decomposed plant & animal remains, maybe inorganic constituents
Humus	Plant remains, living organisms & inorganic constituents in topsoil

Interval Scales

Scale of Bedding Spacing	Mean Spacing (mm)	Scale of Spacing of Other Discontinuities / [Blocks]
Very thickly bedded	over 2000	Very widely spaced / [Very large]
Thickly bedded	2000-600	Widely spaced / [Large]
Medium bedded	600-200	Medium spaced / [Medium]
Thinly bedded	200-60	Closely spaced / [Small]
Very thinly bedded	60-20	Very closely / [Very small]
Thickly laminated	20-6	Extremely closely spaced
Thinly laminated	under 6	

Spacing terms may also be used for distance between partings, isolated beds or laminae, desiccation cracks, rootlets etc. Terms such as partings or dustings may be used for laminae less than 2mm and less than 0.6mm respectively.

Discontinuity Shape (See Standard for Persistence/Openness)	Small scale (mm's) rough, smooth Medium scale (cm's) planar, stepped, undulating Large scale (m's) wavy, curved, straight

Particle Nature

Particle Shape & Form

Very angular
(Sub) angular
(Sub) rounded
Well rounded

Low Sphericity
Flat or Elongate

High Sphericity
Cubic

Particle Surface Texture

Rough

Smooth

Polished

NOTES Identification and descriptive method, and descriptions, generally in accordance with BS5930:1999 Section 6 clauses 41 and 43 and BS EN ISO 14688-1:2002
Additional notes relating to BS EN ISO 14688-2:2004 – modified terms for content of secondary fraction given in Annex B Table B1 are not comparable to 5930 and are not be used.
Organic Content :- Low – 2 to 6%; Medium - 6 to 20%; High - >20%. Terms not used on borehole records
Carbonate content :- Only noted if field test with dilute HCl undertaken – Carbonate free if no effervescence; Calcareous if slight effervescence; Highly calcareous if strong reaction
Undrained shear strength :- terms from laboratory or in situ tests not given on borehole records.
Very Coarse Soils – described by initially removing very coarse materials and describing residue before adding back the very coarse soils. If residue is cohesive then described as '.....(COBBLES / BOULDERS) with low (cobble / boulder) content with (some / much etc) matrix of .....' If residue is granular then described as ' with matrix of ' or as a coarse soil.
Cobbles :- <10% - low cobble content; 10 to 20% - medium content; >20% - high content; **Boulders** <5% - low boulder content; 5 to 20% - medium content; >20% - high content

Drilling Method Cable Percussion **Equipment** Dando 2000 **Drill Crew** **Dates Drilled** Start 19/06/2008 End 19/06/2008	**Borehole Diameter** 150mm to 5.00m **Casing Diameter** 150mm to 5.00m **Logged by** AA 19/06/2008 **Compiled by** cp 24/06/2008 **Checked by** NHH 26.08.08	**BOREHOLE No.** BH101 **Coordinates** 469972.14 E **(National Grid)** 169850.92 N **Ground Level** 39.55 m OD	

Date & Time	Casing Depth (m)	Depth to Water (m)	Sample Details: Depth (m) From	To	Type	No.	SPT Blows/N Drive mm: Test	U100 Blows/ Recovery mm: Result	Description of Strata	Depth (Thickness) (m)	Level	Legend
19/06									MADE GROUND: Brown slightly clayey gravelly sand. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse flint, concrete and brick.	(0.40)		
			0.50		CDKV	1				0.40	39.15	
			0.50-1.00		B	2						
			1.00		CDKV	3			MADE GROUND: Brown silty sand with occasional pockets of grey and red mottled sandy clay and rare subangular to subrounded medium flint gravel. Sand is mainly fine and medium (Possibly engineered fill).	(1.25)		
	1.50	DRY	1.50-2.00		D	4	S42					
			1.50-2.00		B	5				1.65	37.90	
									Stiff dark grey slightly organic sandy slightly gravelly CLAY with occasional brown sand partings. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse flint. [Alluvium]	(0.15)		
										1.80	37.75	
	1.50	DRY	2.50		D	6	S18					
			2.50-3.00		B	7			Medium dense grey white and brown sandy GRAVEL. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse flint. [River Terrace Deposits]			
										(2.95)		
	1.50	DRY	3.50		D	8	S23					
			3.50-4.00		B	9						
	1.50	DRY	4.50		D	10	S18					
			4.50-5.00		B	11						
19/06	1.50	DRY								4.75	34.80	
									Stiff green grey mottled brown red slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse flint. [Lambeth Group]	(0.25)		
										5.00	34.55	
									End of Borehole			

Remarks (See notes & keysheets)
1 Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out.
2 See installation details on final sheet.
3 Groundwater was encountered at 2.50m during boring and rose to 2.10m after 20 mins.

Scale 1:50

FUGRO

Project
GREEN PARK, PLOT 3.2, READING, BERKS
PRUDENTIAL PROPERTY MANAGERS
PETER BRETT ASSOCIATES

Contract No. WAL080045

Figure No. FR1 (1 of 2)

301/04

Drilling Method Cable Percussion **Equipment** Dando 2000 **Drill Crew** **Dates Drilled** Start 19/06/2008 End 19/06/2008	**Borehole Diameter** 150mm to 5.00m **Casing Diameter** 150mm to 5.00m **Logged by** AA 19/06/2008 **Compiled by** cp 24/06/2008 **Checked by**	**BOREHOLE No.** **BH101** **Coordinates** 469972.14 E **(National Grid)** 169850.92 N **Ground Level** 39.55 m OD

Description	Depth (m)	Level m OD	
Concrete	0.50	39.05	Flush lockable stopcock box cover with gas tap. Pipe diameter 50mm to 4.50m.
Bentonite Seal	1.00	38.55	
Pea Gravel Filter	4.50	35.05	
Bentonite Seal	5.00	34.55	Base of Hole

Remarks
(See notes & keysheets)

Not to Scale

FUGRO	**Project** GREEN PARK, PLOT 3.2, READING, BERKS PRUDENTIAL PROPERTY MANAGERS PETER BRETT ASSOCIATES	**Contract No.** WAL080045 **Figure No.** FR1 (2 of 2)

309/03

Drilling Method Cable Percussion	**Borehole Diameter** 150mm to 5.00m	**Casing Diameter** 150mm to 5.00m	**BOREHOLE No.** **BH102**
Equipment Dando 2000			**Coordinates** 470041.83 E
			(National Grid) 169833.61 N
Drill Crew	**Logged by** CP	**Compiled by** SO	**Checked by** NHJ 26.08.08
Dates Drilled Start 18/06/2008			**Ground Level** 39.35 m OD
End 18/06/2008	18/06/2008	20/06/2008	

Date & Time	Casing Depth (m)	Depth to Water (m)	Sample Details: Depth (m) From	To	Type	No.	SPT Blows/N Drive mm Test	U100 Blows/ Recovery mm Result	Description of Strata	Depth (Thick-ness) (m)	Level	Legend
18/06									MADE GROUND: Turf over brown, slightly clayey gravelly sand. Sand is fine to coarse. Gravel is subangular to rounded, fine to coarse of flint concrete and brick.	(0.70)		
			0.50		CDKV	1						
			0.50	1.00	B	2				0.70	38.65	
									MADE GROUND: Yellowish brown mottled grey and red sandy, silty clay, with occasional subangular to rounded, fine to coarse flint gravel (possibly engineered fill).	(0.45)		
			1.00		CDKV	3				1.15	38.20	
										(0.25)		
										1.40	37.95	
	1.50	DRY	1.50		D	4	S20		MADE GROUND: Firm black organic, slightly sandy, slightly gravelly clay. Gravel is subangular to subrounded, fine to coarse of flint , chalk with charcoal fragments (possibly engineered fill).			
	1.50	DRY	1.50	2.00	B	5						
									Medium dense, becoming dense with depth, grey, white and brown sandy GRAVEL. Sand is fine to coarse. Gravel is subangular to rounded, fine to coarse of flint. [River Terrace Deposits] Between 1.50m and 2.00m: yellowish brown and grey clayey gravelly sand.			
	2.50	DAMP	2.50		D	6	S33					
			2.50	3.00	B	7				(3.25)		
	3.50	1.80	3.50		D	8	S33					
			3.50	4.00	B	9						
	4.50	1.70	4.50		D	10	S17					
			4.50	5.00	B	11				4.65	34.70	
18/06	5.00	1.70							Stiff yellowish brown and grey, mottled red sandy CLAY. Sand is mainly fine and medium. [Lambeth Group]	(0.35)		
										5.00	34.35	
									End of Borehole			

Remarks (See notes & keysheets)
1 Prior to boring a Cable Avoidance Tool (CAT) survey was carried out. An inspection pit was hand-dug to 1.20m depth and rescanned using the CAT to check for services. Services were not located.
2 See installation details on final sheet.
3 Groundwater was encountered at 2.50m during boring and rose to 2.35m after 20 mins.

Scale 1:50

FUGRO

Project
GREEN PARK, PLOT 3.2, READING, BERKS
PRUDENTIAL PROPERTY MANAGERS
PETER BRETT ASSOCIATES

Contract No. WAL080045

Figure No. FR2 (1 of 2)

Drilling Method Cable Percussion **Equipment** Dando 2000 **Drill Crew** **Dates Drilled** Start 18/06/2008 End 18/06/2008	**Borehole Diameter** 150mm to 5.00m **Casing Diameter** 150mm to 5.00m **Logged by** CP 18/06/2008 **Compiled by** so 20/06/2008 **Checked by**	**BOREHOLE No.** BH102 **Coordinates** 470041.83 E **(National Grid)** 169833.61 N **Ground Level** 39.35 m OD	

Description	Depth (m)	Level m OD	
Concrete	0.50	38.85	Flush lockable stopcock box cover with gas tap. Pipe diameter 50mm to 4.50m.
Bentonite Seal	1.00	38.35	
Gravel Filter	4.50	34.85	
Bentonite Seal	5.00	34.35	Base of Hole

Remarks
(See notes & keysheets)

Not to Scale

FUGRO	**Project** GREEN PARK, PLOT 3.2, READING, BERKS PRUDENTIAL PROPERTY MANAGERS PETER BRETT ASSOCIATES	**Contract No.** WAL080045 **Figure No.** FR2 (2 of 2)

309/03

Drilling Method Cable Percussion	**Borehole Diameter** 150mm to 5.00m	**Casing Diameter** 150mm to 5.00m	**BOREHOLE No.** **BH103**
Equipment Dando 2000			**Coordinates** 469977.98 E
			(National Grid) 169798.72 N
Drill Crew	**Logged by** CP	**Compiled by** SO	**Checked by** 26.06.08
Dates Drilled Start 18/06/2008	18/06/2008	20/06/2008	**Ground Level** 39.45 m OD
End 18/06/2008			

Date & Time	Casing Depth (m)	Depth to Water (m)	Sample Details: Depth (m) From	To	Type	No.	SPT Blows/N Drive mm Test	U100 Blows/ Recovery mm Result	Description of Strata	Depth (Thickness) (m)	Level	Legend
18/06			0.25		CDKV	1			MADE GROUND: Turf over brown, slightly clayey, gravelly sand with low cobble content. Sand is fine to coarse. Gravel is subangular to rounded, fine to coarse of flint, brick and concrete. Cobbles are of concrete. Occasional fragments of wood	(0.60)		
			0.50	1.00	B	2				0.60	38.85	
									MADE GROUND: Yellowish brown, silty sand intermixed with yellow brown mottled grey and red sandy clay with occasional subangular to rounded, fine to coarse flint gravel (possibly engineered fill).	(0.90)		
			1.25		CDKV	3						
	1.50	DRY	1.50		D	4	S28			1.50	37.95	
			1.50	2.00	B	5			Below 1.30m: becoming yellowish brown sandy clay.	(0.30)		
									Stiff dark grey, slightly organic sandy, slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to rounded, fine to coarse of flint.	1.80	37.65	
	2.50	DAMP	2.50		D	6	S23					
			2.50	3.00	B	7			Medium dense, grey white and brown SAND and GRAVEL. Sand is fine to coarse. Gravel is subangular to rounded, fine to coarse of flint. [River Terrace Deposits] At 2.50m: greenish grey clayey sand and gravel.	(2.75)		
	3.50	1.35	3.50		D	8	S21					
			3.50	4.00	B	9						
	4.50	1.50	4.50		D	10	S14					
			4.50	5.00	B	11				4.55	34.90	
18/06	5.00	1.50							Stiff, fissured greenish grey mottled red and brown CLAY. Fissures are extremely closely spaced. [Lambeth Group]	(0.45)		
										5.00	34.45	
									End of Borehole			

Remarks (See notes & keysheets)

1 Prior to boring a Cable Avoidance Tool (CAT) survey was carried out. An inspection pit was hand-dug to 1.20m depth and rescanned using the CAT to check for services. Services were not located.

2 See installation details on final sheet.

3 Groundwater was encountered at 2.50m during boring and rose to 2.30m after 20 mins.

Scale 1:50

FUGRO

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GREEN PARK, PLOT 3.2, READING, BERKS
PRUDENTIAL PROPERTY MANAGERS
PETER BRETT ASSOCIATES

Contract No. WAL080045

Figure No. FR3 (1 of 2)

301/04

Drilling Method Cable Percussion **Equipment** Dando 2000 **Drill Crew** **Dates Drilled** Start 18/06/2008 End 18/06/2008	**Borehole Diameter** 150mm to 5.00m **Casing Diameter** 150mm to 5.00m **Logged by** CP 18/06/2008 **Compiled by** so 20/06/2008 **Checked by**	**BOREHOLE No.** BH103 **Coordinates** 469977.98 E **(National Grid)** 169798.72 N **Ground Level** 39.45 m OD	

Description	Depth (m)	Level m OD	
Concrete	0.50	38.95	Flush lockable stopcock box cover with gas tap. Pipe diameter 50mm to 4.50m.
Bentonite Seal	1.00	38.45	
Gravel Filter	4.50	34.95	
Bentonite Seal	5.00	34.45	Base of Hole

Remarks
(See notes & keysheets)

Not to Scale

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PETER BRETT ASSOCIATES

Contract No. WAL080045

Figure No. FR3 (2 of 2)

309/03

Drilling Method Cable Percussion	**Borehole Diameter** 150mm to 5.00m	**Casing Diameter** 150mm to 4.80m	**BOREHOLE No.** **BH104**
Equipment Dando 2000			**Coordinates** 469924.56 E
			(National Grid) 169799.18 N
Drill Crew	**Logged by** AA	**Compiled by** cp	**Ground Level** 39.55 m OD
Dates Drilled Start 18/06/2008	17/06/2008	23/06/2008	**Checked by** 26.08.08
End 18/06/2008			

Date & Time	Casing Depth (m)	Depth to Water (m)	Sample Details: Depth (m) From	To	Type	No.	SPT Blows/N Drive mm Test	U100 Blows/ Recovery mm Result	Description of Strata	Depth (Thick-ness) (m)	Level	Legend
18/06			0.50	1.00	B	1			MADE GROUND: Roadstone and crushed concrete over brown clayey sand and gravel with low cobble content. Gravel is subangular to subrounded fine to coarse flint, brick , concrete and pieces of plastic. Cobbles are of brick and concrete	(0.85)		
			1.00		CDKV	2			MADE GROUND: Yellow brown and grey mottled clayey silt (possibly engineered fill). Between 1.20m and 1.40m; becoming yellow brown sandy silt	0.85	38.70	
	1.50	DRY	1.50		D	3	S12		Below 1.50m; intermixed with grey brown mottled red sandy gravelly clay	(0.85)		
			1.50	2.00	B	4				1.70	37.85	
			2.25		D	5			Stiff green grey mottled slightly gravelly sandy CLAY with occasional sand partings. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse flint. [Alluvium]	(0.70)		
			2.40		W	6				2.40	37.15	
	2.50	2.30	2.50		D	7	S19		Medium dense grey white and brown sandy GRAVEL. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse flint. [River Terrace Deposits]			
			2.50	3.00	B	8						
	3.50	1.70	3.50		D	9	S24		At 3.50m; brown gravelly sand. Sand is fine to coarse	(2.20)		
			3.50	4.00	B	10						
	4.50	2.10	4.50		D	11	S13					
			4.50	5.00	B	12				4.60	34.95	
18/06	4.80								Stiff green grey silty CLAY. [Lambeth Group]	(0.40)		
										5.00	34.55	
									End of Borehole			

Remarks (See notes & keysheets)

1. Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out.
2. On completion the borehole was backfilled with compacted arisings.
3. See installation details on final sheet.
4. Groundwater was encountered at 2.50m during boring and rose to 2.35m after 5 mins,2.30m after 10 mins,2.25m after 15 mins,2.25m after 20 mins.

Scale 1:50

FUGRO

Project GREEN PARK, PLOT 3.2, READING, BERKS
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PETER BRETT ASSOCIATES

Contract No. WAL080045

Figure No. FR4 (1 of 2)

301/04

Drilling Method Cable Percussion **Equipment** Dando 2000 **Drill Crew** **Dates Drilled** Start 18/06/2008 End 18/06/2008	**Borehole Diameter** 150mm to 5.00m **Casing Diameter** 150mm to 4.80m **Logged by** AA 17/06/2008 **Compiled by** cp 23/06/2008 **Checked by**	**BOREHOLE No.** BH104 **Coordinates** 469924.56 E **(National Grid)** 169799.18 N **Ground Level** 39.55 m OD	

Description	Depth (m)	Level m OD	
Concrete	0.50	39.05	Flush lockable stopcock box cover with gas tap. Pipe diameter 50mm to 4.50m.
Bentonite Seal	1.00	38.55	
Pea Gravel Filter	4.50	35.05	
Bentonite Seal	5.00	34.55	Base of Hole

Remarks
(See notes & keysheets)

Not to Scale

FUGRO	**Project** GREEN PARK, PLOT 3.2, READING, BERKS PRUDENTIAL PROPERTY MANAGERS PETER BRETT ASSOCIATES	**Contract No.** WAL080045 **Figure No.** FR4 (2 of 2)

Drilling Method Cable Percussion	**Borehole Diameter** 150mm to 5.00m	**Casing Diameter** 150mm to 4.50m	**BOREHOLE No.** **BH105**
Equipment Dando 2000			**Coordinates** 469965.82 E
			(National Grid) 169724.65 N
Drill Crew	**Logged by** AA	**Compiled by** cp	**Checked by** NAA 26.08.08
Dates Drilled Start 18/06/2008	17/06/2008	23/06/2008	**Ground Level** 39.75 m OD
End 18/06/2008			

Date & Time	Casing Depth (m)	Depth to Water (m)	Sample Details: Depth (m) From	To	Type	No.	SPT Blows/N Drive mm Test	U100 Blows/ Recovery mm Result	Description of Strata	Depth (Thick-ness) (m)	Level	Legend
18/06			0.50	1.00	B	1			MADE GROUND: Crushed concrete over brown slightly clayey sand and gravel. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse flint, brick and concrete.	(0.55)		
			0.50		CDKV	2				0.55	39.20	
			1.25		CDKV	3			MADE GROUND: Yellow brown slightly gravelly sand intermixed with grey and mottled red sandy clay. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse flint (possibly engineered fill).	(0.80)		
	1.50	DRY	1.50		D	4	S19			1.35	38.40	
			1.50	2.00	B	5			Stiff dark grey mottled brown slightly organic sandy, gravelly CLAY. Locally grades into very clayey very sandy gravel. Sand is fine to coarse. Gravel is subangular to rounded fine and coarse flint. [Alluvium]	(0.85)		
	2.50	2.25	2.50		D	6				2.20	37.55	
			2.50	2.95			S21		Medium dense green white and brown sandy GRAVEL. Sand is medium to coarse. Gravel is subangular to rounded fine to coarse flint. [River Terrace Deposits]			
			2.50	3.00	B	7				(1.80)		
	3.50	1.70	3.50		D	8	S23					
			3.50	4.00	B	9				4.00	35.75	
	4.50	3.10	4.50	4.95	U	10		100/ 450	Stiff becoming very stiff with depth greenish grey and brown silty CLAY. [Lambeth Group]	(1.00)		
18/06	4.50		5.00		D	11				5.00	34.75	
									End of Borehole			

Remarks (See notes & keysheets)
1 Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out.
2 On completion the borehole was backfilled with compacted arisings.
3 See installation details on final sheet.
4 Groundwater was encountered at 2.50m during boring and rose to 2.50m after 20 mins.

Scale 1:50

FUGRO

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GREEN PARK, PLOT 3.2, READING, BERKS
PRUDENTIAL PROPERTY MANAGERS
PETER BRETT ASSOCIATES

Contract No. WAL080045

Figure No. FR5 (1 of 2)

301/04

Drilling Method Cable Percussion **Equipment** Dando 2000 **Drill Crew** **Dates Drilled** Start 18/06/2008 End 18/06/2008	**Borehole Diameter** 150mm to 5.00m **Casing Diameter** 150mm to 4.50m **Logged by** AA 17/06/2008 **Compiled by** cp 23/06/2008 **Checked by**	**BOREHOLE No.** BH105 **Coordinates** (National Grid) 469965.82 E, 169724.65 N **Ground Level** 39.75 m OD	

Description	Depth (m)	Level m OD	
Concrete	0.50	39.25	Flush lockable stopcock box cover with gas tap. Pipe diameter 50mm to 5.00m.
Bentonite Seal	1.00	38.75	
Pea Gravel Filter	4.50	35.25	
Bentonite Seal	5.00	34.75	Base of Hole

Remarks
(See notes & keysheets)

Not to Scale

FUGRO	**Project** GREEN PARK, PLOT 3.2, READING, BERKS PRUDENTIAL PROPERTY MANAGERS PETER BRETT ASSOCIATES	**Contract No.** WAL080045 **Figure No.** FR5 (2 of 2)

309/03

Drilling Method Cable Percussion	Borehole Diameter 150mm to 15.00m	Casing Diameter 150mm to 10.00m	**BOREHOLE No. BH201**
Equipment Dando 2000			Coordinates 469937.27 E (National Grid) 169870.95 N
Drill Crew CP	Logged by AA	Compiled by cp	Ground Level 39.90 m OD
Dates Drilled Start 19/06/2008 End 23/06/2008	19/06/2008	24/06/2008	Checked by 26.8.8

Date & Time	Casing Depth (m)	Depth to Water (m)	Sample Details: Depth (m) From	To	Type	No.	SPT Blows/N Drive mm Test	U100 Blows/ Recovery mm Result	Description of Strata	Depth (Thickness) (m)	Level	Legend
19/06			0.25		CDKV	1			MADE GROUND: Brown gravelly sand. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of flint and fragments of brick and concrete.	(0.55)		
			0.50	1.00	B	2				0.55	39.35	
									MADE GROUND: Yellowish brown slightly gravelly sand. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of flint (possibly engineered fill).	(0.80)		
			1.00		CDKV	3				1.35	38.55	
			1.50		CDKV	4				(0.35)		
	1.50	DRY	1.50		D	5	S47		Stiff black organic sandy slightly gravelly CLAY. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of flint. [Alluvium]	1.70	38.20	
			1.50	2.00	B	6						
	2.50	2.20	2.50		D	7	S37		Dense grey white and brown SAND and GRAVEL. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of flint. Locally grades into very gravelly sand. [River Terrace Deposits]			
			2.50	3.00	B	8						
	3.50	1.60	3.50		D	9	S32			(3.30)		
			3.50	4.00	B	10						
	4.50	1.70	4.50		D	11	S34					
			4.50	5.00	B	12						
									Dense greyish brown fine and medium SAND. [River Terrace Deposits]	5.00	34.90	
	5.50	1.60	5.50		D	13	S32			(1.00)		
			5.50	6.00	B	14						
			6.00	6.50	B	15				6.00	33.90	
									Firm to stiff thinly laminated grey and brown silty CLAY with grey coarse silt partings and occasional thick laminae of sand. [Lambeth Group]	(0.45)		
										6.45	33.45	
	7.00	1.70	7.00		D	16	S50		Very dense brown fine SAND. [Lambeth Group]			
			7.00	7.50	B	17				(1.35)		
19/06	7.00	2.10										
20/06	7.00	2.10										
										7.80	32.10	
			8.00		D	18			Stiff, locally very stiff with depth green grey mottled red brown CLAY. [Lambeth Group]			
	7.00	2.10	8.50		U	19		100/ 350				
			9.00		D	20			Below 9.00m; becoming fissured red brown and grey mottled. Fissures are rare.			
	7.00	2.10	10.00		D	21	S33					

Remarks (See notes & keysheets)
1 Prior to excavation a Cable Avoidance Tool (CAT) survey was carried out.
2 See installation details on final sheet.
3 Groundwater was encountered at 2.50m during boring and rose to 2.20m after 20 mins.

Scale 1:50

FUGRO

Project: GREEN PARK, PLOT 3.2, READING, BERKS
PRUDENTIAL PROPERTY MANAGERS
PETER BRETT ASSOCIATES

Contract No. WAL080045

Figure No. FR6 (1 of 3)

Drilling Method Cable Percussion **Equipment** Dando 2000 **Drill Crew** CP **Dates Drilled** Start 19/06/2008 End 23/06/2008	**Borehole Diameter** 150mm to 15.00m **Casing Diameter** 150mm to 10.00m **Logged by** AA 19/06/2008 **Compiled by** cp 24/06/2008 **Checked by**	**BOREHOLE No.** BH201 **Coordinates** (National Grid) 469937.27 E, 169870.95 N **Ground Level** 39.90 m OD	

Date & Time	Casing Depth (m)	Depth to Water (m)	Sample Details: Depth (m) From	To	Type	No.	SPT Blows/N Drive mm Test	U100 Blows/ Recovery mm Result	Description of Strata	Depth (Thickness) (m)	Level	Legend
			10.00	10.50	B	22						
	7.00	2.10	11.50		U	23		100/ 350	Below 11.50m; becoming green grey mottled red brown sandy clay.	(7.20)		
			12.00		D	24						
	7.00	2.10	13.00		D	25	S39					
			13.00	13.50	B	26						
20/06	10.00	11.75										
23/06	10.00	2.70										
	10.00		14.50	14.90	U	27		100/ 400				
23/06	10.00	2.70										
			15.00		D	28				15.00	24.90	
									End of Borehole			

Remarks
(See notes & keysheets)

Scale 1:50

FUGRO	**Project** GREEN PARK, PLOT 3.2, READING, BERKS PRUDENTIAL PROPERTY MANAGERS PETER BRETT ASSOCIATES	**Contract No.** WAL080045 **Figure No.** FR6 (2 of 3) 301/04

Drilling Method Cable Percussion **Equipment** Dando 2000 **Drill Crew** CP **Dates Drilled** Start 19/06/2008 End 23/06/2008	**Borehole Diameter** 150mm to 15.00m **Casing Diameter** 150mm to 10.00m **Logged by** AA 19/06/2008 **Compiled by** cp 24/06/2008 **Checked by**	**BOREHOLE No.** BH201 **Coordinates** 469937.27 E **(National Grid)** 169870.95 N **Ground Level** 39.90 m OD

Description	Depth (m)	Level m OD	
Concrete	0.50	39.40	Upstanding lockable cover with gas tap. Pipe diameter 50mm to 15.00m.
Bentonite Seal	1.50	38.40	
Cement/Bentonite Grout	10.00	29.90	
Bentonite Seal	11.50	28.40	
Pea Gravel Filter	15.00	24.90	Base of Hole

Remarks
(See notes & keysheets)

Not to Scale

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Contract No. WAL080045

Figure No. FR6 (3 of 3)

309/03

Drilling Method Cable Percussion **Equipment** Dando 2000 **Drill Crew** CP **Dates Drilled** Start 23/06/2008 End 24/06/2008	**Borehole Diameter** 150mm to 15.00m **Casing Diameter** 150mm to 14.00m **Logged by** AA 24/06/2008 **Compiled by** ds 26/06/2008 **Checked by** 26.08.08	**BOREHOLE No.** BH202 **Coordinates** 470022.33 E **(National Grid)** 169775.90 N **Ground Level** 39.90 m OD	

Date & Time	Casing Depth (m)	Depth to Water (m)	Sample Details: Depth (m) From	To	Type	No.	SPT Blows/N Drive mm Test	U100 Blows/ Recovery mm Result	Description of Strata	Depth (Thickness) (m)	Level	Legend
23/06			0.25		CDKV	1			MADE GROUND: Brown slightly clayey gravelly sand with a low cobble content. sand is fine to coarse. Gravel is subangular to rounded fine to coarse of flint, fragments of brick and concrete. Cobbles of concrete.	(0.80)		
			0.50		B	2				0.80	39.10	
			1.00		CDKV	3			MADE GROUND: Brown mottled grey and red sandy gravelly clay with occasional sand lenses. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of flint and fragments of brick and concrete (possibly engineered fill).	(0.65)		
			1.50		CDKV	4				1.45	38.45	
	1.50	dry	1.50		D	5	S10			(0.15)		
	1.50		1.50-2.00		B	6				1.60	38.30	
									MADE GROUND: Dark grey slightly organic slightly sandy slightly gravelly clay. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of flint and fragments of brick and glass (possibly engineered fill).	(0.80)		
	2.50	damp	2.50		D	7	S19			2.40	37.50	
	2.50		2.50-3.00		B	8			Stiff green grey slightly organic slightly gravelly CLAY. Gravel is subrounded to rounded medium of flint and occasional shell fragments. [Alluvium]	(1.80)		
	3.50	2.50	3.50		D	9	S23		Medium dense grey white and brown SAND and GRAVEL. Sand is fine to coarse. Gravel is subangular to rounded fine to coarse of flint. [River Terrace Deposits]			
			3.50-4.00		B	10				4.20	35.70	
	4.50	4.00	4.50		U	11		100/ 450	Firm to stiff becoming stiff, locally very stiff with depth, bluish grey silty CLAY. [Lambeth Group]			
			5.00		D	12						
	4.50	4.70	5.50		D	13	S33		Between 5.50m and 5.70m; becoming greenish grey with occasional brown and red mottling sandy clay			
			5.50-6.00		B	14						
23/06	4.50	5.00										
24/06	4.50	4.60										
	7.00	dry	7.00		U	15		100/ 450				
			7.50		D	16			Between 7.50m and 8.50m; becoming fissured red brown, brown and grey mottling slightly sandy clay. Fissures are extremely closely spaced and slightly polished.			
	7.00	dry	8.50		D	17	S28		Between 8.50m and 10.50m; becoming grey mottled red brown clay.			
	7.00		8.50		B	18				(10.10)		
	10.00	dry	10.00		U	19		100/				

Remarks (See notes & keysheets)
1 Prior to boring a Cable Avoidance Tool (CAT) survey was carried out. An inspection pit was hand-dug to 1.20m depth and rescanned using the CAT to check for services. Services were not located.
2 On completion of boring a 50mm diameter standpipe was installed to 15.00m. For details see separate sheet.
3 See installation details on final sheet.
4 Groundwater was encountered at 2.70m during boring and rose to 2.55m after 20 mins.

Scale 1:50

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Project GREEN PARK, PLOT 3.2, READING, BERKS
PRUDENTIAL PROPERTY MANAGERS
PETER BRETT ASSOCIATES

Contract No. WAL080045

Figure No. FR7 (1 of 3)

301/04

Drilling Method: Cable Percussion	Borehole Diameter: 150mm to 15.00m	Casing Diameter: 150mm to 14.00m	**BOREHOLE No. BH202**
Equipment: Dando 2000			Coordinates: 470022.33 E
Drill Crew: CP	Logged by: AA	Compiled by: ds	(National Grid): 169775.90 N
Dates Drilled: Start 23/06/2008	24/06/2008	26/06/2008	Ground Level: 39.90 m OD
End 24/06/2008		Checked by:	

Date & Time	Casing Depth (m)	Depth to Water (m)	Sample Details: Depth (m) From	To	Type	No.	SPT Blows/N Drive mm: Test	U100 Blows/ Recovery mm: Result	Description of Strata	Depth (Thick-ness) (m)	Level	Legend
								450				
			10.50		D	20			Below 10.50m; becoming red brown mottled grey sandy clay with occasional sand partings.			
	10.00	dry	11.50		D	21						
	10.00		11.50-11.95				S32					
			11.50-12.00		B	22						
									Below 12.80m; becoming greenish grey			
	13.00	dry	13.00		U	23		100/ 300				
			13.50		D	24						
	14.00	8.80	14.50		D	25	S29		Medium dense brown and grey silty SAND with pockets of greenish grey mottled brown sandy clay. Sand is fine. [Lambeth Group]	14.30 (0.70)	25.60	
24/06	14.00	8.30	14.50-15.00		B	26						
									End of Borehole	15.00	24.90	

Remarks
(See notes & keysheets)

Scale 1:50

FUGRO	Project: GREEN PARK, PLOT 3.2, READING, BERKS PRUDENTIAL PROPERTY MANAGERS PETER BRETT ASSOCIATES	Contract No. WAL080045 Figure No. FR7 (2 of 3)

Drilling Method Cable Percussion **Equipment** Dando 2000 **Drill Crew** CP **Dates Drilled** Start 23/06/2008 End 24/06/2008	**Borehole Diameter** 150mm to 15.00m **Casing Diameter** 150mm to 14.00m **Logged by** AA 24/06/2008 **Compiled by** ds 26/06/2008 **Checked by**	**BOREHOLE No.** BH202 **Coordinates** 470022.33 E **(National Grid)** 169775.90 N **Ground Level** 39.90 m OD

Description	Depth (m)	Level m OD	
Concrete	0.50	39.40	. Pipe diameter 50mm to 15.00m.
Bentonite Seal	1.00	38.90	
Cement/Bentonite Grout	10.50	29.40	
Bentonite Seal	12.00	27.90	
Pea Gravel Filter	15.00	24.90	Base of Hole

Remarks
(See notes & keysheets)

Not to Scale

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Figure No. FR7 (3 of 3)

309/03

APPENDIX B Geotechnical Laboratory Test Results

Geotechnical Testing Schedules of UKAS Accreditation	
General Notes on Laboratory Test Results	LKS/01
Fugro Test Certificate 87613	
Summary of Atterberg Limits Test Results	1 Page
Summary of Moisture Contents	1 Page
Particle Size Distribution Curves	7 Pages
Summary of One-Dimensional Consolidation Test Sample Descriptions	1 Page
Consolidation Test Results	3 Pages
Undrained Triaxial Compression Test Results	7 Pages

STL Test Report COV/534575/2008

Schedule of Accreditation

issued by

United Kingdom Accreditation Service

21 - 47 High Street, Feltham, Middlesex, TW13 4UN, UK

UKAS TESTING

0919

Accredited to ISO/IEC 17025:2005

Fugro Limited

Issue No: 016 **Issue date:** 05 July 2007

Fugro House
Hithercroft Road
Wallingford
Oxon
OX10 9RB

Contact: Mr M Scarratt
Tel: +44 (0)870 402 1355
Fax: +44 (0)870 402 1399
E-Mail: mscarratt@fugro.co.uk
Website: www.fugro.co.uk

Testing performed at the above address only

DETAIL OF ACCREDITATION

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used
SOILS for civil engineering purposes	Shear strength - small shearbox	BS 1377:Part 7:1990
	Residual strength - small ring shear apparatus	BS 1377:Part 7:1990
	Undrained shear strength - triaxial compression without measurement of pore pressure	BS 1377:Part 7:1990
	Undrained shear strength - triaxial compression with multistage loading and without measurement of pore pressure	BS 1377:Part 7:1990
	Effective shear strength - consolidated-undrained triaxial compression test with measurement of pore pressure	BS 1377:Part 8:1990
	Effective shear strength - consolidated-drained triaxial compression test with measurement of volume change	BS 1377:Part 8:1990
	One-dimensional consolidation properties of soils using controlled-strain loading	ASTM D4186-89

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used
SOILS for civil engineering purposes (cont'd)	Effective shear strength - (isotropically) consolidated undrained triaxial extension test with measurement of pore pressure	Documented In-House Method No L-T-023 based on BS 1377:Part 8:1990
	Effective shear strength - (isotropically) consolidated undrained multistage triaxial compression test with measurement of pore pressure	Documented In-House Method No L-T-023 based on BS 1377:Part 8:1990
	Effective shear strength - (isotropically) consolidated drained multistage triaxial compression test with measurement of volume change	Documented In-House Method No L-T-023 based on BS 1377:Part 8:1990
	Effective shear strength - (anisotropically) consolidated undrained triaxial extension test with measurement of pore pressure	Documented In-House Method No L-T-023 based on BS 1377:Part 8:1990
	Effective shear strength - (anisotropically) consolidated undrained triaxial compression test with measurement of pore pressure	Documented In-House Method No L-T-023 based on BS 1377:Part 8:1990
	Effective shear strength - (anisotropically) consolidated drained triaxial compression test with measurement - of volume change	Documented In-House Method No L-T-023 based on BS 1377:Part 8:1990
	Moisture content - oven drying method	BS 1377:Part 2:1990
	Liquid limit - cone penetrometer	BS 1377:Part 2:1990
	Liquid limit - cone penetrometer - one point	BS 1377:Part 2:1990
	Liquid limit - Casagrande apparatus	BS 1377:Part 2:1990

Materials/Products tested	Type of test/Properties measured/Range of measurement	Standard specifications/ Equipment/Techniques used
SOILS for civil engineering purposes (cont'd)	Liquid limit - Casagrande apparatus - one point	BS 1377:Part 2:1990
	Plastic limit	BS 1377:Part 2:1990
	Plasticity index and liquidity index	BS 1377:Part 2:1990
	Density - linear measurement	BS 1377:Part 2:1990
	Particle density - small pyknometer	BS 1377:Part 2:1990
	Particle size distribution - wet sieving	BS 1377:Part 2:1990
	Particle size distribution - dry sieving	BS 1377:Part 2:1990
	Particle size distribution - pipette method	BS 1377:Part 2:1990
	Dry density/moisture content relationship (vibrating hammer)	Documented In-House Methods L-T-027 and L-T-028 based on BS 1377:Part 4:1990
	One-dimensional consolidation properties	BS 1377:Part 5:1990
	Permeability in a triaxial cell	BS 1377:Part 6:1990
	Accelerated permeability test	Environment Agency R & D Technical Report P1-398/TR/2
END		

GENERAL NOTES ON LABORATORY TEST RESULTS

1. TEST METHODS

The tests reported on the following sheets have been carried out in accordance with the methods given in BS 1377:1990 'Methods of test for soils for civil engineering purposes', subject to a small number of variances as described below under the respective headings. These notes also serve as keysheets to any notation used in reporting the laboratory tests.

2. KEY TO NOTATION OF SAMPLE TYPE

D	Small disturbed sample
B	Bulk disturbed sample
U	General purpose open drive tube sample
P	Piston sample
TW	Thin wall sample
C	Rotary core sample

3. CLASSIFICATION TESTS

% passing 425µm:	this figure is only correctly reported when 'WS' is shown in the 'Method of preparation' column. For 'HP' and 'AR', the reported figure is an estimate only.
WS	sample prepared by Wet Sieving
HP	sample prepared by Hand Picking (removal) of gravel sized fragments
AR	sample tested "As Received"
NP:	non-plastic

4. COMPACTION RELATED TESTS

Sample preparation: **Individual** indicates test carried out on individual sub-samples

Single indicates test carried out on a single sample

Assumed values of particle density are reported in brackets e.g. (2.67)

5. SAMPLE DESCRIPTIONS

The sample descriptions shown on the test report sheets are the technician's visual descriptions of the test samples, in accordance with Clause 9.1 of Part 1 of BS 1377:1990 and do not necessarily comply with the requirements of BS 5930:1999 or BS EN ISO 14688-1:2002. For a more comprehensive description of the soil samples to these standards, reference should be made to the exploratory hole records, or an engineering description can be provided on request.

6. INTERPRETATION OF TEST RESULTS

Laboratory test results in this report give the soil properties of individual specimens tested under specified conditions. Individual results or groups of results may not be appropriate for use as design parameters for some geotechnical analyses. The samples may be non-representative, disturbed internally, or prepared and tested under conditions suited for different geotechnical applications. Unless the selection of design parameters is discussed in this report, it is recommended that the advice of an appropriately qualified and experienced specialist is sought.

7. U100 DRIVEN OPEN TUBE SAMPLES

It should be noted that the sampling method generally gives Class 2 samples, ie for use for laboratory classification, moisture content and density testing. BS5930 states that the U100 sampling procedure may sometimes give Class 1 samples (strength, deformation and consolidation testing as well as Class 2 type testing) in non sensitive fine cohesive soils of stiff or lower consistency, but more often provides Class 2 samples. In brittle or closely fissured materials such as hard clays, the sampling method gives Class 3 samples, ie for use for laboratory classification and moisture content testing.

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Drawn by: Z.S Date: 31/07/2008

Template Issue: 4

Filename: 87613 / Labdata / Class / ALL_PI.XLS

Checked by: TPO. Date: 31/07/2008.

Approved by: TPO. Date: 31/07/2008.

Symbol Number	Borehole	Sample	Depth (m)	BS Test Method *	Preparation Method †	Passing 425µm (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)
1	BH101	5	1.50	4.3/5.3/5.4	4.2.4	77	35	16	19
2	BH102	11	4.50	4.3/5.3/5.4	4.2.4	76	35	16	19
3	BH103	5	1.50	4.3/5.3/5.4	4.2.4	54	38	14	24
4	BH104	12	4.50	4.3/5.3/5.4	4.2.4	90	42	17	25
5	BH105	5	1.50	4.3/5.3/5.4	4.2.4	44	32	17	15
6	BH105	11	5.00	4.3/5.3/5.4	4.2.3	100	38	17	21
7	BH201	15	6.00	4.3/5.3/5.4	4.2.4	94	53	15	38
8	BH201	20	9.00	4.3/5.3/5.4	4.2.3	100	56	23	33
9	BH202	12	5.00	4.3/5.3/5.4	4.2.3	100	38	18	20
10	BH202	24	13.50	4.3/5.3/5.4	4.2.3	100	28	13	15

Note: I/S denotes Insufficient Sample

* Tested in accordance with the following clauses of BS 1377: Part 2: 1990:	
4.3	Cone penetrometer method
4.4	One point cone penetrometer method
4.5	Casagrande method
4.6	One point Casagrande method
5.3	Plastic limit method
5.4	Plasticity index

† Tested in accordance with the following clauses of BS 1377: Part 2: 1990:	
4.2.3	Natural soil
4.2.4	Sieved specimen

The symbol N/P in the Plastic Limit column indicates that the sample is Non-Plastic and no Atterberg Limits could be determined

SUMMARY OF ATTERBERG LIMITS TEST RESULTS

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Borehole / Sample	Depth (m)	Moisture Content (%)	Sample Description
BH101 / 4	1.50	12	Grey slightly sandy CLAY with a little fine and medium gravel
BH102 / 11	4.50	29	Greenish grey slightly sandy CLAY with a little fine and medium gravel
BH103 / 5	1.50	12	Brown slightly sandy CLAY with some fine and medium gravel
BH104 / 12	4.50	18	Greenish grey slightly sandy CLAY with a little fine and medium gravel
BH105 / 4	1.50	12	Brown CLAY with a little fine and medium gravel
BH105 / 11	5.00	18	Greyish brown CLAY
BH201 / 15	6.00	25	Grey slightly sandy CLAY with a little fine and medium gravel
BH201 / 20	9.00	22	Brown CLAY
BH202 / 12	5.00	18	Grey CLAY
BH202 / 24	13.50	12	Grey CLAY

Key to Gravel sizes: Fine: 2 - 6mm Medium: 6 - 20mm Coarse: 20 - 60mm

Moisture contents tested in accordance with BS 1377: Part 2: 1990: Clause 3

SUMMARY OF MOISTURE CONTENTS

Drawn by: Z.S Date: 21/07/2008

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Filename: 87613 / Labdata / Class / ALL_MC.XLS

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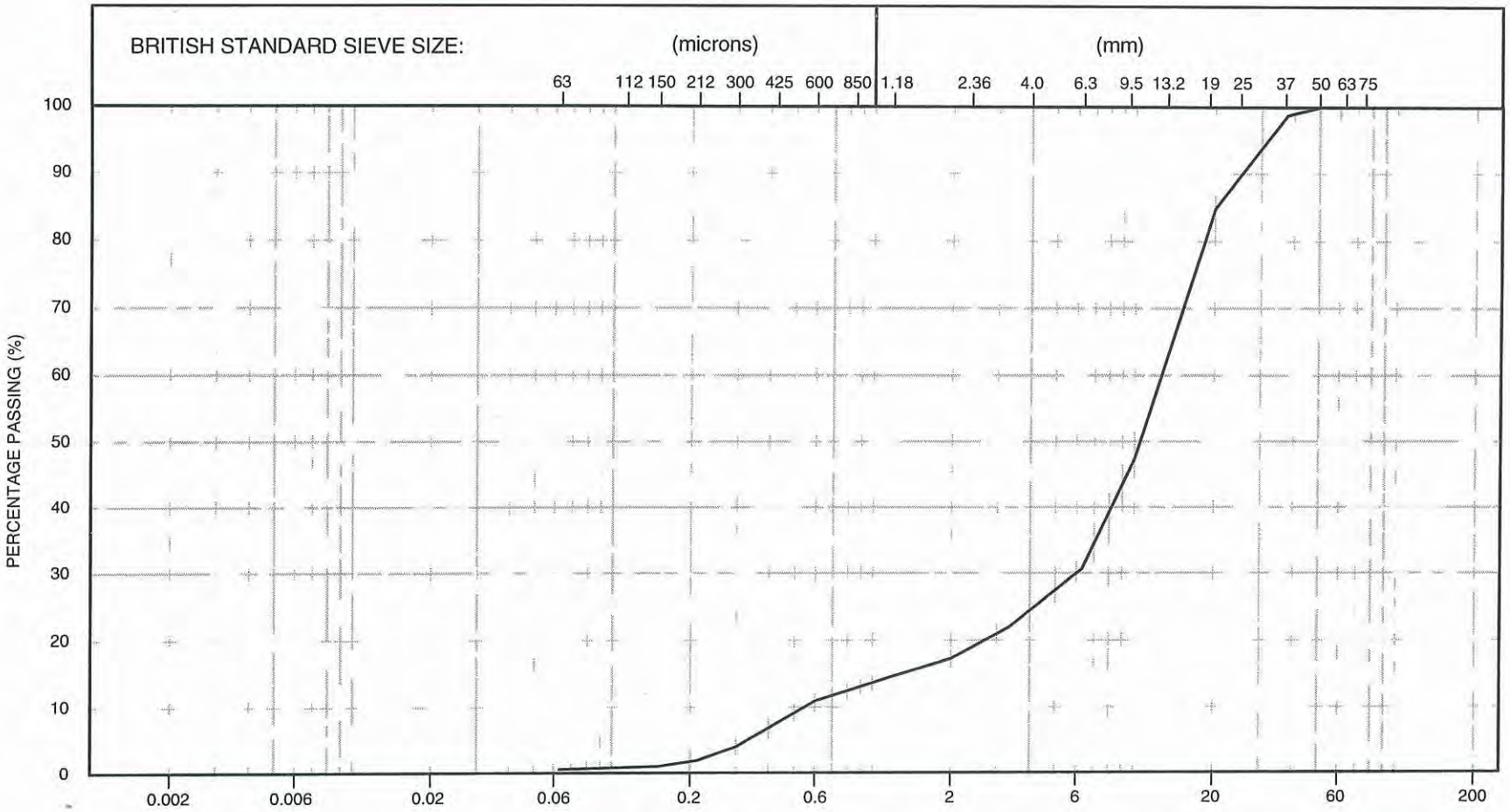
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Approved by: AP Dobbs. Date: 31/07/2008. Filename: 87613 \ CLASS \ BH101_9_ps.OPJ

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Certificate No: 87613

PARTICLE SIZE DISTRIBUTION TEST RESULTS



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

Curve	Borehole	Sample	Depth (m)	BS Test * Method	Pretreatment Method	Percentage soil types				
						Clay	Silt†	Sand	Gravel	Cobbles
⊢	BH101	9	3.50	9.2	N/A	-	-	18	82	-

† Note: Where a sedimentation test was not carried out, this figure represents total fines, i.e., particles of diameter less than 63 microns

* Tested in accordance with the following clauses of BS 1377: Part 2: 1990:

9.2	Wet sieve
9.3	Dry sieve
9.4	Sedimentation by pipette
9.5	Sedimentation by hydrometer

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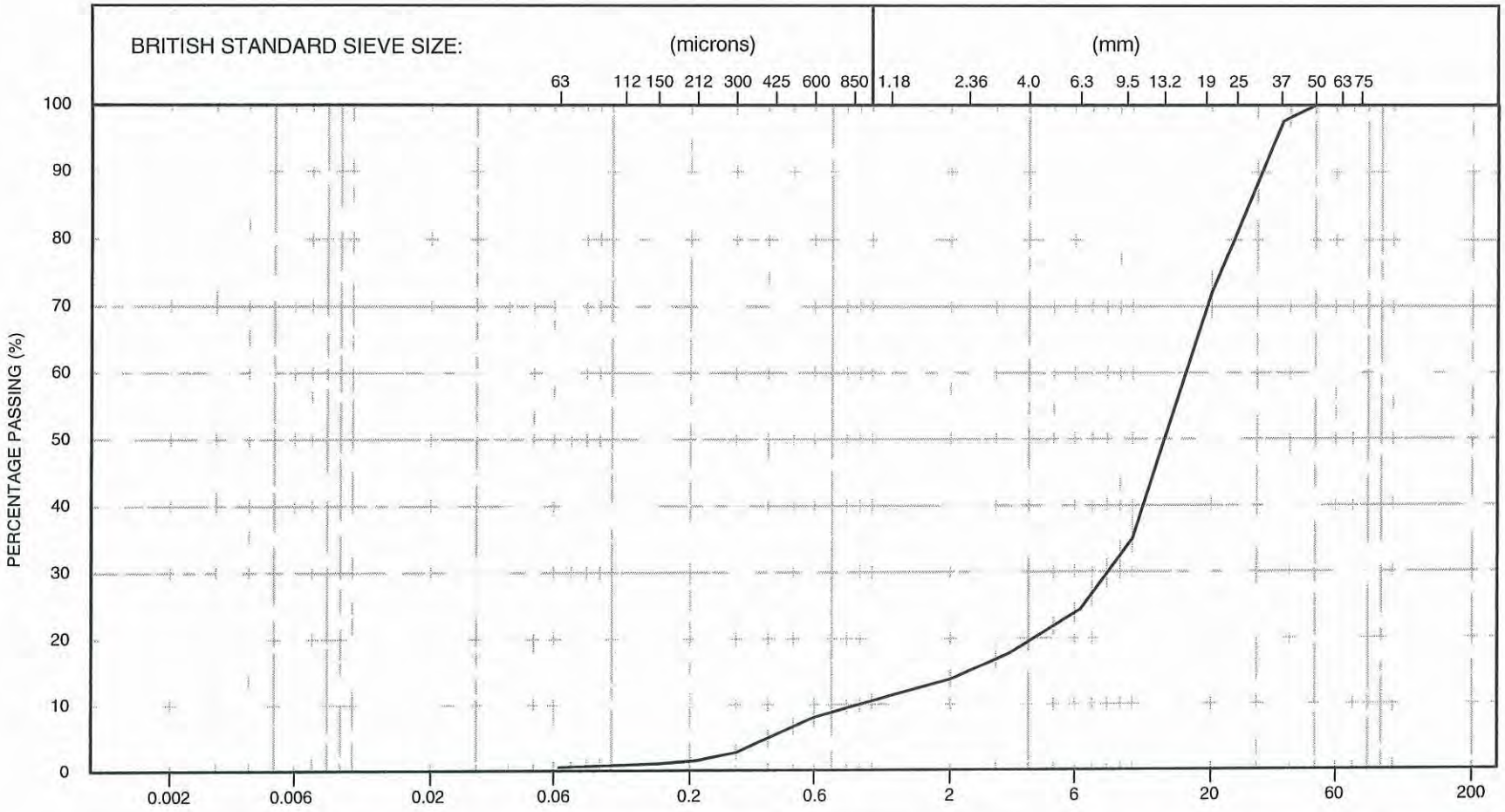
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PARTICLE SIZE DISTRIBUTION TEST RESULTS



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

Curve	Borehole	Sample	Depth (m)	BS Test * Method	Pretreatment Method	Percentage soil types				
						Clay	Silt†	Sand	Gravel	Cobbles
⊢⊣	BH102	7	2.50	9.2	N/A	-	-	14	86	-

† Note: Where a sedimentation test was not carried out, this figure represents total fines, i.e., particles of diameter less than 63 microns

* Tested in accordance with the following clauses of BS 1377: Part 2: 1990:

9.2	Wet sieve
9.3	Dry sieve
9.4	Sedimentation by pipette
9.5	Sedimentation by hydrometer

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Approved by: AP Doubtfire. Date: 31/07/2008.

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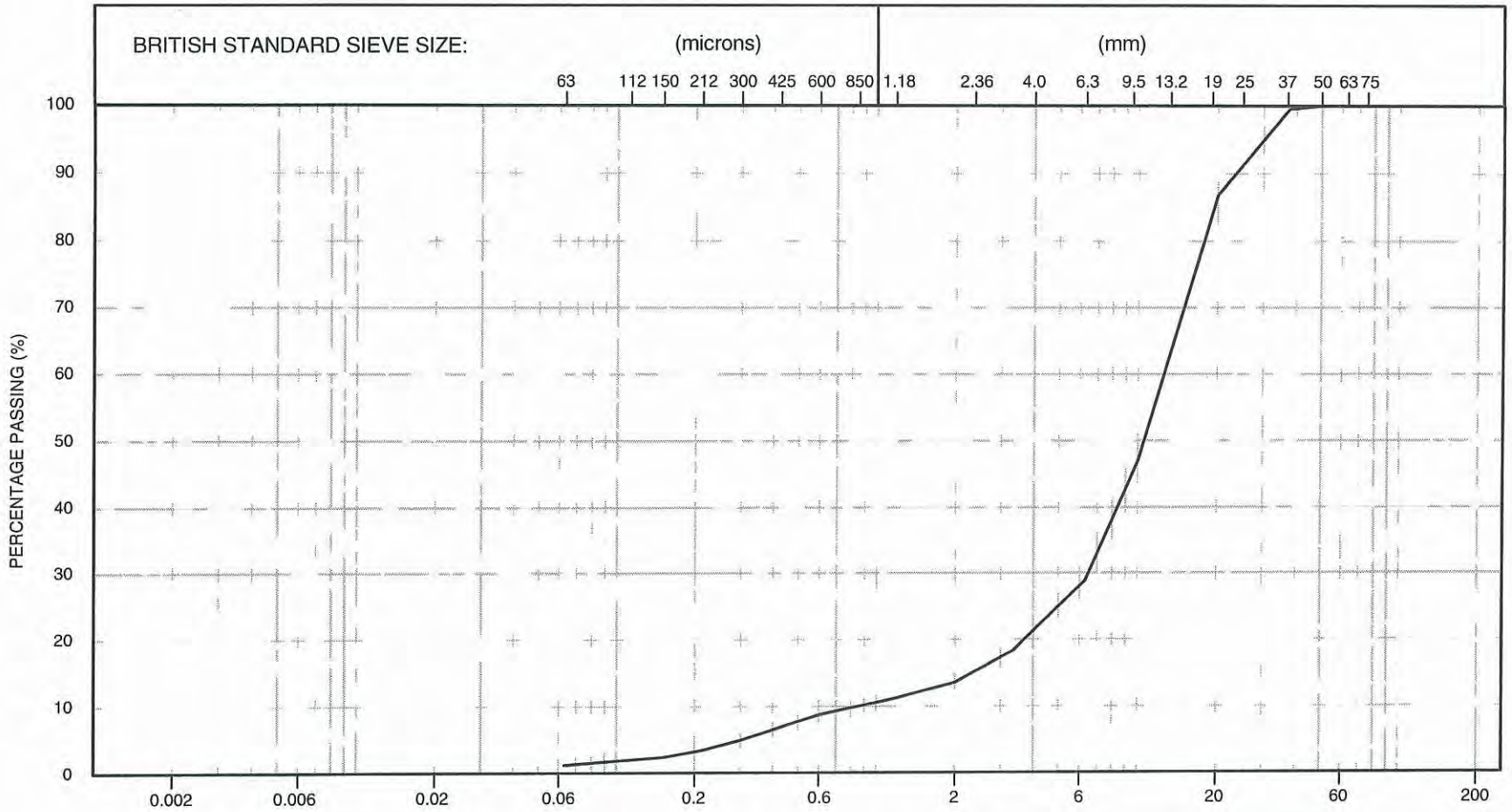
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PARTICLE SIZE DISTRIBUTION TEST RESULTS



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

Curve	Borehole	Sample	Depth (m)	BS Test * Method	Pretreatment Method	Percentage soil types				
						Clay	Silt†	Sand	Gravel	Cobbles
⊢⊣	BH104	8	2.50	9.2	N/A	-	1	13	86	-

† Note: Where a sedimentation test was not carried out, this figure represents total fines, i.e., particles of diameter less than 63 microns

* Tested in accordance with the following clauses of BS 1377: Part 2: 1990:

9.2	Wet sieve
9.3	Dry sieve
9.4	Sedimentation by pipette
9.5	Sedimentation by hydrometer

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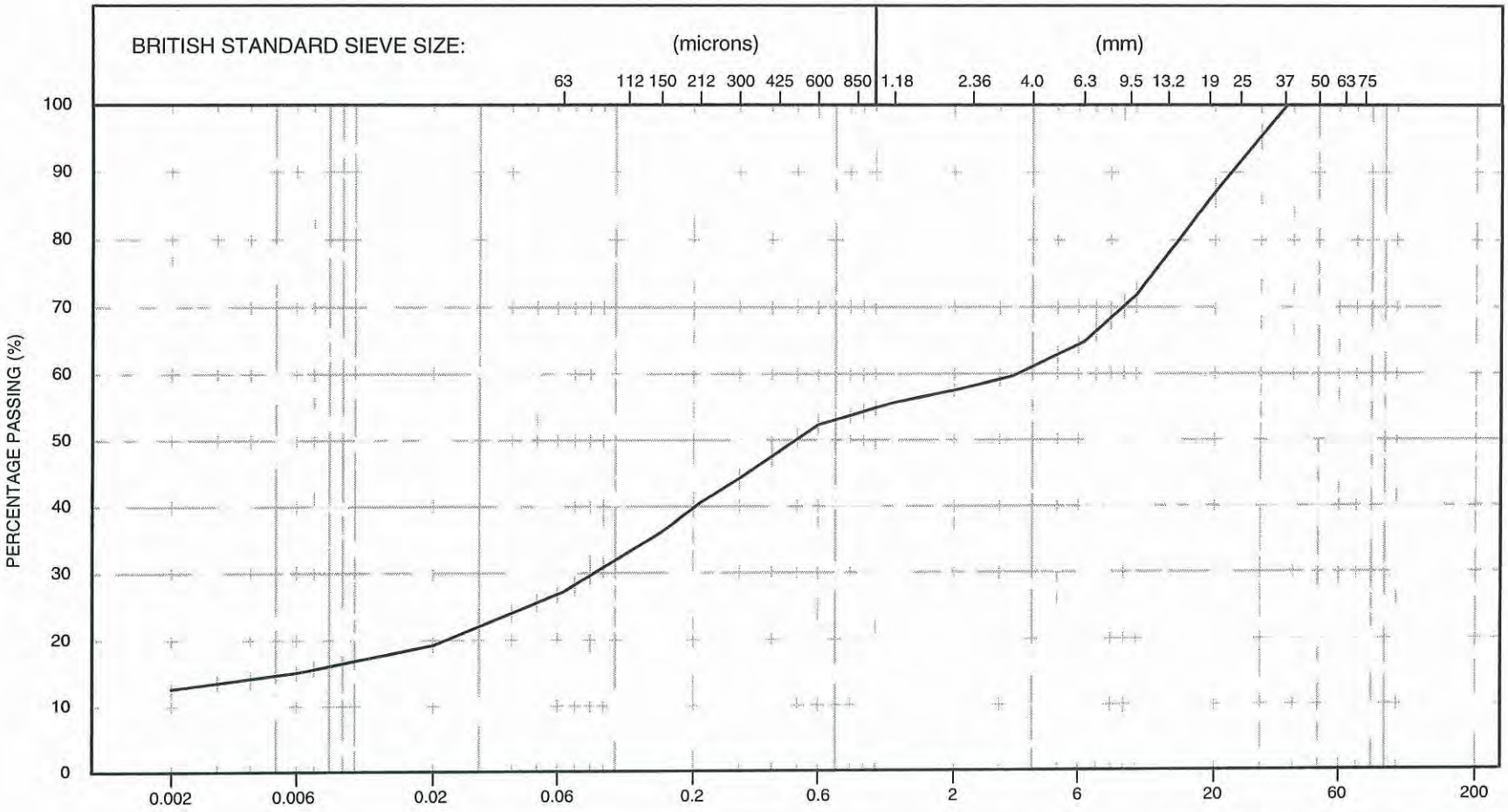
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PARTICLE SIZE DISTRIBUTION TEST RESULTS



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

Curve	Borehole	Sample	Depth (m)	BS Test * Method	Pretreatment Method	Percentage soil types				
						Clay	Silt†	Sand	Gravel	Cobbles
—	BH105	5	1.50	9.2/9.4	N/A	13	13	32	42	-

† Note: Where a sedimentation test was not carried out, this figure represents total fines, i.e., particles of diameter less than 63 microns

* Tested in accordance with the following clauses of BS 1377: Part 2: 1990:

9.2	Wet sieve
9.3	Dry sieve
9.4	Sedimentation by pipette
9.5	Sedimentation by hydrometer

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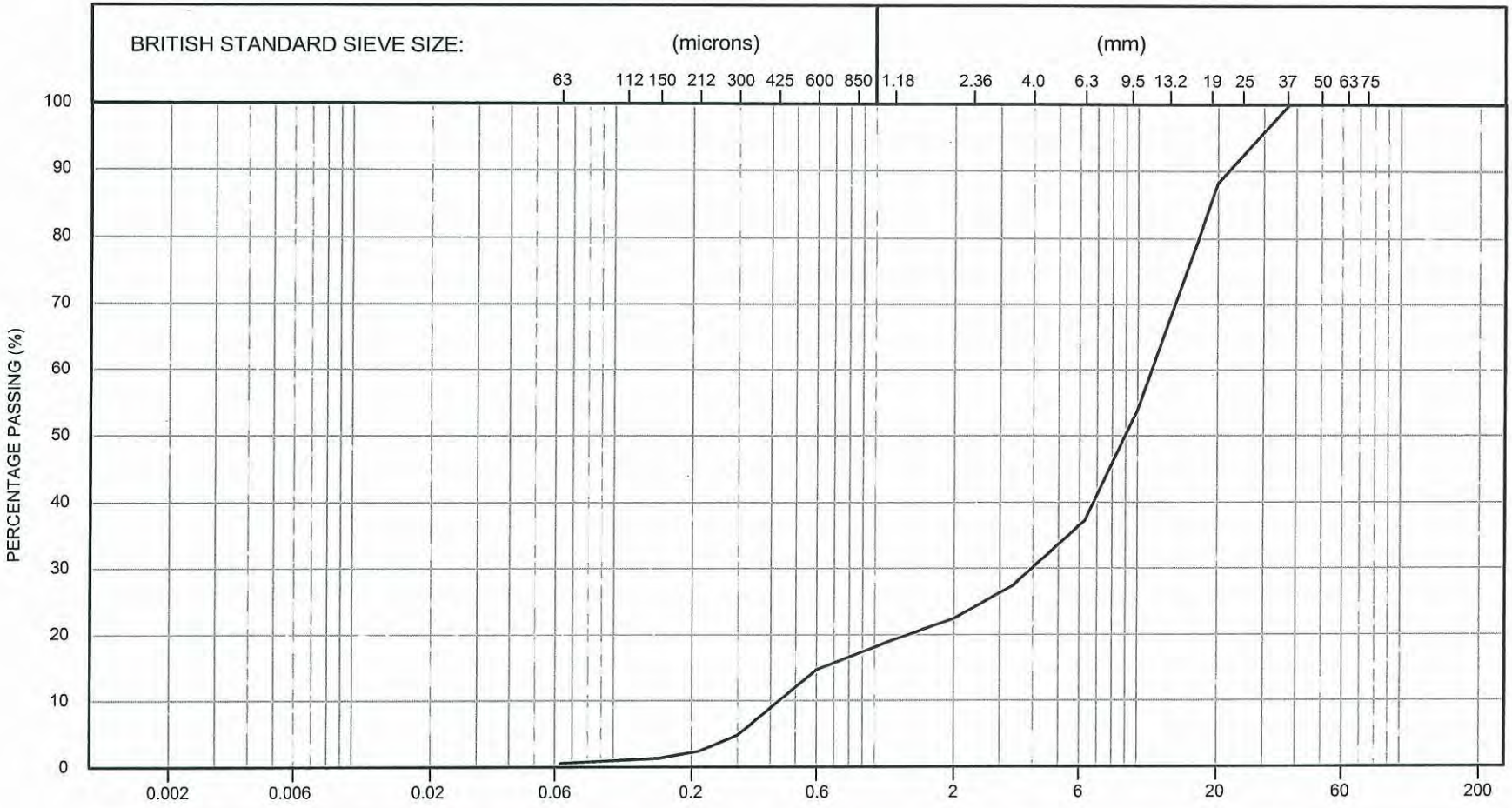
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PARTICLE SIZE DISTRIBUTION TEST RESULTS



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

Curve	Borehole	Sample	Depth (m)	BS Test * Method	Pretreatment Method	Percentage soil types				
						Clay	Silt†	Sand	Gravel	Cobbles
⊢	BH105	7	2.50	9.2	N/A	-	-	23	77	-

† Note: Where a sedimentation test was not carried out, this figure represents total fines, i.e., particles of diameter less than 63 microns

* Tested in accordance with the following clauses of BS 1377: Part 2: 1990:

9.2	Wet sieve
9.3	Dry sieve
9.4	Sedimentation by pipette
9.5	Sedimentation by hydrometer

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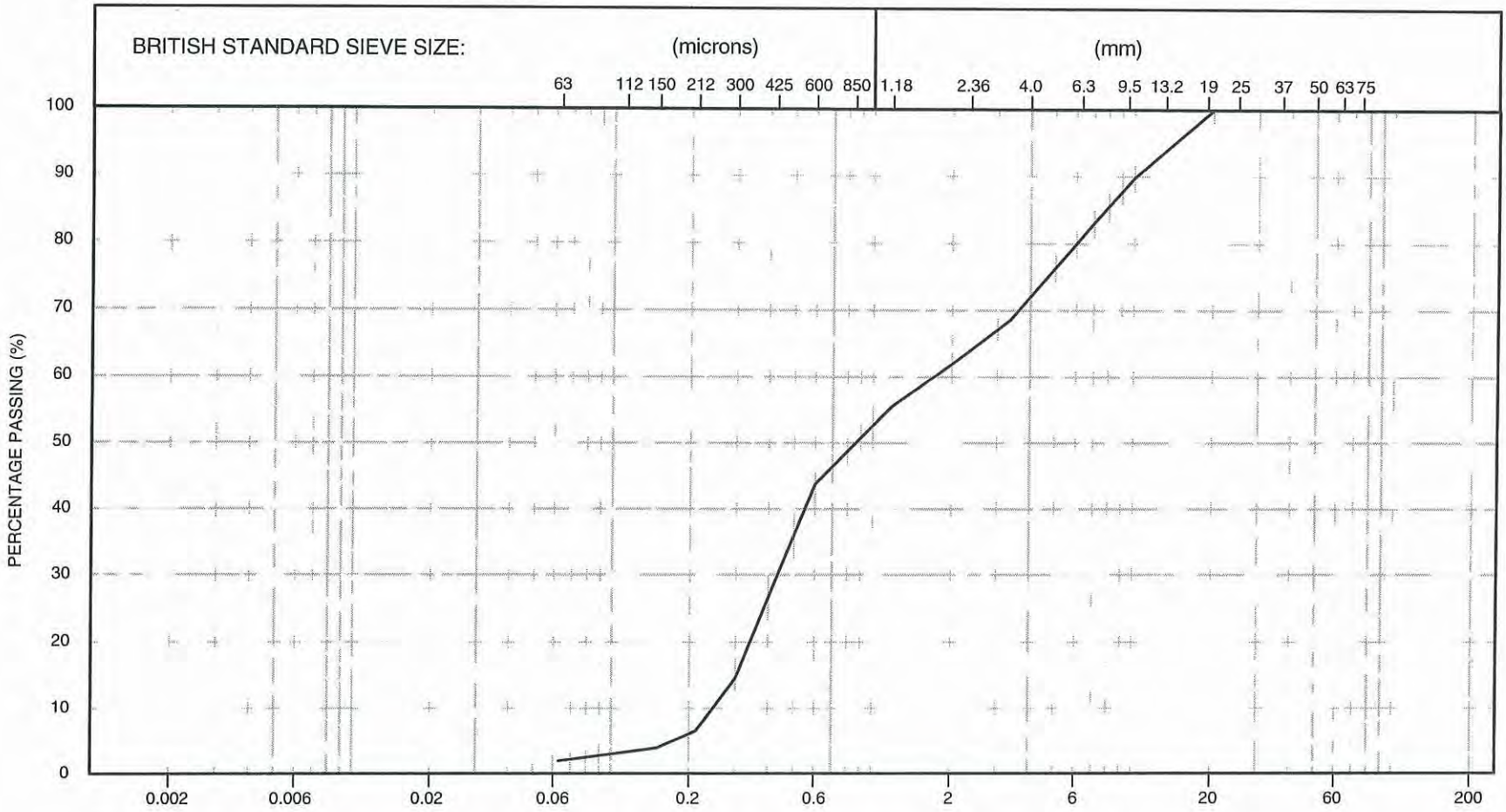
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Certificate No: 87613

PARTICLE SIZE DISTRIBUTION TEST RESULTS



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

Curve	Borehole	Sample	Depth (m)	BS Test * Method	Pretreatment Method	Percentage soil types				
						Clay	Silt†	Sand	Gravel	Cobbles
⊢⊣	BH201	7	2.50	9.2	N/A	-	1	61	38	-

† Note: Where a sedimentation test was not carried out, this figure represents total fines, i.e., particles of diameter less than 63 microns

* Tested in accordance with the following clauses of BS 1377: Part 2: 1990:

9.2	Wet sieve
9.3	Dry sieve
9.4	Sedimentation by pipette
9.5	Sedimentation by hydrometer

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F3005L 01/07

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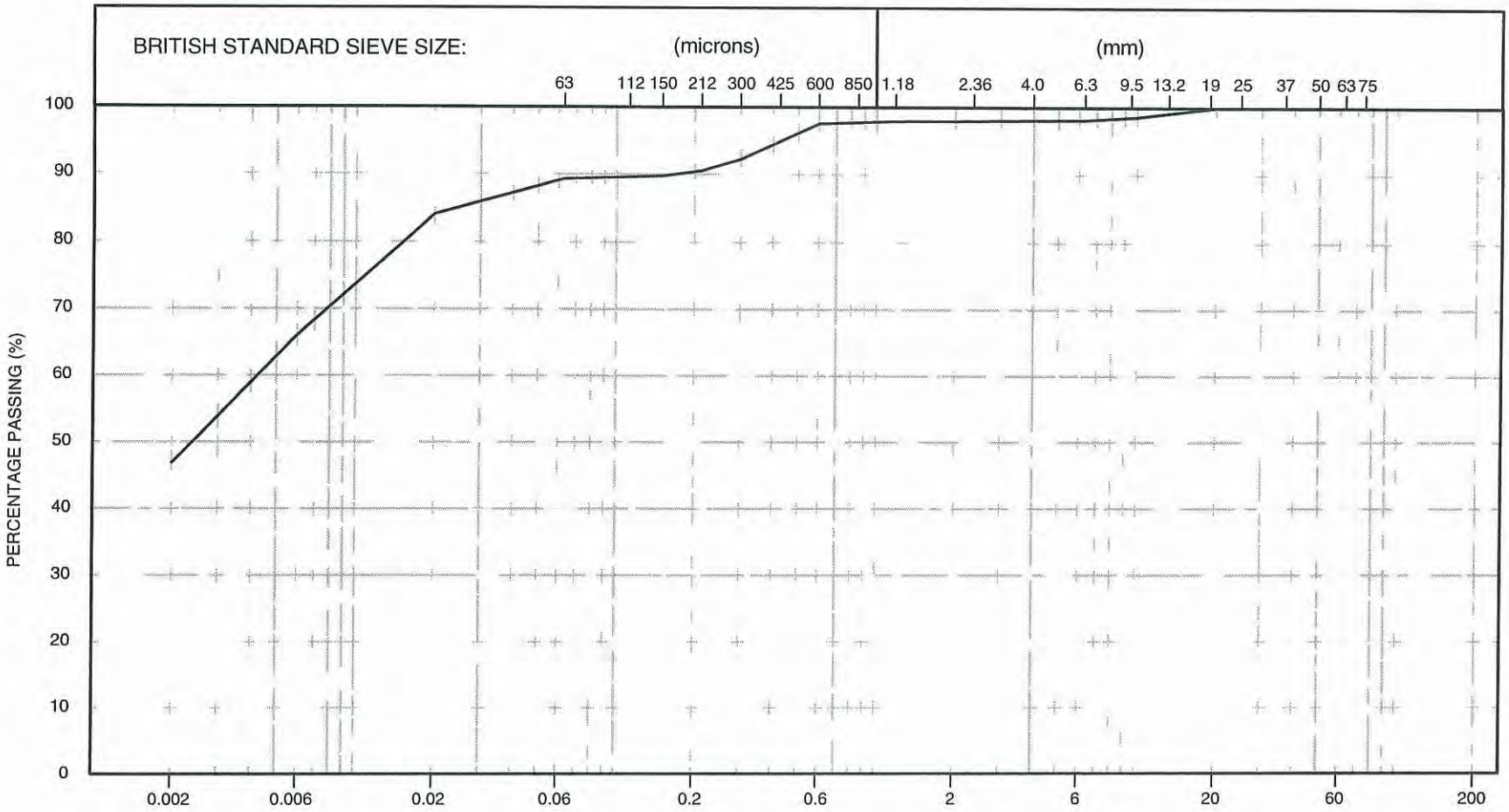
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Certificate No: 87613

PARTICLE SIZE DISTRIBUTION TEST RESULTS



CLAY	Fine	Medium	Coarse	Fine	Medium	Coarse	Fine	Medium	Coarse	COBBLES
	SILT			SAND			GRAVEL			

Curve	Borehole	Sample	Depth (m)	BS Test * Method	Pretreatment Method	Percentage soil types				
						Clay	Silt†	Sand	Gravel	Cobbles
⊢⊣	BH201	15	6.00	9.2/9.4	N/A	47	42	9	2	-

† Note: Where a sedimentation test was not carried out, this figure represents total fines, i.e., particles of diameter less than 63 microns

* Tested in accordance with the following clauses of BS 1377: Part 2: 1990:

9.2	Wet sieve
9.3	Dry sieve
9.4	Sedimentation by pipette
9.5	Sedimentation by hydrometer

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Date: 04/08/2008
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Template Issue: 5
Filename: 87613 / Labdata / Class / OED_SD.XLS
Checked by: TPD. Date: 04/08/2008.
Approved by: TPD. Date: 04/08/2008.

Borehole / Sample	Depth (m)	Sample Description
BH105 / 10	4.50	Firm dark greyish brown and mottled light grey CLAY
BH201 / 19	8.50	Firm olive grey CLAY
BH202 / 23	13.00	Firm greenish grey CLAY

Key to Gravel sizes: Fine: 2 - 6mm Medium: 6 - 20mm Coarse: 20 - 60mm

SUMMARY OF ONE - DIMENSIONAL CONSOLIDATION TEST (OEDOMETER) SAMPLE DESCRIPTIONS

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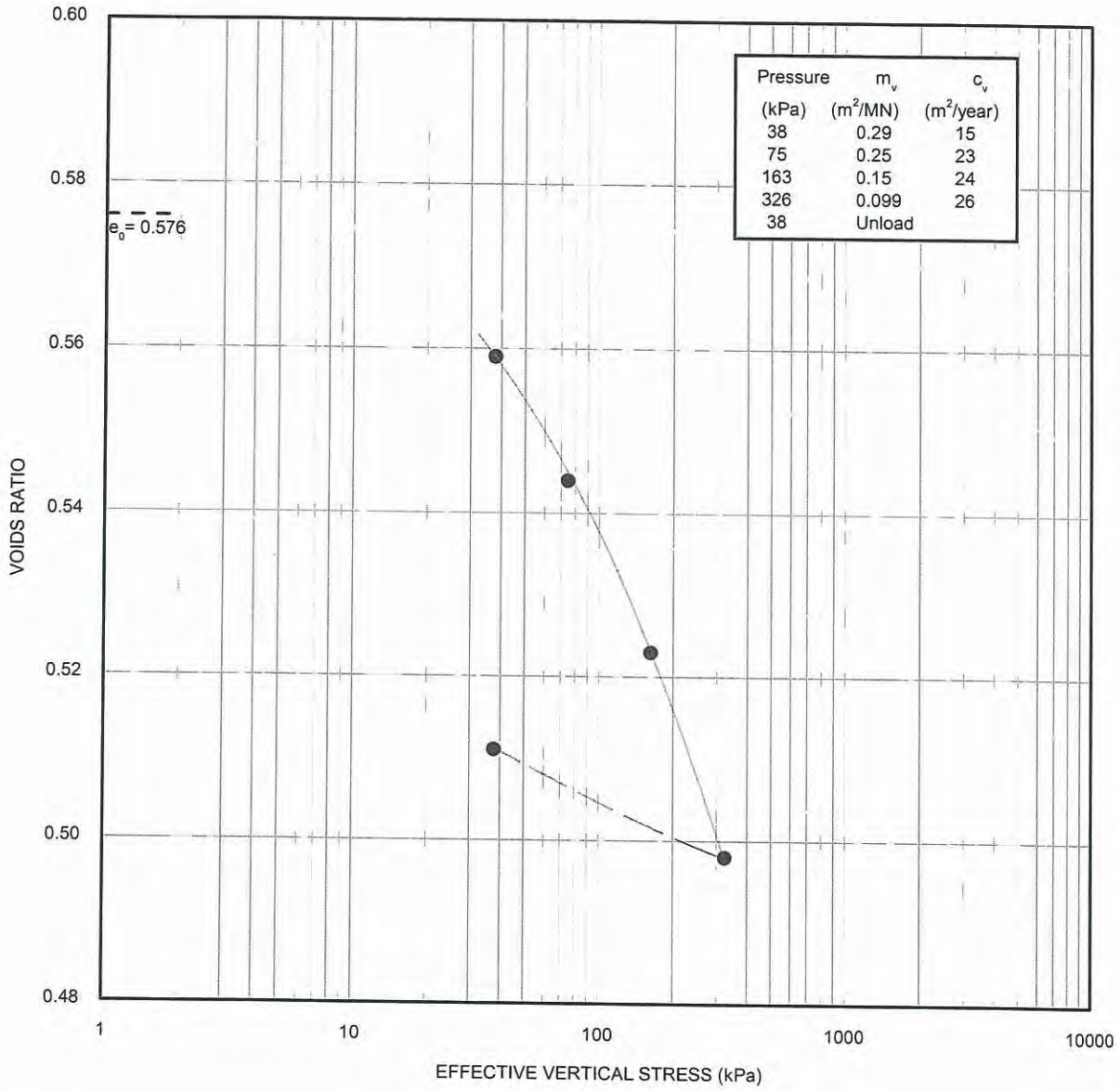
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Template Issue: 2

Filename: 87613 \ Labdata \ Compress \ BH105_10_od.OPJ

Checked by: TPD. Date: 04/08/2008.

Approved by: A Tabbed. Date: 04/08/2008.



Initial Conditions					
Specimen height	: 18.9 mm	Bulk density	: 2.02 Mg/m^3		
Specimen diameter	: 74.9 mm	Dry density	: 1.71 Mg/m^3		
Degree of saturation	: 83 %	Moisture content	: 18 %	Borehole	: BH105
Particle density	: 2.70 Mg/m^3 (Assumed)	Lab. temperature	: 20 °C	Sample	: 10
Specimen condition	: Undisturbed	Swelling pressure	: NA kPa	Depth (m)	: 4.50
Method of time fitting	: Root Time Method				

Tested in accordance with BS1377: Part 5: 1990: Clause 3

ONE - DIMENSIONAL CONSOLIDATION TEST (OEDOMETER)

UKAS TESTING 0919

Certificate No: 87613

FUGRO ENGINEERING SERVICES LTD
GREEN PARK, PLOT 3.2, READING, BERKS

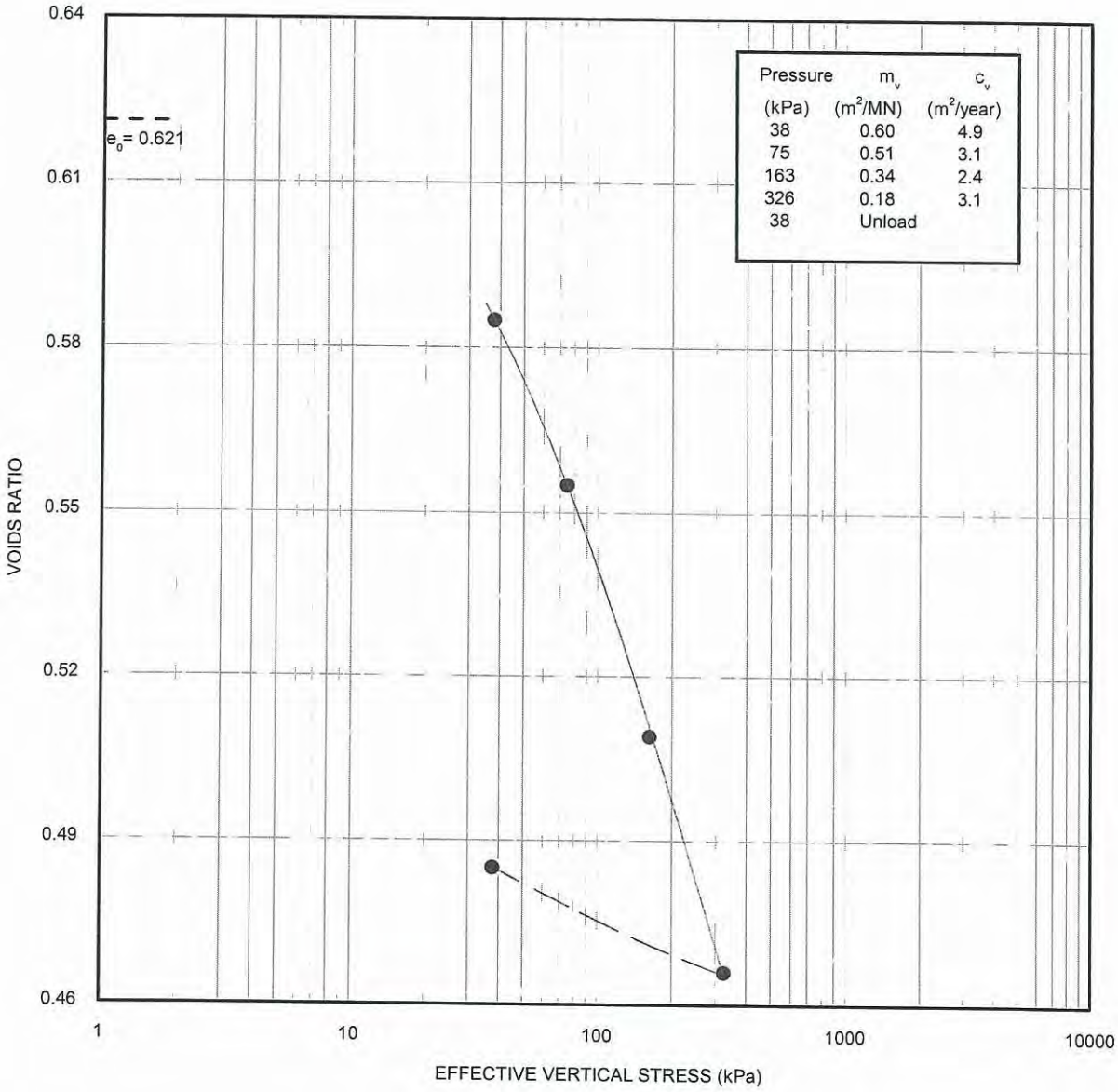
Drawn by: PH Date: 30/07/2008

Template Issue: 2

Filename: 87613 \ Labdata \ Compress \ BH201_19_od.OPJ

Checked by: TPD. Date: 04/08/2008.

Approved by: [illegible] Date: 04/08/2008.



Initial Conditions					
Specimen height	: 19.0 mm	Bulk density	: 2.02 Mg/m³		
Specimen diameter	: 74.8 mm	Dry density	: 1.67 Mg/m³		
Degree of saturation	: 93 %	Moisture content	: 21 %	Borehole	: BH201
Particle density	: 2.70 Mg/m³ (Assumed)	Lab. temperature	: 20 °C	Sample	: 19
Specimen condition	: Undisturbed	Swelling pressure	: NA kPa	Depth (m)	: 8.50
Method of time fitting	: Root Time Method				

Tested in accordance with BS1377: Part 5: 1990: Clause 3

ONE - DIMENSIONAL CONSOLIDATION TEST (OEDOMETER)

UKAS TESTING 0919

Certificate No: 87613

F3005L 01/07

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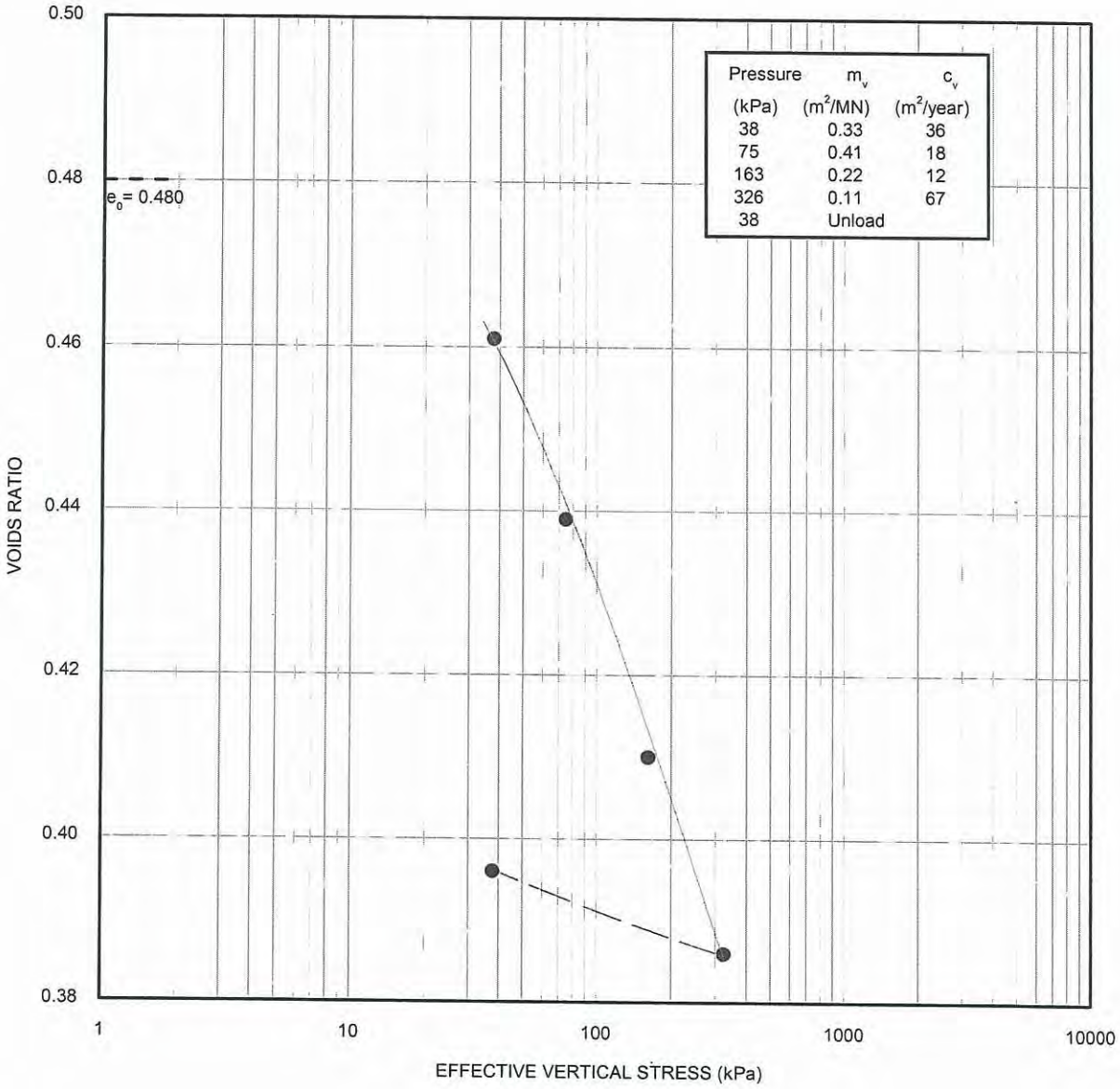
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Checked by: TPD. Date: 04/08/2008.

Approved by: Approved. Date: 01/08/2008.



Initial Conditions			
Specimen height : 19.0 mm	Bulk density : 2.08 Mg/m^3		
Specimen diameter : 74.8 mm	Dry density : 1.82 Mg/m^3		
Degree of saturation : 78 %	Moisture content : 14 %	Borehole : BH202	
Particle density : 2.70 Mg/m^3 (Assumed)	Lab. temperature : 20 °C	Sample : 23	
Specimen condition : Undisturbed	Swelling pressure : NA kPa	Depth (m) : 13.00	
Method of time fitting : Root Time Method			

Tested in accordance with BS1377: Part 5: 1990: Clause 3

ONE - DIMENSIONAL CONSOLIDATION TEST (OEDOMETER)

UKAS TESTING 0919

Certificate No: 87613

F3005L 01/07

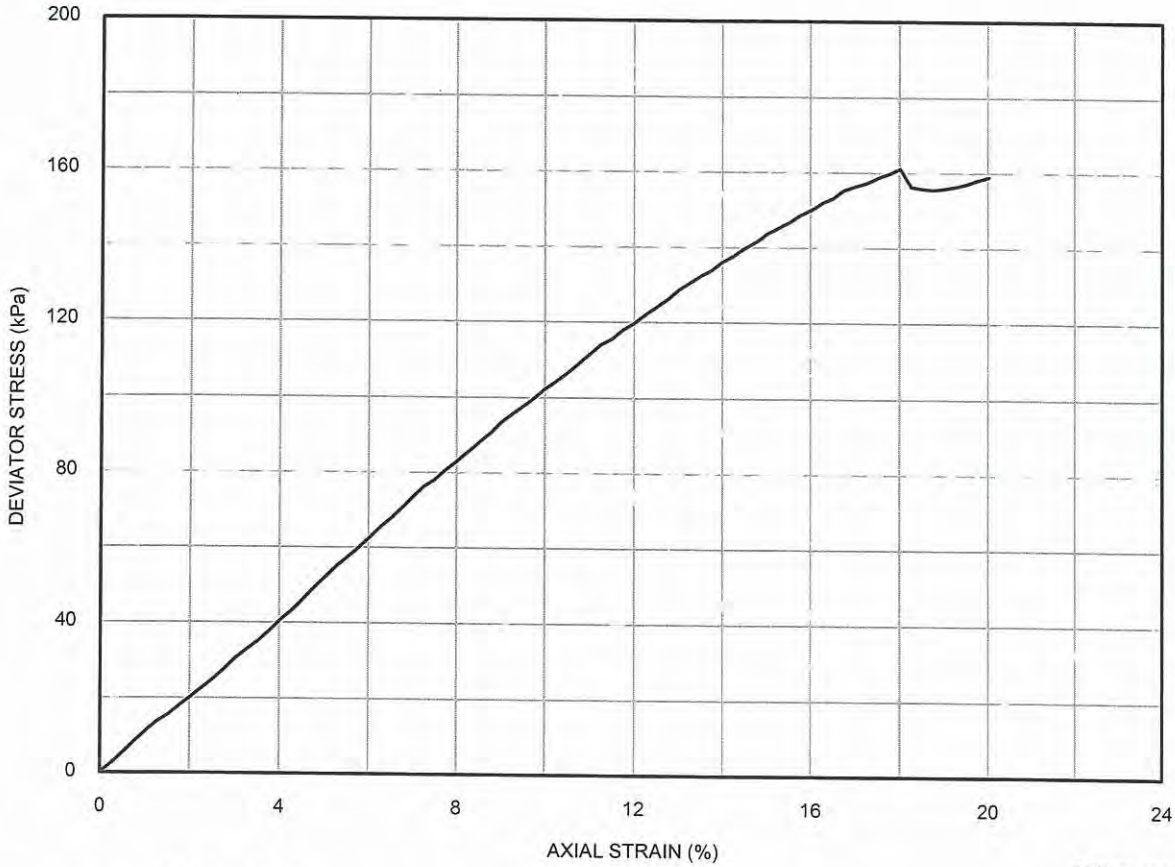
FUGRO ENGINEERING SERVICES LTD
GREEN PARK, PLOT 3.2, READING, BERKS

Drawn by: Z.S Date: 24/07/2008

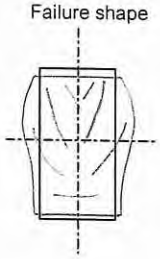
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Date : Checked by:

Date : Approved by:



Failure shape



Failure Conditions			
Cell pressure	(kPa)	:	90
Membrane correction	(kPa)	:	1
Corrected deviator stress	(kPa)	:	161
Strain at failure	(%)	:	18.0
Undrained shear strength	(kPa)	:	81

Tested in accordance with BS 1377: Part 7: 1990: Clause 8

Initial Conditions					
Sample length	: 159.5	mm	Bulk density	: 2.12	Mg/m^3
Sample diameter	: 104.2	mm	Dry density	: 1.76	Mg/m^3
Membrane thickness	: 0.24	mm	Moisture content	: 21	%
Rate of strain	: 2.0	%/min			
Stiff dark greyish brown and mottled light grey CLAY					

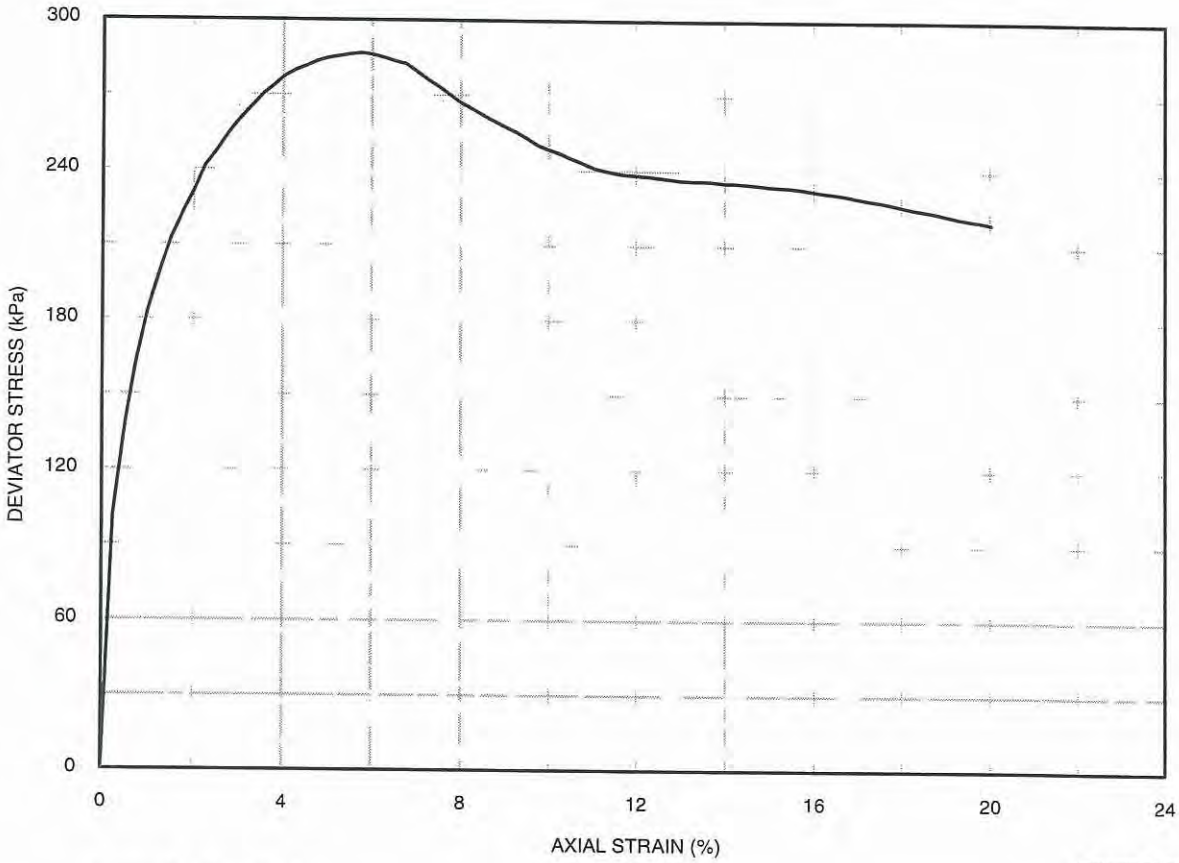
Borehole	:	BH105
Sample	:	10
Depth (m)	:	4.55

UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST

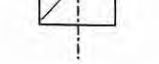
UKAS TESTING 0919

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GREEN PARK, PLOT 3.2, READING, BERKS



Failure shape



Failure Conditions			
Cell pressure	(kPa)	:	170
Membrane correction	(kPa)	:	0
Corrected deviator stress	(kPa)	:	287
Strain at failure	(%)	:	5.8
Undrained shear strength	(kPa)	:	143

Tested in accordance with BS 1377: Part 7: 1990: Clause 8

Initial Conditions					
Sample length	: 151.4	mm	Bulk density	: 2.11	Mg/m^3
Sample diameter	: 102.4	mm	Dry density	: 1.73	Mg/m^3
Membrane thickness	: 0.24	mm	Moisture content	: 22	%
Rate of strain	: 2.0	%/min			
Stiff olive grey CLAY					

Borehole	:	BH201
Sample	:	19
Depth (m)	:	8.55

Drawn by: Z.S Date: 24/07/2008
Template Issue: 2
Filename: 87613 \ Labdata \ Triaxial \ BH201_19_UU.OPJ
Checked by: TPO. Date: 30/07/2008.
Approved by: AJ Bobbitt Date: 31/07/2008.

UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST

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Certificate No: 87613

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GREEN PARK, PLOT 3.2, READING, BERKS

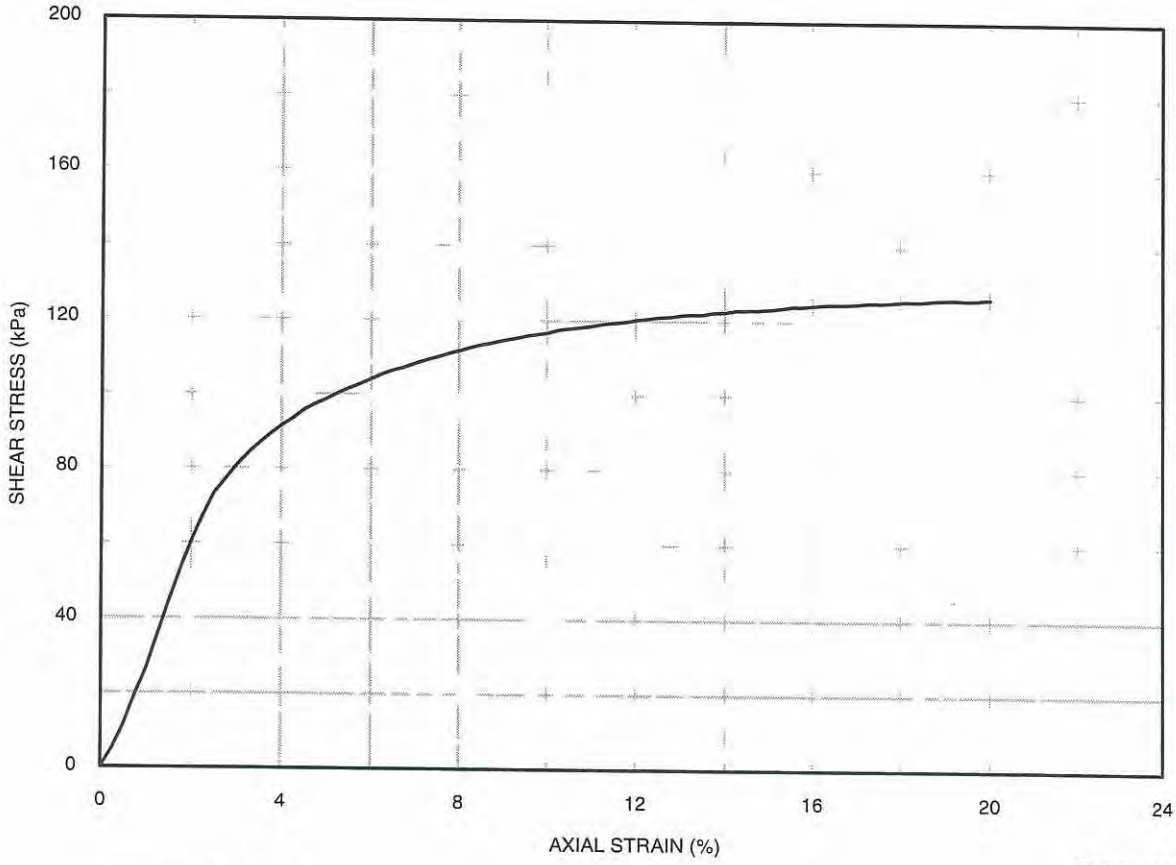
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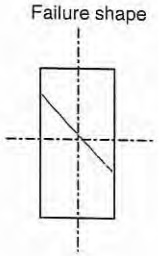
Filename: 87613 \ Labdata \ Triaxial \ BH201_23_UU.OPJ

Checked by: TRO. Date: 30/07/2008.

Approved by: Date: 31/07/2008.



Failure shape



Failure Conditions			
Cell pressure	(kPa)	:	230
Membrane correction	(kPa)	:	1
Corrected deviator stress	(kPa)	:	253
Strain at failure	(%)	:	20.0
Undrained shear strength	(kPa)	:	126

Tested in accordance with BS 1377: Part 7: 1990: Clause 8

Initial Conditions					
Sample length	: 201.2	mm	Bulk density	: 2.12	Mg/m^3
Sample diameter	: 104.4	mm	Dry density	: 1.86	Mg/m^3
Membrane thickness	: 0.24	mm	Moisture content	: 14	%
Rate of strain	: 2.0	%/min			
Stiff light olive grey and mottled pink CLAY					

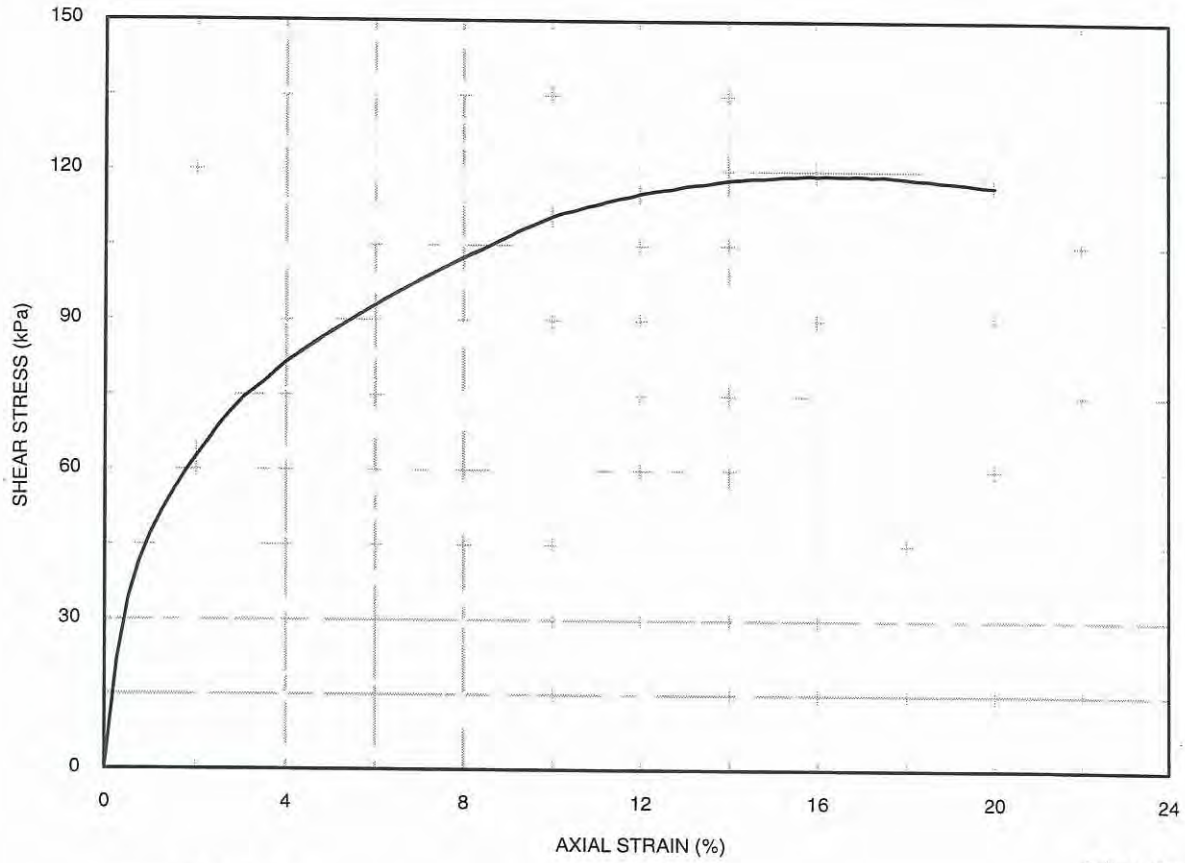
Borehole	:	BH201
Sample	:	23
Depth (m)	:	11.55

UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST

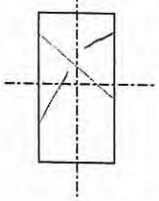
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GREEN PARK, PLOT 3.2, READING, BERKS



Failure shape



Failure Conditions			
Cell pressure	(kPa)	:	290
Membrane correction	(kPa)	:	1
Corrected deviator stress	(kPa)	:	238
Strain at failure	(%)	:	15.8
Undrained shear strength	(kPa)	:	119

Tested in accordance with BS 1377: Part 7: 1990: Clause 8

Initial Conditions					
Sample length	: 201.9	mm	Bulk density	: 2.15	Mg/m^3
Sample diameter	: 103.1	mm	Dry density	: 1.82	Mg/m^3
Membrane thickness	: 0.24	mm	Moisture content	: 18	%
Rate of strain	: 2.0	%/min			
Stiff olive brown and mottled grey CLAY					

Borehole	:	BH201
Sample	:	27
Depth (m)	:	14.55

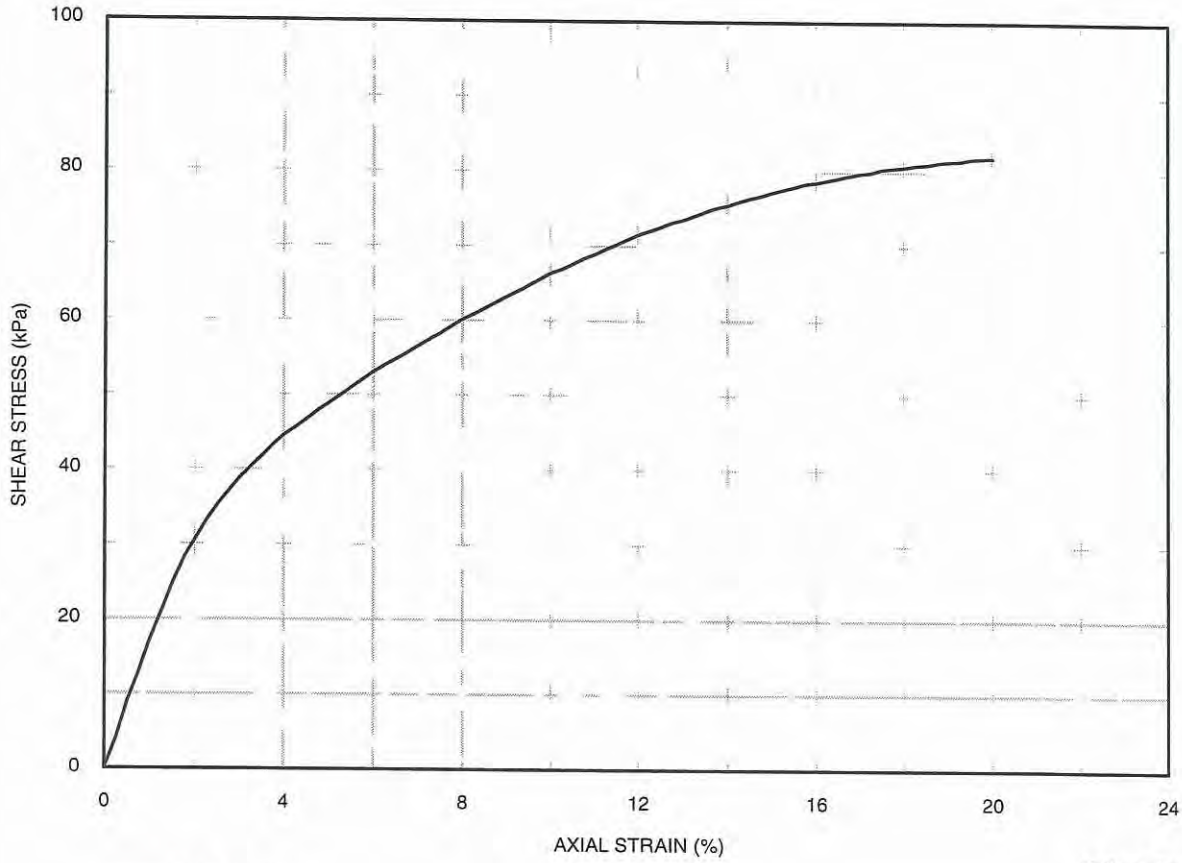
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Approved by: [signature] Date: 31/07/2008.

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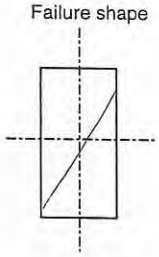
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Failure shape



Failure Conditions			
Cell pressure	(kPa)	:	90
Membrane correction	(kPa)	:	1
Corrected deviator stress	(kPa)	:	164
Strain at failure	(%)	:	20.0
Undrained shear strength	(kPa)	:	82

Tested in accordance with BS 1377: Part 7: 1990: Clause 8

Initial Conditions					
Sample length	: 202.8	mm	Bulk density	: 2.14	Mg/m^3
Sample diameter	: 102.7	mm	Dry density	: 1.79	Mg/m^3
Membrane thickness	: 0.24	mm	Moisture content	: 20	%
Rate of strain	: 2.0	%/min			
Stiff olive grey CLAY					

Borehole	:	BH202
Sample	:	11
Depth (m)	:	4.55

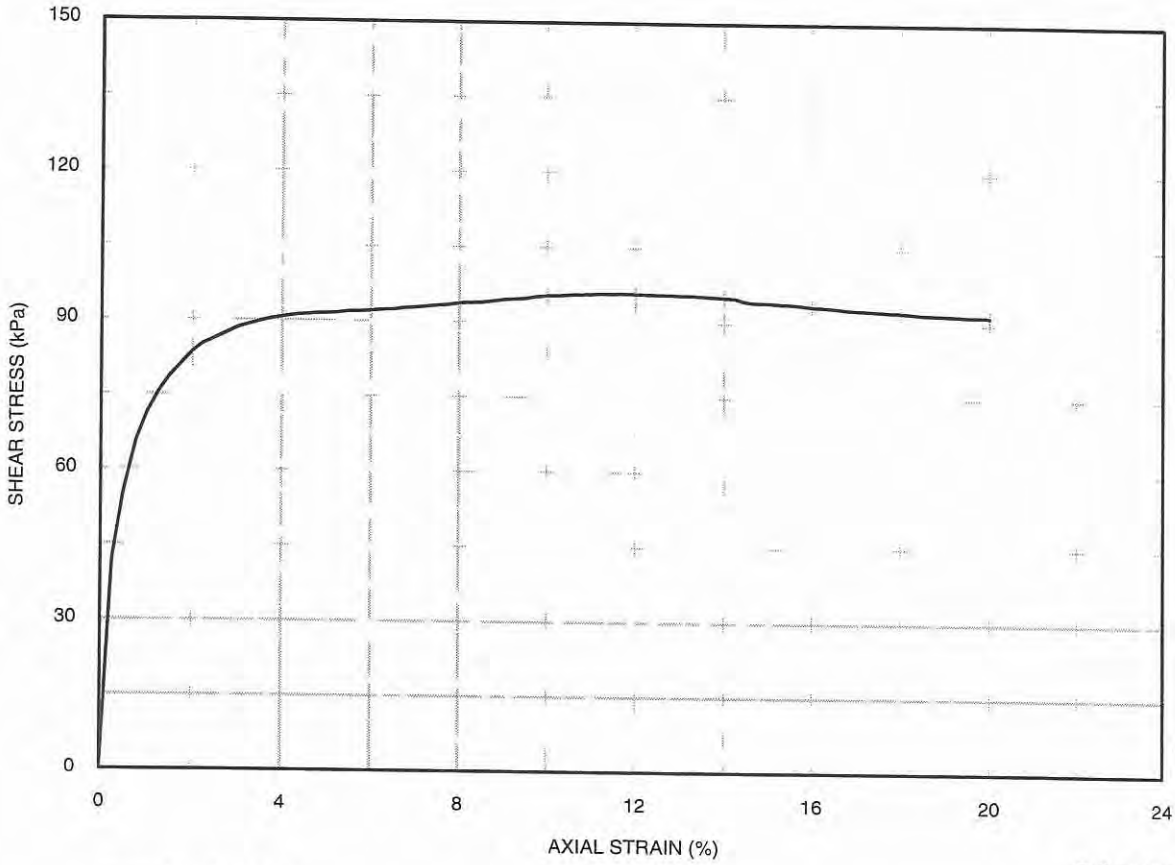
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Approved by: Date: 31/07/2008.

UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST

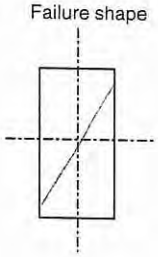
UKAS TESTING 0919

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GREEN PARK, PLOT 3.2, READING, BERKS



Failure shape



Failure Conditions			
Cell pressure	(kPa)	:	140
Membrane correction	(kPa)	:	1
Corrected deviator stress	(kPa)	:	192
Strain at failure	(%)	:	11.8
Undrained shear strength	(kPa)	:	96

Tested in accordance with BS 1377: Part 7: 1990: Clause 8

Initial Conditions						Borehole : BH202
Sample length	: 202.1	mm	Bulk density	: 2.11	Mg/m^3	Sample : 15
Sample diameter	: 102.9	mm	Dry density	: 1.73	Mg/m^3	
Membrane thickness	: 0.24	mm	Moisture content	: 22	%	Depth (m) : 7.05
Rate of strain	: 2.0	%/min				
Stiff grey and mottled pinkish red CLAY						

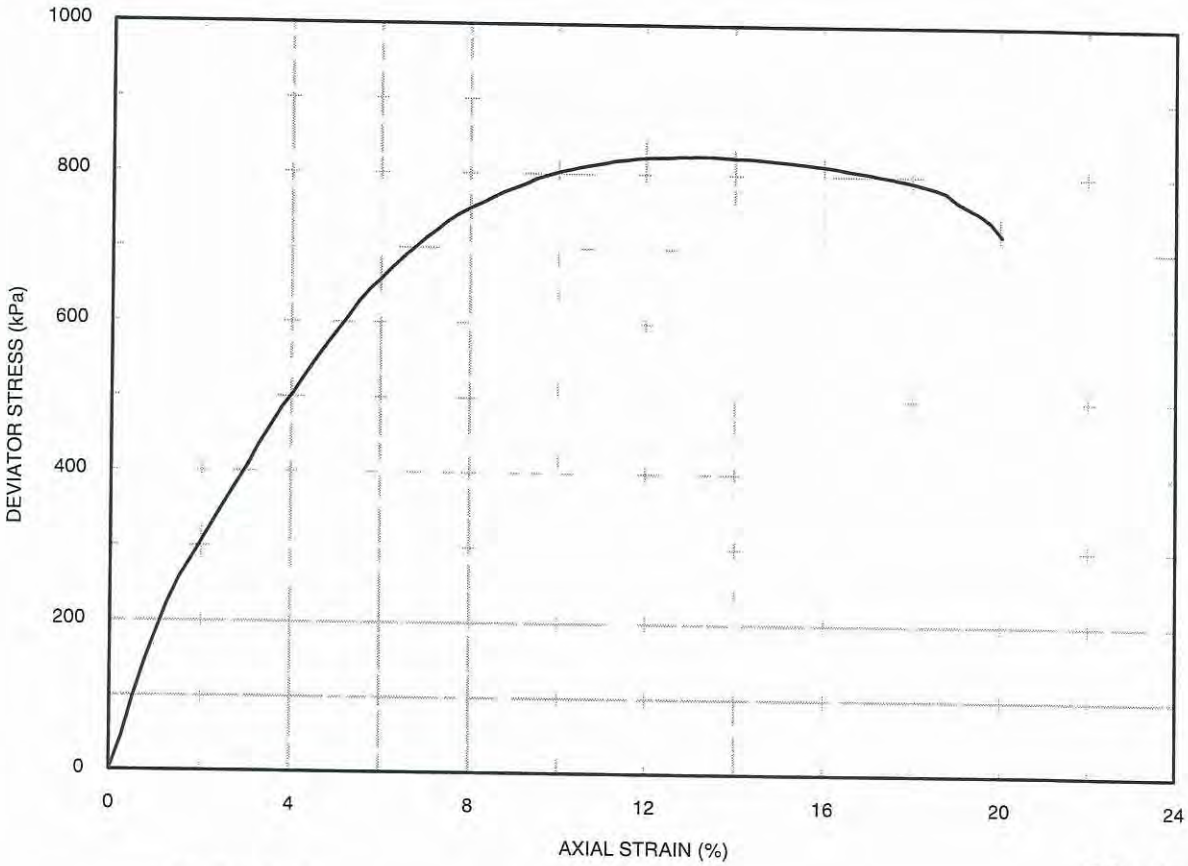
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Approved by: [signature] Date: 31/07/2008.

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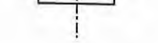
UKAS TESTING 0919

Certificate No: 87613

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GREEN PARK, PLOT 3.2, READING, BERKS



Failure shape



Failure Conditions			
Cell pressure	(kPa)	:	200
Membrane correction	(kPa)	:	1
Corrected deviator stress	(kPa)	:	825
Strain at failure	(%)	:	13.5
Undrained shear strength	(kPa)	:	413

Tested in accordance with BS 1377: Part 7: 1990: Clause 8

Initial Conditions						Borehole	:	BH202
Sample length	:	201.5	mm	Bulk density	: 2.25	Mg/m^3	Sample	: 19
Sample diameter	:	102.5	mm	Dry density	: 1.98	Mg/m^3		
Membrane thickness	:	0.24	mm	Moisture content	: 13	%	Depth (m)	: 10.02
Rate of strain	:	2.0	%/min					
Hard mottled dark reddish grey and grey slightly sandy CLAY								

Drawn by: PH Date: 22/07/2008

Template Issue: 2

Filename: 87613 \ Labdata \ Triaxial \ BH202_19_UU.OPJ

Checked by: TPD. Date: 30/07/2008.

Approved by: AP Dabbs. Date: 31/07/2008.

UNCONSOLIDATED UNDRAINED TRIAXIAL COMPRESSION TEST

UKAS TESTING 0919

Certificate No: 87613

SEVERN TRENT STL

Mr Doublet
Fugro GeoConsulting Limited
Fugro House
Hithercroft Road
Walingford OX10 9RB
Oxfordshire

04 August 2008

Test Report: COV/534575/2008

Dear Mr Doublet

Analysis of your sample(s) submitted on 28 July 2008 is now complete and we have pleasure in enclosing the appropriate test report(s).

An invoice for the analysis carried out will be sent under separate cover.

Should you have any queries regarding this report(s) or any part of our service, please contact Customer Services on +44 (0)24 7642 1213 who will be happy to discuss your requirements.

If you would like to arrange any further analysis, please contact Customer Services. To arrange container delivery or sample collection, please call the Couriers Department directly on 024 7685 6562.

Thank you for using STL and we look forward to receiving your next samples.

Yours Sincerely,

Signed: Susa Clancy

Name: S. Clancy

Title: Organic Chemistry Manager

Report Summary

Mr Tony Doublet
Fugro GeoConsulting Limited
Fugro House
Hithercroft Road
Walingford
Oxfordshire
OX10 9RB

UKAS TESTING
1314
0897
1229
1510

SEVERN TRENT STL

Date of Issue: **04 August 2008**

Report Number: **COV/534575/2008** Issue **1**

Number of Samples included in this report **6**

Number of Test Results included in this report **25**

Site Name: **Green Park Plot 3.2 Reading Berks**
Job Received: **28 July 2008**
Analysis Commenced: **28 July 2008**
Order No: **W1646**

Signed: Susan Clancy Name: **S. Clancy** Date: **04 August 2008**
Title: **Organic Chemistry Manager**

STL was not responsible for sampling unless otherwise stated. Sampling is not covered by our UKAS accreditation.

Information on the methods of analysis and performance characteristics are available on request.
Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.
Tests marked 'Not UKAS Accredited' in this Report/Certificate are not included in the UKAS Accreditation Schedule for our laboratory.

Certificate of Analysis

UKAS TESTING
1314
0897
1229
1510

SEVERN TRENT STL

Report Number: **COV/534575/2008** Issue **1**
Site Name: **Green Park Plot 3.2 Reading Berks**

Group	Determinand	Unit	Method/ Accreditation			Soil					
						10695046	10695047	10695048	10695049	10695050	10695051
						BH101 Sample 5 B 1.50m	BH102 Sample 10 D 4.50m	BH103 Sample 6 D 2.50m	BH105 Sample 5 B 1.50m	BH201 Sample 25 D 13.00m	BH202 Sample 17 D 8.50m
Sample Preparation	Stones NG Method	%	Stones	N	Mid	25	15	17	24	20	11
	Moisture content at 30C	%	33A	N	Mid	13	12	12	13	13	14
Inorganics	Organic matter	%	36	Y	Mid	<0.20	-	<0.20	0.88	-	-
	Sulphate as SO4, Water Soluble	g/l	46	Y	Mid	0.10	<0.060	<0.060	-	<0.060	<0.060
	pH	pH units	39	Y	Mid	9.8	9.2	8.1	-	9.1	9.2

Signed: Susan Clancy

Name: **S. Clancy** Date: **04 August 2008**

Title: **Organic Chemistry Manager**

Accreditation Codes: Y = UKAS Accredited, N = Not UKAS Accredited, M = MCERTS, S = Sub-contracted.
Analysed at: Bri = STL Bridgend, Cov = STL Coventry, Mid = STL Midlands, Rea = STL Reading, Run = STL Runcorn.
For Microbiological determinands 0 or ND=Not Detected, For Legionella ND=Not Detected in volume of sample filtered. I/S=Insufficient sample

SEVERN TRENT STL

ANALYST COMMENTS FOR REPORT COV/534575/2008 Issue 1

Date of Issue: **04 August 2008**

Sample No	Analyst Comments
10695046	
10695047	
10695048	
10695049	
10695050	
10695051	

Signed: Susan Clancy

Name: **S. Clancy** Date: **04 August 2008**

Title: **Organic Chemistry Manager**

SEVERN TRENT STL

DETERMINAND COMMENTS FOR REPORT COV/534575/2008 ISSUE 1

Date of Issue : 04 August 2008

Sample No	Description	Determinand	Comments

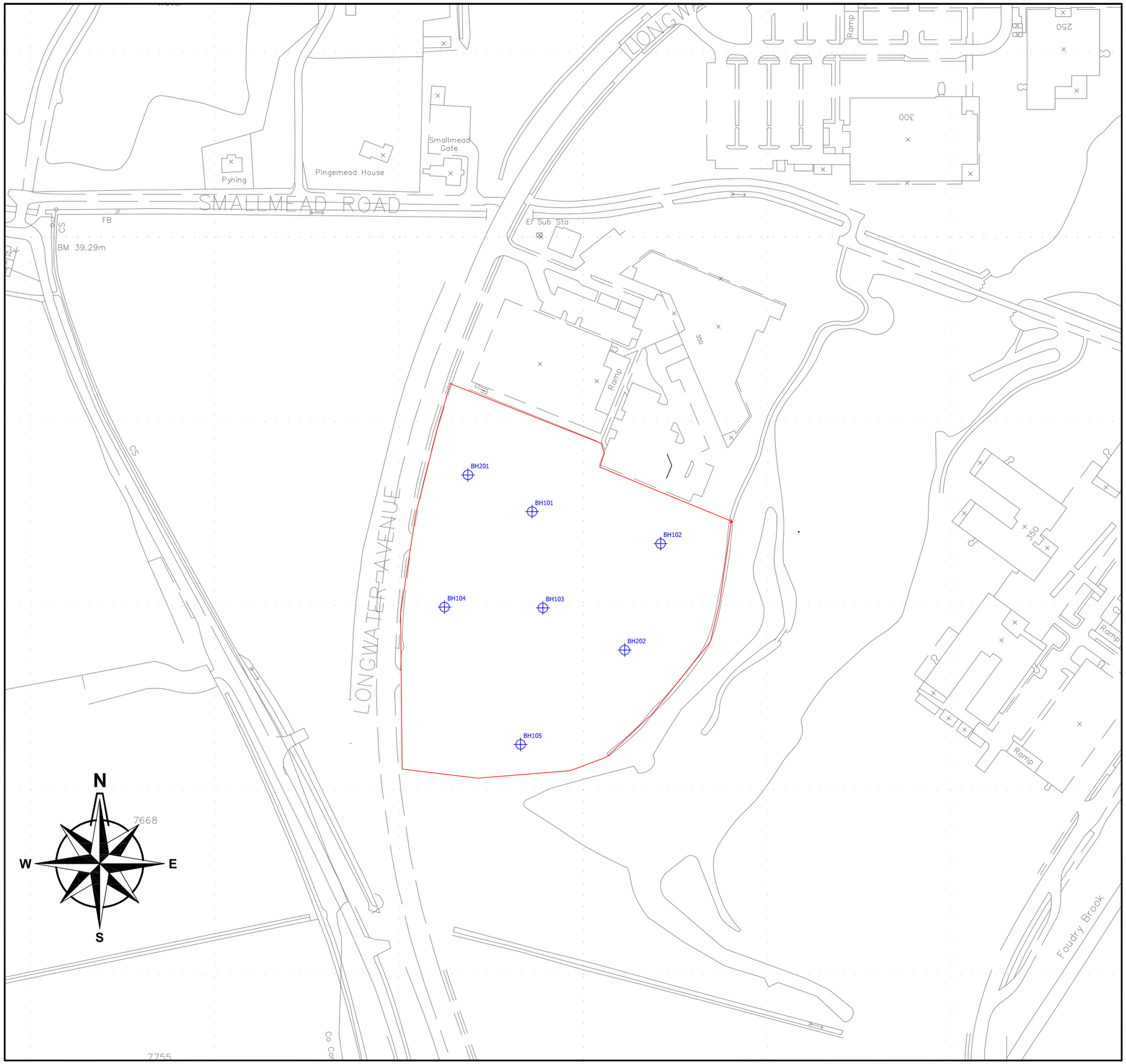
Signed: Susan Clancy

Name: **S. Clancy** Date: **04 August 2008**

Title: **Organic Chemistry Manager**

APPENDIX C Drawings

Site Plan





GENERAL LOCATION PLAN SCALE :

0 500 1,000 1,500 2,000 2,500 3,000 3,500 4,000 4,500 5,000

SCALE : Scale 1 : 2,000

0 20 40 60 80 100

NOTES :

1. *Base Plan supplied by Peter Brett Associates (The Engineer) for the purposes of reporting.*
2. *Reproduced from the 2000 Ordnance Survey 1:50,000 Reading and Windsor Map with the permission of the controller of Her Majesty Stationery Office , copyright Crown Copyright. Fugro Engineering Services Ltd, Fugro House, Wallingford, OX10 9RB, Licence Number AL10004922*

LEGEND :

BH105 — *Borehole Location & number*

Site Boundary

CLIENT : PRUDENTIAL PROPERTY MANAGERS

PROJECT : GREEN PARK, PLOT 3.2, READING, BERKS

TITLE : SITE PLAN

INTERP. BY :	EJP	*DATE:*	15/08/2008	*DRAWN BY:*	EJP	*DATE :*	15/08/2008
CHECKED BY :	CC	*DATE:*	15/08/2008	*APPROVED BY:*		*DATE :*	

REPORT No. : WAL080045 — APPENDIX C_SP1

CAD FILE NAME : WAL080045_SP1

PLOTTED DRAWING SIZE : A3 (420 X 297)

FUGRO ENGINEERING SERVICES LIMITED
Fugro House, Hithercroft Road
Wallingford, Oxfordshire, OX10 9RB
Tel : +44 (0)870 4021 400 Fax : +44 (0)870 4021 499
Email : info@fes.co.uk. www.fes.co.uk

APPENDIX 2

SUMMARY OF GEOENVIRONMENTAL INFORMATION FOR PLOT 3 GREEN PARK READING

CLIENT:

PRUDENTIAL PORTFOLIO MANAGERS LTD
PRINCETON HOUSE
271/273 HIGH HOLBORN
LONDON
WC1V 7EE

PETER BRETT ASSOCIATES
CONSULTING ENGINEERS
16 WESTCOTE ROAD
READING
BERKSHIRE
RG30 2DE

TEL: 0118-950-0761
FAX: 0118-959-7498
E-mail: reading@pba.co.uk

2942/815/PLOT3/FINAL/WST/KB/RP/FC/JE
DECEMBER 1998

This report has been prepared by Peter Brett Associates with reasonable skill, care and diligence within the terms of the Contract with the client and generally in accordance with ACE Conditions of Engagement (Agreement D) 1995 and taking account of the manpower, resources, investigations and testing devoted to it by agreement with the client.

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Peter Brett Associates disclaims any responsibility to the client and others in respect of any matters outside the scope of the above.
This report is confidential to the client and Peter Brett Associates accepts no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies upon the report at their own risk.

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1.0 INTRODUCTION

Peter Brett Associates have been retained by Prudential Portfolio Managers Limited (PPML) to provide civil and structural consultancy services for the Green Park development, which was formerly known as Reading Business Park. The location of the site is shown in Figure 1.

As part of the development, the site level has been raised using imported fill to provide level development plots above the predicted 1:200 year flood level. A flood relief channel has also been constructed running approximately south west to north east through the centre of the site. A general layout plan is presented in Figure 2 which indicates the individual plots. Green Park is subdivided into Northern and Southern sectors with Plots 1-7 forming the northern sector

This report contains details of the geotechnical and geoenvironmental issues related to Plot 3 of the development and includes the following aspects:

- ground and groundwater conditions based on existing site investigation data
- details of the construction and conformance testing of the platforms including details on the materials used as fill material
- general engineering considerations regarding allowable bearing pressures and settlement of structures located within the Plot.

Part of Plot 3 encompasses a former waste transfer station where a localised area of hydrocarbon contamination was identified and remediated. An assessment of groundwater quality post remediation was carried out and the results are discussed in this report.

The comments made in this report and the opinions expressed are based on the sources quoted, the ground conditions encountered within the exploratory holes and on the results of tests made in the field and laboratory. There may however be conditions pertaining at the site which have not been disclosed by the investigation and which therefore could not be taken into account. In particular, it should be noted that groundwater conditions vary with seasonal and other effects.

2.0 THE SITE

2.1 Location and Description

Green Park is located on the north west of Junction 11 of the M4 Motorway and west of the A33 Basingstoke Road on the southern outskirts of Reading, Berkshire. The National Grid Reference of the centre of the park is approximately SU 704 694. Green Park in total covers an area of approximately 30ha and was formerly comprised of largely low lying meadow land.

Plot 3 is located along the western boundary of Green Park and covers an area of approximately 4.5 ha. Plot 3 is bounded by the western access road to the west and by the proposed flood relief channel on the other boundaries.

2.2 Geology

Information from the British Geological Survey (Reference 1) indicate that the site is underlain by the following sequence:

Recent Deposits:	Alluvium
	Valley Gravels
Solid Deposits:	Reading Formation
	Upper Chalk Formation

The geological map indicates that for Plot 3, Valley gravels underlain by the Reading Formation are present.

The geological map indicates that the London Clay Formation, which overlies the Reading Formation is present to the south and east of the Green Park. The strata at the site therefore dip to the south-east.

3.0 GROUND INVESTIGATIONS

3.1 General

A number of ground investigations have been carried out historically for the whole of the Green Park Development. Of these, five investigations included exploratory holes (boreholes and/or trial pits) sunk within or adjacent to Plot 3, as discussed in the following sections. The location of all the exploratory holes relevant to Plot 3 are presented in Figure 3.

Representative disturbed and undisturbed samples were obtained from the exploratory holes for further examination and laboratory testing. Standard penetration tests (SPT) were carried out at regular intervals in the boreholes and the results are plotted against elevation in Figure 4 for the whole of the northern sector boreholes.

3.2 Tarmac 1983

A mineral reserve investigation was carried out over Green Park by Tarmac in 1983 (Reference 2). The site investigation was undertaken using continuous flight augered drilling techniques and hence the description of the strata encountered are limited in terms of engineering properties. Two of the mineral reserve boreholes (BH3 and 7) were sunk within Plot 3 to depths of 4.5m and the logs are contained in Appendix 1.

3.3 Southern Testing 1985

A geotechnical investigation was carried out by Southern Testing in 1985 for a proposed Flood Relief Channel (Reference 3). Two trial pits were excavated along the line of the proposed channel (TP4 and TP5) within Plot 3 to depths of between 1.5m and 3.0m. The logs for these trial pits are contained in Appendix 2.

3.4 Foundation and Exploration Services Ltd 1988

A ground investigation covering the whole of the northern sector of Green Park was carried out by Foundation and Exploration Services (FES) in 1988 (Reference 4).

Two boreholes (BH2 and BH12) were sunk in Plot 3 as part of the FES survey. The boreholes was sunk using cable percussion drilling techniques to depths of between 5.5m and 20.0m. In addition six trial pits (TP36, TP40, TP41, TP42, TP53 and TP57) were also excavated within or adjacent to Plot 3 as part of this survey. The trial pits were excavated to depths of between 1.6m and 3.2m using a wheeled excavator.

Details of the strata encountered, samples taken, in-situ test results and groundwater observations are contained on the exploratory hole records in Appendix 3.

The following laboratory tests were carried out on samples recovered from the FES holes.

- natural moisture content and bulk density
- plasticity index
- unconsolidated, undrained triaxial compression tests
- one dimensional consolidation test
- sulphate and pH analyses

The results of the laboratory testing are contained in Appendix 4.

3.5 PBA 1995

PBA carried out a contamination investigation at Green Park in 1995 (Reference 5). As part of this investigation three trial pits (TP95/27, TP95/29 and TP95/32) were sunk within or adjacent to Plot 3. The records for these trial pits are contained in Appendix 5.

Six soil samples recovered from this investigation were tested for a suite of commonly occurring industrial contaminants and the results are contained on Table 2.

3.6 PBA 1996

PBA carried out a contamination investigation at the site of the former Small Mead Farm in 1996 (Reference 6). This investigation comprised the excavation of 9 trial pits. The records of these trial pits are contained in Appendix 6.

Part of the farm was used for a relatively short period as a waste transfer station as shown on Figure 9. A layer of the waste material from this operation was present at the time of the investigation overlying concrete hardstanding. A earth bund associated with the transfer station had been broken down by spreading locally.

Sixteen soil samples and three groundwater samples were recovered from this investigation and were tested for a suite of commonly occurring industrial contaminants. The results are contained in Appendix 12.

3.7 AMEC 1997

A trial pit investigation was carried out by AMEC Civil Engineering in 1997 along the proposed re-aligned flood relief channel. Eleven trial pits were excavated adjacent to Plot 3 as part of this survey (TP43 to TP53) to depths of 3.0m.

Details of the strata encountered, samples taken and groundwater observations are contained in Appendix 7.

4.0 GROUND CONDITIONS

4.1 General

The results of the exploratory holes generally confirm the published information, although made ground deposits are described on one borehole record (BH2, FES 1988). A summary of the ground conditions at Plot 3 are given in the table below and the nature and engineering properties of the strata are discussed in the following sections.

Topsoil was encountered in all the pre 1995 exploratory holes as a brown silty clay with roots, varying in thickness from between 0.15m to 0.5m. All topsoil beneath Plot 3 was removed prior to constructing the fill platform and is not discussed further.

Summary of Ground Conditions

Strata	Depth to top (mbgl)	Elevation to top (mAOD)	Thickness (m)
Made Ground (only present in one borehole)	0.0	38.8	1.45
Alluvium (locally absent)	0.0 - 0.5	37.8 - 38.5	0.2 - 1.5
Valley Gravels	0.0 - 1.5	36.6 - 38.1	1.75 - 2.4
Reading Formation	2.1 - 3.4	35.0 - 35.6	Not proven

The base of the Reading Formation was not encountered in any of the boreholes within Plot 3 itself, although it was proven to an elevation of 18.8m OD in borehole 2 (FES, 1988). The depth and elevation to the chalk strata has not been proven for Plot 3. The elevation to the top of the chalk was however proven in Plot 7 at around 17m AOD. As discussed in Section 2.2, the strata at the site dip to the south east and hence the elevation to the top of the chalk is likely to vary across the site.

4.2 Made Ground

Made ground deposits were encountered in one borehole (BH2 FES 1988) as a brown, silty sandy clay with abundant flint gravel and brick fragments. The made ground extended to a depth of 1.45m. Borehole 2 was sunk in the vicinity of Smallmead farm, which was formerly licenced as a waste transfer station. It is considered that the made ground encountered in BH2 is a result of former activities at the farm. This is discussed in more detail in Section 7.0.

4.3 Alluvial Deposits

Material thought to represent alluvial deposits were encountered in the majority of the exploratory holes typically as a soft to firm, grey brown, silty clay to clayey silt with occasional fine to medium flint gravels. The thickness of the alluvium, where present, varied from 0.2m to 1.5m.

4.4 Valley Gravels

Valley Gravels were encountered in each exploratory hole as a sandy to very sandy, fine to coarse flint gravel with occasional flint cobbles. Pockets/bands of sand are also present. The thickness of the Valley Gravels varied from 1.75m to 2.4m where proven.

Standard penetration tests carried out in the Valley Gravels gave N values of between 14 and 29 indicating the material to be medium dense. A scatter of N values has been recorded for the Valley Gravels across the whole of Green Park, with N values of between 9 and 29 being recorded, probably reflecting the variation in grading and the presence of sand lenses.

4.5 Reading Formation

Reading Formation strata were encountered below the Valley Gravels in the boreholes carried out, at elevations of between 35.0m AOD and 35.6m AOD. The Reading Formation were recovered as a series of grey, mottled red, green and grey silty clays, with occasional silty fine sand bands, becoming a brown, slightly silty to silty, fine to medium sand with depth. Bands of sandstone were recorded in some of the boreholes in the upper sections of the Reading Formation..

The results of the standard penetration tests gave N values for the Reading Formation of between 34 and 88, generally increasing linearly with depth (see Figure 4).

The results of the triaxial tests carried out on samples recovered from the top of the Reading Formation sequence (see Appendix 4), gave an undrained shear strength of 44 kN/m^2 increasing to 260 kN/m^2 some 3m into the sequence, indicating the material to be firm becoming stiff with depth. The bulk density of the samples tested in the triaxial cell varied from around 1.90 to 2.18 Mg/m^3 with natural moisture contents of 16% and 24%. The results of plasticity tests carried out on the Reading Formation gave liquid limits of between 39% and 56% with plasticity indicies of between 20 and 32% indicating the material to be of intermediate to high plasticity. Natural moisture contents of between 16 and 27% were recorded.

4.6 Groundwater

Groundwater was typically encountered in each exploratory hole within the gravels. Groundwater inflows were generally noted as being heavy causing sidewall instability in the trial pits.

A groundwater monitoring piezometer (P1) was installed adjacent to Plot 3 in 1990 (see Figure 9). Monitoring of water levels within the piezometer was carried out over an 18 month period and the results are contained in Appendix 8. An average water level of around 37.4m AOD was recorded. The monitoring carried out historically over the whole of Green Park indicates the groundwater flow direction in the gravels is to the north east towards Foudry Brook.

5.0 CONSTRUCTION OF PLATFORMS

5.1 General

As part of the development of Green Park, platforms were constructed using imported fill that was placed to an end product earthworks specification to provide level areas for construction above the 1 in 200 year flood level. In addition to the bulk filling, flood relief measures have also been carried out comprising a flood relief channel with flood storage areas.

5.2 Source of fill material and construction details

The material used to provide the bulk fill comprised the Reading Formation which was obtained from an adjacent borrow pit which was being excavated for a new landfill site to the north west of Green Park (see Figure 6). A specific geotechnical assessment of the nature and properties of the materials in the Borrow pit was carried out by AMEC (Reference 7).

A detailed assessment of the suitability of the materials from these areas was undertaken and compaction trials were carried out to confirm the acceptability of the source material for use as an Engineered Fill (Reference 8 to 10). Based on the results of this assessment, two classes of material (B and F) were identified for use as fill material reflecting the natural lithological variations in the Reading Formation. The two classes of material were also identified to enable the compliance testing regime to be modified to suit each material type. The two classes of material were:

- suitable material Type B - comprised of slightly silty to silty sands from the Reading Formation
- suitable material Type F - comprising the cohesive material from the Reading Formation.

A typical section through the completed platform is given in Figure 6. Type F or B material was placed from ground level after topsoil stripping to 600mm from the final earthworks level, where Type B material only was placed to allow for a general capping layer overlying the general fill for future road and floor slab requirements.

5.3 Specification and Quality Control

The earthworks contract and specification were prepared largely based on the Specification for Road and Bridge Works (Blue Book) (Reference 11). A copy of the Earthwork series of the specification is contained in Appendix 9.

The materials were placed in to 300mm thick layers using sheeps foot and smooth wheeled vibrating rollers as appropriate to achieve the required specification.

In order to ensure the specified engineering criteria was achieved, an extensive quality control testing regime was established. The testing was carried out by the main contractor (AMEC Civil Engineering) and supervised by PBA.

A summary of the Quality Control testing requirements is given below together with the frequency of testing and compaction specification acceptance criteria.

Material	Parameter	Frequency	Acceptance Criteria
B	In-situ CBR	1 per 1000m^2 of each layer placed	>5%
	In-situ density	1 per 1000m^2 of each layer placed	>95% of maximum dry density
F	Undrained shear strength	1 per 1000m^2 of each layer placed	Cu>50 kN/m^2 or CBR>3% if hand vane inappropriate
	Residual air voids	1 per 5000m^2 of each layer placed	Not more than 5%
	Stiffness	1 per 2500m^2 of each layer placed for first 5% of material placed under the contract (not just Plot 2), 1 per 5000m^2 of each layer placed for 5% to 15% of material and 1 per 10000m^2 of each layer for remaining 85% of material	E'=90% >10000 all results >7000 kN/m^2

5.4 Compliance Test Results

The results of the compliance testing carried out on the earthworks for Plot 3 are summarised in Appendix 10 and the location of the tests are given on Figure 7.

The results of the compliance testing confirms that the material placed to date meets the requirements of the specification.

The stiffness testing and values of E' were determined from the results of plate bearing tests. The tests were carried out on the surface of the compacted layer in order to obtain a K_{30}, modulus of subgrade reaction value. The K_{30} value was achieved by applying increasing increments of pressure to a 300m diameter plate and holding each incremental pressure stage over a time period sufficiently long enough to establish that settlement was complete. Pressures or stresses up to 150kN/m^2 proved sufficient to achieve a settlement of 1.27mm to the plate, allowing K_{30} values to be calculated.

The stiffness E' value was determined from these results and converted to a 30 inch diameter plate. The ratio between the 30 inch and 300mm plates used was 2.27, and the E' value calculated using a poisons ratio of 0.3.

5.5 Check Testing

Check mexe probes were carried out in Plot 3 by PBA to confirm CBR values. Readings were taken at 75mm intervals starting from finished earthworks level and at 0.5m depth and 1.0m depth in the base of trial pits. In some areas, the fill material was too 'dense' for the mexe probe to penetrate (>14% reading on the

probe) and in other areas, where 'dense' material was present over 'softer' areas, the force used to push the mexe probe resulted in some individual readings not being taken.

The results of the mexe probes have been correlated to CBR readings using the calibration curves prepared by AMEC (Reference 7) for the various type of materials present (ie sand, silts and clays). The results of the mexe probes are summarised on Table 1 and the location of the probes are given in Figure 8. The calibration curves developed by AMEC are contained in Appendix 11.

It should be noted that, as a result of disturbance/stress relief from the excavation of the trial pits, the upper mexe probe readings started at 0.5m and 1.0m depth respectively are considered to be erroneously low.

The results of the check mexe probes indicate that for Plot 3, both the B and F material meet the specification requirements in terms of CBR values. The exception to the above is reduced CBR values at surface and this is discussed further in section 6.6.

6.0 GEOTECHNICAL CONSIDERATIONS

6.1 General

Peter Brett Associates carried out preliminary assessments of the engineering characteristics of the soils and performance of the fill materials in order to provide outline design information for the proposed business park development (Reference 12). Extracts from this assessment are contained in the following sections. It is recommended however that detailed assessments are carried out once specific information on the nature of the proposed structural development, layout and anticipated loading conditions are known.

6.2 Foundations

The type and capacity of foundations adopted for the Plot will be dependent on the soil structure interaction ie load, size and spacing of the footings, the stiffness of the soil and tolerances of the structure to settlement, particularly differential settlement. The differential settlement criteria relative to each structure will be dependent on the structure type ie flexible steel frames as opposed to more rigid reinforced concrete; the type of cladding adopted ie flexible steel sheeting compared to more rigid brickwork or glass; and the end use of the structure ie if sensitive equipment or plant are to be used or operated within the building. Differential settlement will also be controlled by the consistency in thickness and strength/density of the underlying fill and soil strata.

An assessment of the likely total settlements for lightly loaded structures that are not sensitive to significant differential settlements founded on spread footings 0.5m into the fill was carried out. The assessment assumed that at least 1.5m of gravel is present and upto 0.9m of firm alluvium. As discussed in section 4, the thickness of the alluvium over Plot 3 varies from 0.2m to 1.5m and the minimum thickness of Valley Gravels recorded was 1.75m.

The results of the preliminary assessment are given below for an isolated square pad foundation founded on Engineered fill with a minimum drained modulus of deformation of 7000kN/m^2

Pad Size	Net Loading Intensity (kN/m^2)	Maximum Total Settlement (mm)
1.0m x 1.0m	100 200	15 30
2.0m x 2.0m	100 200	25 45

It should be noted that pad footings larger than 2m by 2m even at low net loading intensities (say 100 kN/m^2) would experience large total settlements which may give rise to problems of differential settlement.

Differential settlements of upto half the value of the total settlement may occur for uniform ground conditions. Consideration should be given to the column spacings to ensure the maximum differential settlement between spans do not exceed allowable tolerances.

As an alternative to placing traditional footings on the fill material, consideration could be considered to placing footings on the underlying Valley Gravels. No assessment of the likely total settlements for this option has been undertaken to date as it is considered that, due to the likely founding depths of around 2.0m to 2.5m, this option is not likely to be economically viable when compared to founding in the fill platform and may not significantly restrict total and hence differential settlements when compared to founding in the

fill platform as the Reading Formation will be stressed more.

For structures that impose heavier loadings, typically with net loading intensities above 150kN/m^2 for a 2.0m x 2.0m footing or for structures sensitive to differential settlements, foundations will need to be piled. Consideration could be given to ground improvement techniques and discussions should be held with specialist contractors as the applicability and performance of a ground improvement technique is dependent on the proprietary system adopted. It is thought however that specialist contractors are likely to restrict their guarantee on the performance of foundations to a maximum allowable bearing capacity of 150kN/m^2 with maximum total settlement of 20mm to 25mm. Again, differential settlements are likely to be up to half this value in uniform soil conditions.

The intensity of loading and value of settlement is in line with that estimated for pad footings placed in the engineered fill. Therefore for lightly loaded structures not sensitive to differential settlements, the use of ground improvement techniques are not likely to be required. However, these techniques would reduce the risk associated with significant variations occurring in differential settlements across a structure from possible variation in both the strength and thickness of the alluvium, consistency of the fill materials and the presence of made ground over part of the plot.

For larger/heavier structures and for buildings where tolerances to differential settlements are more sensitive than the limits predicted above, the building frames will require support by piling. Piles will require to be founded in the underlying Reading Formation as the thickness of the Valley Gravels will not provide adequate load bearing capacity.

Driven piles will be suitable for all areas where the site is under construction. However, because of potential noise and vibration problems, they may only be suitable where adjacent developed structures are supported by piles and have flexible frame structures, and insensitive cladding and finishes. The Environment Agency may also object to driven piles due to potential contamination migration pathways being generated.

As an alternative, bored piles could also be considered, either traditional bored and cast in-situ piles or continuous flight auger (CFA) concrete injection piles. It should be noted that, due to the presence of the alluvium and Valley Gravels temporary casing is likely to be required for traditional bored piles.

Discussions should be held with specialist piling contractors to confirm the most appropriate pile type for the site, carrying out detailed design and to provide cost estimates. As a guide however, a preliminary assessment of pile lengths for a square precast concrete driven pile and bored cast in-situ piles for various working loads and pile diameters has been carried out as detailed below:

TOTAL PILE LENGTH FOR PRECAST DRIVEN PILES

Diameter (mm)	Working Load		
	200kN	300kN	500kN
300	9.0m	10.5m	13.5m
400	7.5m	9.0m	12.0m

TOTAL PILE LENGTH FOR BORED CAST IN-SITU PILES

Diameter (mm)	Working Load		
	200kN	300kN	500kN
300	12.0m	14.5m	18.5m
400	9.5m	12.0m	16.0m

We would point out that preliminary discussions with the Environment Agency have indicated that they may object to piles that penetrated the Reading Formation and extended into the underlying chalk. We understand this concern arises principally from the development of the Reading Football Club where piles have been formed through a considerable thickness of landfill material and the Agency is concerned with potential leachate migration which they feel may also occur into or from the sandier horizons within the Reading Formation.

Although these concerns are valid for developments such as the football club we would not envisage an impact in relation to Plot 3. However, the view of the Environment Agency should be obtained in relation to each development.

6.3 Ground Slabs

Ground bearing slabs founded on the bulk fill materials may be adopted for Plot 3. Settlements should be less than 20mm for a 20m x 20m ground slab with a net bearing pressure of 30kN/m^2, assuming a minimum drained modulus of elasticity of 7000kN/m^2 for the fill material. If a higher slab load is envisaged, it is recommended that a further analysis be carried out to confirm the anticipated settlement and its acceptability.

Specific analysis of the settlement of the alluvium present beneath the platform has not been carried out. Monitoring of the settlement of a localised area of organic alluvium located adjacent to the Foudry Brook was however carried out. This indicates that the settlement of the alluvium was effectively complete between 75 and 130 days after placing of an equivalent surcharge load of around 20kN/m^2. The alluvial thickness in this area is considerably greater and has a notable organic content. The settlement data indicates that drainage within the Reading Formation within Plot 3 will be rapid reflecting the interbedded and sandy nature of the material

The slab should be constructed to act independently of the foundations to allow for differential movement of the slab and frame and we recommend that it is cast after the building of the frame is completed.

6.4 Buried Concrete

The results of the sulphate analysis on water:soil extract and groundwater samples indicate that the sub-surface concrete should be designed in accordance with Class 1 Conditions of BRE Digest 363 (Reference 13). The results of the pH testing indicate near neutral conditions.

6.5 Pavement Design

The specification for the bulk fill placement requires a minimum insitu CBR of 5% for the capping layer. However, recommendations given in TRRL 90 (Reference 14) indicate that cohesionless materials are frost susceptible where the fines content (material less than 75μm in size) exceeds 10%. The bulk fill material are liable to have a fines content at or above 10% and should therefore be regarded as frost susceptible.

Design of the pavements should accommodate for this, with a minimum construction thickness of 450mm.

A flexible pavement construction is preferred since this can more easily accommodate any potential differential movement arising from the consolidation of the underlying fill and alluvial materials.

6.6 Trafficability

The fill materials were placed to a performance criteria which was expressed variously in the upfill contract in terms of density/strength and stiffness requirements for both the short and long term. However, the surface of any soil will suffer degradation due to trafficking disturbance and deterioration due to moisture ingress. The extent of the degradation will be a function of the degree to which these factors have occurred and on the intrinsic characteristics of the type of material used (eg its plasticity index). The fill materials used will be susceptible to such degradation and the surface CBR and hence trafficability cannot be expected to be maintained at the design value during periods of inclement weather or from excessive, repeated loading from construction traffic.

The results of the check mexe probe testing tend to confirm the above and show that a reduced CBR value is measured where lateral restraint is not provided.

To accommodate for potential trafficability problems and degradation that may be experienced, the upper 150mm of the finished material was placed as a nominal sacrificial layer. However, actual site conditions should be ascertained at the time of construction with due regard to the proposed method of construction.

7.0 CONTAMINATION

7.1 Assessment Regime

There are no official or statutory limits on acceptable concentrations of contaminants in the ground in the UK, although the Interdepartmental Committee on the Redevelopment of Contaminated Land (ICRCL) (Reference 15) list tentative concentrations for selected contaminants in respect of the proposed end use of the site. The purpose of the guidelines is to assist in the assessment of the level of contamination and in deciding whether remedial action is required.

The ICRCL Guidelines are based on an 'end use' approach, which tailors the contamination standard to the immediate end use proposed for the site. These guidelines introduce the concept of 'trigger concentrations' where the determination of the significance of the concentration of a particular contaminant recorded in the soil is related to the following land use: domestic gardens and allotments; parks and playing fields and open space; buildings and hardcover. Domestic gardens and allotments are the most sensitive end use whilst buildings and hardcover are the least sensitive.

The trigger levels have been determined to define three ranges of concentrations:

I) Below 'threshold trigger concentration' - the land may be regarded as uncontaminated with no significant risk that hazard(s) will occur.

ii) Between 'threshold' and 'action trigger concentration' - does not automatically imply a significant risk but identifies a need to consider, based on informed judgement, whether the presence of the contamination justifies remedial action.

iii) Above 'action trigger concentration' - risk sufficiently high that the presence of contamination must be regarded as undesirable or even unacceptable and remedial action is normally essential.

The trigger concentration values given for various contaminants are given on Table 2. For the zootoxic metal contaminants which may pose a hazard to health, there are no 'action trigger concentration values' quoted. Assessment is therefore based solely on threshold trigger concentration values, although action trigger values, if produced, are likely to be significantly higher than the threshold trigger values. The values quoted are also restricted to two types of land use ie domestic gardens and allotments; and parks, playing fields and open spaces. The values applicable for commercial and industrial developments, if produced are also likely to be significantly higher. Contaminants which are phytotoxic but not normally hazardous to health also have no quoted action trigger concentrations, only a single threshold trigger concentration for any uses where plants are grown.

7.2 Soil Samples - General Survey across Plot 3

Six samples of near surface soils within or adjacent to Plot 3 were tested for a general suite of commonly occurring industrial contaminants as part of the 1995 PBA survey. The results of the testing are given on Table 2.

The results of the testing for both zootoxic and phytotoxic elements indicate concentrations below the ICRCL Guidelines for domestic gardens (ie the most stringent end use). The exception to the above is a slightly elevated level of boron recorded in the sample from 0.5m in TP95/32. This however is not considered to be significant in terms of the proposed end use of the site and the fact that areas where the sample was taken will be at least 1.5m below the finished platform level.

The results of contamination testing of soil samples from other areas of Green Park has also indicated that no significant contamination is present.

7.3 Soil Samples - Former Waste Transfer Station

Plot 3 encompasses the former Smallmead Farm and part of the former was historically used as a waste transfer station (see Figure 10). PBA carried out a contamination investigation at the former transfer station in 1996 (Reference 6).

The results of this investigation confirmed that material associated with the waste transfer station was present to depths of upto 0.8m. This material generally comprised a dark brown, gravelly sand or clay with fragments of plastic, brick, concrete, metal, wood, wire, foam and ceramics. Contamination testing was carried out on sixteen samples of the made ground (see Appendix 12) and indicated slightly elevated levels of arsenic, mercury, boron, copper, lead and zinc. Three samples of the made ground were also tested for hydrocarbons. The results of the testing did not reveal any significant levels of solvents or BTEX compounds, although slightly elevated levels of total petroleum hydrocarbons were recorded.

The material associated with the former waste transfer station was removed from the site for disposal at a suitably licenced facility prior to the placing of the platform fill material.

7.4 Groundwater

As part of the 1991 and 1995 PBA investigations (Reference 16 and 5 respectively) samples of groundwater were taken for contamination testing. The results of the testing are summarised on Table 2 and the location of the sampling points is shown on Figure 9.

The results of the analyses on the water samples have been assessed by reference to the maximum prescribed concentrations given in the Water Supply (Water Quality) Regulations (Reference 17). It should be noted that this regulation is strictly applicable only to the quality of water to be used as drinking water but, as there are no official or mandatory guidelines for the quality of groundwater in general, they are useful in giving an indication of the presence of any contamination. The maximum prescribed concentrations given in the Regulations are indicated on Table 2.

Reference has also been made to the Dutch Guidelines (Reference 18) as these are also requently referred to. The Dutch Guidelines consist of an 'S' value (also frequenty referred to as the target value or 'value to aim for') and an 'I' value (frequently known as the intervention value). It should be noted that the Dutch system is based on a multi-functional approach, that is the level of contamination is assessed relative to the most critical end use, assuming all possible exposure pathways are present, thereby implying long term flexibility in site use. The system however does not take into account the end use of the site and, as such, has been rejected by the UK Government. The Dutch also recently announced (June 1997) that they would no longer adopt the multi-functional approach but will consider the level of contamination relative to the intended site use. Their assessment range is therefore likely to be revised.

The results of the testing indicate the quality of the groundwater to be good across the whole of Green Park, with only slightly elevated levels of cadmium, chromium and iron being recorded. An elevated zinc level was also recorded in sample WS2 from the 1991 investigation. Elevated ammonia levels were also recorded in the 1991 and 1997 samples but this may be a function of the sampling techniques adopted then.

As discussed in Section 7.3, a waste transfer station was present over part of the former Smallmead Farm. As part of the 1996 PBA contamination investigation, three samples of groundwater were obtained from the trial pits and tested for a general suite of industrial contaminants and hydrocarbons. The results of the testing is contained in Appendix 12. One sample of water tested exhibited traces of iron and manganese and one sample exhibited slightly elevated levels of chloride and sulphate. These however were not considered to be significant.

Of more significance was the results of the total petroleum hydrocarbon analyses with concentrations of between 975μg/l and 149000μg/l being recorded. The results of the trial pits indicated a strong diesel odour in trial pit 2. Further work was therefore carried out in the vicinity of trial pit 2 and this identified the presence of hydrocarbon material within the made ground and gravels. The hydrocarbon contaminated soil was subsequently removed from the site and a groundwater monitoring regime was instigated to determine the extent and levels of contamination present. The location of the remediated areas and monitoring positions are shown in Figure 11.

PBA prepared a detailed report (Reference 19) on the contamination issues and monitoring carried out for this area. Extensive groundwater sampling and testing has been carried out by various companies for QA/QC purposes. The test results from two of the laboratories are contained on Table 4.

The report concludes that soil remediation has removed the primary source of hydrocarbons and that widespread hydrocarbon contamination in the groundwater is not present. Although some discrepancies exists between laboratories in the reported hydrocarbon values. It is considered that if actually present these represent isolated and localised values. Natural attenuation processes within the aquifer will reduce any residual hydrocarbons that may be present. It is considered therefore that no further remediation or monitoring work is required at the site although final confirmation will be required with the Environment Agency.

8.0 LANDFILL GAS

A number of potential sources of landfill gas are present around Green Park, namely Halls Landfill, Smallmead Landfill and former sewage works (see Figure 10). Waste Management Paper 27 (Reference 20) recommends that for a site to be developed within 250m of a landfill, a survey should be carried out to assess any potential landfill gas migration.

As plot 3 lies at distances greater than 250m of all of the potential gas sources, no specific monitoring for Plot 3 has been carried out.

The results of the monitoring carried out for the other Plots within Green Park, which started in 1991, has revealed no significant concentrations of methane throughout the monitoring period. Minor concentrations of carbon dioxide have been recorded, but these are thought to include naturally occurring levels of carbon dioxide.

No significant gas issues are envisaged for Plot 3 and no special precautions are considered to be required.

Prepared by and submitted on behalf of
Peter Brett Associates

.....	.....
Kevin Burbidge	Richard Puttock
Senior Geotechnical Engineer	Associate

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GREEN PARK READING TABLE 1
PLOT 3
IN SITU MEXE PROBE RESULTS

	MP19		MP20		MP21		MP22		MP23		MP24	
Depth (mbgl)	Mexe Probe Reading	CBR Value (%)	Mexe Probe Reading	CBR Value (%)	Mexe Probe Reading	CBR Value (%)	Mexe Probe Reading	CBR Value (%)	Mexe Probe Reading	CBR Value (%)	Mexe Probe Reading	CBR Value (%)
0.075	6	15	7	22	4	6	2.5	3	2	3	2	3
0.15	11.5	>28	7	22	7	22	4	6	4.5	7	5	8
0.225	13	>28	11	>28	10	>28	>14	>28	>14	>28	12	>28
0.3	13	>28	11.5	>28	>14	>28	>14	>28	>14	>28	13	>28
0.375	-	-	8.5	26	-	-	-	-	-	-	12	>28
0.45	10	>28	7	22	-	-	-	-	-	-	14	>28
0.575	6.5	18	4	6	4	6	6	15	1.5	2	2	3
0.65	11	13	13.5	15	11	13	>14	>16	12	14	12	14
0.725	10	12	-	-	>14	>16	>14	>16	13.5	15	12	14
0.8	>14	>16	4	7	-	-	-	-	12.5	14	>14	>16
0.875	-	-	4.5	7	3	5	-	-	4	7	-	-
0.95	-	-	5.5	8	10	12	-	-	10	12	-	-
1.075	12	14	3	5	13	14	6	8	6	8	11	13
1.15	12	14	2	4	>14	>16	-	-	>14	>16	13.5	15
1.225	10	12	4	7	-	-	3	5	-	-	>14	>16
1.3	14	16	5	8	-	-	12	14	-	-	-	-
1.375	>14	>16	5	8	-	-	7	10	-	-	-	-
1.45	-	-	10	12	-	-	13	14	-	-	-	-
East	470053		470051		470063		470036		469999		469960	
North	169888		169840		169803		169770		169739		169712	
Level	39.12		38.96		39.04		39.06		39.02		39.00	

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GREEN PARK READING TABLE 1 (Cont)
PLOT 3
IN SITU MEXE PROBE RESULTS

	MP25		MP26		MP27		MP28		MP29		MP30	
Depth (mbgl)	Mexe Probe Reading	CBR Value (%)	Mexe Probe Reading	CBR Value (%)	Mexe Probe Reading	CBR Value (%)	Mexe Probe Reading	CBR Value (%)	Mexe Probe Reading	CBR Value (%)	Mexe Probe Reading	CBR Value (%)
0.075	5	8	4.5	7	2.5	3	3.5	5	3.5	5	2	3
0.15	5	8	7	22	3	4	7	22	7.5	24	4.5	7
0.225	12	>28	11	>28	6	15	4.5	7	9	27	-	-
0.3	14	>28	-	-	>14	>28	11	>28	13.5	>28	5.5	11
0.375	>14	>28	7	22	-	-	>14	>28	13.5	>28	-	-
0.45	>14	>28	5	8	-	-	-	-	14	>28	4.5	7
0.575	10	>28	5.5	11	3	4	0.5	1	6	15	13.5	>28
0.65	>14	>16	13	14	2	4	2	4	>14	>16	7	10
0.725	6	8	>14	>16	2.5	5	4	7	-	-	10.5	12
0.8	9	11	-	-	>14	>16	4.5	7	-	-	13	14
0.875	10	12	-	-	-	-	>14	>16	-	-	>14	>16
0.95	9	11	-	-	-	-	-	-	-	-	-	-
1.075	1.5	3	12	14	9	11	8	10	>14	>16	11	13
1.15	2.5	5	10	12	>14	>16	7	10	-	-	>14	>16
1.225	-	-	7	10	-	-	13	14	-	-	>14	>16
1.3	7	10	>14	>16	-	-	>14	>16	-	-	-	-
1.375	4	7	-	-	-	-	-	-	-	-	-	-
1.45	3.5	6	-	-	-	-	-	-	-	-	-	-
East	469962		469973		469962		469950		469919		469905	
North	169756		169803		169851		169900		169936		169883	
Level	39.06		39.21		39.21		39.19		39.08		39.17	

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GREEN PARK READING TABLE 1 (Cont)
PLOT 3
IN SITU MEXE PROBE RESULTS

Depth (mbgl)	MP31		MP32		MP33		MP34		MP35			
	Mexe Probe Reading	CBR Value (%)	Mexe Probe Reading	CBR Value (%)	Mexe Probe Reading	CBR Value (%)	Mexe Probe Reading	CBR Value (%)	Mexe Probe Reading	CBR Value (%)	Mexe Probe Reading	CBR Value (%)
0.075	2.5	3	1.5	2	4	6	3	4	7	22		
0.15	6	15	3.5	5	4	6	8	25	-	-		
0.225	9.5	>28	10	>28	5	8	10	>28	6	15		
0.3	12	>28	14	>28	6.5	18	13.5	>28	-	-		
0.375	11.5	>28	>14	>28	>14	>28	8	25	-	-		
0.45	-	-	-	-	>14	>28	>14	>28	6.5	18		
0.575	2.5	3	3.5	5	4.5	7	10	>28	4	6		
0.65	3.5	6	4.5	7	12.5	14	13.5	15	7.5	10		
0.725	3.5	6	>14	>16	>14	>16	>14	>16	13	14		
0.8	6	8	-	-	-	-	-	-	12	14		
0.875	>14	>16	-	-	-	-	-	-	11.5	13		
0.95	-	-	-	-	-	-	-	-	>14	>16		
1.075	2	4	6.5	9	8.5	11	12	14	11	13		
1.15	>14	>16	-	-	11	13	12.5	14	-	-		
1.225	-	-	-	-	-	-	12	14	>14	>16		
1.3	-	-	4	7	8.5	11	>14	>16	8.5	11		
1.375	-	-	4	7	>14	>16	-	-	9	11		
1.45	-	-	5	8	-	-	-	-	8	10		
East	469909		469922		470011		470004		469992			
North	169831		169780		169833		169881		169926			
Level	39.16		39.08		39.19		39.36		39.27			

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PLOT 3 GREEN PARK
TABLE 2
CONTAMINATION TEST RESULTS - SOIL SAMPLES

Determinand	Unit	TP95/27 0.1m	TP95/27 0.2m	TP95/29 0.2m	TP95/29 0.5m	TP95/29 1.5m	TP95/32 0.5m	ICRCL Guidelines	
								Domestic Gardens	Open Space
pH	-	6.3	6.8	7.0	7.7	8.2	6.2	-	-
Electrical Conductivity	µs/cm	420	150	290	220	120	190	-	-
Arsenic	mg/kg	<5	<5	8	<5	<5	<5	10	40
Cadmium	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	3	15
Chromium	mg/kg	20	10	25	8	<5	20	600	1000
Copper	mg/kg	25	15	60	10	6	25	130	130
Lead	mg/kg	90	30	260	25	10	50	500	2000
Mercury	mg/kg	<0.5	<0.5	0.7	<0.5	<0.5	<0.5	1	20
Nickel	mg/kg	15	30	15	15	<5	25	70	70
Zinc	mg/kg	95	55	250	30	10	180	300	300
Cyanide (total)	mg/kg	<5	<5	<5	<5	<5	<5	250	1000
Phenols	mg/kg	<5	<5	<5	>5	<5	<5	5	5
Chloride	mg/kg	30	35	50	70	40	60	-	-
Nitrate	mg/kg	<10	<10	<10	<10	<10	<10	-	-
Soluble Boron	mg/kg	1.7	0.9	1.8	0.6	<0.5	4.8	3	3
Soluble Sulphate	mg/kg	<50	<50	<50	<50	<50	<50	2000	2000
Toluene Extractable Material	%	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	-	-

PLOT 3, GREEN PARK
TABLE 3
CONTAMINATION TEST RESULTS - WATER SAMPLES

Determinand	Units	WS1	WS2	WS3	WS4	Maximum Prescribed concentrations Water Supply Regulations
pH Value	-	7.1	7.3	6.9	6.8	9.5
Electrical Conductivity	μs/cm	250	685	1010	825	1500 at 20°C
Free and Saline Ammonia	mg/l	5.6	2.8	7.0	6.2	0.5
Chemical Oxygen demand	mg/l	33	34	52	49	-
Cyanide	μg/l	20	20	30	20	50
Total Phenols	mg/l	<100	<100	<100	<100	0.5
Freon Extractable Material	mg/l	<1	<1	<1	<1	-
Chloride	mg/l	20	35	105	90	400
Sulphate	mg/l	3	150	70	100	250
Arsenic	μg/l	<20	<20	<20	20	50
Cadmium	μg/l	10	10	10	<10	5
Chromium	μg/l	<50	<50	<50	<50	50
Copper	μg/l	<10	20	10	10	3000
Lead	μg/l	20	40	20	40	50
Mercury	μg/l	<1	<1	<1	<1	1
Nickel	μg/l	20	30	30	30	50
Zinc	μg/l	1700	7500	100	100	5000

Note-sampled and tested 1991

PLOT 3 GREEN PARK
TABLE 3 Con't
CONTAMINATION TEST RESULTS - WATER SAMPLES

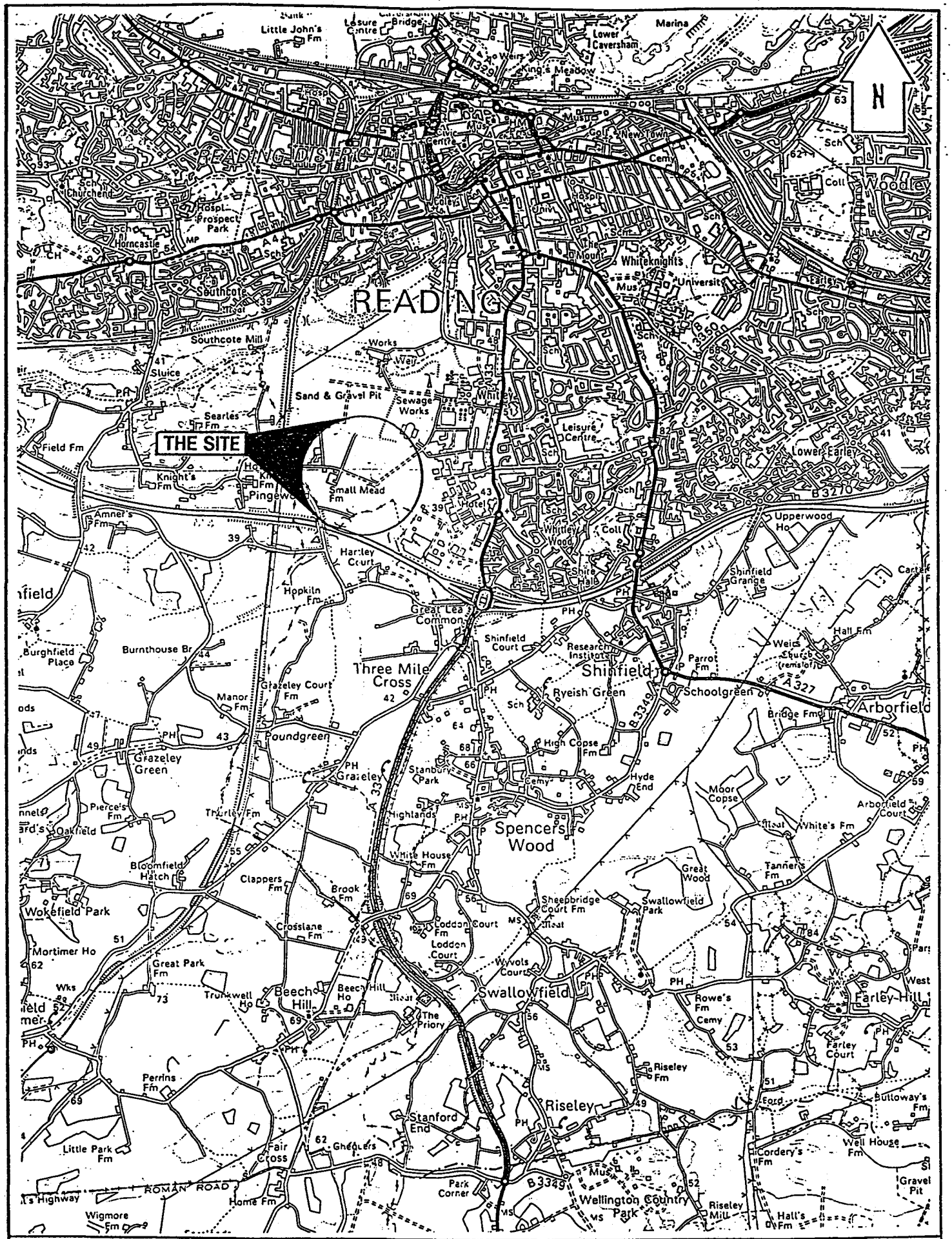
Determinand	Units	TP95/ 14	TP95/ 17	TP95/ 21	TP95/ 25	TP95/ 27	TP95/ 33	Maximum Prescribed concentrations Water Supply Regulations
pH Value	-	6.7	6.6	5.6	6.4	6.7	6.6	9.5
Electrical Conductivity	μs/cm	580	480	350	460	560	440	1500 at 20°C
Free and Saline Ammonia	mg/l	0.7	0.3	0.1	0.2	<0.1	<0.1	0.5
Chemical Oxygen demand	mg/l	40	30	50	35	30	40	-
Free and combined Cyanide	μg/l	<50	<50	<50	<50	<50	<50	50
Total Phenols	mg/l	<50	<50	<50	<50	<50	<50	0.5
Freon Extractable Material	mg/l	<1	<1	<1	<1	<1	<1	-
Kjeldahl Nitrogen	mg/l	0.9	0.4	1.0	0.9	0.6	0.6	1
Chloride	mg/l	35	30	30	45	50	40	400
Fluoride	mg/l	<1	<1	<1	<1	<1	<1	1.5
Nitrate	mg/l	<5	<5	<5	<5	40	9	50
Nitrite	mg/l	<0.1	<0.1	0.2	0.1	<0.1	<0.1	0.1
Phosphate	mg/l	<1	<1	<1	<1	<1	<1	-
Sulphate	mg/l	140	45	120	75	75	80	250
Sulphide	mg/l	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	-
Arsenic	μg/l	100	<50	<50	<50	<50	<50	50
Cadmium	μg/l	<10	<10	<10	<10	<10	<10	5
Chromium	μg/l	<50	70	70	70	60	60	50
Copper	μg/l	<50	<50	<50	<50	<50	<50	3000
Iron	μg/l	110	300	2500	700	300	350	200
Lead	μg/l	<50	<50	<50	<50	<50	<50	50
Manganese	μg/l	200	100	100	350	<50	<50	50
Mercury	μg/l	<1	<1	<1	<1	<1	<1	1
Nickel	μg/l	<50	<50	60	50	<50	<50	50
Zinc	μg/l	<50	<50	80	<50	<50	<50	5000

Note sampled and tested 1995

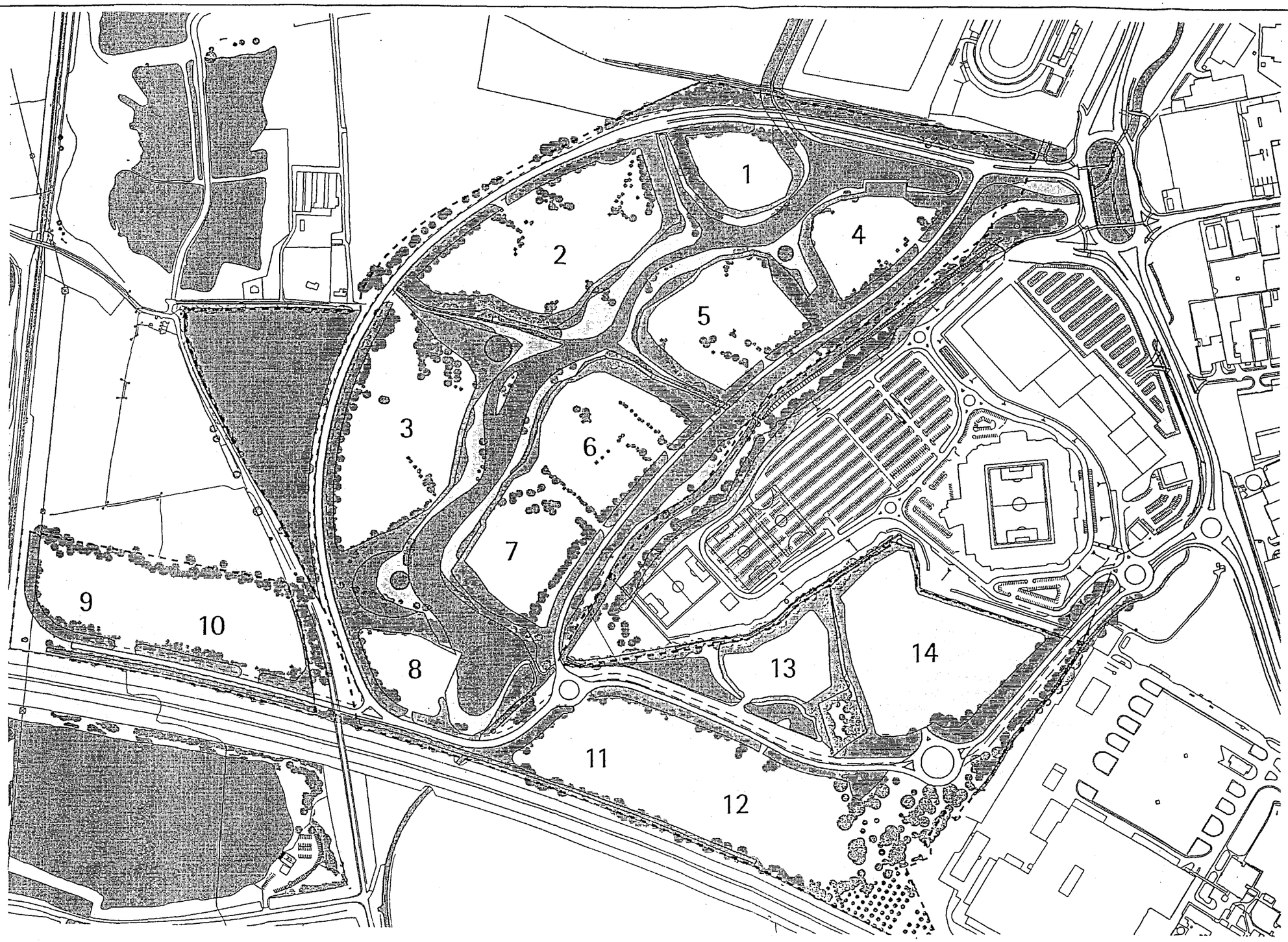
PLOT 3 GREEN PARK
TABLE 4
GROUNDWATER MONITORING - FORMER WASTE TRANSFER STATION AREA

Position	Date Sampled													
	6/6/97 Voelckers	24/6/97 Voelckers	7/8/97 Voelckers	8/9/98 Voelckers	6/10/97			20/10/97		21/11/97		27/1/98		
					Voelckers	Geochem		Voelckers	Geochem	Voelckers	Geochem	Voelcker	Geochem	
						TPH	Mineral Oil		Mineral Oil				Mineral Oil	Diesel Range
BH97/201	2760	3440	I/D	160	50	520	69	50	<10	150	322	210	<10	115
BH97/202	280	80	I/D	105	<50	984	<10	<50	<10	210	42	80	<10	106
BH97/203	970	<50	I/D	<50	I/D	I/D	I/D	-	-	-	-	-	-	-
BH97/204	665	695	190	<50	<50	1088	48	2560	<10	280	34	70	<10	117
BH97/205	570	1955	320	<50	I/D	I/D	I/D	-	-	-	-	140	<10	107
BH97/206	1735	140	<50	<50	<50	1269	123	<50	<10	310	31	80	<10	111
BH97/209	-	-	-	-	<50	1523	103	-	-	-	-	80	<10	145
BH97/210	-	-	-	-	170	350	90	2520	<10	300	33	110	<10	<10
BH97/211	-	-	-	-	1620	178	50	190	<10	340	940	150	1756	2066
BH97/212	-	-	-	-	480	78	<10	60	<10	360	44	80	<10	99
BH97/213	-	-	-	-	830	132	<10	-	-	-	-	80	<10	144
Tap Water	-	<50	50	<50	<50	14	<10	<50	<10	3350	41	60	<10	112
Spiked Sample	-	20800	5600	7375	4470	905	3940	1560	Not tested	-	1999	12340	5860	6511

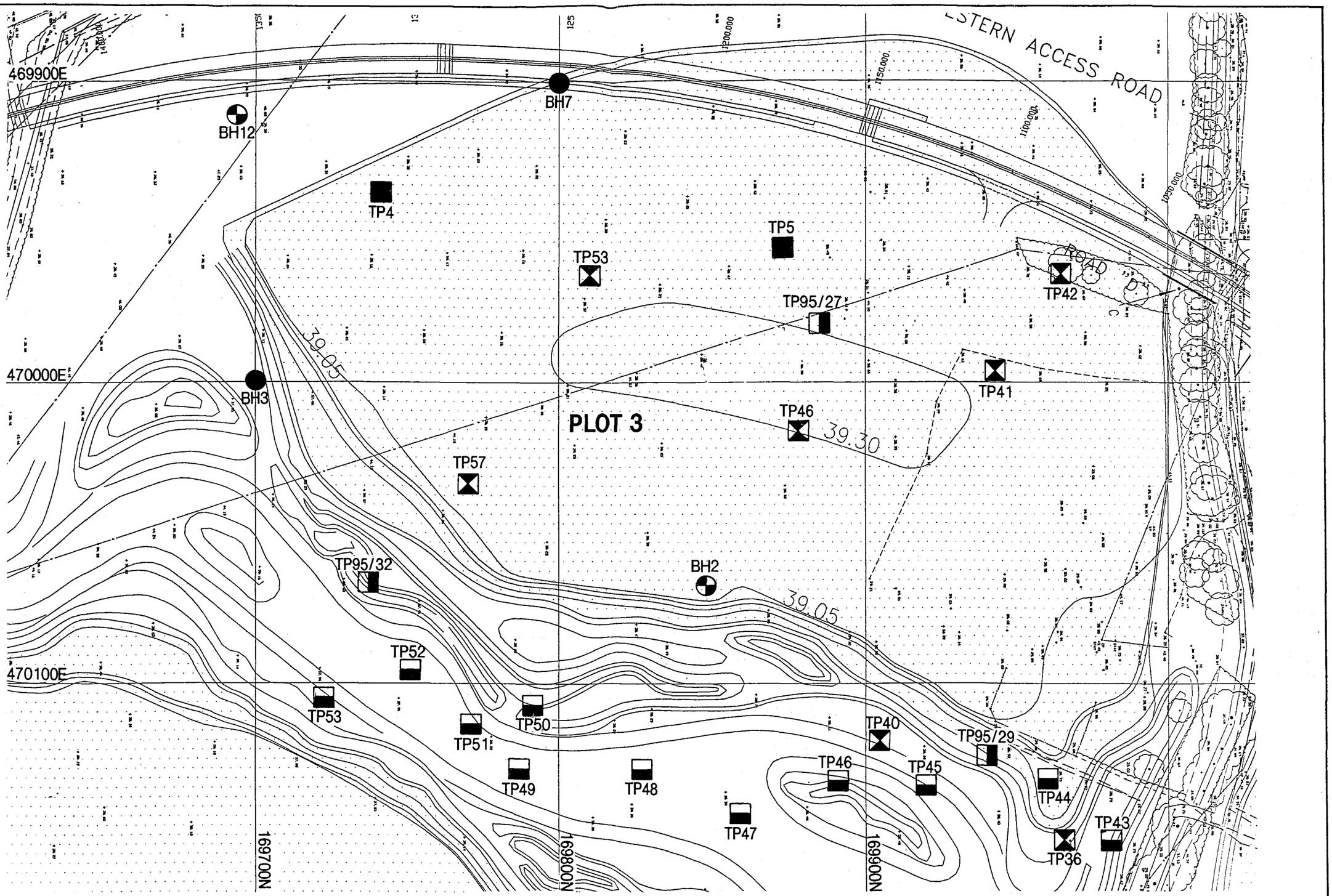
I/D - Installation Damaged (unable to take samples)



Site: Green Park, Reading – Site Location Plan			
Client: Prudential Portfolio Managers Ltd	Date: Jan 1998		Job No: 2942/815
Peter Brett Associates Consulting Engineers	By: W C-D	Checked: KD	Figure: 1



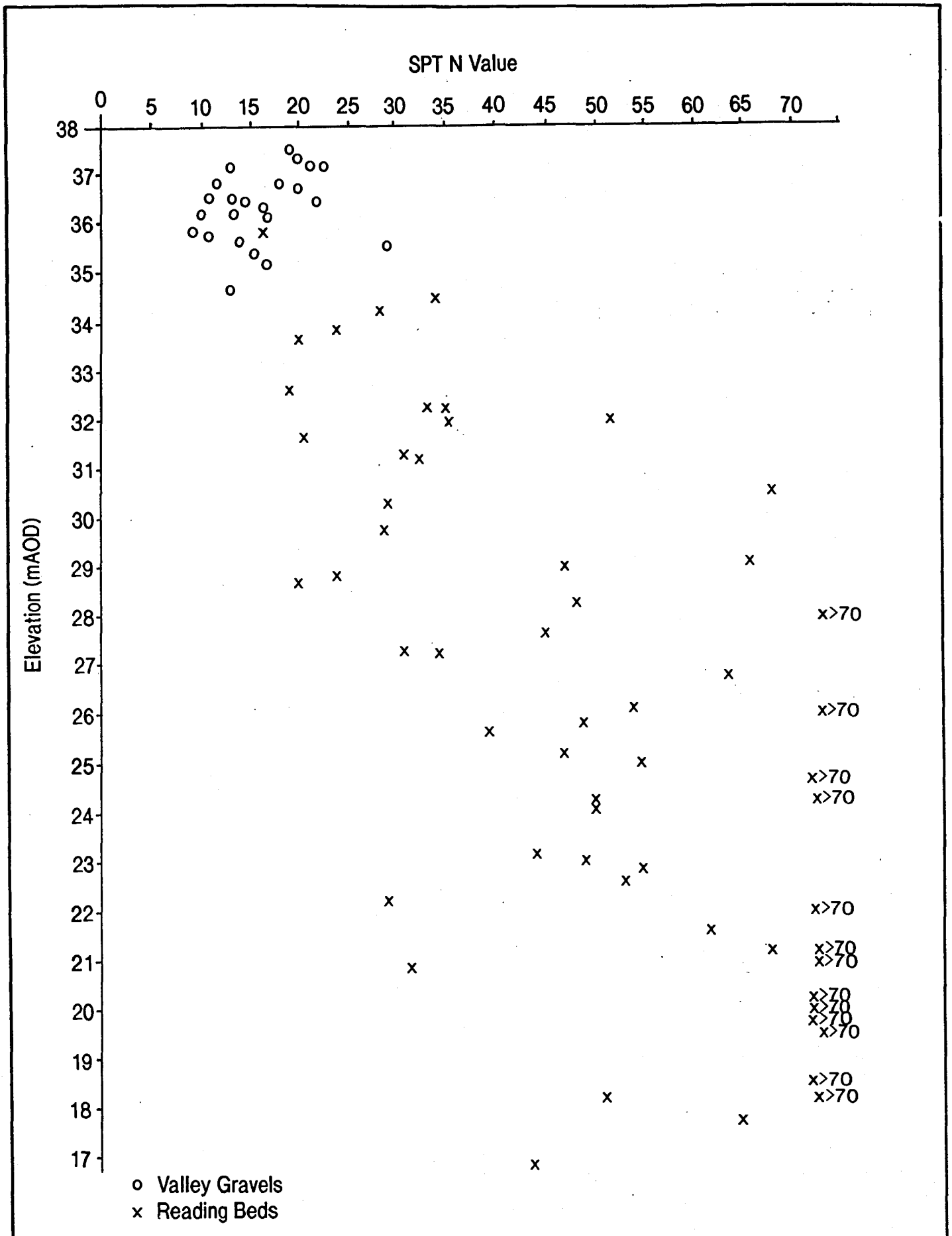
Site: Green Park, Reading – General Layout Plan			
Client: Prudential Portfolio Managers Ltd	Date: Jan 1998		Job No: 2942/815
Peter Brett Associates Consulting Engineers	By: W C-D	Checked: AB	Figure: 2



- Borehole - Tarmac 1983
- Trial Pit - Southern Testing 1985
- Borehole - FES 1988
- Trial Pit - FES 1988
- Trial Pit - PBA 1995
- Trial Pit - Amec 1995

Scale 1:1250

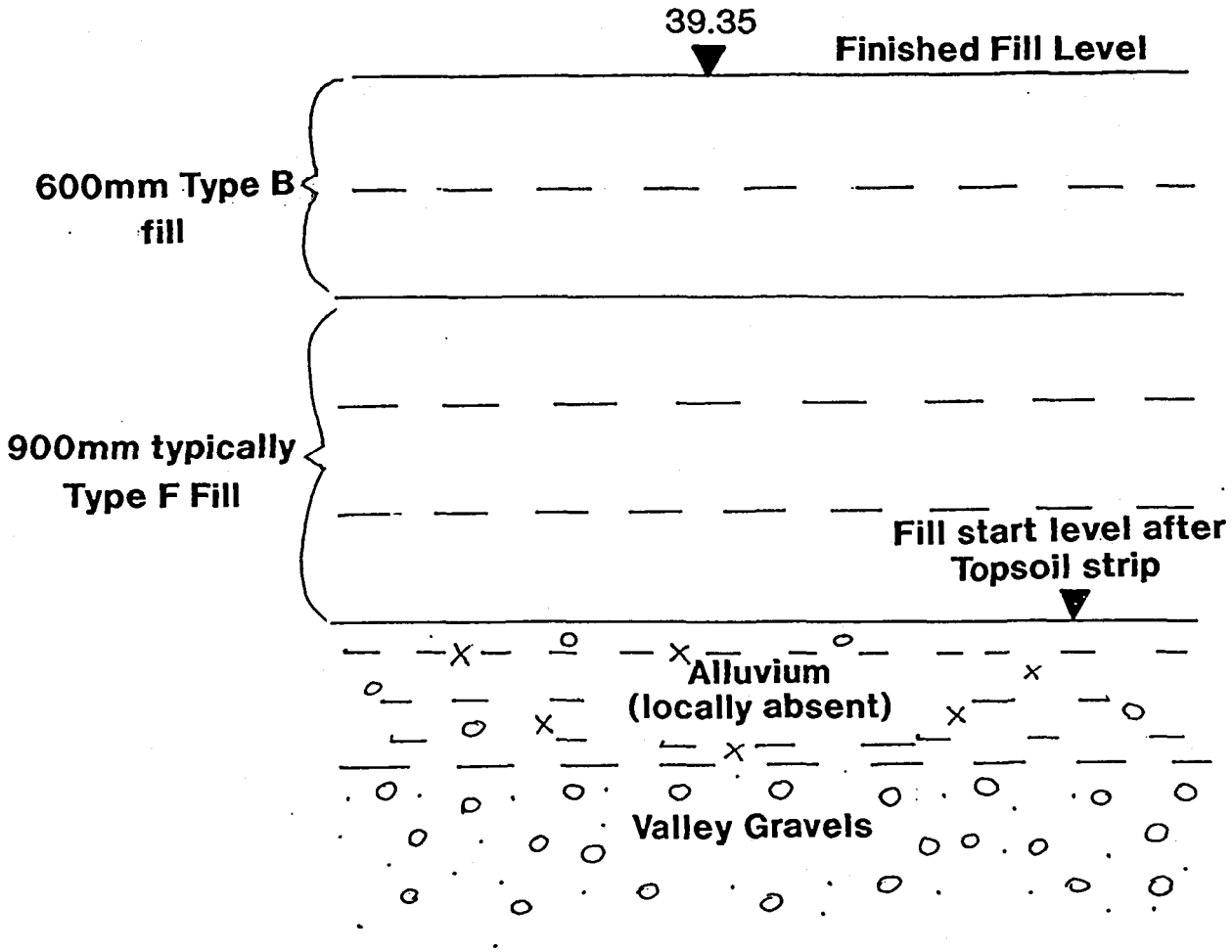
Site: Green Park - Reading Plot 3			Location of Exploratory Holes
Client: Prudential Portfolio Managers Ltd	Date: Feb 1998		Job No: 2942/815
Peter Brett Associates Consulting Engineers	By: W C-D	Checked: KB	Figure: 3



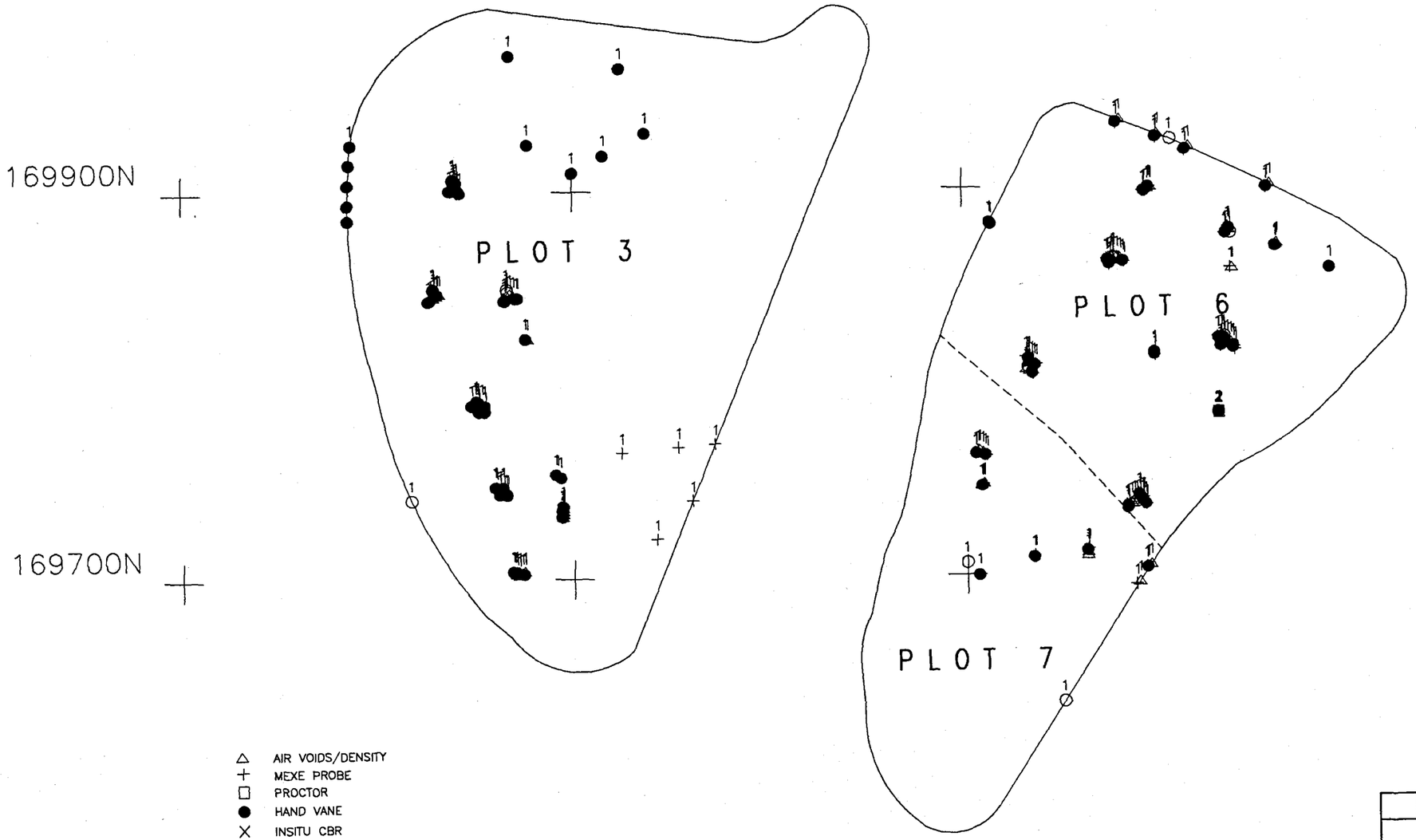
Site: Green Park, Reading Northern Sector			SPT N Value versus Elevation
Client: Prudential Portfolio Managers Ltd	Date: Feb 1998		Job No: 2942/815
Peter Brett Associates Consulting Engineers	By: W C-D	Checked: KB	Figure: 4



Site: Green Park, Reading – Location of source material for bulk filling			
Client: Prudential Portfolio Managers Ltd	Date: Jan 1998		Job No: 2942/815
Peter Brett Associates Consulting Engineers	By: W C-D	Checked: KB	Figure: 5



Site: Green Park, Reading – Typical section through platform			
Client: Prudential Portfolio Managers Ltd	Date: Jan 1998		Job No: 2942/815
Peter Brett Associates Consulting Engineers	By: W C-D	Checked: KD	Figure: 6



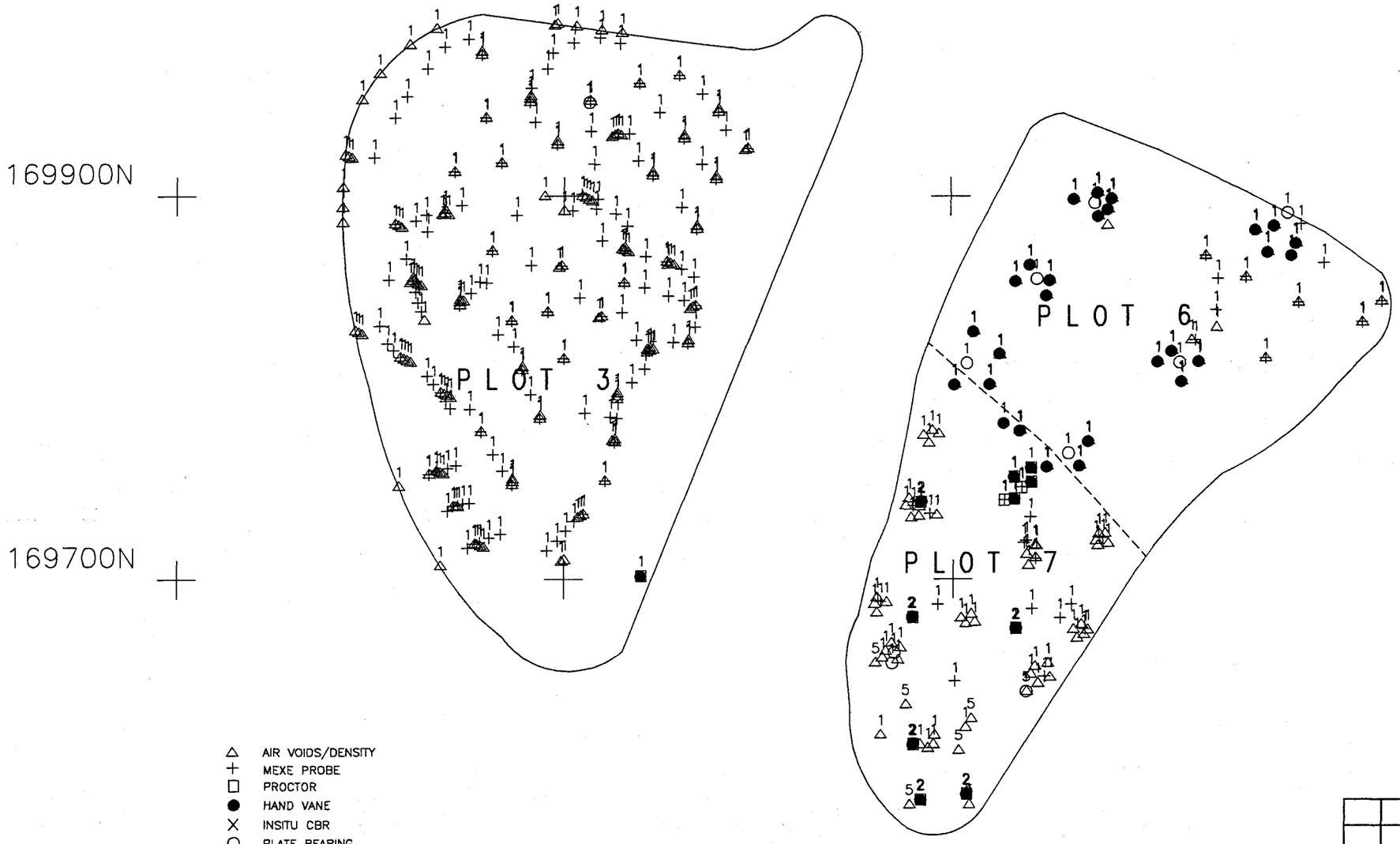
Mark	Revision	Chkd	Date	Drawn
	First issue		Feb 1998	ljj

GREEN PARK, READING
LOCATION OF
COMPLIANCE TESTS
LAYER 1

pba
peter brett associates
CONSULTING ENGINEERS
16 WESTCOTE ROAD READING BERKSHIRE RG30 2DE TEL 0118 950 0761 FAX 0118 959 7498

Scales 1:2500
Machine Ref. J:\02942\B15\CAD
Cad Ref. FIG7A.DWG

Figure No. 7a



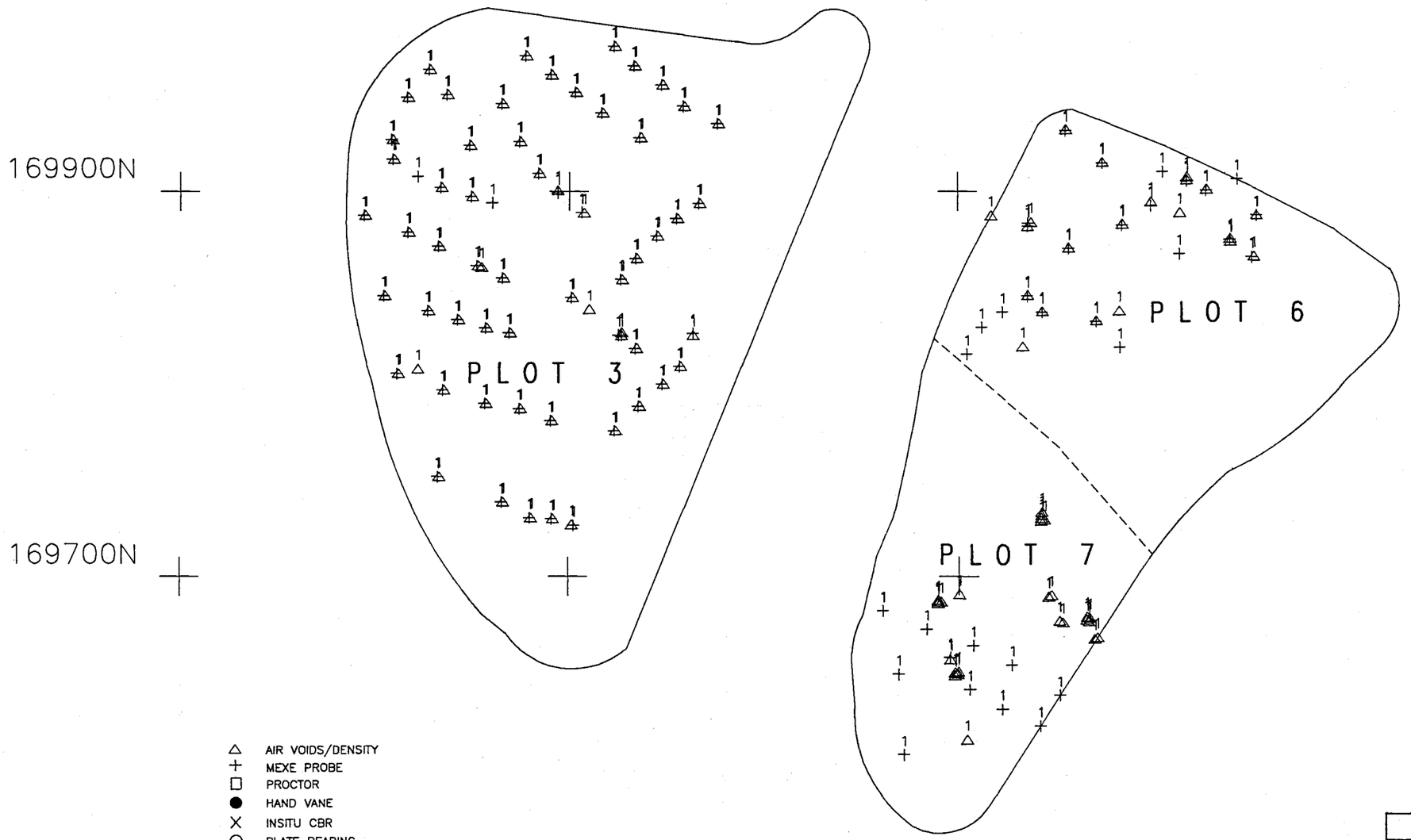
Mark	Revision	Chkd	Date	Drawn
	First Issue		Feb 1998	ljj

GREEN PARK, READING
LOCATION OF
COMPLIANCE TESTS
LAYER 2

pba
peter brett associates
CONSULTING ENGINEERS
16 WESTCOTE ROAD READING BERKSHIRE RG30 2DE TEL 0118 950 0761 FAX 0118 959 7498

Scales 1:2500
Machine Ref. J:\02942\815\CAD
Cad Ref. FIG7B.DWG

Figure No.
7b



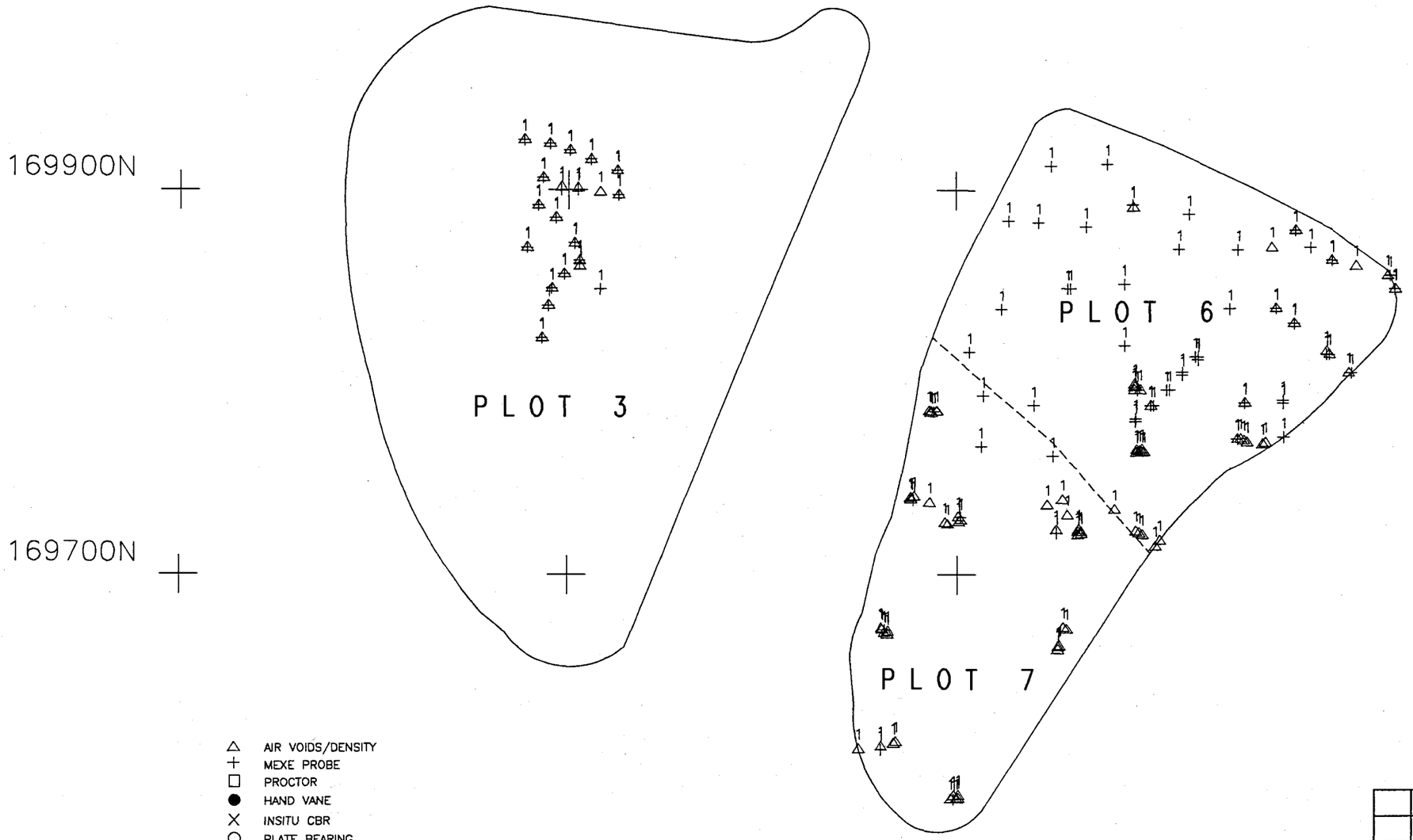
Mark	Revision	Chkd	Date	Drawn
	First Issue		Feb 1998	lj

GREEN PARK, READING
LOCATION OF
COMPLIANCE TESTS
LAYER 3

pba
peter brett associates
CONSULTING ENGINEERS
16 WESTCOTE ROAD READING BERKSHIRE RG30 2DE TEL 0118 950 0761 FAX 0118 959 7498

Scales	1:2500
Machine Ref.	J:\02942\815\CAD
Cad Ref.	FIG7C.DWG

Figure No. 7c



Mark	Revision	Chkd	Date	Drawn
	First Issue		Feb 1998	lij

GREEN PARK, READING
LOCATION OF
COMPLIANCE TESTS
LAYER 4

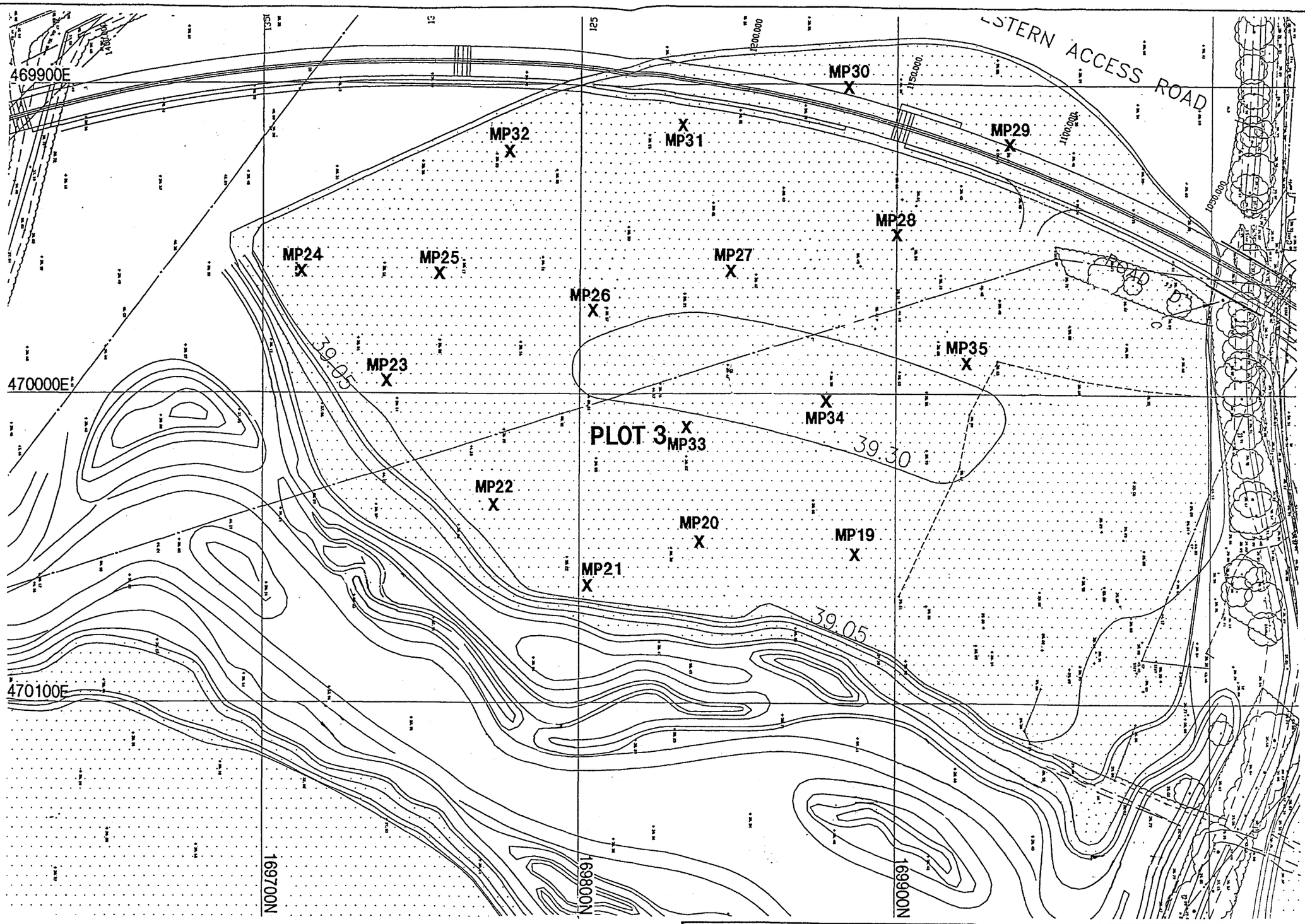
pba
peter brett associates
CONSULTING ENGINEERS
16 WESTCOTE ROAD READING BERKSHIRE RG30 2DE TEL 0118 950 0761 FAX 0118 959 7498

Scales 1:2500

Machine Ref. J:\02942\815\CAD

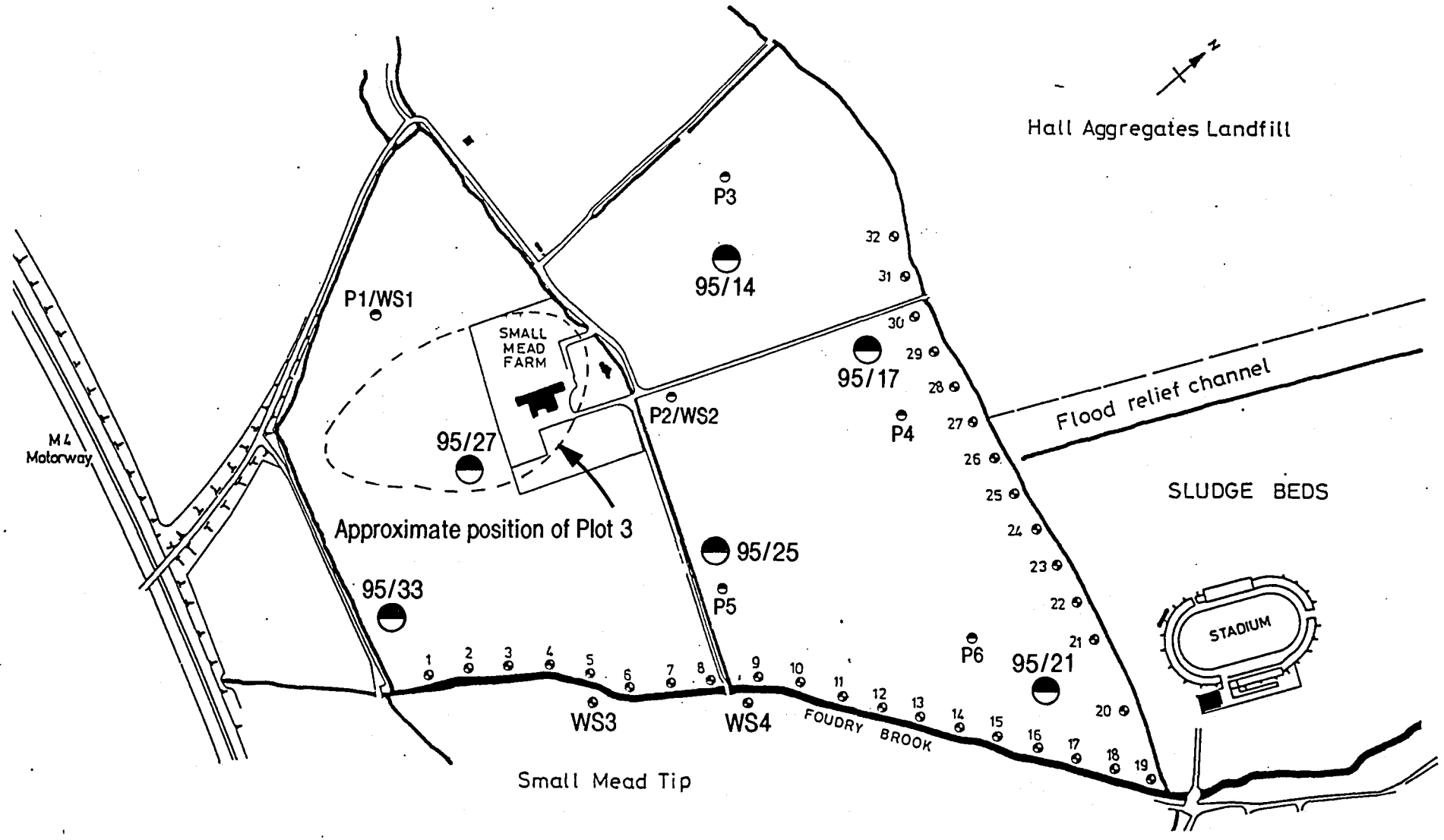
Cad Ref. FIG7D.DWG

Figure No. 7d



Site: Green Park – Reading Plot 3			Position of Check Mexe Probes
Client: Prudential Portfolio Managers Ltd		Date: Sept 1998	Job No: 2942/815
Peter Brett Associates Consulting Engineers	By: W C-D	Checked: KB	Figure: 8

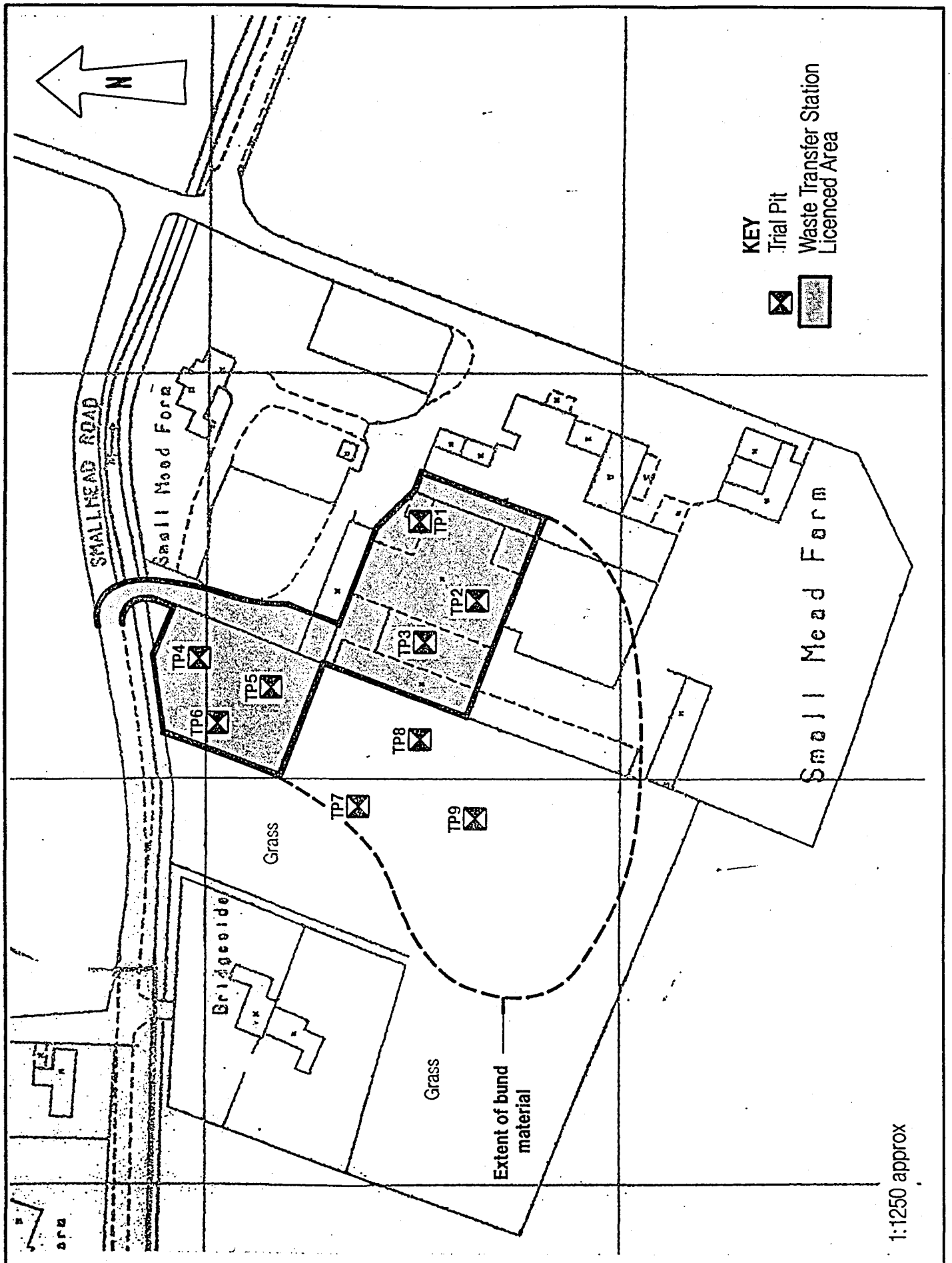
Scale 1:1250



Gas Monitoring Position

Groundwater Sampling Position

Site: Green Park, Reading - Monitoring Positions			
Client: Prudential Portfolio Managers Ltd	Date: Feb 1998		Job No: 2942/815
Peter Brett Associates Consulting Engineers	By: W C-D	Checked: KB	Figure: 9



Site: Green Park, Reading – Location of Former Waste Transfer Station			
Client: Prudential Portfolio Managers Ltd	Date: Feb 1998		Job No: 2942/845
Peter Brett Associates Consulting Engineers	By: W C-D	Checked: KB	Figure: 10

APPENDIX 1

BOREHOLE LOGS

BH 1

0.0 - 0.15 Topsoil/Subsoil
0.15- 4.50 Gravel/Sand
4.50- 5.0 Clay
5.0 - 6.0 Gravel/Sand
6.0 - 7.5 Blue Clay
GWL 0.7 m

BH 2

0.0 - 0.15 Topsoil/Subsoil
0.15- 3.0 Gravel/Sand
3.0 - 3.5 Sandy Clay
3.5 - 4.5 Clay

GWL 0.9 m

BH 3

0.0 - 0.15 Topsoil/Subsoil
0.15- 2.10 Gravel/Sand
2.10- 4.5 Clay
GWL 1.0 m

BH 4

0.0 - 0.25 Topsoil/Subsoil
0.25- 0.95 Clay
0.95- 2.0 Gravel/Sand
2.0 - 3.0 Grey Clayey Sand
GWL 0.9 m

BH 5

0.0 - 0.40 Topsoil/Subsoil
0.40- 0.90 Gravel/Sand
0.90- 1.50 Clay
GWL 0.9 m

BH 6

0.0 - 0.45 Topsoil/Subsoil
0.45- 2.0 Gravel/Sand
2.0 - 3.0 Clay
GWL 0.6 m

BH 7

0.0 - 0.3 Topsoil/Subsoil
0.3 - 2.70 Gravel/Sand
2.70- 4.5 Clay
GWL 1.0 m

BH 8

0.0 - 0.3 Topsoil/Subsoil
0.3 - 2.0 Gravel/Sand
2.0 - 2.5 Sandy Clay
2.5 - 3.0 Clay
GWL 0.7 m

BH 10

0.0 - 0.1 Topsoil
0.1 - 3.15 Gravel/Sand
3.15- 4.15 Red green clay
4.15- 6.0 Grey Clay
GWL 0.6 m

BH 11

0.0 - 0.3 Topsoil/Subsoil
0.3 - 1.5 Clay
1.5 - 3.0 Gravel/Sand
3.0 - 4.5 Clay
GWL 1.0 m

BH 12

0.0 - 0.2 Topsoil/Subsoil
0.2 - 1.5 Clay
1.5 - 3.0 Gravel/Sand
3.0 - 4.5 Sandy Clay
GWL 1.0

BH 13

0.0 - 0.15 Topsoil/Subsoil
0.15- 3.25 Gravel/Sand
3.25- 3.55 Red green Clay
3.55- 4.5 Gravel/Sand
4.5 - 6.0 Clayey Sand
GWL 1.0

BH 14

0.0 - 0.3 Topsoil/Subsoil
0.3 - 0.74 Clay/Gravel
0.75- 2.85 Gravel/Sand
2.85- 3.0 Clay
GWL 0.74

BH 15

0.0 - 0.43 Topsoil/Subsoil
0.43- 2.50 Gravel/Sand
2.50- 3.0 Clay
GWL 0.9

BH 16

0.0 - 0.3 Topsoil/Subsoil
0.3 - 2.5 Gravel/Sand
2.5 - 3.0 Clayey Sand

BH 17

0.0 - 0.4 Topsoil/Subsoil
0.4 - 2.5 Gravel/Sand
2.5 - 3.0 Clay

GWL 0.6 m

BH 18

0.0 - 0.3 Topsoil/Subsoil
0.3 - 2.5 Gravel/Sand
2.5 - 3.0 Clay

GWL 0.6 m

BH 19

0.0 - 0.3 Topsoil/Subsoil
0.3 - 2.5 Gravel/Sand
2.5 - 3.0 Clay

GWL 0.8 m

APPENDIX 2

EXCAVATION METHOD

CLIENT PETER BRETT ASSOCIATES

TEST HOLE LOG

JOB NO. 2248

SITE LOCATION KENNET VALLEY, READING

O.S. REFERENCE SU 705703 DATE /4/85

T.H. No. 1

Water Strikes 1m.

Standing Water Level: 1.3m after 5 minutes

Penetration Value Blows per 300mm or U.C.S. kN/m²	Sample Type or Test Type	Thickness m/mm	Depth m/mm	Key	DESCRIPTION & REMARKS
		250	250		TOPSOIL — Brown clay with rootlets
		300	550		CLAY — Firm pale grey and rust mottled plastic clay
	C	250	800		CLAY — Firm dark blue grey fissured plastic clay with many flints.
32			1.4		SANDY GRAVEL — Loose/medium dense brown clean sandy sub angular fine-coarse flint gravel. Lense of soft/firm dark blue grey and brown sandy silty clay with scattered flints ('buried channel')
	B	1.6			
11	+				
5* for 150mm	⊗ B		2.4		

Land-drain at 900mm.
Gravel collapsing as dug preventing further penetration.
Hole backfilled on completion

T.H. No. 2

Water Strikes 1m

Standing Water Level: 1.3m after 5 minutes

Penetration Value Blows per 300mm or U.C.S. kN/m²	Sample Type or Test Type	Thickness m/mm	Depth m/mm	Key	DESCRIPTION & REMARKS
		250	250		TOPSOIL
	B	350			CLAY — Brown and rust mottled plastic silty clay
130	⊥	300	600		CLAY — Firm dark blue grey and orange mottled plastic silty clay
18	B		900		SANDY GRAVEL — Medium dense whitish, pale grey clean gravel with seams of orange, rust sandy clay/clay sand with flints at 1m. and 1.10m.
18		1.1			
19	+				
27	B		2.0		

Fast inflow from land drain at 1m.
Running gravel. Sides collapsing as dug preventing further penetration (hole size approximately 3m. x 2m.).
Hole backfilled on completion.

T.H. No. 3

Water Strikes 1.20m

Standing Water Level: Backfilled

Penetration Value Blows per 300mm or U.C.S. kN/m²	Sample Type or Test Type	Thickness m/mm	Depth m/mm	Key	DESCRIPTION & REMARKS
		150	150		TOPSOIL
		350			CLAY — Firm grey and dark brown silty clay with flints
		350	500		SANDY GRAVEL — Loose pale brown and grey sandy fine - medium flint gravel
		300	800		SANDY GRAVEL — Loose/medium dense grey sandy fine - medium flint gravel
18	B				
		1.2			
13	+				
14	B		2.0		
16					
18					
5* for 150mm					

Running gravels, sides collapsing as dug preventing further penetration

T.H. No. 4

Water Strikes

Standing Water Level:

Penetration Value Blows per 300mm or U.C.S. kN/m²	Sample Type or Test Type	Thickness m/mm	Depth m/mm	Key	DESCRIPTION & REMARKS
		250	250		TOPSOIL — Brown silty clay
	B	350			CLAY — Firm brown and orange brown silty clay. Becomes blue grey at depth
		200	600		SANDY GRAVEL — Orange brown and grey clayey sandy gravel
			800		SANDY GRAVEL — Medium dense grey sandy fine - medium sub angular flint gravel with soft grey silty pockets
16	B				
27		1.4			
28					
25	B		2.2		
		500			SANDY GRAVEL — Medium dense yellow, orange brown and grey sandy gravel
			2.7		
	⊗	300			CLAY — Firm/stiff blue grey brown mottled very silty clay
	+		3.0		

Sides collapsing from surface, but not as severe as previous holes

▽ PERTH PENETRATION TEST
O DISTURBED SAMPLE
Ⓑ BULK SAMPLE
⊗ WATER SAMPLE

SAMPLE DEPTHS ARE DRAWN TO SCALE

▼ STANDARD PENETRATION TEST
□ UNDISTURBED SAMPLE
⊥ U.C.S. =UNCONFINED COMPRESSION STRENGTH BY HAND PENETROMETER MEASURED IN kN/m2
V VANE TEST . COHESION GIVEN IN kN/m2

Engineer PRB

EXCAVATION METHOD

CLIENT PETER BRETT ASSOCIATES

TEST HOLE LOG

JOB NO. 2248

SITE LOCATION KENNET VALLEY, READING

O.S. REFERENCE SU 705703 DATE /4/85

T.H. No. 5

Water Strikes 1.2m

Standing Water Level: Surface

Penetration Value Blows per 300mm or U.C.S. kN/m²	Sample Type or Test Type	Thickness m/mm	Depth m/mm	Key	DESCRIPTION & REMARKS
		480			TOPSOIL Dark grey brown very silty clay, rootlets
		200	480		CLAY Firm dark brown grey silty clay with occasional flints
			680		SANDY GRAVEL Medium dense pale yellow brown and grey brown very sandy fine-medium sub-angular flint gravel
13	B	980			
21		+	1.5		
28					
17					
16					Fast inflow from land drain at 1.20m.
19					

T.H. No. 6

Water Strikes 1.1m

Standing Water Level: 1.4m after 5 minutes

Penetration Value Blows per 300mm or U.C.S. kN/m²	Sample Type or Test Type	Thickness m/mm	Depth m/mm	Key	DESCRIPTION & REMARKS
		250			
	D		250		TOPSOIL Brown silty clay
		550			CLAY Firm grey brown and rust mottled slightly sandy silty clay
			800		
6	B				SANDY GRAVEL Loose/medium dense grey and yellow brown silty sandy flint gravel. Becomes clean grey brown yellow brown sandy fine-medium sub angular flint gravel at depth
		1.2			
16		+			
21	B				
17			2.0		
13					
6* for 150mm					Sides collapsing as dug preventing further penetration. Pit size 3m. x 2m. on completion

T.H. No. 7

Water Strikes 1.3m

Standing Water Level: Backfilled

Penetration Value Blows per 300mm or U.C.S. kN/m²	Sample Type or Test Type	Thickness m/mm	Depth m/mm	Key	DESCRIPTION & REMARKS
		350			TOPSOIL Black silty clay
		200	350		CLAY Brown, grey, rust mottled silty clay
		200	550		SANDY GRAVEL Orange, yellow silty sandy gravel
		250	750		SANDY GRAVEL Pale grey, brown very sandy gravel
12	B		1.0		
		300			SANDY GRAVEL Medium dense orange slightly silty sandy flint gravel
			1.3		
14					SANDY GRAVEL Medium dense brown silty sandy flint gravel
28		1.8			
22	B	+			
29			2.3		
24					
					Sides unstable
					Black plastic water pipe (25mm.) exposed in side of pit at about 700mm.

T.H. No. 8

Water Strikes 1.4m.

Standing Water Level: Backfilled

Penetration Value Blows per 300mm or U.C.S. kN/m²	Sample Type or Test Type	Thickness m/mm	Depth m/mm	Key	DESCRIPTION & REMARKS
		300			TOPSOIL Black silty topsoil
		200	300		CLAY Firm dark blue grey rust mottled sandy clay with flints
		200	500		CLAY Firm buff, orange sandy clay (silt in off side)
	C		700		SANDY GRAVEL Loose/medium dense pale brown, pale grey sandy gravel
10	B				
		800			
19					
			1.5		SANDY GRAVEL Medium dense orange rust silty sandy gravel
28		400			
17*			1.9		SANDY GRAVEL Medium dense dark brown silty sandy gravel with organics
		700			
	B		2.6		
	B	100	2.7		SILT Firm pale grey silt
					CLAY Firm pale blue, yellow brown and red mottled plastic clay, silty at depth.
	B	900			
		+			
	B		3.6		
					Gravels slightly more stable but sides collapsed when hole at 2.7m.

▽ PERTH PENETRATION TEST

O DISTURBED SAMPLE

Ⓑ BULK SAMPLE

⊗ WATER SAMPLE

SAMPLE DEPTHS ARE DRAWN TO SCALE

▼ STANDARD PENETRATION TEST

□ UNDISTURBED SAMPLE

⊥ U.C.S. =UNCONFINED COMPRESSION STRENGTH BY HAND PENETROMETER MEASURED IN kN/m2

V VANE TEST . COHESION GIVEN IN kN/m2

Engineer PRB

APPENDIX 3

RECORD OF BOREHOLE No: 2

START DATE 2ND JUNE 1988
CASING DETAILS 200mm to 12.60m, 150mm to 20.00m
SHEET 1 OF 2
DRILLING METHOD CABLE PERCUSSION
BOREHOLE DIA 200mm to 12.60m, 150mm to 20.00m
ORIENTATION VERTICAL
CO-ORDINATES
EQUIPMENT PILCON WAYFARER
DRILL FLUID
E.. 2075.5 N 2846.5
GROUND LEVEL 38.79 m O D

Date & Time	Casing Depth (m)	Water Level-m (Flush Return%)	SAMPLE/CORE RECOVERY Depth (m)	Type Total %	No ROD (SCR)	Core Size	Fracture	DESCRIPTION OF STRATA	Depth -m (Thickness)	Level (m O D.)	Strata Symbol
2/6 08.00								MADE GROUND: Soft mid to dark brown silty sandy (fine to medium) clay with abundant angular fine to medium flint gravel and brick fragment.	(1.45)		
			0.50	D	1						
			1.00	D	2						
			S(23)								
			1.00	B	3						
			1.50	D	4				1.45	37.34	
								Medium dense brown sandy (coarse) angular, occasional sub-rounded to sub-angular fine to medium flint GRAVEL.			
			2.00	D	5						
			S(12)								
			2.00	B	6				(1.75)		
			2.50	D	7						
			3.00	D	8						
			S(17)								
			3.00	B	9				3.20	35.59	
			3.50 - 3.95 (0.40m rec)	U	10			Firm blue grey mottled red fissured very silty CLAY with occasional inclusions of brown organic meterial. (READING BEDS)			
			4.00	D	11						
			4.50 - 4.95 (0.40m rec)	U	12			becoming hard below about 5m depth.			
			5.00	D	13						
			5.50	D	14						
			6.00 - 6.45 (0.40m rec)	U	15						
			6.50	D	16				(9.40)		
			7.00	D	17						
			7.50 - 7.95 (0.40m rec)	U	18						
			8.00	D	19						
			8.50	D	20						
			9.00 - 9.45 (0.40m rec)	U	21						
18.00 2/6 2/6 08.00	9.50		9.50	D	22						

REMARKS:

Groundwater was encountered at 2.30m rising to 2.03m after 30 minutes, also encountered at 12.60m rising to 5.40m after 30 minutes.
Water was added to assist boring through the gravel to 3.2m.
On completion of boring the borehole was backfilled with clay arisings to 3.00m, with a standpipe installed at 2.50m with a gravel filter, from 3.00m to 2.00m and backfilled with clay arisings from 2.00m and a stopcock cover installed at ground level.

SCALE 1 : 50 (When reduced to A4)

Logged by ..... Date
Checked by .....
Approved by .....

FOUNDATION & EXPLORATION SERVICES

READING BUSINESS PARK

CONTRACT No: 910

FIGURE: 80

RECORD OF BOREHOLE No: 2

START DATE 2ND JUNE, 1988 | CASING DETAILS 200mm to 12.60m, 150mm to 20.00m | SHEET 2 OF 2

DRILLING METHOD CABLE PERCUSSION | BOREHOLE DIA. 200mm to 12.60m, 150mm to 20.00m | ORIENTATION VERTICAL

EQUIPMENT PILCON WAYFARER | DRILL FLUID: | CO-ORDINATES E N | GROUND LEVEL 38.79 mOD

Date & Time	Casing Depth (m)	Water Level-m (Flush Return %)	SAMPLE/CORE RECOVERY Depth (m)	Type	No	ROD (SCR)	Core Size	Fracture	DESCRIPTION OF STRATA	Depth -m (Thickness)	Level (mOD)	Strata Symbol
			10.00	D	23				CONTINUED FROM SHEET 1 OF 2			
			10.50 - 10.95 (0.40m rec.)	U	24							
			11.00	D	25					(9.40)		
			11.50	D	26							
			12.00 - 12.45 (0.40m rec.)	U	27							
			12.50	D	28					12.60	26.19	
		+	13.00	D	29				Mid brown clayey silty fine SAND.	(0.80)		
			13.50 - 13.95 (0.35m rec.)	U	30				Stiff dark blue grey mottled red fissured silty CLAY.	13.40	25.39	
			14.00	D	31					(1.45)		
			14.50	D	32					14.85	23.94	
			15.00 S(56)	D	33				Very stiff and hard dark grey thinly laminated fissured silt CLAY with occasional silt parting and occasional shell fragments.			
			15.50	D	34							
			16.00	D	35							
			16.50 - 16.95 (0.35m rec.)	U	36							
			17.00	D	37				Polished fissured fissure surfaces at 17.00m.	(5.15) +		
			17.50	D	38							
			18.00 S(52)	D	39							
			18.50	D	40							
			19.00	D	41							
			19.50 - 19.95 (0.35m Rec.)	U	42							
3/6 18.00	20.00	10.50	20.00	D	43					20.00	18.79	

END OF BOREHOLE

REMARKS:

Logged by	Date
Checked by	
Approved by	

SCALE 1 : 50 (When reduced to A4)

FOUNDATION & EXPLORATION SERVICES

READING BUSINESS PARK

CONTRACT No: 910

FIGURE: 81

RECORD OF BOREHOLE No: 12

START DATE: 6TH JUNE 1988 | CASING DETAILS: 150mm to 5.00m | SHEET 1 OF 1

TYPE OF BORING: CABLE PERCUSSION | BOREHOLE DIA: 150mm to 5.50m | ORIENTATION VERTICAL

EQUIPMENT: PILCON WAYFARER | DRILL FLUID: | CO-ORDINATES E 1903.0 N 2672.0

GROUND LEVEL: 38.44

Date & Time	Casing Depth (m)	Water Level -m (Flush Return)	SAMPLE/CORE RECOVERY Depth (m)	Type	No	Core Size	Fracture	DESCRIPTION OF STRATA	Depth -m (Thickness)	Level (m OD)	Strata Symbol
				Total %	RQD (SCR)						
6/6								GRASS and STONEY TOPSOIL (Drillers Description)	(0.20) 0.20	38.24	
			0.50	D	1			Soft to firm orange brown silty sandy (fine) CLAY with frequent fine, occasionally medium, flint gravel and with laminae and pockets of dark brown silty clay.	(1.10)		
			1.00 - 1.45 (0.30m Rec)	U	2				1.30	37.14	
			1.50	D	3			Medium dense mid brown sandy (coarse) sub rounded to angular fine to coarse flint GRAVEL			
			2.00 C(22)	B	4				(2.10)		
			2.50	D	5						
			3.00 C(16)	B	6						
			3.50 - 3.95 (0.40m rec.)	U	7				3.40	35.04	
			4.00	D	8			Firm to stiff grey brown mottled grey fissured silty CLAY with pockets of fine grey sand and polished fissures.	(0.70)		
			4.50 C(14)	D	9			Medium dense brown silty fine to medium, occasionally coarse SAND.	4.10	34.34	
			5.00	B	10				(1.40) +		
6/6			5.50	D	11				5.50	32.94	
								END OF BOREHOLE			

REMARKS:

Groundwater was encountered at 2.50m, rising to 2.10m after 30 minutes
On completion of boring the borehole was backfilled with arisings.

SCALE 1 : 50 (When reduced to A4)

FOUNDATION & EXPLORATION SERVICES

READING BUSINESS PARK

CONTRACT No: 910

FIGURE: 100

RECORD OF TRIAL PIT No:- 36.

Location : READING BUSINESS PARK
Contract No. : 910
Method of Excavation : JCB 3C
Date of Excavation : 19/5/88

Dimensions of Pit : 1.00M X 2.20M
Ground Level : 38.50 m.O.D.

In-Situ Tests		SAMPLES			STRATA			DESCRIPTION OF STRATA
Depth	Type	Depth	Type	No.	Legend	Depth	Thickness	
						0.40	0.40	Dark brown, sandy TOPSIL with occasional fine to medium gravel.
						1.10	0.70	Orange brown and pale grey mottled slightly clayey, very silty, fine SAND to very sandy SILT.
						3.20	2.10+	Brown, coarse SAND and fine to medium, angular to sub-angular GRAVEL becoming below 1.60m sandy to very sandy (coarse), fine to medium, occasionally coarse, angular GRAVEL.
								END OF PIT

FIGURE: 139

Remarks:-
1. Groundwater was encountered at 1.70m.
2. The trial pit was unstable below 0.90m.

SCALE 1 : 25

FOUNDATION & EXPLORATION SERVICES

RECORD OF TRIAL PIT No:- 40

Location : READING BUSINESS PARK
Contract No. : 910
Method of Excavation : JCB 3C
Date of Excavation : 19/5/88

Dimensions of Pit : 1.00M X 2.30M
Ground Level : 38.65 m.O.D.

In-Situ Tests		SAMPLES			STRATA			DESCRIPTION OF STRATA
Depth	Type	Depth	Type	No.	Legend	Depth	Thickness	
						0.50	0.50	Firm/friable, dark brown/black, silty, sandy TOPSOIL with occasional fine to medium angular gravel and brick fragments.
0.60 m 54, 62, 66kPa	VN	0.60	D	1				Firm, brown becoming orange brown, sandy, silty CLAY.
0.80 m 82, 77, 73kPa	VN	0.90	Core Cutter	2				
1.10 m 58, 64, 48kPa	VN					1.20	0.70	
								Light brown, coarse SAND and fine to medium, angular GRAVEL.
		1.80	W	3				becoming below 1.80m, sandy to very sandy (coarse), fine to medium, occasionally coarse, angular GRAVEL.
		2.00	B	4				
						2.60	1.40+	
								END OF PIT

FIGURE: 143

Remarks:- 1. Groundwater was encountered at 1.80m.
2. The trial pit was unstable below 1.10m.

SCALE 1 : 25

FOUNDATION & EXPLORATION SERVICES

RECORD OF TRIAL PIT No:- 41

Location : READING BUSINESS PARK
Contract No. : 910
Method of Excavation : JCB
Date of Excavation : 18/5/88

Dimensions of Pit : 1.00M X 2.30M
Ground Level : 38.48 m.O.D.

In-Situ Tests		SAMPLES			STRATA			DESCRIPTION OF STRATA
Depth	Type	Depth	Type	No.	Legend	Depth	Thickness	
						0.10	0.10	MADE GROUND: Gravel track.
						0.40	0.30	Firm grey clayey, silty, TOPSOIL.
						0.80	0.40	Soft to firm, very light grey and light yellow brown mottled clayey SILT, with vertical grey root zones.
						2.80	2.00	Grey brown fine to medium occasionally coarse subangular to subrounded, sandy GRAVEL, with occasional thin (0.05m) sandy horizons. Rusty brown stained layer at 1.20m and 1.70m depth.
						2.90	0.10+	Indications of firm to stiff blue grey streaks and patches of silty CLAY. (Noted in bucket of excavator depth approximate pit flooded).
								END OF PIT

FIGURE: 144

Remarks:- 1. Groundwater was encountered at 1.60m.
2. Pit abandoned at 2.90m caving sides from 1.20m.

SCALE 1 : 25

FOUNDATION & EXPLORATION SERVICES

RECORD OF TRIAL PIT No:- 42

Location : READING BUSINESS PARK
Contract No. : 910
Method of Excavation : JCB
Date of Excavation : 18/5/88

Dimensions of Pit : 1.00M X 2.30M
Ground Level : 38.65 m.O.D.

In-Situ Tests		SAMPLES			STRATA			DESCRIPTION OF STRATA
Depth	Type	Depth	Type	No.	Legend	Depth	Thickness	
						0.14	0.14	Firm to stiff, light brown sandy silty TOPSOIL, with occasional fine to medium flint gravel.
						0.28	0.28	Light ornage brown, fine to medium SAND, rare fine to medium gravel.
						0.60	0.32	Soft to firm, brown becoming orange brown with depth, clayey SILT.
								Grey, fine to medium very sandy GRAVEL. At 0.80m, SAND layer. Below 0.80m gravel becoming light brown, angular to subrounded with occasional sand horizons. From 1.70 to 1.80m rusty brown coating to gravel. Gravel becoming dense below 1.80m.
						2.80	2.20+	END OF PIT

FIGURE: 145

Remarks:- 1. Groundwater was encountered at 1.80m.
2. Pit abandoned at 2.80m sides caving from 1.10m.

SCALE 1:25

FOUNDATION & EXPLORATION SERVICES

RECORD OF TRIAL PIT No:- 53

Location : READING BUSINESS PARK
Contract No. : 910
Method of Excavation : JCB 3C
Date of Excavation : 17/5/88

Dimensions of Pit : 1.00M X 2.30M
Ground Level : 38.37 m.O.D.

In-Situ Tests		SAMPLES			STRATA			DESCRIPTION OF STRATA
Depth	Type	Depth	Type	No.	Legend	Depth	Thickness	
						0.20	0.20	Firm/friable, dark brown, silty, clayey TOPSOIL with occasional fine to medium gravel.
						0.60	0.40	Firm, dark brown, silty CLAY with occasional rootlets and some to many, fine to medium, angular gravel.
						1.60	1.00+	Light brown, coarse SAND and fine to medium, angular GRAVEL with occasional lenses of orange brown, medium to coarse sand. becoming below 1.30m, very sandy (coarse) fine to medium, occasionally coarse, angular GRAVEL.
								END OF PIT

FIGURE: 156

Remarks:-
1. An active land drain was encountered at 1.1m in the south face.
2. Groundwater was encountered at 1.40m.
3. The trial pit was unstable below ground level.

SCALE 1 : 25

FOUNDATION & EXPLORATION SERVICES

RECORD OF TRIAL PIT No: 57

Location : READING BUSINESS PARK
Contract No. : 910
Method of Excavation : JCB 3C
Date of Excavation : 19/5/88

Dimensions of Pit : 1.00M X 2.30M
Ground Level : 38.02 m.O.D.

In-Situ Tests		SAMPLES			STRATA			DESCRIPTION OF STRATA
Depth	Type	Depth	Type	No.	Legend	Depth	Thickness	
						0.20	0.20	Friable, black, silty sandy TOPSOIL with many fine to medium angular gravel.
						0.50	0.30	Orange brown, coarse SAND and fine to medium, angular GRAVEL.
0.60 m 34, 44, 46kPa	VN	0.70	Core Cutter	1				Soft to firm, grey with some brown mottling, silty CLAY with frequent shell debris.
0.80 m 40, 35, 42kPa	VN							
1.00m 24, 26, 30kPa	VN	1.00	D	2		1.20	0.70	
		1.30	D	3		1.40	0.20	Soft, dark brown, slightly sandy (fine) silty CLAY with decaying organic material.
						2.20	0.80+	Grey, coarse SAND and fine to medium, angular GRAVEL. becoming below 1.90m, sandy (coarse), fine to medium occasionally coarse angular GRAVEL.
								END OF PIT A pump test was carried out whilst the pit was at 2.00m. Depth to water at the start of the test -1.60m. Depth to the water at the end of the test -1.60m. Time to fill 45 gallon drum - 1 minute 40 seconds.

FIGURE: 160

Remarks:- 1. Groundwater was encountered at 1.90m.
2. The trial pit was unstable below 1.30m.

SCALE 1 : 25

FOUNDATION & EXPLORATION SERVICES

APPENDIX 4

SUMMARY OF SOIL CLASSIFICATION TESTS

Borehole/Sample No.	Depth m	Bulk Density Mg/m³	Moisture Content %	Specific Gravity	Liquid Limit %	Plastic Limit %	Plasticity Index %	Linear Shrinkage %	% Passing 2.00mm	% Passing 425μm	Description of Sample
2/10	3.00		19		45	17	28			90	Green/yellow mottled red sandy silty
											CLAY with fine gravel.
2/15	6.00		16		39	19	20			100	Red/brown silty CLAY.
2/21	9.00		17		50	18	32			100	Yellow/brown/red sandy silty CLAY.
2/27	12.00		18		55	25	30			100	Red/grey mottled yellow silty CLAY.
2/36	16.50		27		56	31	25			100	Dark grey/red friable silty CLAY.

SYMBOLS: NP : Non Plastic

FOUNDATION & EXPLORATION SERVICES

Compiled by	Date	Checked by	Date	Approved by	For Contractor	Date	For Engineer	Date

READING BUSINESS PARK

CONTRACT No: 910

FIGURE: 3

SUMMARY OF UNDRAINED TRIAXIAL COMPRESSION TESTS

Borehole/Sample No.	Depth m	Bulk Density Mg/m³	Moisture Content %	Dry Density Mg/m³	UNDRAINED TRIAXIAL COMPRESSION TESTS (Total Stress) Size mm	Lateral Pressure σ_3 kN/m²	Cohesion $\frac{1}{2}(\sigma_1 - \sigma_3)$ kN/m²	Average Cohesion kN/m²	Failure Strain %	Type of Failure	Description of Sample
2/10	3.50	2.00	19	1.68	38x	50	33	44	8.9	P	Firm grey green slightly silty CLAY
		2.08	20	1.73	76	75	47		7.9	P	with medium to fine gravel.
		2.07	20	1.73		150	53		11.6	C	
2/15	6.00	2.18	16	1.87	38x	50	261	261	5.3	B	Hard light grey silty CLAY.
		2.18	17	1.87	76	100	250		5.8	P	
		2.14	17	1.84		150	273		4.7	P	
2/21	9.00	2.14	17	1.84	38x	100	185	250	2.1	B	Hard red grey slightly silty CLAY.
		2.17	17	1.86	76	200	219		3.7	B	
		2.15	17	1.84		400	347		15.3	B	
2/27	12.00	2.14	18	1.82	38x	50	131	302	2.6	B	Hard red grey slightly silty CLAY.
		2.12	19	1.79	76	300	278		5.8	C	
		2.16	18	1.83		500	497		9.5	C	
2/36	16.50	1.79	24	1.45	38x	200	135	199	4.7	B	Very stiff dark grey slightly silty
		1.92	21	1.58	76	300	106		1.6	B	CLAY.
		1.90	19	1.60		500	357		3.2	B	

SYMBOLS: RM : Remoulded MS : Multistage B : Brittle P : Plastic C : Compound

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Compiled by	Date	Checked by	Date	Approved by	For Contractor	Date	For Engineer	Date

READING BUSINESS PARK

CONTRACT No: 910

FIGURE: 11

SUMMARY OF CHEMICAL ANALYSES

Borehole/Sample No.	Depth m	Date/Time of Sampling	Date/Time of Testing	Sulphur Trioxide Content			Chloride Content		pH Value	Organic Content	Carbonate Content	Remarks
				Soil %	2:1 Water:Soil Extract g/l	Groundwater g/l	Soil %	Groundwater g/l		%	%	
2/10	3.50			0.05					7.8			
2/15	6.00			<0.01					8.4			
2/21	9.00			<0.01					8.5			
2/27	12.00			<0.01					8.1			
4/1	0.50			<0.01					7.6	1.6		
4/7	2.50				0.2				7.6			
4/11	4.00			<0.01					7.1			

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Compiled by	Date	Checked by	Date	Approved by	For Contractor	Date	For Engineer	Date

CONTRACT No: 910

READING BUSINESS PARK

FIGURE: 18

ONE DIMENSIONAL CONSOLIDATION TEST

Borehole/Sample No: 2/10 Depth (m): 3.50 Date: July 1988

			Pressure Range kN/m²	Mv m²/MN	Cv m²/yr
Initial Condition	Moisture Content %	15	0- 25	0.44	SWELLED
	Bulk Density Mg/m³	2.06	25- 50	0.22	1.2
	Void Ratio	0.4754	50- 100	0.20	0.91
			100- 200	0.18	0.86
Final Condition	Moisture Content %	15	200- 400	0.11	0.64
	Bulk Density Mg/m³	2.34	400- 800	0.069	0.54
	Void Ratio	0.2980	800-1600	0.041	0.46
			Mv at p_o + 100KN/m²	0.19	m²/MN

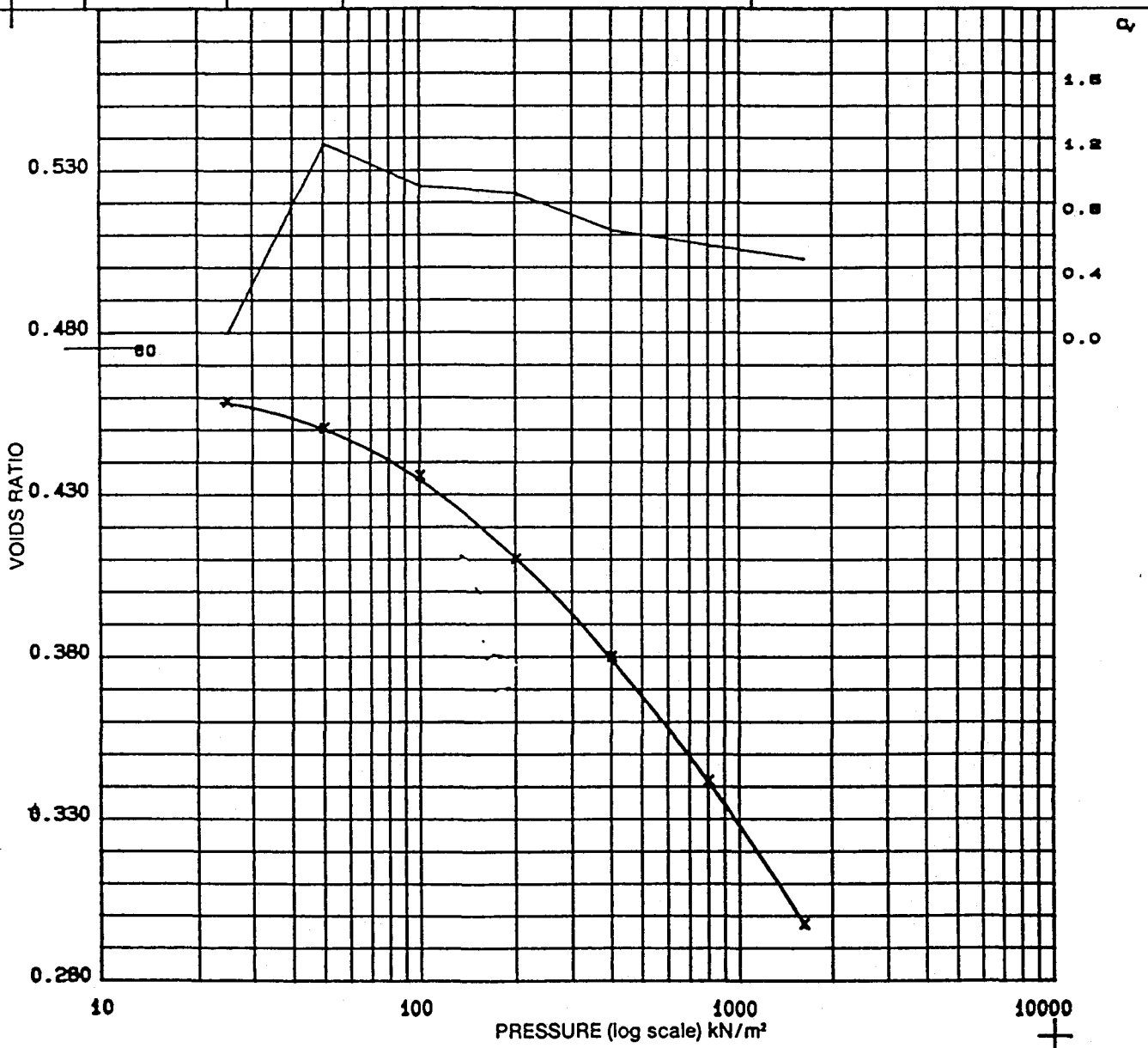
Description
Firm grey green slightly silty CLAY with medium to fine gravel.

S.G. = 2.64 (Actual).

Dimensions of Specimen

Diameter (mm) 75.0

Height (mm) 18.9



Operator		Date		Approved by	For Contractor	Date	For Engineer	Date
Checked by		Date						

FOUNDATION & EXPLORATION SERVICES

READING BUSINESS PARK

CONTRACT No: 910

FIGURE: 51

ONE DIMENSIONAL CONSOLIDATION TEST

Borehole/Sample No: 2/15 Depth (m): 6.00 Date: July 1988

			Pressure Range kN/m²	Mv m²/MN	Cv m²/yr
Initial Condition	Moisture Content %	20	0- 100	0.098	SWELLED
	Bulk Density Mg/m³	2.12	100- 200	0.069	1.5
	Void Ratio	0.5216	200- 400	0.071	1.1
Final Condition	Moisture Content %	16	400- 800	0.051	0.96
	Bulk Density Mg/m³	2.29	800-1600	0.031	0.84
	Void Ratio	0.3622	1600-3200	0.021	0.88

Mv at p_o + 100KN/m² 0.069 m²/MN

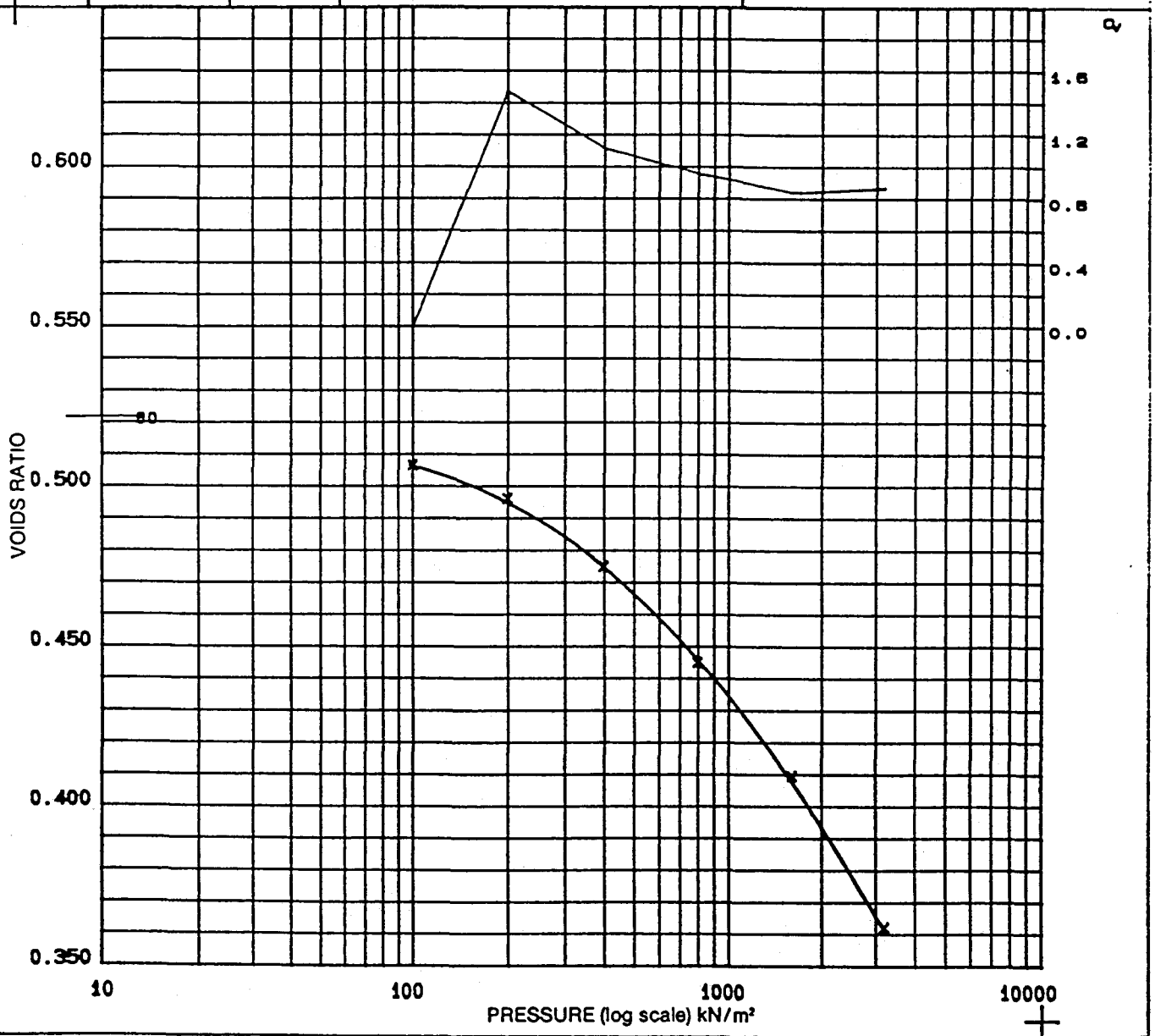
Description: Hard light grey silty CLAY.

S.G. = 2.69 (Actual).

Dimensions of Specimen

Diameter (mm) 75.0

Height (mm) 19.0



Operator		Date		Approved by	For Contractor	Date	For Engineer	Date
Checked by		Date						

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READING BUSINESS PARK

CONTRACT No: 910

FIGURE: 52

ONE DIMENSIONAL CONSOLIDATION TEST

Borehole / Sample No: 2/21 Depth (m): 9.00 Date: July 1988

			Pressure Range kN/m²	Mv m²/MN	Cv m²/yr
Initial Condition	Moisture Content %	21			
	Bulk Density Mg/m³	2.17	0- 107	- SWELLING -	
	Void Ratio	0.4719	107- 215	0.052	1.7
			215- 429	0.058	0.50
			429- 858	0.047	0.40
Final Condition	Moisture Content %	16	858-1716	0.031	0.83
	Bulk Density Mg/m³	2.32	1716-3432	0.020	0.65
	Void Ratio	0.3323	Mv at p_o + 100KN/m²	0.052	m²/MN

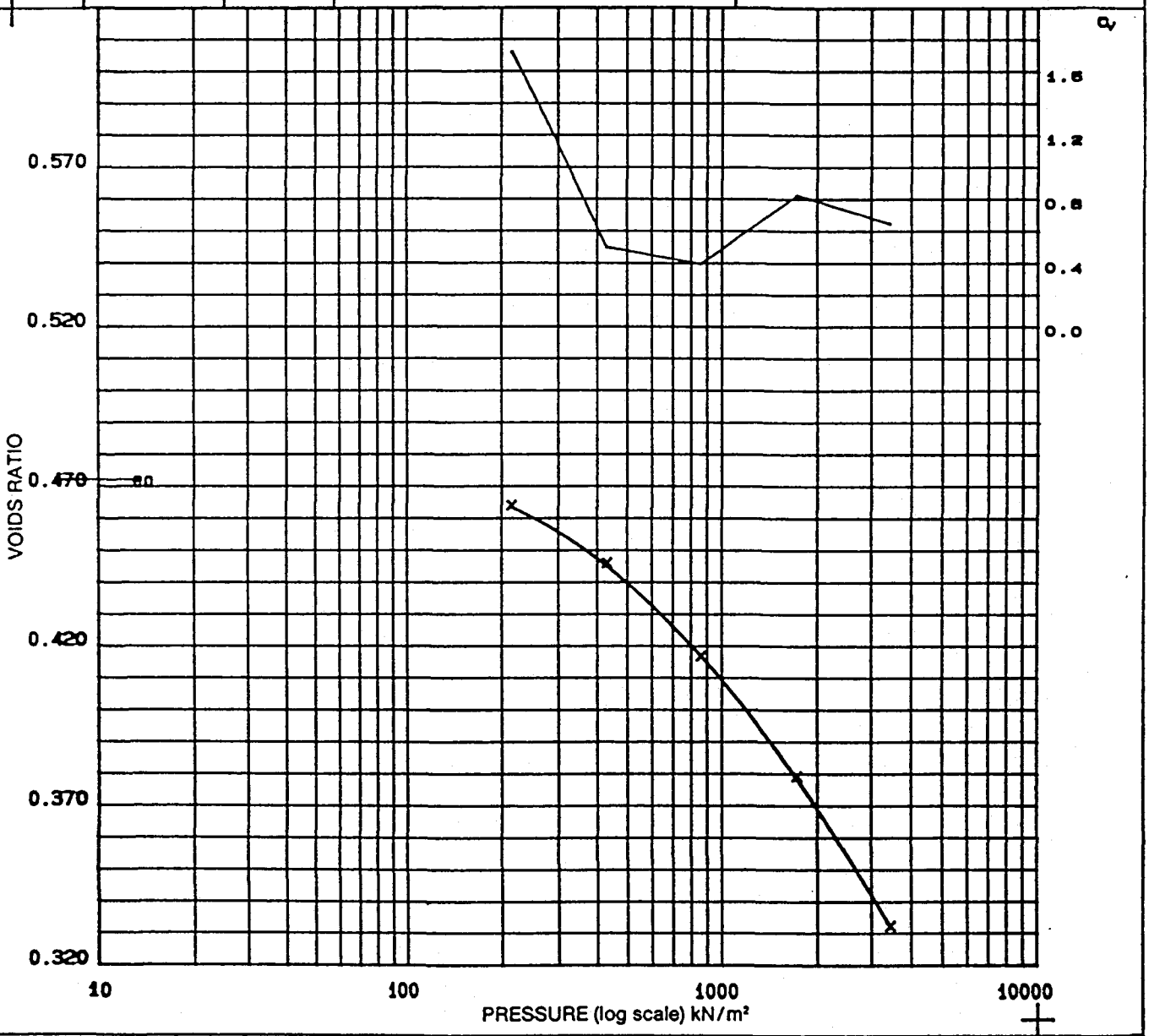
Description
Hard red grey slightly silty CLAY.

S.G. = 2.65 (Actual).

Dimensions of Specimen

Diameter (mm) 76.0

Height (mm) 18.8



Operator		Date		Approved by	For Contractor	Date	For Engineer	Date
Checked by		Date						

FOUNDATION & EXPLORATION SERVICES

READING BUSINESS PARK

CONTRACT No: 910

FIGURE: 53

APPENDIX 5

Peter Brett Associates	16 Westcote Road READING, Berks. RG30 2DE	Tel: (01734) 500761 Fax: (01734) 597498	Trial Pit No. 27 Sheet 1 of 1

Methods	Date	Job No	
JCB Backacter	29/11/19	RBP2942	
	Coordinates	Site	Reading Business Park
	Ground level	Client	Prudential Portfolio Managers Ltd

Water Level m	Depth m	Sample/Test Type	Sample/Test No.	Test Result	Level m AOD	Depth m (Thick)	Description	Legend
	0.10	D	1			0.15	TOPSOIL Dark brown silty fine sand with occasional gravel and rootlets	
	0.20	D	2			0.30	Soft to firm red-brown fine sandy clayey SILT with rootlets	
	0.70	W	3				Brown sandy medium and coarse GRAVEL with bands of very sandy medium gravel	
						2.30	Trial Pit Terminated at 2.30 m	

Remarks

1) Strong Ingress of water at 0. 60m below ground level 2) Walls collapsing at 2. 30m, pit terminated

Trial pit length:	2.5 m	Standing Water Level: ▼	0.60 m	pba	Scale 1:50
Trial pit width:	1.0 m	Water Strike: ▽			Logged By ATR
Stability of Faces:	Poor				
Shoring used:	None				

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Trial Pit No. 29
Sheet 1 of 1

Methods: JCB Backacter	Date: 29/11/19	Job No: RBP2942	
	Coordinates:	Site: Reading Business Park	
	Ground level:	Client: Prudential Portfolio Managers Ltd	

Water Level m	Depth m	Sample/Test Type	Sample/Test No.	Test Result	Level m AOD	Depth m (Thick)	Description	Legend
	0.20	D	1			0.30	TOPSOIL Dark brown silty fine sand with gravel and rootlets	
	0.50	D	2				Light grey-brown slighty silty fine SAND	
						1.20		
	1.50	D	3				Orange brown sandy medium GRAVEL	
						3.30	Trial Pit Terminated at 3.30 m	

Remarks

1) Strong ingress of water at 2. 00m below ground level 2) Walls collapsing at 3. 30m, pit terminated

Trial pit length:	2.5 m	Standing Water Level: ▼	2.00 m	pba	Scale 1:50
Trial pit width:	1.0 m	Water Strike: ▽			Logged By ATR
Stability of Faces:	Poor				
Shoring used:	None	See key sheet for abbreviations			

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Trial Pit No. 32
Sheet 1 of 1

Methods: JCB Backacter	Date: 29/11/19	Job No: RBP2942	
	Coordinates:	Site: Reading Business Park	
	Ground level:	Client: Prudential Portfolio Managers Ltd	

Water Level m	Depth m	Sample/Test Type	Sample/Test No.	Test Result	Level m AOD	Depth m (Thick)	Description	Legend
	0.10	D	1			0.20	TOPSOIL Dark brown clayey silty fine sand with gravel and rootlets	
	0.50	D	2			0.60	Firm dark brown mottled red-brown silty CLAY with occasional gravel and rootlets	
	1.00	D	3				Brown sandy medium and coarse GRAVEL. Occasional bands of grey sandy gravel with organic material	
						2.40	Trial Pit Terminated at 2.40 m	

Remarks

1) Strong ingress of water at 0. 60m below ground level 2) Walls collapsing at 2. 40m, pit terminated

Trial pit length:	2.5 m	Standing Water Level: ▼	0.50 m		Scale 1:50
Trial pit width:	1.0 m	Water Strike: ▽			Logged By ATR
Stability of Faces:	Poor				
Shoring used:	None	See key sheet for abbreviations			

APPENDIX 6

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Trial Pit No. 1
Sheet 1 of 1

Methods: JCB Backacter	Date: 16/04/1996	Job No: 8626	
	Coordinates:	Site: Small Mead Farm	
	Ground level:	Client: Bucknell Brothers Group	

Water Level m	Depth m	Sample/Test Type	Sample/Test No.	Test Result	Level m AOD	Depth m (Thick)	Description	Legend
						0.15	CONCRETE	
	0.50	D	1			0.40	MADE GROUND White clayey chalk fragments in a chalk putty matrix	
	1.10	D	2			1.00	Soft to firm red-brown fine sandy silty CLAY with occasional orange-brown fine sand and patches of dark grey silty clay. Slight organic aroma.	
	1.60	D	3			1.40	Soft to firm dark grey fine sandy silty CLAY. Slight organic aroma.	
▼							Grey becoming orange-brown sandy fine, medium and coarse GRAVEL	
						2.20	Trial Pit Terminated at 2.20 m	

Remarks

Gas Levels: CH4 = 0 ppm; CO2 = 0 %; O2 = 20.8 %; Press = 1006 Mb

Trial pit length:	2.0	Standing Water Level: ▼	1.80 m	Scale	1:50
Trial pit width:	1.0	Water Strike:			
Stability of Faces:	Fair			Logged By	ATR
Shoring used:	None	*See key sheet for abbreviations*			

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Trial Pit No. 2
Sheet 1 of 1

Methods: JCB Backacter	Date: 16/04/1996	Job No: 8626	
	Coordinates:	Site: Small Mead Farm	
	Ground level:	Client: Bucknell Brothers Group	

Water Level m	Depth m	Sample/Test Type	Sample/Test No.	Test Result	Level m AOD	Depth m (Thick)	Description	Legend
	0.20	D	1			0.25 (0.35)	MADE GROUND Dark brown sandy gravelly clay with plastic, paper, brick, concrete, metal, wood, wire, foam and ceramic fragments	
	0.40	D	2					
	0.50	J	3			0.55 (0.65)	CONCRETE	
	0.75	D	4			1	MADE GROUND Dark brown/black sandy gravelly clay with brick and concrete fragments. Strong diesel aroma	
							CONCRETE	
						1.60	Soft to firm dark grey fine sandy silty CLAY. Slight organic aroma	
▼	2.00	W	5			2	Dark grey becoming orange-brown sandy fine, medium and coarse GRAVEL. Strong diesel aroma	
						2.20	*Trial Pit Terminated at 2.20 m*	
						3		
						4		
						5		
						6		
						7		

Remarks

Gas Levels: CH4 = 50 ppm; CO2 = 0 %; O2 = 20.6 %; Press = 1006 Mb

Trial pit length: 2.0
Trial pit width: 1.0
Stability of Faces: Fair
Shoring used: None

Standing Water Level: ▼ 2.00 m
Water Strike:

See key sheet for abbreviations

Scale: 1:50
Logged By: ATR

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Trial Pit No. 3
Sheet 1 of 1

Methods JCB Backacter	**Date** 16/04/1996	**Job No** 8626	
	Coordinates	**Site** Small Mead Farm	
	Ground level	**Client** Bucknell Brothers Group	

Water Level m	Depth m	Sample/Test Type	Sample/Test No.	Test Result	Level m AOD	Depth m (Thick)	Description	Legend
	0.25	D	1			0.35	MADE GROUND Dark brown sandy gravelly clay with plastic, paper, brick, concrete, metal, wood, wire, foam and ceramic fragments	
						0.55	CONCRETE	
	0.80	D	2			0.70		
						1.00	Light brown SAND and GRAVEL (Possible Made Ground)	
							Soft to firm red-brown fine sandy silty CLAY with occasional gravel	
	1.50	D	3				Light brown slightly clayey silty fine SAND	
▼						1.90	Orange-brown sandy fine, medium and coarse GRAVEL	
						2.30	Trial Pit Terminated at 2.30 m	

Remarks

Gas Levels: CH4 = 10 ppm; CO2 = 0 %; O2 = 20.7 %; Press = 1006 Mb

Trial pit length : 2.0	Standing Water Level: ▼ 2.20 m		Scale 1:50
Trial pit width: 1.0	Water Strike: —		
Stability of Faces: Fair			Logged By ATR
Shoring used: None	*See key sheet for abbreviations*		

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Trial Pit No. 4
Sheet 1 of 1

Methods: JCB Backacter	Date: 16/04/1996	Job No: 8626	
	Coordinates:	Site: Small Mead Farm	
	Ground level:	Client: Bucknell Brothers Group	

Water Level m	Depth m	Sample/Test Type	Sample/Test No.	Test Result	Level m AOD	Depth m (Thick)	Description	Legend
	0.40	D	1			0.70	MADE GROUND Dark brown gravelly sand with plastic, paper, brick, concrete, metal, wood, wire, foam and ceramic fragments. Slight organic aroma	
	0.80	D	2			1.50	Orange-brown slightly clayey silty fine SAND with occasional red-brown discoloration	
▼						1.80	Orange-brown sandy fine, medium and coarse GRAVEL	
							Trial Pit Terminated at 2.00 m	

Remarks

Gas Levels: CH4 = 5 ppm; CO2 = 0 %; O2 = 20.7 %; Press = 1006 Mb

Trial pit length: 2.0
Trial pit width: 1.0
Stability of Faces: Fair
Shoring used: None

Standing Water Level: ▼ 1.80 m
Water Strike: ▽

See key sheet for abbreviations

Scale: 1:50
Logged By: ATR

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Trial Pit No. 5
Sheet 1 of 1

Methods: JCB Backacter	Date: 16/04/1996	Job No: 8626	
	Coordinates:	Site: Small Mead Farm	
	Ground level:	Client: Bucknell Brothers Group	

Water Level m	Depth m	Sample/Test Type	Sample/Test No.	Test Result	Level m AOD	Depth m (Thick)	Description	Legend
	0.15	D	1			0.20	MADE GROUND Dark brown gravelly sand with plastic, paper, brick, concrete, metal, wood, wire, foam, cloth and ceramic fragments and battery parts	
	0.40	D	2			0.30		
	0.50	J	3			0.50	CONCRETE	
	0.60	D	4			1.10	MADE GROUND Dark brown silty gravelly sand with brick fragments and pockets of clay. Slight organic aroma	
						1.50	Dark grey-brown silty fine SAND with occasional fine gravel	
▼	2.00	W	5				Orange-brown silty fine SAND	
						2.50	Orange-brown sandy fine, medium and coarse GRAVEL	
							Trial Pit Terminated at 2.50 m	

Remarks

Gas Levels: CH4 = 10 ppm; CO2 = 0 %; O2 = 20.7 %; Press = 1006 Mb

Trial pit length: 2.0
Trial pit width: 1.0
Stability of Faces: Fair
Shoring used: None

Standing Water Level: ▼ 1.90 m
Water Strike:

See key sheet for abbreviations

Scale: 1:50
Logged By: ATR

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Trial Pit No. 6
Sheet 1 of 1

Methods: JCB Backacter	Date: 16/04/1996	Job No: 8626	
	Coordinates:	Site: Small Mead Farm	
	Ground level:	Client: Bucknell Brothers Group	

Water Level m	Depth m	Sample/Test Type	Sample/Test No.	Test Result	Level m AOD	Depth m (Thick)	Description	Legend
	0.30	D	1			0.70	MADE GROUND Dark brown gravelly sand with plastic, paper, brick, concrete, metal, wood, wire, foam and ceramic fragments	
	0.80 0.90	D J	2 3			1.20	MADE GROUND Dark brown clayey gravelly sand with sandy gravelly clay and occasional black patches. Roots and fragments of brick and cloth and a slight organic aroma	
	1.25	D	4			1.60	Orange-brown very sandy very silty CLAY/ very sandy very clayey SILT	
▼						2.10	Orange-brown sandy fine, medium and coarse GRAVEL	
							Trial Pit Terminated at 2.10 m	

Remarks

Gas Levels: CH4 = 10 ppm; CO2 = 0 %; O2 = 20.6 %; Press = 1006 Mb

Trial pit length :	2.0	Standing Water Level: ▼	2.00 m		Scale 1:50
Trial pit width:	1.0	Water Strike:			Logged By ATR
Stability of Faces:	Fair				
Shoring used:	None	*See key sheet for abbreviations*			

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Trial Pit No. 7
Sheet 1 of 1

Methods: JCB Backacter	Date: 16/04/1996	Job No: 8626	
	Coordinates:	Site: Small Mead Farm	
	Ground level:	Client: Bucknell Brothers Group	

Water Level m	Depth m	Sample/Test Type	Sample/Test No.	Test Result	Level m AOD	Depth m (Thick)	Description	Legend
	0.30	D	1			0.40	MADE GROUND Dark brown gravelly sand with plastic, paper, brick, concrete, metal, wood, wire, foam and ceramic fragments	
	0.50	D	2			0.80	Old TOPSOIL layer Dark brown gravelly sand with grass and roots. Organic aroma.	
						1.50	Light brown sandy clayey SILT	
▼						1.70	Orange-brown sandy fine, medium and coarse GRAVEL	
							Trial Pit Terminated at 1.70 m	

Remarks

Gas Levels: CH4 = 5 ppm; CO2 = 0 %; O2 = 20.6 %; Press = 1005 Mb

Trial pit length: 2.0
Trial pit width: 1.0
Stability of Faces: Fair
Shoring used: None

Standing Water Level: ▼ 1.60 m
Water Strike:

See key sheet for abbreviations

Scale 1:50
Logged By ATR

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Trial Pit No. 8
Sheet 1 of 1

Methods: JCB Backacter	Date: 16/04/1996	Job No: 8626	
	Coordinates:	Site: Small Mead Farm	
	Ground level:	Client: Bucknell Brothers Group	

Water Level m	Depth m	Sample/Test Type	Sample/Test No.	Test Result	Level m AOD	Depth m (Thick)	Description	Legend
	0.30	D	1			0.50	MADE GROUND Dark brown gravelly sand with plastic, paper, brick, concrete, metal, wood, wire, foam and ceramic fragments	
	0.60	D	2			0.80	Old TOPSOIL layer Dark brown gravelly sand with grass and roots. Organic aroma.	
	1.00	D	3			1.20	Dark brown gravelly SAND	
						1.70	Light brown silty fine SAND with clayey pockets	
▼						2.30	Orange-brown sandy fine, medium and coarse GRAVEL	
							Trial Pit Terminated at 2.30 m	

Remarks

Gas Levels: CH4 =600 ppm; CO2 = 3.1 %; O2 = 18.9 %; Press = 1005 Mb

Trial pit length:	2.0	Standing Water Level: ▼	2.10 m		Scale 1:50
Trial pit width:	1.0	Water Strike:			Logged By ATR
Stability of Faces:	Fair				
Shoring used:	None	*See key sheet for abbreviations*			

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Trial Pit No. 9
Sheet 1 of 1

Methods: JCB Backacter	Date: 16/04/1996	Job No: 8626	
	Coordinates:	Site: Small Mead Farm	
	Ground level:	Client: Bucknell Brothers Group	

Water Level m	Depth m	Sample/Test Type	Sample/Test No.	Test Result	Level m AOD	Depth m (Thick)	Description	Legend
	0.50	D	1			0.80	MADE GROUND Dark brown gravelly sand with plastic, paper, brick, concrete, metal, wood, wire, foam and ceramic fragments	
	0.90	D	2			1.00	Old TOPSOIL layer Dark brown gravelly sand with grass and roots. Organic aroma.	
	1.10	D	3				Light brown silty fine SAND	
▼	1.90	W	4			1.60	Orange-brown sandy fine, medium and coarse GRAVEL	
						2.00	Trial Pit Terminated at 2.00 m	

Remarks

Gas Levels: CH4 = 20 ppm; CO2 = 0.1 %; O2 = 20.4 %; Press = 1005 Mb

Trial pit length: 2.0
Trial pit width: 1.0
Stability of Faces: Fair
Shoring used: None

Standing Water Level: ▼ 1.80 m
Water Strike:

See key sheet for abbreviations

Scale: 1:50
Logged By: ATR

APPENDIX 7

AMEC Civil Engineering

AMEC Civil Engineering Limited

TP44	0 - .200	Hardcore
	.200 - .800	Sandy Gravel
	.800 - 1.4	Tan Silty Sand with pockets of Silt
	1.4 - 3.0	Sandy Gravel

Water @ 2.1

TP45	0 - .100	Gravelly Subsoil
	.100 - .700	Tan Sandy Silt
	.700 - 3.0	Sandy Gravel.

Water @ 1.5

TP46	0 - .400	Gravelly Subsoil
	.400 - 3.0	Sandy Gravel

Water @ 1.6m

TP47	0 - .300	Topsoil
	.300 - .600	Subsoil
	.600 - .900	Sandy Silt
	.900 - 3.0	Sandy Gravel

SAMPLE NR 25 @ 700mm

Water @ 1.7m

TP48	0 - .500	Subsoil
	.500 - .600	Sandy Silt
	.600 - 1.5	Sandy Gravel
	1.5 - 1.6	Olive Silty Sand
	1.6 - 3.0	Sandy Gravel
	3.0 -	Firm Grey Clay

N.B. Groundwater Blank @ 2m - NO SHEEN

Water @ 1.4m.

TP49	0 - .400	Gravelly Subsoil
	.400 - 1.6	Sandy Gravel
	1.6 - 1.7	Tan Silty Sand
	1.7 - 2.1	Hard Coarse Sandstone
	2.1 - 3.0	Olive Silty Sand

Water @ 1.2m

AMEC Civil Engineering

AMEC Civil Engineering Limited

TP 50	0 - 1.5	Sandy Gravel
	1.5 - 1.7	Tan Silty Sand.
	1.7 - 3.0	Sandy Gravel.
	Water @ 1.1	

TP 51	0 - .300	Topsoil
	.300 - .500	Gravelly Subsoil
	.500 - 2.5	Sandy Gravel + SANDSTONE FRAGMENTS @ 2.2m
	2.5 - 3.0	Coarse grey Silty Sand.
	Land drain @ 1.2m	

TP 52	0 - 1.0	Medium to firm Red/Grey Slightly silty clay.
	1.0 - 1.5	Dark grey medium silty clay with some gravel
	1.5 - 2.5	Sandy Gravel
	2.5 - 3.0	Olive Silty Sand.
	Land drain @ 1.4m	

TP 53	0 - 2.50	Soft Tan/Red Silty Clay
	2.50 - 3.0	Sandy Gravel.
	Water @ 1.5 -	

Random

470504.726	170259.820	37.740 PIT 1
470479.172	170243.020	37.795 PIT 2
470485.998	170201.033	37.480 PIT 3
470460.273	170161.000	37.514 PIT 4
470457.118	170137.672	37.607 PIT 5
470438.575	170135.822	37.627 PIT 6
470417.973	170097.537	37.610 PIT 7
470421.047	170094.337	37.644 PIT 8
470395.777	170096.758	37.906 PIT 9
470379.808	170068.059	37.674 PIT 10
470340.671	170057.456	38.065 PIT 11
470330.002	170034.346	38.080 PIT 12
470306.664	170033.530	37.827 PIT 13
470291.105	170004.690	37.681 PIT 14
470266.459	169992.120	37.723 PIT 15
470450.405	170274.812	37.847 PIT 16
470449.261	170246.936	37.948 PIT 17
470435.090	170228.610	37.953 PIT 18
470435.413	170206.250	37.956 PIT 19
470415.547	170184.141	37.862 PIT 20
470406.634	170160.322	37.983 PIT 21
470381.957	170155.377	37.677 PIT 22
470369.999	170117.262	38.131 PIT 23
470318.784	170106.341	37.952 PIT 24
470307.400	170073.838	37.875 PIT 25
470278.870	170079.089	37.670 PIT 26
470266.718	170055.438	37.905 PIT 27
470233.500	170035.601	37.917 PIT 28
470284.673	169964.696	37.664 PIT 29
470315.792	169948.128	38.024 PIT 30
470351.127	169936.757	38.247 PIT 31
470398.610	169918.373	38.305 PIT 32
470406.301	169882.813	37.903 PIT 32A
470348.901	169911.164	38.061 PIT 33
470298.607	169931.466	38.001 PIT 34
470229.593	169927.036	38.347 PIT 35
470200.972	169900.754	38.320 PIT 36
470196.428	169857.861	38.436 PIT 37
470164.715	169811.186	38.347 PIT 38
470164.441	169768.948	38.185 PIT 39
470141.227	169727.605	37.975 PIT 40
470142.654	169715.038	37.939 PIT 41
470133.448	169672.542	38.048 PIT 42
470144.274	169969.173	38.512 PIT 43
470124.510	169956.915	38.932 PIT 44
470127.334	169929.964	38.361 PIT 45
470128.888	169894.083	38.152 PIT 46
470138.914	169853.787	38.491 PIT 47
470134.715	169826.135	38.388 PIT 48
470125.603	169785.784	38.149 PIT 49
470112.159	169786.815	37.798 PIT 50
470114.027	169774.679	38.144 PIT 51
470097.613	169750.366	38.095 PIT 52
470100.406	169726.969	37.928 PIT 53

APPENDIX 8

TABLE 1

WATER LEVEL MONITORING DATA

READING BUSINESS PARK - PIEZOMETER SUMMARY

DATE	P1	P2	P3	P4	P5	P6	BH1	KENNET W.L.
29.01.90	36.56	37.41	37.73	35.81	37.15	36.21	-	-
07.02.90	37.14	38.05	flooded	flooded	flooded	flooded	flooded	38.35
12.02.90	37.36	38.14	flooded	flooded	flooded	flooded	flooded	flooded
23.02.90	37.54	37.78	38.24	flooded	38.12	flooded	36.72	37.59
02.03.90	37.61	37.69	38.06	37.99	38.02	flooded	35.62	37.43
09.03.90	37.65	37.62	37.83	flooded	37.75	flooded	35.40	37.30
16.03.90	37.64	37.41	37.81	37.71	37.55	37.33	35.22	37.19
23.03.90	37.59	37.34	37.62	37.41	37.50	37.58	35.04	37.15
30.03.90	37.59	37.28	37.56	37.30	37.43	37.48	34.94	37.09
06.04.90	37.59	37.28	37.55	37.29	37.38	37.64	34.85	37.00
12.04.90	37.58	37.46	37.52	37.14	37.39	37.37	34.67	36.95
20.04.90	37.60	37.27	37.52	37.05	37.75	37.32	34.82	36.95
27.04.90	37.55	37.23	37.49	36.82	37.30	37.16	34.54	36.92
03.05.90	37.51	37.14	37.45	36.82	37.25	37.11	34.35	36.84
11.05.90	37.49	37.12	37.44	36.83	37.21	37.07	34.30	36.86
18.05.90	37.49	37.07	37.41	36.71	37.17	37.01	34.13	36.80
25.05.90	37.47	36.99	37.34	36.61	37.27	36.96	34.08	36.80
08.06.90	37.42	36.96	37.32	36.47	37.10	36.85	33.95	36.79
21.06.90	37.35	36.88	37.28	36.41	37.06	36.72	33.91	36.77
13.07.90	37.33	36.78	37.19	36.29	36.85	36.60	34.15	36.63
20.07.90	37.28	36.73	37.17	36.29	36.82	36.55	34.21	36.59
03.08.90	37.23	36.62	37.13	36.17	36.70	36.45	34.26	36.56
17.08.90	37.19	36.54	37.06	36.08	36.63	36.37	34.11	36.59
17.10.90	37.14	36.52	37.14	35.94	36.58	36.26	34.26	36.52
24.10.90	37.17	36.58	37.15	35.94	36.64	36.28	34.20	36.67
14.11.90	37.18	36.61	37.16	35.95	36.67	36.32	34.07	36.70
28.11.90	37.18	36.63	37.18	35.98	36.69	36.34	33.87	36.51
03.01.91	37.38	37.16	37.43	36.35	36.96	36.55	36.17	37.65
24.01.91	37.63	37.30	37.67	37.25	37.42	37.05	35.20	36.69
12.02.91	37.46	37.13	37.44	37.51	37.36	37.04	34.57	36.56
24.02.91	37.48	37.25	37.87	37.37	37.23	37.06	34.35	36.80
13.3.91	37.64	37.37	37.70	37.29	37.44	37.20	34.61	36.77
28.3.91	37.55	37.24	37.58	37.41	37.37	37.26	33.80	36.74
11.4.91	37.48	37.19	37.53	37.17	37.29	37.24	33.15	36.79
22.5.91	37.42	37.04	37.43	37.17	37.15	37.11	32.69	36.69
21.6.91	37.43	37.08	LOST	36.96	37.07	36.46	32.10	36.79
26.7.91	37.06	37.02	LOST	36.56	36.68	36.40	33.26	36.94
AVERAGE	37.40	37.16	37.48	36.79	37.20	36.89	33.42	

2942/83

APPENDIX 9

Number	SPECIFICATION
	SERIES 500 - DRAINAGE
516	Diversion of Foul Water Rising Main in Island Road The existing twin foul water rising main in Island Road to be diverted to allow the construction of the Island Road box culvert as shown on dwg no. 2942/5132B. The Contractor's price for this work is to include all work necessary to provide finished installation including all necessary temporary permanent works, disposal of surplus excavated material, testing etc. The final phase of the diversion will involve:- (a) Thames Water shutting down the pumps at Southcote Pumping Station and closing valves to isolate the diversion area. (b) Dewatering the rising main within the isolated reach. (c) Connection of the new main to the old main. All works will be carried out to the approval of Thames Water. Shut-down of the Southcote Pumping Station may mean that sewage entering the station will be disposed of the tanker or other means. Thames Water may, therefore, require that the final diversion works are undertaken at an off-peak time. ie early hours of a Sunday morning). Thames Water will not allow the work to be carried out during bad weather because of run-off infiltration to the sewers. The sum entered for diversion should allow for all aspects of the work, particularly: (a) Provision for sewage disposal by tankers or other means at Southcote Pumping Station. (b) Any payments to Thames Water. (c) Inclement Weather. The Contractor is required to submit a Method Statement for the approval of Thames Water and the Engineer. Liaison with Thames Water should be via: To be confirmed
	SERIES 600 - EARTHWORKS
601.S	Definitions, Classification and General Use of Earthworks Materials 1. The following definitions of earthworks materials shall apply to this and other Clauses of the Specification in which reference is made to the defined materials: (i) 'top soil' shall mean soils classified under BS 3882:1994 as meeting the description 'top soil'. Refer to the particular landscape specification for the handling of topsoil. (ii) 'suitable material Type A' shall comprise all that which is acceptable in accordance with the Contract for use in the Works except landscaping material. Suitable materials to be used in embankments shall have permitted moisture contents as follows:- (a) Cohesive Soils - within the range 0.9 to 1.3 times the Plastic Limit unless the Plasticity Index lies between 8 and 30 when it shall not exceed 1.0 x the Plastic Limit. Both short and long term CBR values of material placed shall be greater than 2%.

Number	SPECIFICATION
	(b) Well graded and uniformly graded granular materials, 1% above to 2% below the optimum moisture content at determined by the laboratory compaction test (Method 3.3, Part 4 of British Standard 1377 Methods of Testing Soils for Civil Engineering Purposes). (iii) 'suitable material Type B' shall consist of slightly silty and silty sand of the Woolwich Beds excavated from within the designated borrow pit at Small Mead Farm. The Contractor shall demonstrate the suitability of the source material to the satisfaction of the Engineer. The suitable fill material shall have an insitu CBR value of not less than 5% immediately after compaction and in the long term. The specification will be deemed to have been achieved if 8 out of 10 consecutive tests undertaken are not less than the specified requirement provided that no value falls below 3%. The CBR test shall be carried out in accordance with Method 4.3, Part 9 of BS 1377. The fill shall also meet the following density specification: the density of the compacted fill is to be equal to, or to exceed 95% of the maximum dry density. The degree of compaction shall be deemed to have been obtained it at least 9 out 10 consecutive samples taken of the compacted material attain the specified dry density provided that no value falls below 90%. The maximum dry density shall be determined by Method 3.3, Part 4 of BS 1377 (2.5kg rammer). The insitu density shall be determined by Method 2.4 Part 9 of BS1377 (Core Cutter) (Densities may be measured by Method 2.5 Part 9 of BS 1377 (Nuclear Density Gauge) subject to the approval of the Engineer after calibration trials). If the core cutter method proves unsatisfactory, densities shall be determined by Method 2.1, Part 9 of BS 1377 (sand replacement). The insitu density and CBR tests shall be carried out by the Contractor generally once each in every 1000m^2 of each layer of material placed or as relaxed by the Engineer. The compaction tests shall be carried out by the Contractor generally once each in every 5000m^2 of each layer of material places or as relaxed by the Engineer. Two copies of the results shall be presented at the end of each working day to the Engineer in a tabular form which is amenable to statistical analysis.

Number	SPECIFICATION
	Presentation of results shall be in accordance with BS 1377 with the following additions: type of test and method adopted; date and time of test; co-ordinates and level AOD of test position; indication of weather and site conditions and description of the soil. The location and depth of tests shall be decided by the Engineer. At the end of the Contract the Contractor shall supply 6 copies of the test reports, indexed with location plans in permanent hard covered bindings. In addition to the paper records above, the Contractor shall supply the results of all in situ and laboratory testing in ditigal form in accordance with the Association of Geotechnical Specialist (AGS) publication "Electronic transfer of geotechnical data from ground investigations". The date shall be provided in ASCII format, on 3+ inch double-sided high-density disks or other transmission media as agreed by the Engineer, and formatted to be compatible with MS-DOS Version 3.2 or higher. The files shall not be compressed. The format of the digital data files shall comply with Appendix 1 of the AGS publication. Unless otherwise required in Schedule 1, Key, Common and Additional data fields shall be included from key, Common and Additional data groups in accordance with Appendices 2 and 3 of the AGS publication to correspond with paper records required by the Contract. Any new, amended or additional groups or fields shall only be created with the Engineer's approval. Prior to the commencement of the investigation the Contractor shall submit to the Engineer a dummy set of data in the required format for the approval of the Engineer. All disks, or other agreed transmission media, shall be securely labelled and clearly marked with The title 'AGS Format ASCII Data' The project identification (PROJ-ID) The date of issue to the Engineer The name of the Contractor The name of the Engineer The unique issue sequence number If more than one disk, or other agreed transmission medium, is required, then each shall be clearly labelled to indicate the order in which the Engineer should read the data. The split of the data into separate files shall be decided by the Contractor. The unique sequence number shall run sequentially from the start of the Contract. Where more than one disk is required for a particular issue of digital data, this fact shall be clearly identified on the lables in that issue. The Contractor shall undertake, or commission from a testing establishment approved by the Engineer, additional tests over and above those referred to in this clause, at the Employer's expense as directed by the Engineer.
(iv)	'Suitable material Type B1' shall consist of material included as Type B above but having a fines content of not greater than 20 percent ie material passing the 63μm sieve not to exceed 20 percent as determined by laboratory test Method 9.2, Part 2 of BS 1377.

Number	SPECIFICATION

Type B1 material shall be tested and compacted in the same manner as that for Type B material above and shall be subject to the same acceptance criteria. Reporting and presentation of the results shall be as per Type B material.

(v) 'suitable material Type C' - gravel drainage layer material.

Gravel won from within the site area for use as drainage layer beneath fill areas shall be selected by the Contractor to be well graded and lie within the following grading envelope.

BS Sieve	Range of Grading % by mass passing
75 mm	100
37.5 mm	90 - 100
10 mm	30 - 90
5 mm	15 - 70
600 μm	0 - 18
75 μm	0 - 3

The density of the compacted fill is to be equal to, or to exceed 95% of the maximum dry density. The degree of compaction shall be deemed to have been obtained if at least 9 out of 10 consecutive samples taken of the compacted material attain the specified dry density provided that no value falls below 90%. The maximum dry density of the fill shall be determined by Method 3.7, Part 4 of BS 1377 (Vibrating hammer). The insitu density shall be determined by Method 2.2, Part 9 of BS 1377 (sand replacement). (Densities may be measured by Method 2.5, part 9 of BS 1377 (Nuclear Density Gauge) subject to the approval of the Engineer after calibration trials). if the sand replacement method proves unsatisfactory, densities shall be determined by Method 2.3, Part 9 of BS 1377 (Water replacement for coarse grained soils).

(vi) 'Suitable material Type D' - Clay bund material

Material proposed to be used shall be subject to a programme of testing to prove its suitability to form a seal. This shall include determination of the Atterberg Limit (liquid limit, plastic limit and plasticity index), dry density, grain-size, natural moisture content, compaction tests and permeability tests. The number of tests to be undertaken and the methods to be used shall be in accordance with BS 1377: 1990 and BS 5930: 1981 and shall be to the satisfaction of the Waste Disposal Authority.

The materials used for the clay bund shall conform to the following minimum requirements:

i) have a clay content such that the plasticity index is at least 20%

ii) have a plasticity index and liquid limit above the A-line when plotted on a plasticity chart (BS 5930: 1981);

iii) have a permeability determined under falling head test conditions, not exceeding 1 x 10-7 cm/sec;

iv) have been approved by the Waste Disposal Authority (Berkshire County Council).

The material forming the bund shall be placed in layers and compacted using suitable machinery so that no more than 5% air voids remain (as calculated from the dry density/moisture content relationship).

Any section of bund failing to meet the maximum permeability of 1 x 10-7 cm/sec shall be replaced or otherwise remedied to the satisfaction of the Waste Disposal Authority.

Number	SPECIFICATION
	(vii) 'Suitable material Type E' - gravel to flood plain - is to be 20-25mm diameter washed river gravel to the approval of the Engineer. (viii) 'Suitable material Type F1 and F2 shall consist of cohesive material of the Woolwich and Reading Beds excavated from within the designated borrow pit at Small Mead Farm. Approval of the material from the borrow pit will be as per suitable material Type B. Type F1 shall have a natural moisture content equal to or less than the plastic limit, but not less than the plastic limit minus 4%. Type F2 shall have a natural moisture content equal or less than the plastic minus 4%. The suitable fill material, Type F1 and F2, shall have an undrained shear strength of not less than 50 kN/m^2 immediately after compaction and in the long term. The specification will be deemed to have been achieved if 8 out of 10 consecutive tests undertaken are not less than the specified requirement, provided that no value falls below 40 kN/m^2. The undrained shear strength shall be determined by Method 4.4 Part 9 of BS 1377 and in accordance with Method 8:Part 7:BS 1377(1990). Specimens should be remoulded and tested as given in SHW (Clause 633). The laboratory tested specimens shall also be tested by a hand shear vane to allow calibration to insitu tests using the same apparatus. Where hand shear vane tests are unsuitable the fill material shall have an in-situ CBR value of not less than 3% immediately after compaction and in the long term. The specification will be deemed to have been achieved if 8 out of 10 consecutive tests undertaken are not less than the specified requirement provided that no value falls below 2%. The CBR test shall be carried out in accordance with Method 4.3:Part 9 of BS1377 (1990). The density of the compacted fill is to be such that the residual air voids content is equal to or less than 5%, as calculated from natural moisture content and particle density, Method 8.3:Part 2:BS1377 (1990). The insitu density shall be determined by Method 2.1 or, if unsatisfactory, by Method 2.4: Part 9: BS 1377 (1990). The degree of compaction shall be deemed to have been achieved if at least 9 out of 10 consecutive tests attain the specified air voids limit. The compacted fill shall have a stiffness (E') immediately after compaction and in the long term of not less than 7000 kN/m^2. The specification will be deemed to have been achieved if 9 out of 10 consecutive tests undertaken indicate the compacted fill to have a stiffness (E') of not less than 10000 kN/m^2 and that no value falls below 7000 kN/m^2. The stiffness of the compacted fill shall be determined by Method 3, Part 5 of BS 1377 for a pressure range of 50 kN/m^2 to 150 kN/m^2. If sampling of the compacted fill is unsatisfactory then the stiffness shall be determined by Method 4.1, Part 9 of BS 1377.

Number	SPECIFICATION
	The insitu CBR tests will be carried out 1 per 1000m² of each layer of material placed. The undrained shear strength of the compacted clays will be determined by sets of 5 hand shear vane tests, generally at 1 set per 1000m² of each layer placed. The particle density of the clays will be determined as 1 per 5000m² of each layer placed. The stiffness of the compacted fill will be determined as 1 per 2500m² of each layer placed for first 5% of material, 1 per 5000m² of each layer for 5% to 15% of material and 1 per 10,000m² of each layer for remaining 85% of material. These frequencies may be reduced by the Engineer if consistent results are obtained. Reporting and presentation of the results shall be as per Type B material. (ix) Inert material - for the purposes of this contract inert material shall be 'suitable material Type A'. (x) 'Unsuitable material' shall mean other than suitable material and shall comprise: (a) Material from swamps, marshes and bogs; (b) Peat, logs, stumps and perishable materials; (c) Material susceptible to spontaneous combustion; (d) Material in a frozen condition; (e) Clay of Liquid limit exceeding 90% and/or plasticity index exceeding 65; (f) Materials having a moisture content outside those permitted for such materials in the Contract, unless otherwise permitted by the Engineer; (g) Chalk; Materials of class (d) if otherwise suitable shall be classified as suitable when unfrozen. (xi) 'Rock' shall mean those geological strata or deposits as described in the Contract and any hard natural or artificial material requiring the use of blasting or approved pneumatic tools for its removal but excluding individual masses less than 0,20 m³. (xii) 'Rock fill' shall consist of hard durable inert material of suitable size for deposition as in Clause 607 and compaction as in Clause 608. (xiii) 'Soft material' shall mean all suitable material within the group in 601S. 2. For the purpose of Clause 608 materials are grouped as follows: (i) 'Cohesive soil' includes clays and marls with up to 20 percent of gravel or rock and having a moisture content not less than the value of the plastic limit (determined in accordance with Method 5.3, Part 2 of BS 1377) minus 4. (ii) 'Well graded granular and dry cohesive soils' include clays and marls containing more than 20 per cent of gravel or rock and/or having a moisture content less than the value of the plastic limit (determined in accordance with Method 5.3, Part 2 of BS 1377) minus 4, well-graded sands and gravels with a uniformity coefficient exceeding 10. (iii) 'Uniformly-graded material' includes sands and gravels with a uniformity coefficient to 10 or less, and all silts and pulverised fuel ashes. Any soil containing 90 percent or more of material of the particular size can be 0.06-0.002mm will be regarded as nil, for this purpose.

Number	SPECIFICATION
	3. The Contractor shall employ only that plant which is suited to the soils to be handled. He shall be responsible for maintaining the nature of the suitable material so that when it is placed and compacted it remains suitable in accordance withe the Contract. 4. Any fill material used within 500mm of concrete structures or cement bound materials shall have a soluble sulphate content not exceeding 2.5 g per litre when tested in accordance with Method 5.5 or 5.6, Part 3 of BS 1377, unless special precautions to the approval of the Engineer are taken to protect the concrete or cement bound materials. 5. No excavated material other than surplus to requirement of the Contact shall be removed from the Site except on the direction, or with the permission of the Engineer who may require material which is unsuitable only due to the reason of being frozen to be retained on site when in that condition. Should the Contractor be permitted to remove suitable materials from the Site to suit his operational procedure, then he shall make good any consequent deficit of filling arising therefrom. 6. If any suitable material excavated from within the Site is, with the permission of the Engineer, taken by the Contractor for purposes other than the forming of embankments and other areas of fill, sufficient suitable filing material to occupy after full compaction, a volume corresponding to that which the excavated material occupied shall, unless otherwise directed by the Engineer, be provided by the Contractor from his own resources. 7. Suitable material and topsoil surplus to the total requirements of the works and all unsuitable material shall, unless the Engineer permits otherwise, be run in spoil tips provided by the Contractor. 8. Where the excavation reveals a combination of suitable and unsuitable materials, the Contractor shall unless otherwise agreed by the Engineer, carry out the excavation in such manner that the suitable materials are excavated separately for use in the Works without contamination by the unsuitable materials. 9. The Contractor shall make his own arrangements for stockpiling of suitable material, and for the provision of sites for the purposes. Suitable materials other than topsoil shall be compacted in accordance with Clause 606 when stockpiling. 10. The Contractor shall, without extra payment, separate excavated topsoil and sub-soil selected by the Engineer's representatives as being suitable material for reinstatement.
603.S	<u>Excavation of Cuttings</u> 1. Haulage of material from cuttings or borrow pits to the embankments of other areas of fill shall proceed only when sufficient spreading and compaction plant are operating at the place of deposition to ensure compliance with the requirements of Clause 608.

Number	SPECIFICATION
	2. The slopes of cuttings shall be cleared of all rock fragments which move when prosed with a crow-bar. Where in the slopes of cuttings layers of rock and soft material alternate and the Engineer considers that the slope, immediately after dressing, will permanently withstand the effect of weather, the Contractor shall excavate any insecure material to an approved depth and build up the resulting spaces with concrete to Clause 1601 Class 22.5/37.5 with a maximum water/cement ratio of 0.50 or masonry using rock similar to the adjoining natural rock so as to ensure a solid face. 3. Constructional plant shall not use the surface of the bottom of a cutting unless the cutting is in rock containing no soft material or the Contractor maintains the level of the bottom surface at least 300mm above formation level as appropriate. Any damage to the subgrade arising from such use of the surface shall be made good by the contractor with material having the same characteristics as the materials which has been damaged. From the time the Contractor begins to trim the remaining material on any given area to formation level or capping level to complete this operation shall be in accordance with the requirements of Clause 703 and all plant shall comply with the requirements of paragraph 1 of that Clause.' 4. Except where indicated on the Drawings or directed by the Engineer, over excavation of cuttings and over-steepening of sides slopes shall not be permitted. 5. Immediately after completion of cutting excavation of completion of cutting excavation to berm level, slopes shall be soiled, and then seeded in accordance with Clause 611. The Contractor shall employ only that plant which is suited to the soils whether in-situ or to be handled. He shall be responsible for maintaining the nature of suitable material so that when it is placed and compacted it remains suitable in accordance with the Contract. No excavated suitable or landscaping material shall be removed from the Site except on the direction or with the permission of the Engineer who may require material which is unsuitable only by reason of being frozen to be retained on site when in that condition. Should the Contractor be permitted to remove suitable or landscaping material from the Site to suit his operational procedure, then he shall be responsible for making good any consequent deficit of filling arising therefrom.
616	<u>Hardcore</u> Hardcore filling shall be broken concrete, hard-brick or durable unstratified and non-porous stone, rubble or gravel. All hardcore fillings shall be free from rubbish, dust and unsound material. It shall be of uniform grading, approximately cuboid in shape and of a size capable of passing through a 150mm ring, such that it may be adequately compacted.
617	<u>Keying of Slopes for Topsoil</u> 1. Where directed by the Engineer, the Contractor shall roughen the surfaces of cutting and embankment slopes prior to the placing of topsoil to provide a key. 2. The roughening shall take the form of horizontal furrows made with the teeth of an excavator bucket or by such other method as the Engineer may approve.
618	<u>Geogrid reinforcement to gravel drainage layer</u> Geogrid reinforcement to gravel layer Type B shall be Tender SS30 as manufactured by Netlon Ltd, Kelly Street, Blackburn BB2 4PJ or similar and approved and used strictly in accordance with the manufacturer's printed instructions.

Number	SPECIFICATION
	Geotextile reinforcement to silty sand layer Type B1 shall be Geolon 25 as manufactured by Nicolon BV, PO Box 236, 7600 AE Almelo, Holland or similar and approved and used strictly in accordance with the manufacturer's printed instructions.
619	Gabions and Reno Mattresses
	1. Gabion and Reno mattress units shall be assembled in accordance with the manufacturer's instructions and shall be sufficiently filled with material complying with 4 below, with an allowance for consolidation so as to minimise distortion during construction.
	Gabion and Reno mattress units shall, where appropriate be maintained square and with vertical sides during filling. Internal tie wires shall be inserted and units shall be tensioned in accordance with the manufacturers instructions.
	2. Gabion and Reno mattress mesh shall be 8 x 10cm hexagonal manufactured from wire complying with BS 1052, having a minimum core diameter of 2.0mm.
	3. All wire shall be galvanised on compliance with BS 443 and coated with a minimum thickness of 0.55mm PVC.
	4. The fill material shall be selected granular material comprising natural gravel or crushed rock (other than argillaceous rock0 with a minimum size not less than the mesh opening and a maximum size not greater than two thirds of the minimum compartment dimension or 200mm whichever is the smaller.
	5. Mechanical equipment may be used to fill mattress units but may only be used to fill gabion units where the Engineer is satisfied that the results are equivalent to filling by hand.
620	Registration of Waste Carriers
	1. The Contractor shall, if required by the Engineer, provide evidence that he (or his sub-contractor if appropriate) is properly registered for the carriage of controlled waste arising from his operations on site, in conformity with the Control of Pollution (Amendment) Act 1989 and the Controlled Waste Regulation of Carriers and Seizure of Vehicles) Regulations 1991.
	2. For the purposes of this clause, Controlled Waste shall be assumed to include all surplus earthworks materials and all materials which require disposal away from the site.
621	Waste Management
	The Contractor shall provide to the Engineer evidence that he (or his sub-contractor as appropriate) is complying with responsibilities and regulations of the Environmental Protection Act (EPA) 1990 Waste Management - The Duty of Care - A Code of Practice 1991, and the EPA 1990 Part 2 "Waste on Land" Waste Management Licensing Regulations 1994.
	SERIES 1300 - PILING FOR STRUCTURES
1304.S	Steel Sheet Piling
	1. General
	1.1 Piling shall conform in all respects with the principles contained in the British Standard Code of Practice for Foundations, BS 8004: 1986.
	1.2 The Contractor shall report immediately to the Engineer in any circumstances which indicates that the ground conditions differ from those expected by the Contractor from his interpretation of the soil survey so as to affect materially the bearing capacity or passive resistance of the ground.

GREEN PARK, READING PLOT 3

End Product Compaction Tests

Sample No.	Date	Northing	Easting	Level (mOD)	Moisture Content (%)	Max Dry Density (Mg/m^3)	In situ Density (Mg/m^3)	Rel Comp (%)
2790	05-Jun-97	469931	169754	38.72	14.6	1.81	1.73	95.6
2791	05-Jun-97	469935	169756	38.74	13.1	1.81	1.78	98.3
2792	05-Jun-97	169937	169758	38.76	11.9	1.81	1.75	96.7
2793	05-Jun-97	469940	169757	38.20	7.6	1.81	1.79	98.9
2794	05-Jun-97	469945	169759	38.82	11.9	1.81	1.73	95.6
2800	05-Jun-97	169940	169735	38.78	13.5	1.81	1.82	100.5
2801	05-Jun-97	469943	169738	38.76	13.1	1.81	1.87	103.3
2802	05-Jun-97	469946	169738	38.76	12.7	1.81	1.85	102.2
2803	05-Jun-97	469948	169739	38.76	14.6	1.81	1.83	101.1
2804	05-Jun-97	169952	169739	38.79	12.8	1.81	1.84	101.6
2810	05-Jun-97	469951	169716	38.71	12.3	1.81	1.74	96.1
2811	05-Jun-97	469954	169718	38.73	14.2	1.81	1.79	98.9
2812	05-Jun-97	469957	169719	38.73	13.4	1.81	1.75	96.7
2813	05-Jun-97	469962	169721	38.66	12.1	1.81	1.83	101.1
2814	05-Jun-97	469968	169723	38.72	15.1	1.81	1.79	98.9
2820	06-Jun-97	469923	169855	38.77	11.4	1.81	1.80	99.4
2821	06-Jun-97	469924	169849	38.75	12.9	1.81	1.79	98.9
2822	06-Jun-97	469925	169843	38.80	12.2	1.81	1.80	99.4
2823	06-Jun-97	469927	169839	38.81	14.4	1.81	1.83	101.1
2824	06-Jun-97	469928	169834	38.82	14.6	1.81	1.85	102.2
2830	06-Jun-97	469906	169831	38.64	13.3	1.81	1.82	100.5
2831	06-Jun-97	469907	169827	38.62	13.7	1.81	1.82	100.5
2832	06-Jun-97	469910	169822	38.61	13.8	1.81	1.85	102.2
2833	06-Jun-97	469916	169815	38.54	12.9	1.81	1.82	100.5
2834	06-Jun-97	469930	169805	38.59	11.8	1.81	1.82	100.5
2840	06-Jun-97	469930	169801	38.57	13.5	1.81	1.82	100.5
2841	06-Jun-97	469933	169801	38.57	14.3	1.81	1.83	101.1
2842	06-Jun-97	469937	169797	38.52	12.7	1.81	1.82	100.5
2843	06-Jun-97	469940	169792	38.57	13.5	1.81	1.81	100.0
2844	06-Jun-97	469942	169789	38.63	12.9	1.81	1.81	100.0
2884	13-Jun-97	470010	169733	38.66	14.3	1.81	1.85	102.2
2885	13-Jun-97	470006	169730	38.64	13.5	1.81	1.84	101.6
2886	13-Jun-97	470002	169725	38.59	13.4	1.81	1.81	100.0
2887	13-Jun-97	469997	169719	38.56	14.2	1.81	1.80	99.5
2888	13-Jun-97	469992	169714	38.64	12.8	1.81	1.82	100.5
2894	13-Jun-97	469974	169749	38.71	13.3	1.81	1.79	98.9
2895	13-Jun-97	469969	169756	38.71	12.5	1.81	1.81	100.0
2896	13-Jun-97	469964	169765	38.69	13.6	1.81	1.81	100.0
2897	13-Jun-97	469958	169776	38.76	14.2	1.81	1.85	100.0
2898	13-Jun-97	469952	169788	38.75	14.8	1.81	1.79	98.9

GREEN PARK, READING PLOT 3

End Product Compaction Tests

Sample No.	Date	Northing	Easting	Level (mOD)	Moisture Content (%)	Max Dry Density (Mg/m^3)	In situ Density (Mg/m^3)	Rel Comp (%)
2904	13-Jun-97	469988	169783	38.55	13.8	1.81	1.79	98.9
2905	13-Jun-97	469984	169796	38.51	14.3	1.81	1.81	100.0
2906	13-Jun-97	469979	169808	38.56	15.5	1.81	1.78	98.3
2907	13-Jun-97	469975	169821	38.70	12.1	1.81	1.78	98.3
2908	13-Jun-97	469974	169834	38.71	13.3	1.81	1.81	100.0
2914	14-Jun-97	469947	169842	38.55	14.7	1.81	1.80	99.5
2915	14-Jun-97	469953	169848	38.55	13.4	1.81	1.83	101.0
2916	14-Jun-97	469952	169854	38.60	14.3	1.81	1.87	103.3
2917	14-Jun-97	469961	169854	38.60	14.2	1.81	1.86	102.7
2918	14-Jun-97	469964	169870	38.62	14.0	1.81	1.85	102.0
2924	14-Jun-97	469914	169884	38.65	12.8	1.81	1.83	101.0
2925	14-Jun-97	469921	169886	38.60	13.5	1.81	1.81	100.0
2926	14-Jun-97	469930	169889	38.63	13.7	1.81	1.82	100.5
2927	14-Jun-97	469940	169890	38.70	13.0	1.81	1.81	100.0
2928	14-Jun-97	469948	169894	38.64	14.2	1.81	1.82	100.5
2935	15-Jun-97	469911	169855	38.71	13.7	1.69	1.72	102.0
2936	15-Jun-97	469919	169866	38.72	12.6	1.69	1.75	103.0
2937	15-Jun-97	469930	169881	38.77	15.4	1.69	1.75	103.0
2938	15-Jun-97	469939	169893	38.70	14.5	1.69	1.72	102.0
2939	15-Jun-97	469944	169911	38.73	13.7	1.69	1.72	102.0
2945	15-Jun-97	469903	169919	38.78	12.6	1.69	1.73	102.0
2946	15-Jun-97	469914	169939	38.71	13.4	1.69	1.75	103.0
2947	15-Jun-97	469920	169950	38.71	12.3	1.69	1.74	103.0
2948	15-Jun-97	469931	169965	38.66	14.2	1.69	1.70	100.0
2949	15-Jun-97	469940	169976	38.70	15.3	1.69	1.72	101.0
2997	07-Jul-97	469998	169926	38.76	14.2	1.69	1.77	105.0
2998	07-Jul-97	469986	169937	38.66	14.2	1.69	1.78	105.0
2999	07-Jul-97	469984	169948	38.68	16.2	1.69	1.71	101.0
3000	07-Jul-97	469984	169955	38.69	15.3	1.69	1.76	104.0
3001	07-Jul-97	469993	169965	38.79	15.2	1.69	1.81	107.0
3007	07-Jul-97	469996	169973	38.79	13.7	1.69	1.78	105.0
3008	07-Jul-97	470006	169978	38.68	14.2	1.69	1.78	105.0
3009	07-Jul-97	470020	169981	38.64	13.4	1.69	1.78	105.0
3010	07-Jul-97	470030	169978	38.71	13.3	1.69	1.76	104.0
3011	07-Jul-97	470029	169931	38.74	13.9	1.69	1.76	104.0
3017	07-Jul-97	470027	169771	38.68	12.7	1.69	1.70	100.0
3018	07-Jul-97	470025	169784	38.68	15.0	1.69	1.74	103.0
3019	07-Jul-97	470028	169793	38.71	14.7	1.69	1.70	100.0
3020	07-Jul-97	470036	169802	38.71	14.8	1.69	1.74	103.0
3021	07-Jul-97	470043	169809	38.75	16.0	1.69	1.76	104.0

GREEN PARK, READING PLOT 3

End Product Compaction Tests

Sample No.	Date	Northing	Easting	Level (mOD)	Moisture Content (%)	Max Dry Density (Mg/m^3)	In situ Density (Mg/m^3)	Rel Comp (%)
3027	07-Jul-97	470045	169818	38.81	14.3	1.69	1.71	101.0
3028	07-Jul-97	470031	169828	38.72	15.0	1.69	1.74	103.0
3029	07-Jul-97	470020	169836	38.68	14.3	1.69	1.71	101.0
3030	07-Jul-97	470009	169846	38.71	13.7	1.69	1.71	101.0
3031	07-Jul-97	470000	169862	38.79	13.8	1.69	1.71	101.0
3043	09-Jul-97	470032	169871	38.54	14.8	1.80	1.72	95.5
3044	09-Jul-97	470043	169867	38.72	14.9	1.80	1.71	95.0
3045	09-Jul-97	470054	169865	38.59	12.8	1.80	1.71	95.0
3046	09-Jul-97	470062	169861	38.58	13.2	1.80	1.71	95.0
3047	09-Jul-97	470068	169857	38.61	9.9	1.80	1.76	97.8
3053	09-Jul-97	470069	169842	38.50	8.3	1.80	1.77	98.3
3054	09-Jul-97	470063	169844	38.56	14.3	1.80	1.77	98.3
3055	09-Jul-97	470055	169847	38.50	11.2	1.80	1.83	102.0
3056	09-Jul-97	470042	169851	38.54	17.2	1.80	1.74	96.7
3057	09-Jul-97	470032	169854	38.55	11.3	1.80	1.76	97.8
3063	09-Jul-97	470038	169824	38.70	14.0	1.80	1.75	97.2
3064	09-Jul-97	470047	169823	38.58	14.5	1.80	1.79	99.4
3065	09-Jul-97	470057	169823	38.53	12.2	1.80	1.76	97.8
3066	09-Jul-97	470065	169822	38.50	13.3	1.80	1.75	97.2
3067	09-Jul-97	470068	169831	38.43	14.2	1.80	1.74	96.7
3077	10-Jul-97	470010	169900	38.41	12.0	1.80	1.84	102.0
3078	10-Jul-97	470006	169891	38.48	13.9	1.80	1.83	102.0
3079	10-Jul-97	470018	169892	38.50	11.4	1.80	1.80	100.0
3080	10-Jul-97	470028	169890	38.48	12.0	1.80	1.86	103.0
3081	10-Jul-97	470034	169883	38.49	14.1	1.80	1.81	100.5
3087	10-Jul-97	470015	169948	38.74	12.0	1.80	1.76	97.8
3088	11-Jul-97	470015	169932	38.77	13.2	1.80	1.84	102.0
3089	11-Jul-97	470017	169915	38.68	12.8	1.80	1.71	95.0
3090	11-Jul-97	470018	169897	38.57	13.4	1.80	1.83	102.0
3091	11-Jul-97	470021	169876	38.56	11.9	1.80	1.75	97.2
3107	11-Jul-97	470021	169751	38.36	15.2	1.80	1.81	100.5
3108	14-Jul-97	470011	169786	38.47	13.0	1.80	1.74	96.7
3109	14-Jul-97	470001	169814	38.51	13.3	1.80	1.77	98.3
3110	14-Jul-97	469992	169839	38.42	13.9	1.80	1.79	99.4
3111	14-Jul-97	469984	169863	38.40	13.8	1.80	1.78	98.9
3117	14-Jul-97	469977	169889	38.60	13.0	1.80	1.81	100.5
3118	14-Jul-97	469969	169916	38.47	14.0	1.80	1.82	101.0
3119	14-Jul-97	469961	169939	38.51	12.6	1.80	1.78	98.9
3120	14-Jul-97	469959	169972	38.49	12.1	1.80	1.79	99.4
3121	14-Jul-97	469952	169980	38.53	14.6	1.80	1.78	98.9

GREEN PARK, READING PLOT 3

End Product Compaction Tests

Sample No.	Date	Northing	Easting	Level (mOD)	Moisture Content (%)	Max Dry Density (Mg/m^3)	In situ Density (Mg/m^3)	Rel Comp (%)
3128	14-Jul-97	470069	169881	38.45	14.2	1.80	1.81	100.5
3129	21-Jul-97	470062	169893	38.51	13.4	1.80	1.73	96.1
3130	21-Jul-97	470046	169910	38.54	13.9	1.80	1.72	95.6
3131	21-Jul-97	470039	169917	38.50	14.4	1.80	1.73	96.1
3132	21-Jul-97	470035	169931	38.47	15.0	1.80	1.82	101.0
3138	21-Jul-97	470079	169907	38.47	13.1	1.80	1.78	98.9
3139	21-Jul-97	470072	169915	38.52	13.7	1.80	1.75	97.2
3140	21-Jul-97	470063	169929	38.50	13.4	1.80	1.75	97.2
3141	21-Jul-97	470050	169942	38.70	12.8	1.80	1.75	97.2
3142	21-Jul-97	470040	169958	38.52	13.5	1.80	1.75	97.2
3148	21-Jul-97	470096	169923	38.57	14.1	1.80	1.72	95.6
3149	21-Jul-97	470084	169933	38.54	11.4	1.80	1.81	100.5
3150	21-Jul-97	470081	169942	38.74	12.9	1.80	1.82	101.0
3151	21-Jul-97	470072	169952	38.71	13.7	1.80	1.77	98.3
3152	21-Jul-97	470060	169962	38.63	13.2	1.80	1.76	97.8
3158	21-Jul-97	470002	169726	39.00	12.8	1.80	1.77	98.3
3159	23-Jul-97	469993	169729	38.98	13.7	1.80	1.75	97.2
3160	23-Jul-97	469981	169729	38.98	12.8	1.80	1.76	97.8
3161	23-Jul-97	469967	169737	39.03	14.0	1.80	1.75	97.2
3162	23-Jul-97	469934	169751	39.11	15.0	1.80	1.72	95.6
3168	23-Jul-97	469992	169780	39.03	13.1	1.80	1.79	99.4
3169	23-Jul-97	469976	169786	39.03	12.1	1.80	1.78	98.9
3170	23-Jul-97	469958	169789	39.04	12.4	1.80	1.74	96.7
3171	23-Jul-97	469937	169796	38.87	13.4	1.80	1.74	96.7
3172	23-Jul-97	469913	169804	38.97	13.5	1.80	1.76	97.8
3178	23-Jul-97	469971	169825	39.03	14.5	1.80	1.76	97.8
3179	23-Jul-97	469959	169828	39.03	13.7	1.80	1.77	98.3
3180	23-Jul-97	469944	169832	39.05	12.6	1.80	1.79	99.4
3181	23-Jul-97	469929	169837	39.13	13.8	1.80	1.78	98.9
3182	23-Jul-97	469906	169844	39.04	12.6	1.80	1.77	98.3
3188	23-Jul-97	469967	169853	38.99	13.2	1.80	1.77	98.3
3189	23-Jul-97	469954	169860	38.96	14.0	1.80	1.75	97.2
3190	23-Jul-97	469935	169870	39.00	12.5	1.80	1.77	98.3
3191	23-Jul-97	469919	169877	39.06	13.3	1.80	1.74	96.7
3192	23-Jul-97	469896	169886	39.06	14.3	1.80	1.73	96.1
3198	23-Jul-97	469962	169893	38.94	15.0	1.80	1.76	97.8
3199	23-Jul-97	469951	169895	38.92	13.5	1.80	1.75	97.2
3200	23-Jul-97	469936	169900	39.01	14.1	1.80	1.73	96.1
3201	23-Jul-97	469923	169806	39.08	12.9	1.80	1.75	97.2
3202	23-Jul-97	469911	169915	38.97	13.5	1.80	1.74	96.7

GREEN PARK READING PLOT 3

Mexe Probes

Sample	Date	Northing	Easting	Level (mOD)	Mexe Probe	Calc CBR %
2909	13-Jun-97	469988.2	169783	38.55	5.9	9.5
2910	13-Jun-97	469983.5	169796	38.51	5.4	9
2911	13-Jun-97	469979.2	169808	38.56	5.9	9.5
2912	13-Jun-97	469975.1	169821	31.70	4.4	6.5
2913	13-Jun-97	469973.7	169834	38.71	4.6	7
2919	14-Jun-97	469946.8	169842	38.55	4.4	6.5
2920	14-Jun-97	469952.7	169848	38.55	4.4	6.5
2921	14-Jun-97	469957.6	169854	38.60	4.3	6.5
2922	14-Jun-97	469961	169854	38.60	4.6	7
2923	14-Jun-97	469963.9	169870	38.62	5.7	9.5
2929	14-Jun-97	469913.8	169884	38.65	4.8	7.5
2930	14-Jun-97	469924.5	169886	38.60	5.3	8.5
2931	14-Jun-97	469929.9	169889	38.63	4.6	7
2932	14-Jun-97	469939.5	169890	38.70	4.6	7
2933	14-Jun-97	469948.2	169894	38.64	4.6	7
2940	15-Jun-97	469910.6	169855	38.71	4.6	7
2941	15-Jun-97	469919.4	169866	38.72	4	5.5
2942	15-Jun-97	469930.5	169880	38.77	5.5	9
2943	15-Jun-97	469939.4	169893	38.70	4.5	7
2944	15-Jun-97	469944.3	169911	38.73	8	13.5
2950	15-Jun-97	469903.1	169919	38.78	5.6	9
2951	15-Jun-97	469914	169939	38.71	6	9.5
2952	15-Jun-97	469920.1	169950	38.71	4	5.5
2953	15-Jun-97	469930.8	169965	38.66	5.2	8
2954	15-Jun-97	469939.7	169976	38.70	5	8
3002	07-Jul-97	469997.6	169926	38.76	5.3	8.5
3003	07-Jul-97	469986.4	169937	38.66	5.4	9
3004	07-Jul-97	469983.6	169948	38.68	5.3	8.5
3005	07-Jul-97	469984.3	169955	38.69	6	9.5
3006	07-Jul-97	469992.8	169965	38.79	5.6	9
3012	07-Jul-97	469995.6	169973	38.79	5.7	9.5
3013	07-Jul-97	470006.3	169978	38.68	6.4	10.5
3014	07-Jul-97	470019.8	169981	38.64	4.8	7.5
3015	07-Jul-97	470030.1	169978	38.71	5.7	9.5
3016	07-Jul-97	470028.5	169931	38.74	6	9.5
3022	07-Jul-97	470026.5	169771	38.68	4.5	7
3023	07-Jul-97	470024.5	169784	38.68	3.7	5
3024	07-Jul-97	470027.8	169783	38.71	4.1	5.5
3025	07-Jul-97	470035.6	169802	38.71	3.9	5.5
3026	07-Jul-97	470042.5	169809	38.75	3.7	5

GREEN PARK READING PLOT 3

Mexe Probes

Sample	Date	Northing	Easting	Level (mOD)	Mexe Probe	Calc CBR %
3032	07-Jul-97	470044.8	169818	38.81	4	5.5
3033	07-Jul-97	470030.6	169838	38.72	3.8	5
3034	07-Jul-97	470019.9	169836	38.68	3.9	5.5
3035	07-Jul-97	470009.1	169846	38.71	4.4	6
3036	07-Jul-97	469999.7	169862	38.79	4	5.5
3048	09-Jul-97	470032.1	169871	38.57	4.9	8
3049	09-Jul-97	470043.1	169867	38.72	6.5	10.5
3050	09-Jul-97	470053.9	169865	38.59	6.1	10
3051	09-Jul-97	470061.5	169861	38.58	6.1	10
3052	09-Jul-97	470067.8	169857	38.61	6.6	11
3058	09-Jul-97	470068.6	169842	38.50	4.2	6
3059	09-Jul-97	470062.7	169844	38.56	4.5	7
3060	09-Jul-97	470054.7	169847	38.50	4.7	7
3061	09-Jul-97	470042.4	169851	38.54	4.6	7
3062	09-Jul-97	470031.7	169854	38.55	4.4	6
3068	09-Jul-97	470038	169824	38.70	4.1	5.5
3069	09-Jul-97	470046.7	169823	38.58	4.4	6
3070	09-Jul-97	470057.1	169823	38.53	4.8	7.5
3071	09-Jul-97	470064.6	169822	38.50	4.4	6
3072	09-Jul-97	470068.2	169831	38.43	5.2	8
3082	10-Jul-97	470010.5	169900	38.41	4.4	6
3083	10-Jul-97	470005.6	169891	38.48	5.6	9
3084	10-Jul-97	470017.6	169892	38.50	4.7	7
3085	10-Jul-97	470027.6	169890	38.48	5.3	8.5
3086	10-Jul-97	470033.6	169883	38.49	5.5	9
3092	11-Jul-97	470014.5	169948	38.74	4.5	6.5
3093	11-Jul-97	470014.9	169932	38.77	3.9	5.5
9094	11-Jul-97	470016.6	169915	38.68	4.2	5.5
3095	11-Jul-97	470018.4	169897	38.57	4.4	6
3096	11-Jul-97	470020.5	169876	38.56	4.6	7
3112	14-Jul-97	470021.4	169751	38.36	4.1	5.5
3113	14-Jul-97	470011.5	169786	38.47	4.1	5.5
3114	14-Jul-97	470000.8	169814	38.51	3.9	5.5
3115	14-Jul-97	469992.4	169839	38.42	3.8	5
3116	14-Jul-97	469984.1	169863	38.40	4.3	6
3122	14-Jul-97	469976.9	169889	38.60	4.4	6
3123	14-Jul-97	469968.7	169916	38.47	4.2	5.5
3124	14-Jul-97	469960.8	169939	38.51	3.8	5
3125	14-Jul-97	469958.7	169972	38.49	3.8	5
3126	14-Jul-97	469952	169980	38.53	4.5	6.5

GREEN PARK READING PLOT 3

Mexe Probes

Sample	Date	Northing	Easting	Level (mOD)	Mexe Probe	Calc CBR %
3133	21-Jul-97	470069.4	169881	38.45	4.1	5.5
3134	21-Jul-97	470061.7	169893	38.51	3.7	5
3135	21-Jul-97	470046.4	169910	38.54	4.2	5.5
3136	21-Jul-97	470039.1	169917	38.50	6	9.5
3137	21-Jul-97	470034.7	169931	38.47	3.7	5
3143	21-Jul-97	470079	169907	38.47	3.8	5
3144	21-Jul-97	470071.9	169915	38.52	4.1	5.5
3145	21-Jul-97	470062.8	169929	38.50	4.2	5.5
3146	21-Jul-97	470050.2	169942	38.70	4.1	5.5
3147	21-Jul-97	470039.8	169958	38.52	3.9	5.5
3153	21-Jul-97	470095.7	169923	38.57	4.2	5.5
3154	21-Jul-97	470084.5	169933	38.54	3.8	5
3155	21-Jul-97	470080.5	169942	38.74	4.2	5.5
3156	21-Jul-97	470072.5	169952	38.71	3.6	4.5
3157	21-Jul-97	470060.4	169962	38.63	4.3	6
3163	23-Jul-97	470002.1	169726	39.00	7.3	12
3164	23-Jul-97	469992.5	169729	38.98	8.6	15
3165	23-Jul-97	469981.2	169729	38.98	7.8	13.5
3166	23-Jul-97	469966.6	169737	39.03	9.4	16.5
3167	23-Jul-97	469934	169751	39.11	6.8	11.5
3173	23-Jul-97	469992.1	169780	39.03	7.6	12.5
3174	23-Jul-97	469975.9	169786	39.03	5.6	9
3175	23-Jul-97	469958.4	169789	39.04	7.1	12
3176	23-Jul-97	469937	169796	38.87	4.4	6
3177	23-Jul-97	469913.4	169804	38.97	5.1	7.5
3183	23-Jul-97	469970.7	169825	39.03	5.2	8
3184	23-Jul-97	469958.7	169828	39.03	7.5	13
3185	23-Jul-97	469944.4	169832	39.05	6.6	11
3186	23-Jul-97	469929.1	169837	39.13	6.4	10.5
3187	23-Jul-97	469906.5	169844	39.04	5.9	9.5
3193	23-Jul-97	469967.4	169853	38.99	4.7	7
3194	23-Jul-97	469954.5	169860	38.96	8.4	14.5
3195	23-Jul-97	469934.8	169870	39.00	8.6	15
3196	23-Jul-97	469918.9	169877	39.06	4.2	5.5
3197	23-Jul-97	469896.4	169886	39.06	4.6	7
3203	23-Jul-97	469961.7	169893	38.94	6	9.5
3204	23-Jul-97	469951.4	169895	38.92	6.8	11.5
3205	23-Jul-97	469935.7	169900	39.01	4.3	6
3206	23-Jul-97	469923.5	169906	39.08	4.1	5.5
3207	23-Jul-97	469911.3	169915	38.97	8.4	14.5

GREEN PARK READING PLOT 3

Mexe Probes

Sample	Date	Northing	Easting	Level (mOD)	Mexe Probe	Calc CBR %
3213	23-Jul-97	469910.6	169925	38.97	4.7	7
3214	23-Jul-97	469918.7	169947	39.09	6.4	10.5
3215	23-Jul-97	469929.9	169961	38.96	6.6	11
3216	23-Jul-97	469939.2	169948	39.04	6.7	11.5
3217	23-Jul-97	469950.7	169922	38.96	9.2	16
3223	24-Jul-97	470024.8	169774	39.02	7.2	12.5
3224	24-Jul-97	470036.8	169787	39.00	5.9	9.5
3225	24-Jul-97	470049.3	169798	38.97	7.6	12.5
3226	24-Jul-97	470058.1	169808	38.99	5.2	8
3227	24-Jul-97	470064.3	169826	39.05	7.2	12
3233	24-Jul-97	470035.3	169817	39.03	7.4	13
3234	24-Jul-97	470027.6	169824	39.03	6.1	10
3235	24-Jul-97	470021.2	169829	38.98	5.6	9
3236	24-Jul-97	470011.4	169837	39.10	7.6	12.5
3237	24-Jul-97	470002.8	169843	39.07	4	5.5
3243	24-Jul-97	470028.2	169853	38.99	7.4	13
2344	24-Jul-97	470035.6	169864	39.07	6.4	10.5
3245	24-Jul-97	470046.4	169875	39.11	7	12
3246	24-Jul-97	470056.5	169884	39.03	8.4	14.5
3247	24-Jul-97	470068	169892	39.05	7.8	13.5
3253	24-Jul-97	470008.7	169887	38.98	5.6	9
3254	24-Jul-97	469995.2	169897	39.05	5.2	8
3255	24-Jul-97	469985.9	169907	39.01	7.2	12
3256	24-Jul-97	469976.1	169924	39.08	4.3	6
3257	24-Jul-97	469967.1	169943	39.03	7.2	12
3263	24-Jul-97	470037.7	169926	38.94	6.8	11.5
3264	24-Jul-97	470018.3	169939	38.91	4.7	7
3265	24-Jul-97	470004.8	169950	39.10	4.4	6
3266	24-Jul-97	469992.2	169959	39.07	9.6	17
3267	24-Jul-97	469979.3	169968	39.09	4.5	6.5
3273	24-Jul-97	470077.7	169933	39.04	4.4	6
3274	24-Jul-97	470060	169942	39.01	5.2	8
3275	24-Jul-97	470048.9	169953	38.91	6.1	10
3276	24-Jul-97	470034.6	169963	39.10	5.7	9
3277	24-Jul-97	470024.4	169973	39.08	3.9	5.5
3285	01-Aug-97	469978.7	169924	39.27	5.9	9.5
3286	01-Aug-97	469991.7	169923	39.33	5.2	8
3287	01-Aug-97	470001.9	169919	39.34	5.5	9
3288	01-Aug-97	470012.9	169914	39.29	5.8	9
3289	01-Aug-97	470026.7	169909	39.37	4.6	7

GREEN PARK READING PLOT 3

Mexe Probes

Sample	Date	Northing	Easting	Level (mOD)	Mexe Probe	Calc CBR %
3295	01-Aug-97	470027.3	169896	39.23	5.9	9.5
3296	01-Aug-97	470017.9	169847	39.28	4.6	7
3297	01-Aug-97	469994.6	169884	39.35	4.4	6
3298	01-Aug-97	469997.5	169900	39.30	5.3	8
3299	01-Aug-97	470006	169900	39.28	4.6	7
3305	01-Aug-97	470004.4	169871	39.38	5.1	7.5
3306	01-Aug-97	470007	169862	39.37	4.9	8
3307	01-Aug-97	470005.9	169859	39.35	5.4	9
3308	01-Aug-97	469999	169855	39.34	4.8	7
3309	01-Aug-97	469992.6	169848	39.25	7.2	12
3315	01-Aug-97	469990.9	169839	39.17	6.4	10.5
3316	01-Aug-97	469987.6	169822	39.30	5.9	9.5
3317	01-Aug-97	469988.1	169905	39.29	6.1	10
3318	01-Aug-97	469985.6	169891	39.33	4.5	6.5
3319	01-Aug-97	469980	169869	39.31	6	9.5

GREEN PARK, READING PLOT 3

Residual Air Voids

Sample	Date	Northing	Easting	Level (mOD)	Moisture Content (%)	Particle Density (Mg/m^3)	Dry Density (Mg/m^3)	Air Voids (%)
2678	30-May-97	469959	169792	38.30	19.8	2.62	1.76	0.0
2679	30-May-97	469949	169797	38.25	19.6	2.62	1.74	<1
2680	30-May-97	469944	169788	38.19	18.8	2.62	1.85	0.0
2681	30-May-97	469952	169782	38.23	18.6	2.62	1.80	0.0
2682	30-May-97	469958	169784	38.30	19.0	2.62	1.71	2.2
2694	30-May-97	469961	169747	38.44	18.8	2.62	1.73	1.4
2695	30-May-97	469961	169740	38.34	18.5	2.62	1.69	4.2
2696	30-May-97	469968	169735	38.37	19.6	2.62	1.74	<1
2697	30-May-97	469972	169744	38.42	19.4	2.62	1.69	2.7
2698	30-May-97	469968	169749	38.38	19.0	2.62	1.69	3.3
2709	31-May-97	469995	169731	38.10	19.5	2.62	1.78	0.0
2710	31-May-97	469995	169735	38.13	19.9	2.62	1.78	0.0
2711	31-May-97	469994	169742	38.17	18.9	2.62	1.76	<1
2712	31-May-97	469994	169748	38.21	19.3	2.62	1.75	<1
2713	31-May-97	469992	169753	38.26	19.7	2.62	1.74	<1
2724	31-May-97	469975	169703	38.34	21.9	2.62	1.57	5.6
2725	31-May-97	469970	169705	38.32	21.9	2.62	1.64	<1
2726	31-May-97	469967	169707	38.29	20.3	2.62	1.74	0.0
2727	31-May-97	469962	169711	38.28	19.6	2.62	1.71	1.2
2728	31-May-97	469957	169716	38.38	20.9	2.62	1.70	<1
2740	02-Jun-97	469933	169846	38.34	19.9	2.62	1.73	0.0
2741	02-Jun-97	469920	169835	38.37	20.2	2.62	1.75	0.0
2742	02-Jun-97	469916	169840	38.49	19.7	2.62	1.75	0.0
2743	02-Jun-97	469921	169856	38.54	20.6	2.62	1.75	0.0
2744	02-Jun-97	469928	169857	38.46	18.0	2.62	1.78	<1
2756	02-Jun-97	469935	169900	38.55	16.2	2.62	1.75	4.8
2757	02-Jun-97	469937	169908	38.49	19.5	2.62	1.66	4.2
2758	02-Jun-97	469941	169915	38.51	18.6	2.62	1.71	2.9
2759	02-Jun-97	469946	169906	38.51	19.3	2.62	1.72	1.1
2760	02-Jun-97	469944	169897	38.49	18.3	2.62	1.75	1.1
2772	02-Jun-97	469978	169836	38.33	14.6	2.62	1.82	4.0
2773	02-Jun-97	469978	169823	38.34	13.6	2.62	1.84	4.7
2774	02-Jun-97	469967	169835	38.34	15.3	2.62	1.79	4.3
2775	02-Jun-97	469966	169843	38.33	15.7	2.62	1.77	4.6
2776	02-Jun-97	469975	169845	38.40	16.0	2.62	1.75	5.0
2850	10-Jun-97	469889	169885	38.42	20.0	2.62	1.77	<1
2851	10-Jun-97	469890	169893	38.41	20.0	2.62	1.75	<1
2852	10-Jun-97	469894	169903	38.44	19.0	2.62	1.79	<1
2853	10-Jun-97	469897	169913	38.45	19.0	2.62	1.78	<1
2854	10-Jun-97	469901	169922	38.48	19.0	2.62	1.73	1.1

GREEN PARK, READING PLOT 3

Siffness Test Results

Sample	Date	Northing	Easting	Level (mOD)	Stiffness E' (kN/m^2)
2655	28-May-97	469962	169853	38.01	28258
2656	28-May-97	470066	169850	38.02	26374
2678	30-May-97	469953	169790	38.23	23548
2693	30-May-97	469924	169743	38.43	22606
2739	02-Jun-97	469968	169849	38.42	25808
2755	02-Jun-97	469942	169901	38.48	23548
2771	02-Jun-97	469972	169836	38.31	24490
2973	18-Jun-97	470014	169940	38.35	19780
3073	09-Jul-97	470076	169886	38.39	19780
3074	09-Jul-97	470102	169934	38.28	13187
3075	09-Jul-97	470053	169939	38.08	17896
3076	09-Jul-97	470050	169911	38.08	19780

GREEN PARK, READING PLOT 3

End Product Compaction Tests

Sample No.	Date	Northing	Easting	Level (mOD)	Moisture Content (%)	Max Dry Density (Mg/m^3)	In situ Density (Mg/m^3)	Rel Comp (%)
3208	23-Jul-97	469911	169925	38.97	13.8	1.80	1.77	98.3
3209	23-Jul-97	469919	169947	39.09	12.3	1.80	1.74	96.7
3210	23-Jul-97	469930	169961	38.96	15.7	1.80	1.76	97.8
3211	23-Jul-97	469939	169948	39.04	13.1	1.80	1.76	97.8
3212	23-Jul-97	469951	169922	38.96	13.8	1.80	1.74	96.7
3218	23-Jul-97	470025	169774	39.02	14.6	1.80	1.80	100.0
3219	24-Jul-97	470037	169787	39.00	13.2	1.80	1.78	98.9
3220	24-Jul-97	470049	169798	38.97	14.6	1.80	1.81	100.5
3221	24-Jul-97	470058	169808	38.99	13.2	1.80	1.73	96.1
3222	24-Jul-97	470064	169824	39.05	13.7	1.80	1.78	98.9
3228	24-Jul-97	470035	169817	39.03	14.5	1.80	1.79	99.4
3229	24-Jul-97	470028	169824	39.03	13.3	1.80	1.74	96.7
3230	24-Jul-97	470021	169829	38.98	12.8	1.80	1.76	97.8
3231	24-Jul-97	470011	169837	39.10	14.2	1.80	1.78	98.9
3232	24-Jul-97	470003	169843	39.07	14.5	1.80	1.75	97.2
3238	24-Jul-97	470028	169853	38.99	13.8	1.80	1.78	98.9
3239	24-Jul-97	470036	169864	39.07	12.7	1.80	1.80	100.0
3240	24-Jul-97	470046	169875	39.11	13.0	1.80	1.74	96.7
3241	24-Jul-97	470056	169884	39.03	13.7	1.80	1.76	97.8
3242	24-Jul-97	470068	169892	39.05	14.2	1.80	1.80	100.0
3248	24-Jul-97	470009	169887	38.98	13.5	1.80	1.82	101.1
3249	24-Jul-97	469995	169897	39.05	13.1	1.80	1.77	98.3
2350	24-Jul-97	469986	169907	39.01	13.0	1.80	1.74	96.7
3251	24-Jul-97	469976	169924	39.08	13.8	1.80	1.82	101.1
3252	24-Jul-97	469967	169943	39.03	14.3	1.80	1.80	100.0
3258	24-Jul-97	470038	169926	38.94	13.3	1.80	1.75	97.2
3259	24-Jul-97	470018	169939	38.91	14.1	1.80	1.74	96.7
3260	24-Jul-97	470005	169950	39.10	12.6	1.80	1.74	96.7
3261	24-Jul-97	469992	169959	39.07	14.3	1.80	1.75	97.2
3262	24-Jul-97	469979	169968	39.09	13.0	1.80	1.75	97.2
3268	24-Jul-97	470078	169933	39.04	12.4	1.80	1.74	96.7
3269	24-Jul-97	470060	169942	39.01	11.8	1.80	1.74	96.7
3270	24-Jul-97	470049	169953	38.91	12.9	1.80	1.74	96.7
3271	24-Jul-97	470035	169963	39.10	13.6	1.80	1.72	95.6
3272	24-Jul-97	470024	169973	39.08	13.9	1.80	1.76	97.8
3280	01-Aug-97	469979	169924	39.27	12.1	1.80	1.78	98.9
3281	01-Aug-97	469992	169923	39.33	13.4	1.80	1.76	97.8
3282	01-Aug-97	470002	169919	39.34	11.6	1.80	1.82	101.1
3283	01-Aug-97	470013	169914	39.29	12.9	1.80	1.79	99.4
3284	01-Aug-97	470027	169909	39.37	13.7	1.80	1.76	97.8

GREEN PARK, READING PLOT 3

End Product Compaction Tests

Sample No.	Date	Northing	Easting	Level (mOD)	Moisture Content (%)	Max Dry Density (Mg/m^3)	In situ Density (Mg/m^3)	Rel Comp (%)
3290	01-Aug-97	470027	169896	39.23	13.0	1.80	1.74	96.7
3291	01-Aug-97	470018	169897	39.28	13.4	1.80	1.74	96.7
3292	01-Aug-97	469995	169884	39.35	13.4	1.80	1.73	96.1
3293	01-Aug-97	469997	169900	39.30	14.2	1.80	1.72	95.6
3294	01-Aug-97	470006	169900	39.28	12.8	1.80	1.79	99.4
3300	01-Aug-97	470004	169871	39.38	13.1	1.80	1.76	97.8
3301	01-Aug-97	470007	169862	39.37	13.5	1.80	1.75	97.2
3302	01-Aug-97	470006	169859	39.85	12.6	1.80	1.77	98.3
3303	01-Aug-97	469999	169855	39.34	11.9	1.80	1.82	101.1
3304	01-Aug-97	469993	169848	39.25	12.2	1.80	1.80	100.0
3310	01-Aug-97	469991	169839	39.17	13.1	1.80	1.76	97.8
3311	01-Aug-97	469988	169822	39.30	13.0	1.80	1.80	100.0
3312	01-Aug-97	469988	169905	39.29	13.6	1.80	1.78	98.9
3313	01-Aug-97	469986	169891	39.33	11.7	1.80	1.84	102.2
3314	01-Aug-97	469980	169869	39.31	13.6	1.800	1.77	98.3

GREEN PARK READING PLOT 3

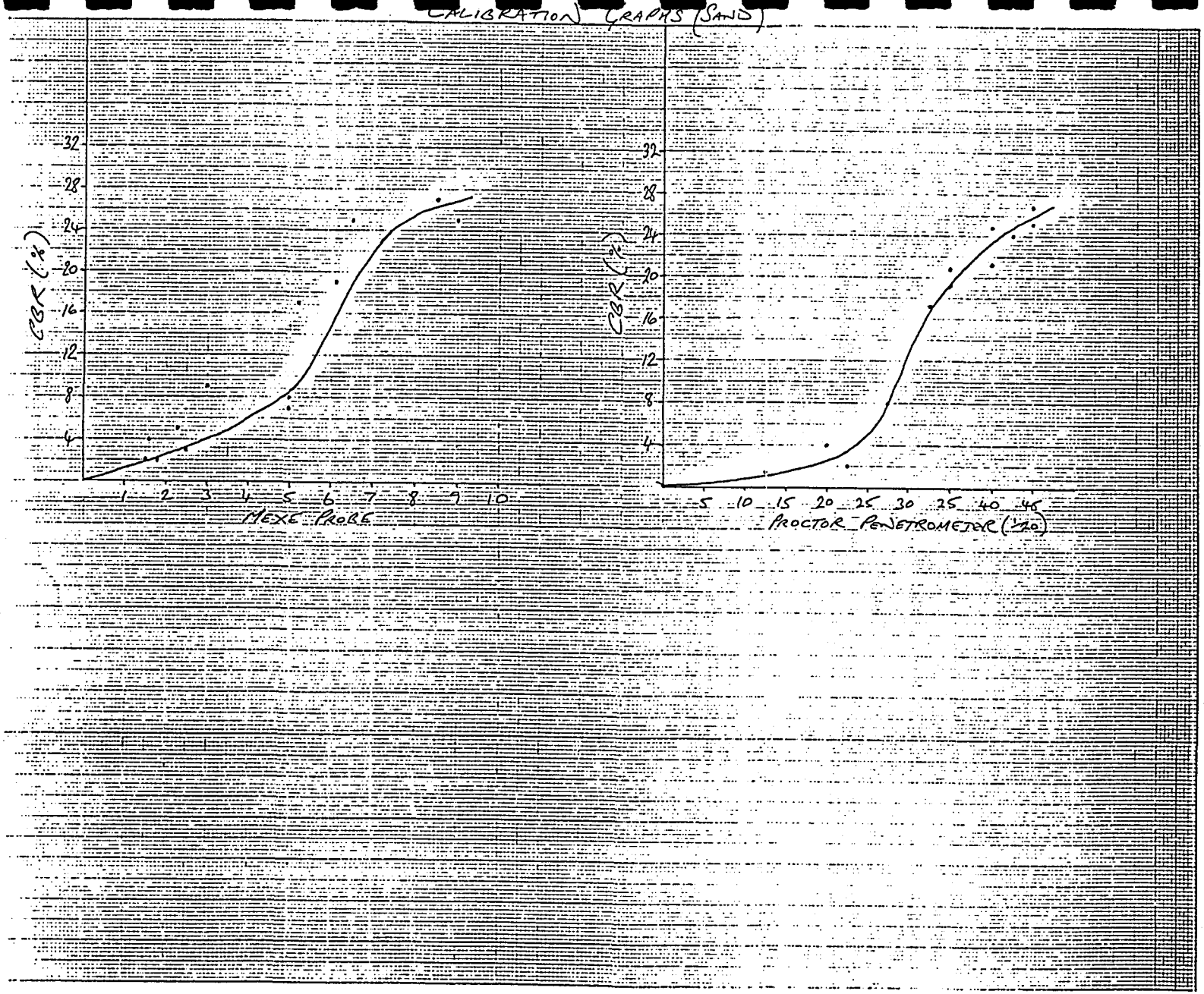
Mexe Probes

Sample	Date	Northing	Easting	Level (mOD)	Mexe Probe	Calc CBR %
2795	05-Jun-97	469930.7	169754	38.72	5	8
2796	05-Jun-97	469934.5	169756	38.74	5	8
2797	05-Jun-97	469937.2	169758	38.76	4.3	7
2798	05-Jun-97	469940.3	169757	38.80	5.3	8
2799	05-Jun-97	469944.5	169759	38.82	5.1	8
2805	05-Jun-97	469940.4	169735	38.78	5.1	8
2806	05-Jun-97	469943.2	169738	38.76	4.5	7
2807	05-Jun-97	469945.8	169738	38.76	5	8
2808	05-Jun-97	469948.1	169739	38.76	4.6	7
2809	05-Jun-97	469951.7	169739	38.79	5.5	9
2815	05-Jun-97	469950.5	169716	38.71	5.1	8
2816	05-Jun-97	469954.2	169718	38.73	5.2	8
2817	05-Jun-97	469956.9	169719	38.73	5.1	8
2818	05-Jun-97	469961.8	169721	38.66	5	8
2819	05-Jun-97	469967.6	169723	38.72	5.4	9
2825	06-Jun-97	469922.8	169855	38.77	4.5	7
2826	06-Jun-97	469924.2	169849	38.75	4.1	6
2827	06-Jun-97	469925.3	169843	38.80	4.5	7
2828	06-Jun-97	469927	169839	38.81	4.7	7
2829	06-Jun-97	469928.5	169834	38.82	4.2	6
2835	06-Jun-97	469905.5	169831	38.64	5.2	8
2836	06-Jun-97	469966.6	169827	38.62	4.4	7
2837	06-Jun-97	469909.6	169822	38.61	5.1	8
2838	06-Jun-97	469912.9	169818	38.57	4.2	6
2839	06-Jun-97	469916.4	169815	38.54	5.2	8
2845	06-Jun-97	469930.2	169805	38.59	4.5	7
2846	06-Jun-97	469933.3	169801	38.57	4.1	6
2847	06-Jun-97	469936.9	169797	38.52	4.1	6
2848	06-Jun-97	469939.5	169792	38.57	4.3	7
2849	06-Jun-97	469941.8	169789	38.63	4	5.5
2889	13-Jun-97	470010.4	169733	38.66	5.5	9
2890	13-Jun-97	470005.9	169730	38.64	5.3	8.5
2891	13-Jun-97	470001.6	169725	38.59	4.8	7.5
2892	13-Jun-97	469997	169719	38.56	4.2	6
2893	13-Jun-97	469991.9	169714	38.64	4.3	6
2899	13-Jun-97	469973.6	169749	38.71	4.8	7
2900	13-Jun-97	469968.8	169756	38.71	4.6	7
2901	13-Jun-97	469963.9	169765	38.69	5	8
2902	13-Jun-97	469957.7	169776	38.76	4.9	8
2903	13-Jun-97	469952	169788	38.75	4.9	8

GREEN PARK, READING PLOT 3

Hand Vanes

Sample	Date	Northing	Easting	Level (mOD)	Shear Strength (kN/m^2)
2688	30/05/97	469959	169792	38.30	>100
2689	30/05/97	469949	169797	38.25	>100
2690	30/05/97	469944	169788	38.19	>100
2691	30/05/97	469951	169782	38.23	>100
2692	30/05/97	469958	169786	38.30	>100
2704	30/05/97	469961	169747	38.44	>100
2705	30/05/97	469961	169740	38.34	>100
2706	30/05/97	469968	169735	38.37	>100
2707	30/05/97	469972	169744	38.42	>100
2708	30/05/97	469968	169749	38.38	>100
2719	31/05/97	469995	169731	38.10	>100
2720	31/05/97	469995	169735	38.13	>100
2721	31/05/97	469994	169742	38.17	>100
2722	31/05/97	469994	169748	38.21	>100
2723	31/05/97	469992	169753	38.26	>100
2734	31/05/97	469975	169703	38.34	>100
2735	31/05/97	469970	169969	38.32	>100
2736	31/05/97	469967	169707	38.29	>100
2737	31/05/97	469962	169711	38.28	>100
2738	31/05/97	469957	169716	38.38	>100
2750	02/06/97	469933	169846	38.34	>100
2751	02/06/97	469921	169835	38.37	>100
2752	02/06/97	469916	169840	38.49	>100
2753	02/06/97	469921	169856	38.54	>100
2754	02/06/97	469928	169857	38.45	>100
2766	02/06/97	469935	169900	38.54	>100
2767	02/06/97	469937	169908	38.49	>100
2768	02/06/97	469941	169915	38.51	>100
2769	02/06/97	469946	169906	38.51	>100
2770	02/06/97	469944	169897	38.49	>100
2782	02/06/97	469978	169836	38.33	>100
2783	02/06/97	469978	169823	38.34	>100
2784	02/06/97	469967	169835	38.34	>100
2785	02/06/97	469966	169843	38.33	>100
2786	02/06/97	469975	169845	38.40	>100
2860	10/06/97	469889	169885	38.42	>100
2861	10/06/97	469890	169893	38.41	>100
2862	10/06/97	469894	169903	38.44	>100
2863	10/06/97	469897	169913	38.45	>100
2864	10/06/97	469901	169922	38.48	>100
2979	18/06/97	469979	169923	38.34	>100
2980	18/06/97	469998	169919	38.41	>100
2981	18/06/97	470017	169917	38.40	>100
2982	18/06/97	470039	169929	38.43	>100
2983	18/06/97	470026	169962	38.49	>100



AMEC Civil Engineering

Materials and Geotechnical Services
AMEC Civil Engineering Limited
Chapel Street, Adlington, Lancashire PR7 4JP
Telephone: (0257) 480264, Fax: (0257) 474539

Client AMEC Civil Engineering Ltd

Title Reading

Contract Reading Business Park

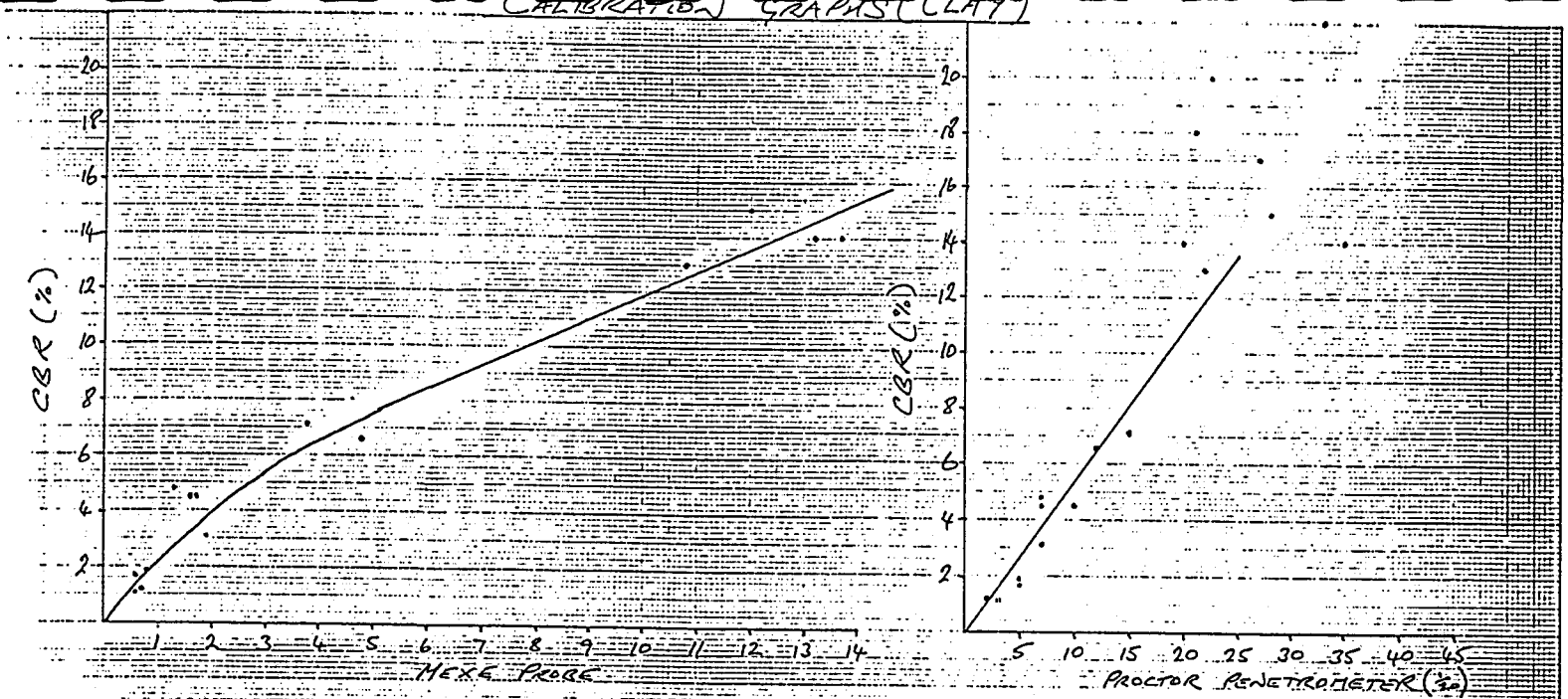
SAND MATERIALS

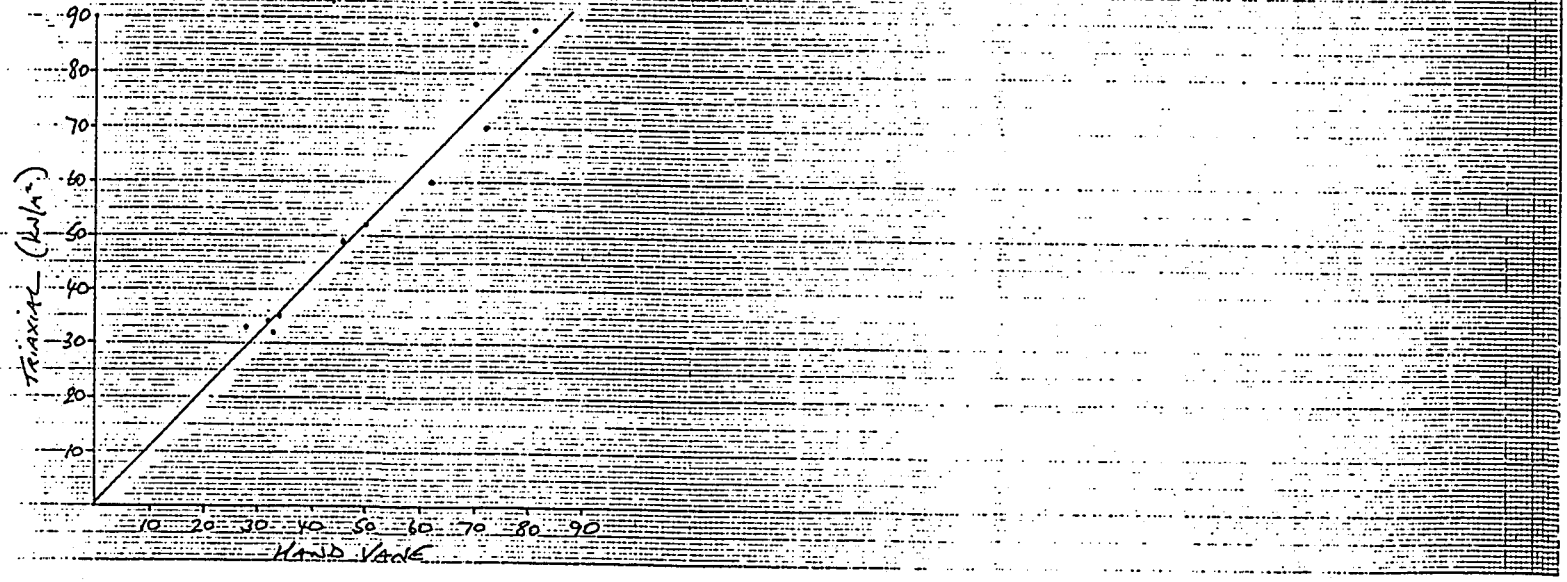
CALIBRATION GRAPHS

Job no. 95/081/927

Appendix sheet no.

CALIBRATION GRAPHS (CLAY)





AMEC Civil Engineering

Materials and Geotechnical Services
AMEC Civil Engineering Limited
Chapel Street, Adlington, Lancashire PR7 4JP
Telephone: (0257) 480264, Fax: (0257) 474539

Client AMEC Civil Engineering Ltd.

Title Reading

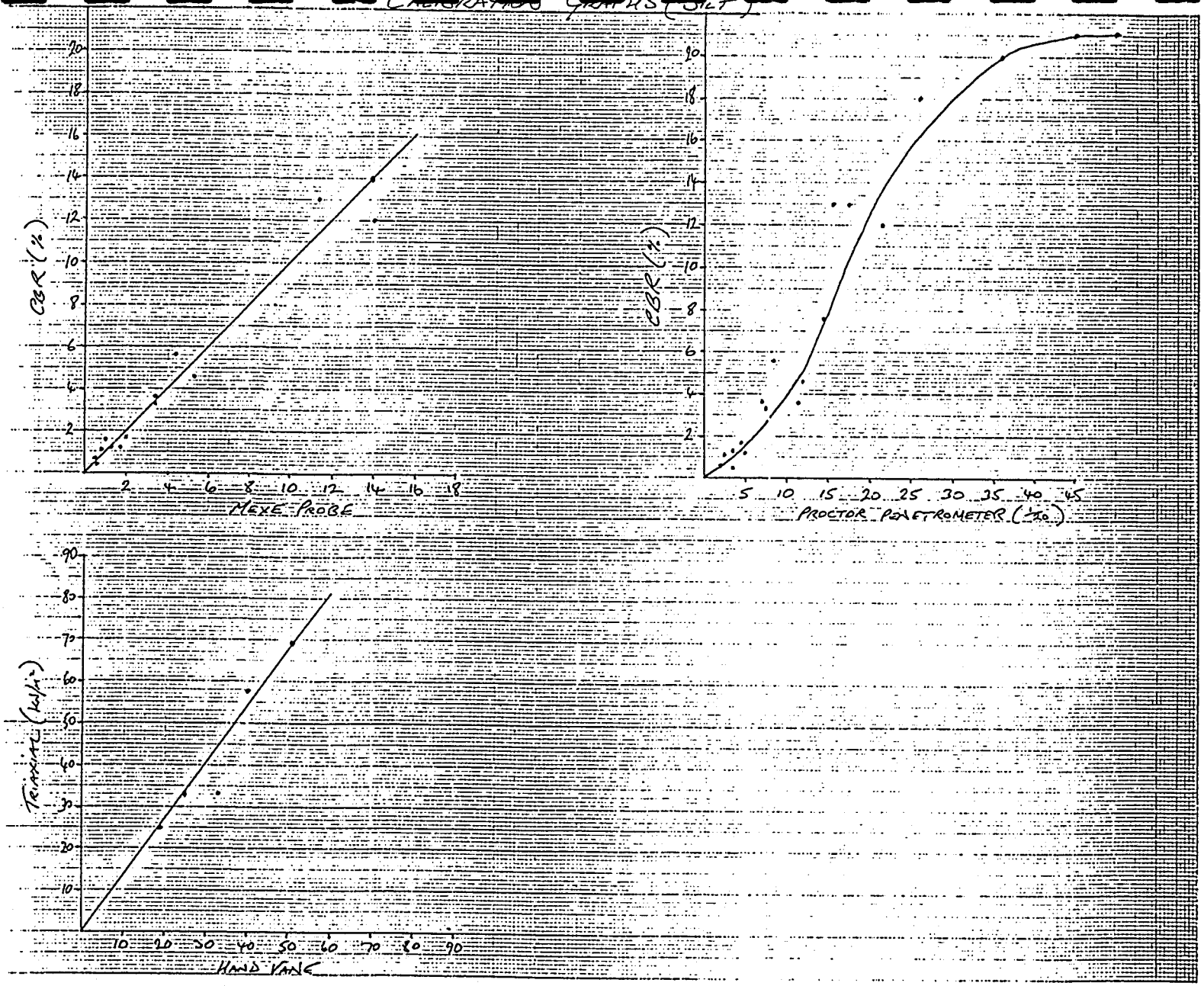
Contract Reading Business Park

CLAY MATERIALS
CALIBRATION GRAPHS

Job no. 95/081/927

Appendix sheet no.

CALIBRATION GRAPHS (SILT)



AMEC Civil Engineering

Materials and Geotechnical Services
AMEC Civil Engineering Limited
Chapel Street, Adlington, Lancashire PR7 4JP
Telephone: (0257) 480264, Fax: (0257) 474539

Client AMEC CIVIL ENGINEERING LTD.

Title READING

Contract READING BUSINESS PARK

SILT MATERIALS

CALIBRATION GRAPHS

Job no. 95/081/927

Appendix sheet no.

APPENDIX 12

Our Ref : 96/07170-91 Client: Peter Brett Associates Site: Small Mead Farm

Your Ref: 8626 Date Received: 17/04/96 Date of Report: 08/05/96

Sample Ref:		TP1 D1 0.5	TP1 D2 1.1	TP2 D1 0.2	TP2 D2 0.4	TP2 D4 0.75	TP3 D1 0.25	TP3 D2 0.8	TP4 D1 0.4
pH Value	units	8.2	8.3	7.8	7.7	8.3	8.4	7.9	9.3
Electrical Conductivity *	µS/cm	660	680	1480	2200	430	2200	930	1900
Total Arsenic (As)	mg/kg	<5	6	12	<5	6	10	<5	<5
Total Cadmium (Cd)	mg/kg	<0.5	<0.5	0.6	<0.5	<0.5	1.6	<0.5	<0.5
Total Chromium (Cr)	mg/kg	8	10	15	10	8	15	10	10
Total Copper (Cu)	mg/kg	15	15	65	20	10	240	15	55
Total Lead (Pb)	mg/kg	40	40	240	180	30	680	40	130
Total Mercury (Hg)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	1.9
Total Nickel (Ni)	mg/kg	15	20	30	15	10	20	25	15
Total Zinc (Zn)	mg/kg	40	40	240	180	30	680	40	130
Total Cyanide (CN)	mg/kg	<5	<5	<5	<5	<5	<5	<5	<5
Total (mono) Phenols	mg/kg	<5	<5	<5	<5	<5	<5	<5	<5
Chloride (Cl)	mg/kg	125	130	150	225	95	255	205	155
Nitrate (NO_3)	mg/kg	<10	20	<10	<10	<10	85	70	80
Soluble Boron (B)	mg/kg	2.0	1.8	1.9	6.0	0.5	2.6	1.7	2.5
Soluble Sulphate * (SO_4)	g/l	0.15	0.57	0.70	1.00	0.05	1.54	0.21	1.27
Toluene Extractable Material	%	<0.05	<0.05	0.55	<0.05	<0.05	0.80	<0.05	0.10
PAHs (as coal tar)	%	--	--	<0.05	--	--	<0.05	--	--

-- dependent option * 1:2 Extract

VOELCKER Science Est. 1863

Our Ref : 96/07170-91 Client: Peter Brett Associates Site: Small Mead Farm

Your Ref: 8626 Date Received: 17/04/96 Date of Report: 08/05/96

Sample Ref:		TP4 D2 0.8	TP5 D2 0.4	TP6 D2 0.8	TP6 D4 1.25	TP7 D1 0.3	TP7 D2 0.5	TP8 D3 1.0	TP9 D2 0.9
pH Value	units	8.1	8.2	7.8	7.8	7.8	7.5	7.8	7.4
Electrical Conductivity *	µS/cm	430	610	580	480	1650	520	280	500
Total Arsenic (As)	mg/kg	<5	8	<5	16	12	<5	<5	<5
Total Cadmium (Cd)	mg/kg	<0.5	1.0	1.2	<0.5	<0.5	<0.5	<0.5	<0.5
Total Chromium (Cr)	mg/kg	10	10	20	10	15	10	10	20
Total Copper (Cu)	mg/kg	10	30	45	15	30	30	20	20
Total Lead (Pb)	mg/kg	40	200	230	55	170	110	65	50
Total Mercury (Hg)	mg/kg	<0.5	1.8	0.8	<0.5	0.5	3.0	1.8	0.8
Total Nickel (Ni)	mg/kg	15	15	20	25	30	20	15	15
Total Zinc (Zn)	mg/kg	40	200	230	55	170	150	50	80
Total Cyanide (CN)	mg/kg	<5	<5	<5	<5	<5	<5	<5	<5
Total (mono) Phenols	mg/kg	<5	<5	<5	<5	<5	<5	<5	<5
Chloride (Cl)	mg/kg	30	95	90	35	130	70	55	100
Nitrate (NO_3)	mg/kg	10	55	15	15	35	30	25	30
Soluble Boron (B)	mg/kg	0.8	5.0	5.0	1.0	2.8	1.3	1.1	0.7
Soluble Sulphate * (SO_4)	g/l	0.17	0.10	0.23	0.14	1.07	0.23	0.05	0.10
Toluene Extractable Material	%	<0.05	0.15	<0.05	<0.05	0.23	<0.05	<0.05	<0.05
PAHs (as coal tar)	%	--	--	--	--	<0.05	--	--	--

-- dependent option * 1:2 Extract

VOELCKER Science Est. 1863

Our Ref : 96/07170-91 Client: Peter Brett Associates Site: Small Mead Farm

Your Ref: 8626 Date Received: 17/04/96 Date of Report: 08/05/96

Sample Ref:		TP2	TP5	TP9
pH Value	units	6.7	6.7	6.9
Electrical Conductivity	µS/cm	1850	1130	1160
Free & Saline Ammonia (NH_4)	mg/l	17.0	4.8	<0.1
Alkalinity ($CaCO_3$)	mg/l	350	370	340
Chemical Oxygen Demand (O_2)	mg/l	175	920	20
Free & Combined Cyanide (CN)	mg/l	<0.05	<0.05	<0.05
Total (mono) Phenols	mg/l	<0.05	<0.05	<0.05
Kjeldahl Nitrogen (N)	mg/l	16.0	5.3	<0.1
Freon Extractable Material	mg/l	115	1350	<1.0
Fluoride (F)	mg/l	<1	<1	<1
Chloride (Cl)	mg/l	300	100	130
Nitrate (NO_3)	mg/l	6	17	<5
Nitrite (NO_2)	mg/l	0.1	<0.1	<0.1
Phosphate (PO_4)	mg/l	<5	<4	<5
Sulphate (SO_4)	mg/l	390	190	200
Sulphide (S_2)	mg/l	<0.02	0.50	<0.02
Arsenic (As)	mg/l	<0.02	<0.02	<0.02
Cadmium (Cd)	mg/l	<0.01	<0.01	<0.01
Chromium (Cr)	mg/l	<0.05	<0.05	<0.05
Copper (Cu)	mg/l	<0.05	<0.05	<0.05
Iron (Fe)	mg/l	0.20	1.40	<0.05
Lead (Pb)	mg/l	<0.05	<0.05	<0.05
Manganese (Mn)	mg/l	0.80	2.60	<0.05
Mercury (Hg)	mg/l	<0.001	<0.001	<0.001
Nickel (Ni)	mg/l	<0.05	<0.05	<0.05
Zinc (Zn)	mg/l	<0.05	<0.05	<0.05

VOELCKER Science Est. 1863

Our Ref : 96/07170-91 Client: Peter Brett Associates Site: Small Mead Farm

Your Ref: 8626 Date Received: 17/04/96 Date of Report: 08/05/96

Sample Ref:		TP2	TP5	TP6
Depth (m) :		0.4	0.4	0.8
Chloroform	mg/kg	<0.1	<0.1	<0.1
1,1,1-trichloroethane	mg/kg	<0.1	<0.1	<0.1
Carbontetrachloride	mg/kg	<0.1	<0.1	<0.1
Bromodichloromethane	mg/kg	<0.1	<0.1	<0.1
Trichlorethylene	mg/kg	<0.1	<0.1	<0.1
Dibromochloromethane	mg/kg	<0.1	<0.1	<0.1
Tetrachloroethylene	mg/kg	<0.1	<0.1	<0.1
Bromoform	mg/kg	<0.1	<0.1	<0.1
Benzene	mg/kg	<0.1	<0.1	<0.1
Toluene	mg/kg	<0.1	<0.1	<0.1
Ethyl benzene	mg/kg	<0.1	<0.1	<0.1
o-xylene	mg/kg	<0.1	<0.1	<0.1
m-xylene	mg/kg	<0.1	<0.1	<0.1
p-xylene	mg/kg	<0.1	<0.1	<0.1
Total Petroleum Hydrocarbons	mg/kg	3529	208	<50

Note: All results expressed as on dried weight basis for soils.

VOELCKER Science Est. 1863

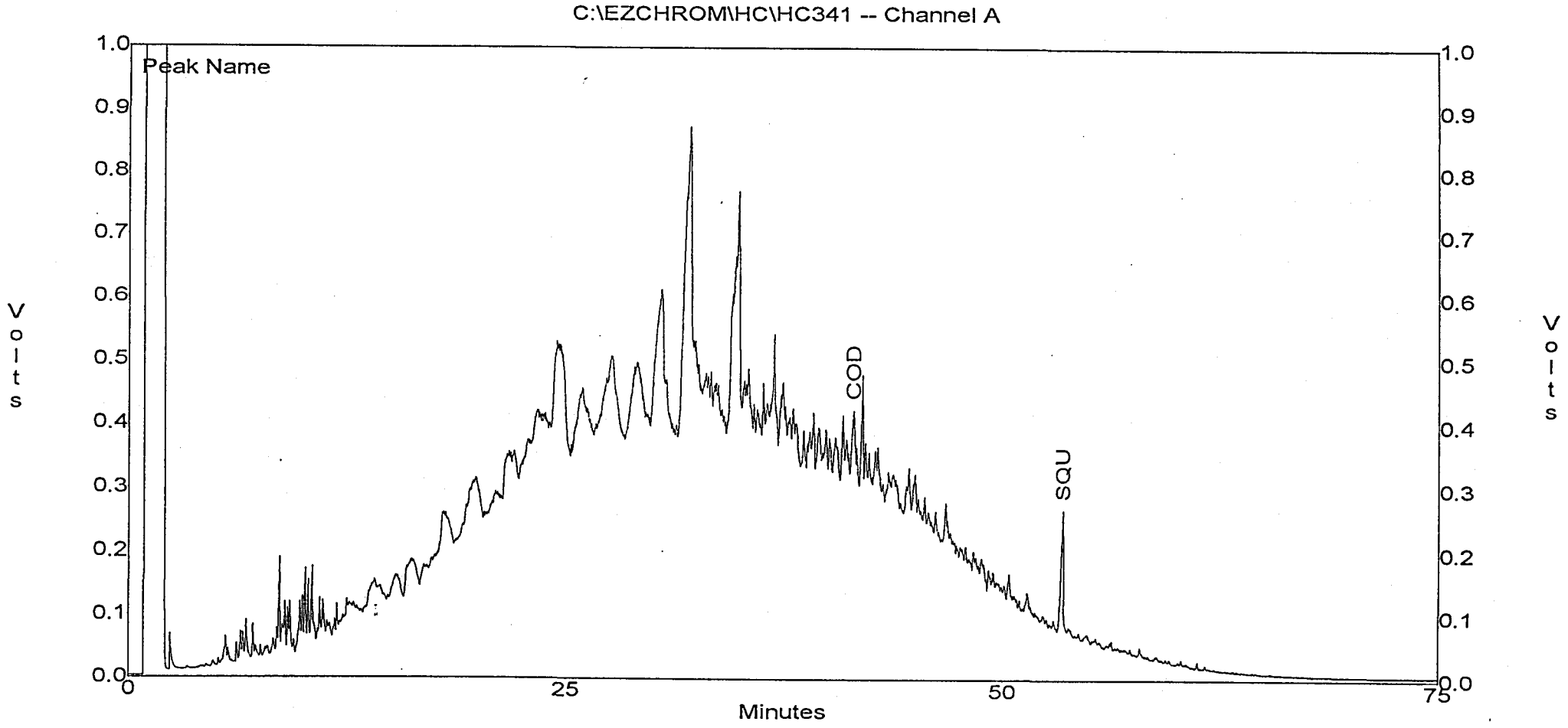
Our Ref : 96/07170-91 Client: Peter Brett Associates Site: Small Mead Farm

Your Ref: 8626 Date Received: 17/04/96 Date of Report: 08/05/96

Sample Ref:		TP2/W	TP5/W	TP8/W 9
Chloroform	µg/l	<0.1	<0.1	<0.1
1,1,1-trichloroethane	µg/l	<0.1	<0.1	<0.1
Carbontetrachloride	µg/l	<0.1	<0.1	<0.1
Bromodichloromethane	µg/l	<0.1	<0.1	<0.1
Trichlorethylene	µg/l	<0.1	<0.1	<0.1
Dibromochloromethane	µg/l	<0.1	<0.1	<0.1
Tetrachloroethylene	µg/l	<0.1	<0.1	<0.1
Bromoform	µg/l	<0.1	<0.1	<0.1
Benzene	µg/l	<0.1	<0.1	<0.1
Toluene	µg/l	<0.1	10.3	<0.1
Ethyl benzene	µg/l	<0.1	<0.1	<0.1
o-xylene	µg/l	18.2	30.2	<0.1
m-xylene	µg/l	<0.1	13.8	<0.1
p-xylene	µg/l	<0.1	5.8	<0.1
Total Petroleum Hydrocarbons	µg/l	--	--	975
Total Petroleum Hydrocarbons	mg/l	21.7	149	--

VOELCKER Science

[redacted] PETER BRETT ASSOCIATES
CONTACT : MR A RADAGE
SITE REF: SMALL MEAD FARM
CLIENT REF : TP2/0.40/SOIL
OUR REF: 96/07186
GC REF: HC 341

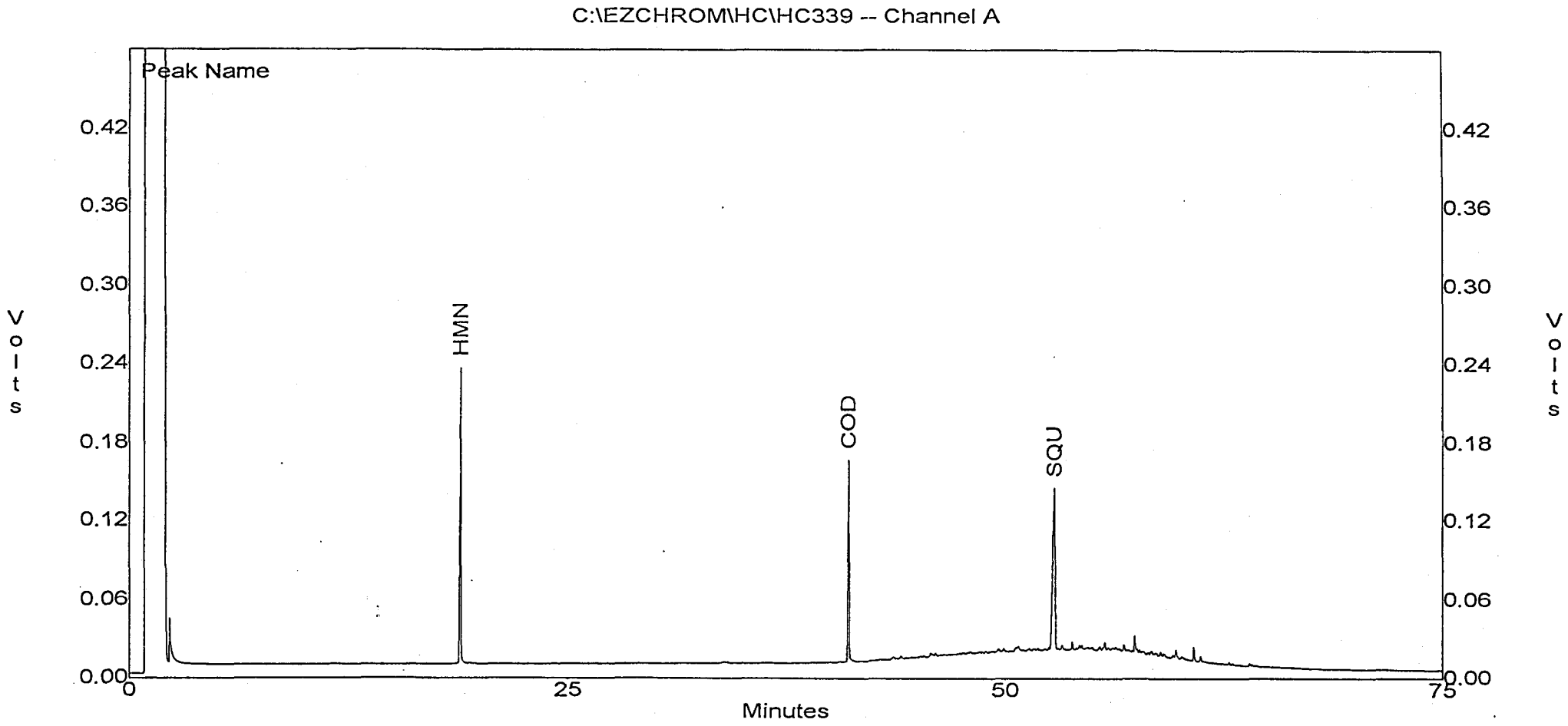


TOTAL PETROLEUM HYDROCARBON: 3529 MG/KG

VOELCKER Science
Est. 1863

[redacted]R [redacted]T [redacted]OCI[redacted]S

CONTACT : MR A RADAGE
SITE REF: SMALL MEAD FARM
CLIENT REF : TP5/0.40/SOIL
OUR REF: 96/07187
GC REF: HC 339

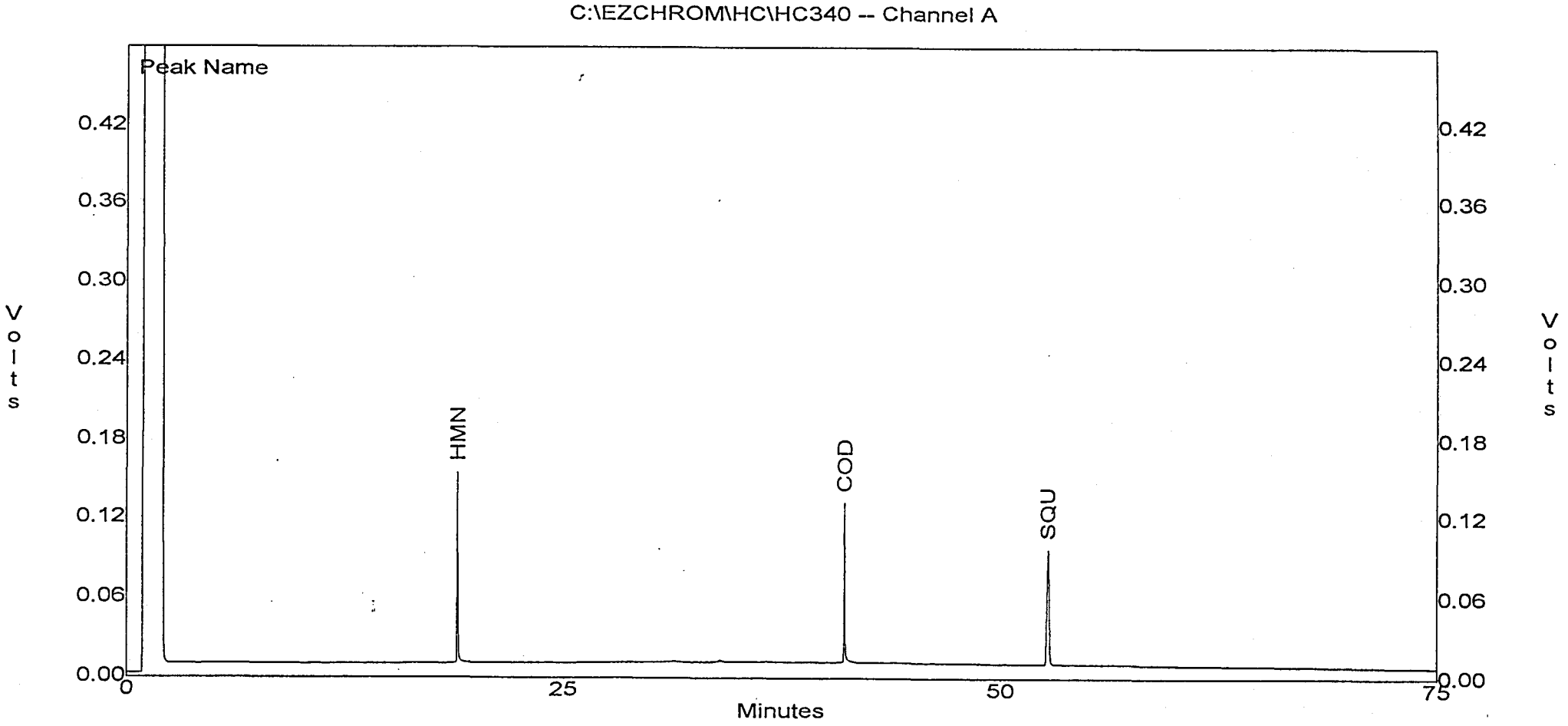


TOTAL PETROLEUM HYDROCARBON: 208 MG/KG

VOELCKER Science
Est. 1863

[redacted] P[redacted]R B[redacted]T A[redacted]OCI[redacted]S [redacted]

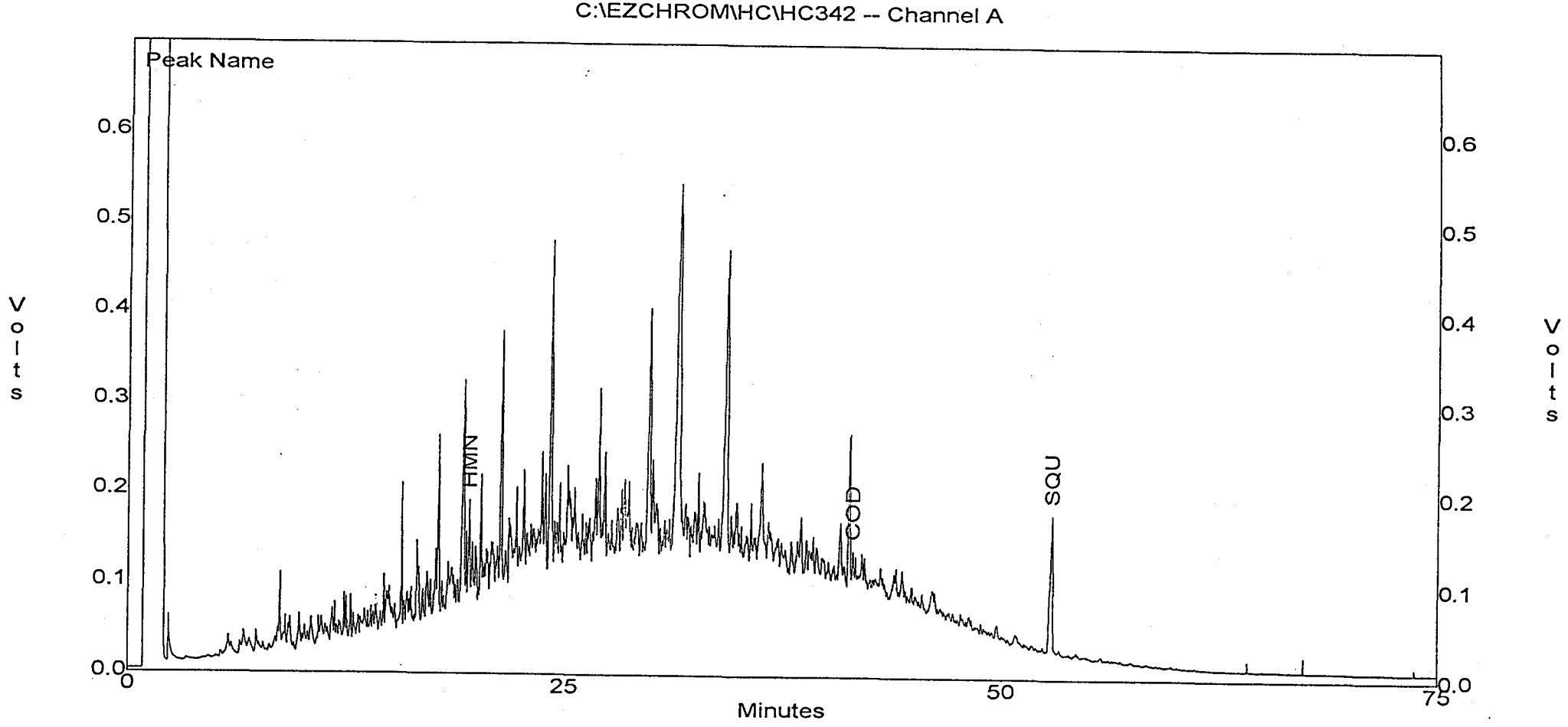
CONTACT : MR A RADAGE
SITE REF: SMALL MEAD FARM
CLIENT REF : TP6/0.80/SOIL
OUR REF: 96/07188
GC REF: HC 340



TOTAL PETROLEUM HYDROCARBON: <50 MG/KG

VOELCKER Science
Est. 1863

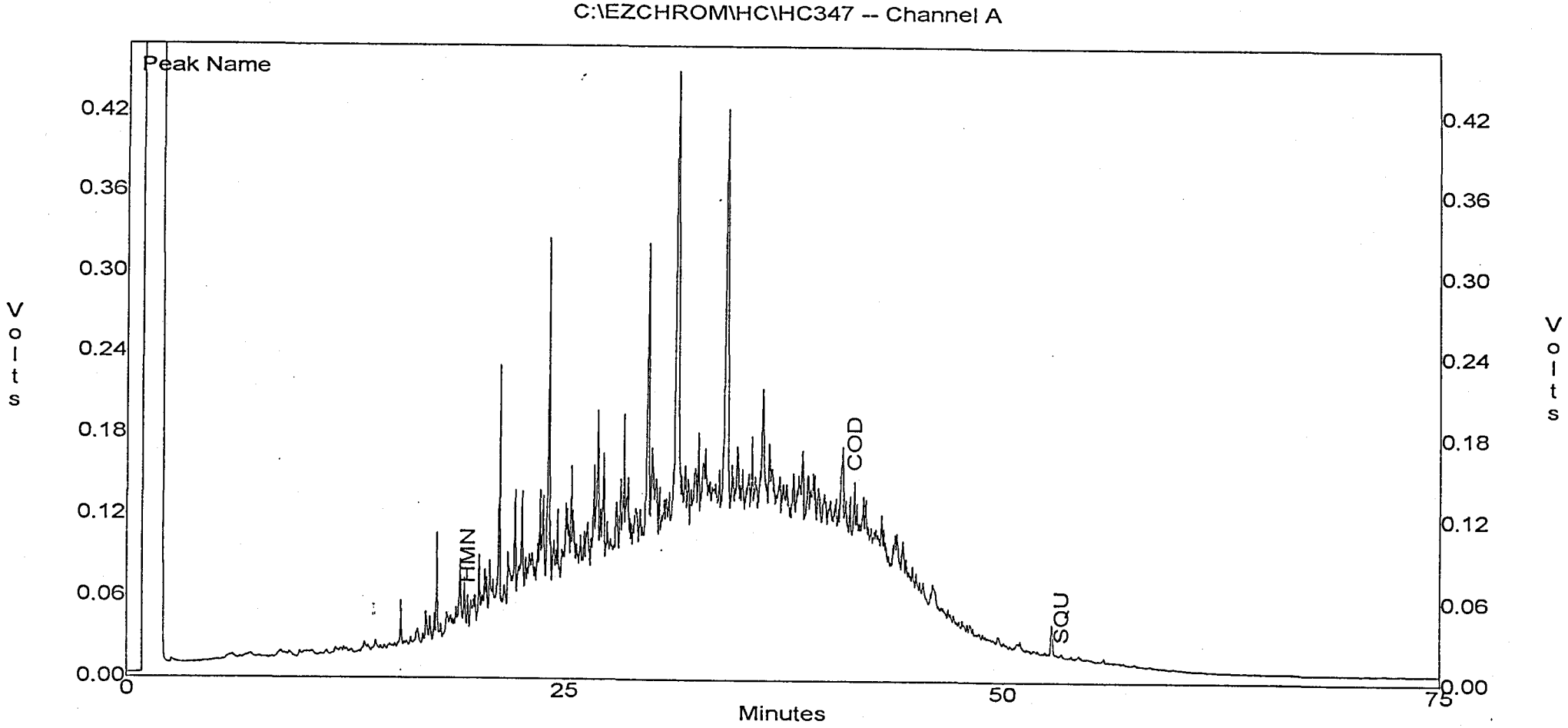
[redacted] R [redacted] T ASSOCIATES
CONTACT : MR A RADAGE
SITE REF: SMALL MEAD FARM
CLIENT REF : TP2/WATER
OUR REF: 96/07189
GC REF: HC 342



TOTAL PETROLEUM HYDROCARBON: 21.7 MG/L

VOELCKER Science
Est. 1863

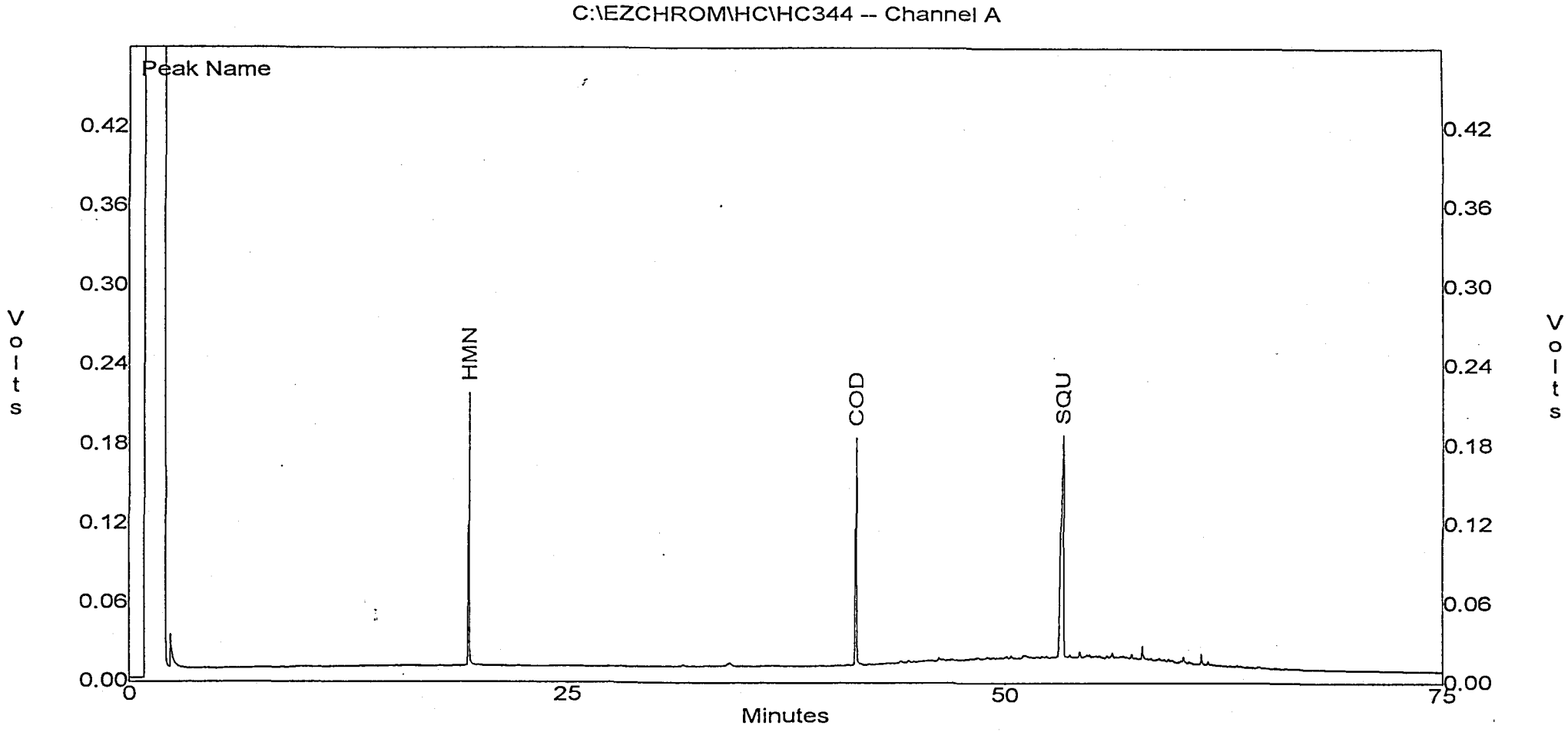
PETER BRETT ASSOCIATES
CONTACT : MR A RADAGE
SITE REF: SMALL MEAD FARM
CLIENT REF : TP5/WATER
OUR REF: 96/07190
GC REF: HC 347



TOTAL PETROLEUM HYDROCARBON: 149 MG/L

VOELCKER Science
Est. 1863

[redacted] R [redacted] T [redacted] OCI[redacted] S
CONTACT : MR A RADAGE
SITE REF: SMALL MEAD FARM
CLIENT REF : TP9/WATER
OUR REF: 96/07191
GC REF: HC 344



TOTAL PETROLEUM HYDROCARBON: 975 UG/L

VOELCKER Science
Est. 1863

APPENDIX 3

GAS AND GROUNDWATER MONITORING RESULTS

25th June 2008

Borehole	Pressure (mb)	Flow (l/hr)	CH4 (%v/v)	CO_2 (%v/v)	O_2 (%v/v)	CH4 (%LEL)	H_2S (ppm)	Depth to Groundwater (mbgl)	Groundwater level (mAD)
BH101	1012	0.0	<0.1	<0.1	20.7	<0.1	<1	2.16	37.39
BH102	1012	0.4	0.8	1.4	17.2	16.0	<1	2.00	37.35
BH103	1012	0.0	<0.1	<0.1	20.8	<0.1	<1	2.08	37.37
BH104	1012	0.0	25.5	2.3	3.0	>150	<1	2.23	37.32
BH105	1012	0.0	2.9	1.6	14.9	53.4	<1	2.20	37.55
BH201	1012	0.0	<0.1	<0.1	20.6	<0.1	<1	2.14	37.76
BH202	1011	0.0	<0.1	<0.1	20.5	<0.1	<1	5.40	34.50

2nd July 2008

Borehole	Pressure (mb)	Flow (l/hr)	CH4 (%v/v)	CO_2 (%v/v)	O_2 (%v/v)	CH4 (%LEL)	H_2S (ppm)	Depth to Groundwater (mbgl)	Groundwater level (mAD)
BH101	1006	0.0	<0.1	0.2	20.5	<0.1	<1	2.20	37.35
BH102	1005	0.0	2.8	3.2	10.0	38.6	<1	2.04	37.31
BH103	1005	0.7	<0.1	0.4	20.6	<0.1	<1	2.15	37..30
BH104	1005	0.0	11.5	2.6	18.6	>150	<1	2.28	37.27
BH105	1006	0.0	7.9	6.0	10.4	>150	<1	2.24	37.51
BH201	1006	0.0	<0.1	0.2	20.5	<0.1	<1	2.16	37.74
BH202	1006	0.0	<0.1	<0.1	20.7	<0.1	<1	4.28	35.62

10th July 2008

Borehole	Pressure (mb)	Flow (l/hr)	CH4 (%v/v)	CO_2 (%v/v)	O_2 (%v/v)	CH4 (%LEL)	H_2S (ppm)	Depth to Groundwater (mbgl)	Groundwater level (mAD)
BH101	1003	>30	6.5	1.8	3.0	51.3	<1	2.01	37.54
BH102	1003	18.4	27.5	5.5	1.5	>150	<1	1.87	37.48
BH103	1003	0.2	<0.1	0.3	20.6	<0.1	<1	1.92	37.53
BH104	1003	0.9	55.0	14.0	8.0	>150	<1	2.08	37.47
BH105	1003	4.7	14.0	10.0	20.8	>150	<1	1.84	37.91
BH201	1003	0.0	<0.1	0.3	20.4	<0.1	<1	2.09	37.81
BH202	1003	0.0	<0.1	<0.1	20.8	<0.1	<1	4.14	35.76

GAS AND GROUNDWATER MONITORING RESULTS

21st July 2008

Borehole	Pressure (mb)	Flow (l/hr)	CH4 (%v/v)	CO_2 (%v/v)	O_2 (%v/v)	CH4 (%LEL)	H_2S (ppm)	Depth to Groundwater (mbgl)	Groundwater level (mAD)
BH101	1020	-9.5	<0.1	2.7	12.3	<0.1	<1	2.23	37.32
BH102	1020	-2.7	<0.1	1.8	8.4	<0.1	<1	2.11	37.24
BH103	1020	-9.7	<0.1	<0.1	20.9	<0.1	<1	2.23	37.22
BH104	1020	0.0	<0.1	0.3	20.6	<0.1	<1	2.32	37.23
BH105	1020	-2.1	<0.1	<0.1	21.0	<0.1	<1	2.30	37.45
BH201	1020	0.0	<0.1	<0.1	20.7	<0.1	<1	2.24	37.66
BH202	1020	-0.2	<0.1	<0.1	20.9	<0.1	<1	3.89	36.01

28th July 2008

Borehole	Pressure (mb)	Flow (l/hr)	CH4 (%v/v)	CO_2 (%v/v)	O_2 (%v/v)	CH4 (%LEL)	H_2S (ppm)	Depth to Groundwater (mbgl)	Groundwater level (mAD)
BH101	1007	3.6	1.8	6.5	1.0	12.6	<1	2.53	37.02
BH102	1009	0.4	<0.1	1.7	14.7	<0.1	<1	2.37	36.98
BH103	1009	4.2	11.5	6.4	20.7	93.0	<1	2.51	36.94
BH104	1010	0.0	<0.1	4.2	14.3	<0.1	<1	2.36	37.19
BH105	1010	0.0	0.6	11.7	19.3	13.1	<1	2.13	37.62
BH201	1007	0.0	<0.1	<0.1	20.8	<0.1	<1	2.47	37.43
BH202	1009	0.0	<0.1	<0.1	20.8	<0.1	<1	4.12	35.78

1st August 2008

Borehole	Pressure (mb)	Flow (l/hr)	CH4 (%v/v)	CO_2 (%v/v)	O_2 (%v/v)	CH4 (%LEL)	H_2S (ppm)	Depth to Groundwater (mbgl)	Groundwater level (mAD)
BH101	1008	0.0	1.2	4.8	4.8	11.4	<1	2.48	37.07
BH102	1007	0.2	2.5	1.5	15.2	30.8	<1	2.13	37.22
BH103	1007	-5.2	6.9	3.2	11.2	>150	<1	2.48	36.97
BH104	1007	0.0	4.2	3.4	13.8	69.8	<1	2.34	37.21
BH105	1007	-0.6	<0.1	<0.1	20.7	<0.1	<1	2.33	37.42
BH201	1007	0.0	<0.1	<0.1	20.8	<0.1	<1	2.27	37.63
BH202	1007	-0.2	<0.1	<0.1	20.8	<0.1	<1	4.10	35.80

GAS AND GROUNDWATER MONITORING RESULTS

18th October 2013

Borehole	Pressure (mb)	Flow (l/hr)	CH4 (%v/v)	CO_2 (%v/v)	O_2 (%v/v)	CH4 (%LEL)	H_2S (ppm)	Depth to Groundwater (mbgl)	Groundwater level (mAD)
BH101	1010	0.1	5.3	3.6	<0.1	35.5	<1	2.86	36.69
BH102	1011	0.2	<0.1	0.9	14.6	<0.1	<1	2.64	36.71
BH103	1011	2.1	31.5	13.0	<0.1	>150	<1	2.40	37.05
BH104	1010	2.4	6.4	12.0	0.6	46.0	<1	2.47	37.08
BH105	1010	0.2	4.2	3.4	12.3	57.6	<1	2.43	37.32
BH201	1010	0.0	<0.1	<0.1	20.8	<0.1	<1	2.42	37.48
BH202	1010	0.0	<0.1	<0.1	20.2	<0.1	<1	2.50	37.40

21st October 2013

Borehole	Pressure (mb)	Flow (l/hr)	CH4 (%v/v)	CO_2 (%v/v)	O_2 (%v/v)	CH4 (%LEL)	H_2S (ppm)	Depth to Groundwater (mbgl)	Groundwater level (mAD)
BH101	999	2.4	4.6	3.1	<0.1	31.0	<1	2.86	36.69
BH102	1000	0.8	14.3	4.4	0.4	>150	<1	2.64	36.71
BH103	999	4.2	22.5	9.6	<0.1	>150	<1	2.40	37.05
BH104	999	10.0	17.5	11.0	0.7	>150	<1	2.47	37.08
BH105	999	1.1	9.3	0.7	3.0	67.9	<1	2.42	37.33
BH201	1000	0.0	<0.1	<0.1	20.8	<0.1	<1	2.42	37.48
BH202	999	0.2	<0.1	<0.1	20.6	<0.1	<1	2.50	37.40

1st November 2013

Borehole	Pressure (mb)	Flow (l/hr)	CH4 (%v/v)	CO_2 (%v/v)	O_2 (%v/v)	CH4 (%LEL)	H_2S (ppm)	Depth to Groundwater (mbgl)	Groundwater level (mAD)
BH101	1005	6.0	6.8	2.2	<0.1	45.5	<1	2.25	37.30
BH102	1004	0.0	<0.1	<0.1	3.8	0.0	<1	2.12	37.23
BH103	1004	4.9	18.0	9.7	<0.1	>150	<1	2.21	37.24
BH104	1004	0.4	10.0	6.0	5.5	76.6	<1	2.29	37.26
BH105	1004	0.2	<0.1	0.4	15.2	<0.1	<1	1.15	38.60
BH201	1005	0.0	<0.1	<0.1	20.7	<0.1	<1	2.28	37.62
BH202	1004	-0.1	<0.1	<0.1	20.5	<0.1	<1	2.47	37.43

GAS AND GROUNDWATER MONITORING RESULTS

7th November 2013

Borehole	Pressure (mb)	Flow (l/hr)	CH4 (%v/v)	CO_2 (%v/v)	O_2 (%v/v)	CH4 (%LEL)	H_2S (ppm)	Depth to Groundwater (mbgl)	Groundwater level (mAD)
BH101	1003	2.9	7.0	2.1	<0.1	47.8	<1	2.14	37.41
BH102	1003	-0.3	<0.1	<0.1	5.3	<0.1	<1	2.00	37.35
BH103	1003	-0.8	14.5	9.0	1.7	>150	<1	2.07	37.38
BH104	1003	0.0	2.5	1.7	19.1	58	<1	2.25	37.30
BH105	1003	-0.7	10.0	1.4	11.1	94.5	<1	1.13	38.62
BH201	1003	0.0	<0.1	<0.1	20.7	<0.1	<1	2.14	37.76
BH202	1003	0.0	<0.1	<0.1	20.5	<0.1	<1	2.38	37.52

14th November 2013

Borehole	Pressure (mb)	Flow (l/hr)	CH4 (%v/v)	CO_2 (%v/v)	O_2 (%v/v)	CH4 (%LEL)	H_2S (ppm)	Depth to Groundwater (mbgl)	Groundwater level (mAD)
BH101	1020	<<<	6.8	1.8	1.7	65	<1	2.06	37.49
BH102	1021	0.7	<0.1	<0.1	3.4	<0.1	<1	2.08	37.27
BH103	1022	0.0	6.5	6.8	5.8	72.4	<1	1.82	37.63
BH104	1023	-0.2	<0.1	1.1	17.3	<0.1	<1	2.28	37.27
BH105	1023	-0.1	<0.1	<0.1	12.9	<0.1	<1	2.31	37.44
BH201	1020	0.0	<0.1	<0.1	20.8	<0.1	<1	2.22	37.68
BH202	1023	0.6	<0.1	<0.1	20.7	<0.1	<1	2.08	37.82

18th November 2013

Borehole	Pressure (mb)	Flow (l/hr)	CH4 (%v/v)	CO_2 (%v/v)	O_2 (%v/v)	CH4 (%LEL)	H_2S (ppm)	Depth to Groundwater (mbgl)	Groundwater level (mAD)
BH101	1003	0.5	4.3	1.9	0.1	34	<1	2.32	37.23
BH102	1003	0.0	<0.1	<0.1	7.5	<0.1	<1	2.17	37.18
BH103	1003	-0.3	17.5	8.7	0.1	>150	<1	2.27	37.18
BH104	1003	1.3	<0.1	6.1	4.3	<0.1	<1	2.38	37.17
BH105	1003	-0.1	<0.1	0.2	6.0	<0.1	<1	2.39	37.36
BH201	1003	0.0	<0.1	<0.1	20.6	<0.1	<1	2.29	37.61
BH202	1003	0.0	<0.1	<0.1	20.4	<0.1	<1	2.36	37.54

APPENDIX 4

ALcontrol Laboratories

Unit 7-8 Hawarden Business Park
Manor Road (off Manor Lane)
Hawarden
Deeside
CH5 3US
Tel: (01244) 528700
Fax: (01244) 528701
email: mkt@alcontrol.co.uk
website: www.alcontrol.co.uk

Peter Brett Associates
Caversham Bridge House
Waterman Place
Reading
Berkshire
RG1 8DN

ATTN: Kevin Burbidge

CERTIFICATE OF ANALYSIS

Date:	24 July, 2008
Our Reference:	08/11223/02/01
Your Reference:	PLOT 3.2/2942/1013
Location:	GREEN PARK

A total of 43 samples was received for analysis on Thursday, 26 June 2008 and completed on Thursday, 17 July 2008. Accredited laboratory tests are defined in the log sheet, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation. We are pleased to enclose our final report, it was a pleasure to be of service to you, and we look forward to our continuing association.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials- whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

Signed

Diane Whittlestone
Tech. Support Manager

David O'Hare
Project Manager

Caroline Suttie
Project Coordinator
Team Leader

Valid if signed by any of the above signatories.

Compiled By

Laura Parr

1291
GROUP

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Registered Office: Templeborough House, Mill Close, Rotherham, S60 1BZ. Registered in England and Wales No. 4057291

ALcontrol Laboratories
TEST SCHEDULE

JOB NUMBER : 08/11223/02
CLIENT : Peter Brett Associates
CONTACT : Kevin Burbidge
DATE OF RECEIPT : 26/06/08
LOCATION : GREEN PARK

BATCH NUMBER : 1
CLIENT REF/CODE : PLOT 3.2/2942/1013
ORDER NUMBER : 2003
TURNAROUND : 10 days

Numeric values indicate additional scheduling

* indicates test subcontracted

		UKAS Accredited ?			✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓		✓	✓	✓	✓	✓
Sample Number	Sample Identity	P / V	Depth	Sample Type	Phenols HPLC (S)	Arsenic (S)	Cadmium (S)	Chromium (S)	Lead (S)	Mercury (S)	Selenium (S)	Nickel (S)	pH (S)	Soil Organic Matter (S)	Sulphate Soluble Kone 2:1 (S)	Copper (S)	Zinc (S)	Vanadium (S)	Beryllium (S)	C6-40 (Band 1) EZ (S)	EPH (DRO) (S)	GRO BTEX MTBE GC (S)	PAH Total 16 Rapid GC (S)	Arsenic ICP-MS (W)	Cadmium ICP-MS (W)	Chromium ICP-MS (W)	Lead ICP-MS (W)	Mercury Dissolved (W) (CVAF)
1	BH101	TUB 400g	0.50	SOLID	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X									
2	BH101	TUB 400g	1.00	SOLID																	3	3	X					
3	BH101	VOC	1.00	SOLID	Sample on Hold																							
4	BH102	ex-VOC	1.00	SOLID	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X			X					
5	BH103	TUB 400g	0.25	SOLID	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X									
6	BH103	VOC	1.25	SOLID																	2	4	X					
7	BH104	TUB 400g	1.00	SOLID	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		3	3	X					
8	BH105	TUB 400g	0.50	SOLID	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X									
9	BH105	ex-VOC	1.25	SOLID																	2	4	X					
10	BH201	TUB 400g	0.25	SOLID	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X									
11	BH201	ex-VOC	1.50	SOLID																	2	4	X					
12	BH201	ex-VOC	1.50	SOLID	Sample on Hold																							
13	BH202	TUB 400g	0.25	SOLID	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		2	4	X					
14	BH102	0.5lglass	UNKNOWN	LIQUID	Sample on Hold																							
15	BH102	1lglass	UNKNOWN	LIQUID	Sample on Hold																							
16	BH102	1lglass	UNKNOWN	LIQUID																								X
17	BH102	1lplastic	UNKNOWN	LIQUID																				X	X	X	X	
18	BH102	2SO4 125r	UNKNOWN	LIQUID																								
19	BH102	NaOH	UNKNOWN	LIQUID																								
20	BH104	0.5lglass	UNKNOWN	LIQUID	Sample on Hold																							
21	BH104	1lglass	UNKNOWN	LIQUID	Sample on Hold																							
22	BH104	1lglass	UNKNOWN	LIQUID																								X

Printed : 24/07/08 14:18:56

ALcontrol Laboratories
TEST SCHEDULE

JOB NUMBER : 08/11223/02
CLIENT : Peter Brett Associates
CONTACT : Kevin Burbidge
DATE OF RECEIPT : 26/06/08
LOCATION : GREEN PARK

BATCH NUMBER : 1
CLIENT REF/CODE : PLOT 3.2/2942/1013
ORDER NUMBER : 2003
TURNAROUND : 10 days

Numeric values indicate additional scheduling

* indicates test subcontracted

					UKAS Accredited ?	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sample Number	Sample Identity	P / V	Depth	Sample Type		Phenols HPLC (S)	Arsenic (S)	Cadmium (S)	Chromium (S)	Lead (S)	Mercury (S)	Selenium (S)	Nickel (S)	pH (S)	Soil Organic Matter (S)	Sulphate Soluble Kone 2:1 (S)	Copper (S)	Zinc (S)	Vanadium (S)	Beryllium (S)	C6-40 (Band 1) EZ (S)	EPH (DRO) (S)	GRO BTEX MTBE GC (S)	PAH Total 16 Rapid GC (S)	Arsenic ICP-MS (W)	Cadmium ICP-MS (W)	Chromium ICP-MS (W)	Lead ICP-MS (W)	Mercury Dissolved (W) (CVAF)
23	BH104	1lplastic	UNKNOWN	LIQUID																					X	X	X	X	
24	BH104	2SO4 125r	UNKNOWN	LIQUID																									
25	BH104	NaOH	UNKNOWN	LIQUID																									
26	BH105	0.5lglass	UNKNOWN	LIQUID		Sample on Hold																							
27	BH105	1lglass	UNKNOWN	LIQUID		Sample on Hold																							
28	BH105	1lglass	UNKNOWN	LIQUID																									X
29	BH105	1lplastic	UNKNOWN	LIQUID																					X	X	X	X	
30	BH105	2SO4 125r	UNKNOWN	LIQUID																									
31	BH105	NaOH	UNKNOWN	LIQUID																									
32	BH201	0.5lglass	UNKNOWN	LIQUID		Sample on Hold																							
33	BH201	1lglass	UNKNOWN	LIQUID		Sample on Hold																							
34	BH201	1lglass	UNKNOWN	LIQUID																									X
35	BH201	1lplastic	UNKNOWN	LIQUID																					X	X	X	X	
36	BH201	2SO4 125r	UNKNOWN	LIQUID																									
37	BH201	NaOH	UNKNOWN	LIQUID																									
38	BH202	0.5lglass	UNKNOWN	LIQUID		Sample on Hold																							
39	BH202	1lglass	UNKNOWN	LIQUID		Sample on Hold																							
40	BH202	1lglass	UNKNOWN	LIQUID																									X
41	BH202	1lplastic	UNKNOWN	LIQUID																					X	X	X	X	
42	BH202	2SO4 125r	UNKNOWN	LIQUID																									
43	BH202	NaOH	UNKNOWN	LIQUID																									
					Total Number of Tests	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	1	6	6	7	5	5	5	5	5

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ALcontrol Laboratories
TEST SCHEDULE

JOB NUMBER : 08/11223/02
CLIENT : Peter Brett Associates
CONTACT : Kevin Burbidge
DATE OF RECEIPT : 26/06/08
LOCATION : GREEN PARK

BATCH NUMBER : 1
CLIENT REF/CODE : PLOT 3.2/2942/1013
ORDER NUMBER : 2003
TURNAROUND : 10 days

Numeric values indicate additional scheduling

* indicates test subcontracted

		UKAS Accredited ?			✓ Nickel ICP-MS (W)	✓ Selenium ICP-MS (W)	✓ Zinc ICP-MS (W)	✓ Antimony ICP-MS (W)	✓ Boron ICP-MS (W)	✓ Barium ICP-MS (W)	✓ Beryllium (ICP-MS) (W)	✓ Copper ICP-MS (W)	✓ Iron ICP-MS (W)	✓ Manganese ICP-MS (W)	✓ Molybdenum ICP-MS (W)	✓ Vanadium ICP-MS (W)	✓ pH (W)	✓ Conductivity (20c) (W)	✓ Alkalinity Total (W)	✓ Ammoniacal Nitrogen as N (W)	✓ Sulphate Kone (W)	✓ Chloride Kone (W)	✓ Phenols HPLC (W)	✓ EPH (DRO) Aqueous (W)	PAH Spec MS Aqueous (W)			
Sample Number	Sample Identity	P / V	Depth	Sample Type																								
1	BH101	TUB 400g	0.50	SOLID																								
2	BH101	TUB 400g	1.00	SOLID																								
3	BH101	VOC	1.00	SOLID	Sample on Hold																							
4	BH102	ex-VOC	1.00	SOLID																								
5	BH103	TUB 400g	0.25	SOLID																								
6	BH103	VOC	1.25	SOLID																								
7	BH104	TUB 400g	1.00	SOLID																								
8	BH105	TUB 400g	0.50	SOLID																								
9	BH105	ex-VOC	1.25	SOLID																								
10	BH201	TUB 400g	0.25	SOLID																								
11	BH201	ex-VOC	1.50	SOLID																								
12	BH201	ex-VOC	1.50	SOLID	Sample on Hold																							
13	BH202	TUB 400g	0.25	SOLID																								
14	BH102	0.5lglass	UNKNOWN	LIQUID	Sample on Hold																							
15	BH102	1lglass	UNKNOWN	LIQUID	Sample on Hold																							
16	BH102	1lglass	UNKNOWN	LIQUID																					X	X		
17	BH102	1lplastic	UNKNOWN	LIQUID	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X						
18	BH102	2SO4 125r	UNKNOWN	LIQUID																X								
19	BH102	NaOH	UNKNOWN	LIQUID																			X					
20	BH104	0.5lglass	UNKNOWN	LIQUID	Sample on Hold																							
21	BH104	1lglass	UNKNOWN	LIQUID	Sample on Hold																							
22	BH104	1lglass	UNKNOWN	LIQUID																					X	X		

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ALcontrol Laboratories
TEST SCHEDULE

JOB NUMBER : 08/11223/02
CLIENT : Peter Brett Associates
CONTACT : Kevin Burbidge
DATE OF RECEIPT : 26/06/08
LOCATION : GREEN PARK

BATCH NUMBER : 1
CLIENT REF/CODE : PLOT 3.2/2942/1013
ORDER NUMBER : 2003
TURNAROUND : 10 days

Numeric values indicate additional scheduling

* indicates test subcontracted

				UKAS Accredited ?	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
Sample Number	Sample Identity	P / V	Depth	Sample Type	Nickel ICP-MS (W)	Selenium ICP-MS (W)	Zinc ICP-MS (W)	Antimony ICP-MS (W)	Boron ICP-MS (W)	Barium ICP-MS (W)	Beryllium (ICP-MS) (W)	Copper ICP-MS (W)	Iron ICP-MS (W)	Manganese ICP-MS (W)	Molybdenum ICP-MS (W)	Vanadium ICP-MS (W)	pH (W)	Conductivity (20c) (W)	Alkalinity Total (W)	Ammoniacal Nitrogen as N (W)	Sulphate Kone (W)	Chloride Kone (W)	Phenols HPLC (W)	EPH (DRO) Aqueous (W)	PAH Spec MS Aqueous (W)				
23	BH104	1lplastic	UNKNOWN	LIQUID	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X						
24	BH104	2SO4 125r	UNKNOWN	LIQUID																X								
25	BH104	NaOH	UNKNOWN	LIQUID																			X					
26	BH105	0.5lglass	UNKNOWN	LIQUID	Sample on Hold																							
27	BH105	1lglass	UNKNOWN	LIQUID	Sample on Hold																							
28	BH105	1lglass	UNKNOWN	LIQUID																				X	X			
29	BH105	1lplastic	UNKNOWN	LIQUID	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X						
30	BH105	2SO4 125r	UNKNOWN	LIQUID																X								
31	BH105	NaOH	UNKNOWN	LIQUID																			X					
32	BH201	0.5lglass	UNKNOWN	LIQUID	Sample on Hold																							
33	BH201	1lglass	UNKNOWN	LIQUID	Sample on Hold																							
34	BH201	1lglass	UNKNOWN	LIQUID																				X	X			
35	BH201	1lplastic	UNKNOWN	LIQUID	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X						
36	BH201	2SO4 125r	UNKNOWN	LIQUID																X								
37	BH201	NaOH	UNKNOWN	LIQUID																			X					
38	BH202	0.5lglass	UNKNOWN	LIQUID	Sample on Hold																							
39	BH202	1lglass	UNKNOWN	LIQUID	Sample on Hold																							
40	BH202	1lglass	UNKNOWN	LIQUID																				X	X			
41	BH202	1lplastic	UNKNOWN	LIQUID	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X						
42	BH202	2SO4 125r	UNKNOWN	LIQUID																X								
43	BH202	NaOH	UNKNOWN	LIQUID																			X					
				Total Number of Tests	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5			

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ISO 17025 Form	FORM NO:SQS 105
ALCONTROL LABORATORIES	SHEET 1 OF 1
	ISSUE NO: 2
	WRITTEN BY: DOH
Title of Form	ISSUE DATE: 27/01/05
Notification of NDP's (No determination possible).	APPROVED BY: DP

Job Number : 08/11223
Client : er Brett Associates
Sample Type : Soil

Job No.	Sample No.	Sample ID.	Analyte(s)	Reason
08/11223	4	BH102 SVOC	c6-40 EZ Flash	No sample Left - no duplicate to use

ALcontrol Laboratories Analytical Services
Sample Descriptions

Job Number: 08/11223/02/01
Client: Peter Brett Associates
Client Ref : PLOT 3.2/2942/1013

Grain sizes

<0.063mm	Very Fine
0.1mm - 0.063mm	Fine
0.1mm - 2mm	Medium
2mm - 10mm	Coarse
>10mm	Very Coarse

Sample Identity	Depth (m)	Colour	Grain Size	Description	Batch
BH101	0.5	Light Brown	0.1mm - 2mm	Sand	1
BH101	1.0	Brown	0.1mm - 2mm	Sand with some Stones	1
BH102	1.0	Brown	0.1mm - 0.063mm	Silty Clay with some Stones	1
BH103	0.25	Brown	0.1mm - 2mm	Sand with some Stones	1
BH103	1.25	Brown	0.1mm - 0.063mm	Silty Clay with some Stones	1
BH104	1.0	Brown	0.1mm - 0.063mm	Silty Clay Loam with some Stones	1
BH105	0.5	Light Brown	0.1mm - 2mm	Sandy Clay	1
BH105	1.25	Brown	0.1mm - 0.063mm	Silty Clay with some Stones	1
BH201	0.25	Brown	0.1mm - 2mm	Sandy Clay with some Stones	1
BH201	1.5	Brown	0.1mm - 0.063mm	Silty Clay with some Stones	1
BH202	0.25	Brown	0.1mm - 2mm	Sandy Clay Loam with some Stones	1

* These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials-whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.
Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.
[1] Sample Description supplied by client

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Preliminary ☐

ALcontrol Laboratories Analytical Services
Table Of Results

ISO 17025 accredited
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* Subcontracted test
» Shown on prev. report

Job Number: 08/11223/02/01 **Matrix:** SOLID
Client: Peter Brett Associates **Location:** GREEN PARK
Client Ref. No.: PLOT 3.2/2942/1013 **Client Contact:** Kevin Burbidge

Sample Identity	BH101	BH101	BH102	BH103	BH103	BH104	BH105	BH105	BH201	Method Code	LoD/Units
Depth (m)	0.5	1.0	1.0	0.25	1.25	1.0	0.5	1.25	0.25		
Sample Type	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID	SOLID		
Sampled Date	25.06.08	25.06.08	25.06.08	25.06.08	25.06.08	25.06.08	25.06.08	25.06.08	25.06.08		
Sample Received Date	26.06.08	26.06.08	26.06.08	26.06.08	26.06.08	26.06.08	26.06.08	26.06.08	26.06.08		
Batch	1	1	1	1	1	1	1	1	1		
Sample Number(s)	1	2-3	4	5	6	7	8	9	10		
Arsenic	<3	-	<3	8	-	<3	<3	-	9	TM129#M	<3.0 mg/kg
Beryllium	<0.4	-	1.0	<0.4	-	1.4	<0.4	-	<0.4	TM129	<0.4 mg/kg
Cadmium	<0.2	-	<0.2	0.5	-	<0.2	<0.2	-	<0.2	TM129	<0.2 mg/kg
Chromium	8.3	-	16	30	-	14	8.4	-	17	TM129#M	<4.5 mg/kg
Copper	<6	-	<6	16	-	8	<6	-	6	TM129#M	<6 mg/kg
Lead	7	-	7	54	-	20	12	-	210	TM129#M	<2 mg/kg
Mercury	<0.4	-	<0.4	<0.4	-	<0.4	<0.4	-	<0.4	TM129#M	<0.4 mg/kg
Nickel	10	-	20	15	-	39	13	-	16	TM129#M	<0.9 mg/kg
Selenium	<3	-	<3	<3	-	<3	<3	-	<3	TM129#M	<3 mg/kg
Vanadium	9.4	-	20	27	-	21	9.9	-	28	TM129#M	<1.5 mg/kg
Zinc	11	-	28	71	-	49	17	-	42	TM129#M	<2.5 mg/kg
Water Soluble Sulphate as SO4 2:1 Extract	0.036	-	0.046	0.35	-	0.21	0.11	-	0.21	TM098#M	<0.003 g/l
Soil Organic Matter	<0.35	-	<0.35	0.90	-	<0.35	<0.35	-	<0.35	TM132#	<0.35 %
Phenols Monohydric	<0.15	-	<0.15	<0.15	-	<0.15	<0.15	-	<0.15	TM062#M	<0.15 mg/kg
pH Value	8.89	-	8.42	11.03	-	8.90	10.62	-	11.66	TM133#M	<1.00 pH Units
EPH (DRO) (C10-C40)	-	500	-	-	<35	58	-	<35	-	TM061#M	<35 mg/kg
EPH (DRO) (C10-C40) % Surrogate Recovery	-	86	-	-	93	130	-	94	-	TM061#M	%
GRO (C4-C10)	-	<10	-	-	<10	<10	-	<10	-	TM089	<10 ug/kg
GRO (C10-C12)	-	<10	-	-	<10	<10	-	<10	-	TM089	<10 ug/kg
Benzene	-	<10	-	-	<10	<10	-	<10	-	TM089#M	<10 ug/kg
Toluene	-	<10	-	-	<10	<10	-	<10	-	TM089#M	<10 ug/kg
Ethyl benzene	-	<10	-	-	<10	<10	-	<10	-	TM089#M	<10 ug/kg
m & p Xylene	-	<10	-	-	<10	<10	-	<10	-	TM089#M	<10 ug/kg
o Xylene	-	<10	-	-	<10	<10	-	<10	-	TM089#M	<10 ug/kg
Sum m&p and o Xylene	-	<10	-	-	<10	<10	-	<10	-	TM089	<10 ug/kg
Sum of BTEX	-	<10	-	-	<10	<10	-	<10	-	TM089	<10 ug/kg
MTBE	-	<10	-	-	<10	<10	-	<10	-	TM089#	<10 ug/kg
TPH C6-40	-	-	NDP	-	-	-	-	-	-	TM154#	<10 mg/kg
PAH Total 16 EPA	-	16	<10	-	<10	<10	-	<10	-	TM213	<10 mg/kg

All results expressed on a dry weight basis.

Date 24.07.2008

Validated ☑
Preliminary ☐

ALcontrol Laboratories Analytical Services
Table Of Results

ISO 17025 accredited
M MCERTS accredited
* Subcontracted test
» Shown on prev. report

Job Number: 08/11223/02/01 **Matrix:** SOLID
Client: Peter Brett Associates **Location:** GREEN PARK
Client Ref. No.: PLOT 3.2/2942/1013 **Client Contact:** Kevin Burbidge

Sample Identity	BH201	BH202								Method Code	LoD/Units
Depth (m)	1.5	0.25									
Sample Type	SOLID	SOLID									
Sampled Date	25.06.08	25.06.08									
Sample Received Date	26.06.08	26.06.08									
Batch	1	1									
Sample Number(s)	11-12	13									
Arsenic	-	9								TM129#M	<3.0 mg/kg
Beryllium	-	0.7								TM129	<0.4 mg/kg
Cadmium	-	0.2								TM129	<0.2 mg/kg
Chromium	-	18								TM129#M	<4.5 mg/kg
Copper	-	19								TM129#M	<6 mg/kg
Lead	-	58								TM129#M	<2 mg/kg
Mercury	-	<0.4								TM129#M	<0.4 mg/kg
Nickel	-	24								TM129#M	<0.9 mg/kg
Selenium	-	<3								TM129#M	<3 mg/kg
Vanadium	-	42								TM129#M	<1.5 mg/kg
Zinc	-	74								TM129#M	<2.5 mg/kg
Water Soluble Sulphate as SO4 2:1 Extract	-	0.29								TM098#M	<0.003 g/l
Soil Organic Matter	-	0.77								TM132#	<0.35 %
Phenols Monohydric	-	<0.15								TM062#M	<0.15 mg/kg
pH Value	-	11.11								TM133#M	<1.00 pH Units
EPH (DRO) (C10-C40)	37	560								TM061#M	<35 mg/kg
EPH (DRO) (C10-C40) % Surrogate Recovery	91	110								TM061#M	%
GRO (C4-C10)	NDP	<10								TM089	<10 ug/kg
GRO (C10-C12)	NDP	<10								TM089	<10 ug/kg
Benzene	NDP	<10								TM089#M	<10 ug/kg
Toluene	NDP	<10								TM089#M	<10 ug/kg
Ethyl benzene	NDP	<10								TM089#M	<10 ug/kg
m & p Xylene	NDP	<10								TM089#M	<10 ug/kg
o Xylene	NDP	<10								TM089#M	<10 ug/kg
Sum m&p and o Xylene	NDP	<10								TM089	<10 ug/kg
Sum of BTEX	NDP	<10								TM089	<10 ug/kg
MTBE	NDP	<10								TM089#	<10 ug/kg
TPH C6-40	-	-								TM154#	<10 mg/kg
PAH Total 16 EPA	<10	<10								TM213	<10 mg/kg

All results expressed on a dry weight basis.

Date 24.07.2008

Validated ☑
Preliminary ☐

ALcontrol Laboratories Analytical Services
Table Of Results

ISO 17025 accredited
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* Subcontracted test
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Job Number: 08/11223/02/01 **Matrix:** LIQUID
Client: Peter Brett Associates **Location:** GREEN PARK
Client Ref. No.: PLOT 3.2/2942/1013 **Client Contact:** Kevin Burbidge

Sample Identity	BH102	BH104	BH105	BH201	BH202					Method Code	LoD/Units
Depth (m)											
Sample Type	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID						
Sampled Date	25.06.08	25.06.08	25.06.08	25.06.08	25.06.08						
Sample Received Date	26.06.08	26.06.08	26.06.08	26.06.08	26.06.08						
Batch	1	1	1	1	1						
Sample Number(s)	14-19	20-25	26-31	32-37	38-43						
Antimony Dissolved (ICP-MS)	<0.75	<0.75	<0.75	<0.75	<0.75					TM152#	<0.75 ug/l
Arsenic Dissolved (ICP-MS)	4.5	2.8	1.4	0.96	1.8					TM152#	<0.75 ug/l
Barium Dissolved (ICP-MS)	54	49	39	26	8					TM152#	<1 ug/l
Beryllium Dissolved (ICP-MS)	<1	<1	<1	<1	<1					TM152#	<1 ug/l
Boron Dissolved (ICP-MS)	66	43	36	34	120					TM152#	<20 ug/l
Cadmium Dissolved (ICP-MS)	0.31	0.23	<0.22	0.35	<0.22					TM152#	<0.22 ug/l
Chromium Dissolved (ICP-MS)	3	3	7	2	<1					TM152#	<1 ug/l
Copper Dissolved (ICP-MS)	<1.6	<1.6	<1.6	<1.6	<1.6					TM152#	<1.6 ug/l
Iron Dissolved (ICP-MS)	<50	99	<50	<50	<50					TM152#	<50 ug/l
Lead Dissolved (ICP-MS)	<0.4	<0.4	<0.4	<0.4	<0.4					TM152#	<0.4 ug/l
Manganese Dissolved (ICP-MS)	610	700	840	40	1					TM152#	<1 ug/l
Molybdenum Dissolved (ICP-MS)	<1	<1	<1	18	38					TM152#	<1 ug/l
Nickel Dissolved (ICP-MS)	3.3	3.7	2.4	4.8	<1.5					TM152#	<1.5 ug/l
Selenium Dissolved (ICP-MS)	2	<1	2	3	32					TM152#	<1 ug/l
Vanadium Dissolved (ICP-MS)	<1	1	2	2	4					TM152#	<1 ug/l
Zinc Dissolved (ICP-MS)	<5	<5	<5	<5	<5					TM152#	<5 ug/l
Mercury Dissolved (CVAF)	<0.01	<0.01	<0.01	<0.01	<0.01					TM183#	<0.01 ug/l
Total Alkalinity as CaCO3	360	300	340	440	670					TM043#	<2 mg/l
Conductivity (at 20 deg.C)	0.87	0.94	0.86	0.74	0.96					TM120#	<0.014 mS/cm
Sulphate (soluble)	92	180	97	140	300					TM098*	<3 mg/l
Chloride	49	67	62	61	110					TM097#	<1 mg/l
Ammoniacal Nitrogen as N	5.5	0.6	1.3	0.3	0.5					TM099#	<0.2 mg/l
Phenols Monohydric	<0.35	<0.35	<0.35	<0.35	<0.35					TM062#	<0.35 mg/l
pH Value	7.97	7.64	7.63	8.41	9.67					TM133#	<1.00 pH Units
EPH (DRO) (C10-C40) Aqueous	<10	<10	<10	<10	<10					TM172#	<10 ug/l

Date 24.07.2008

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ALcontrol Laboratories Analytical Services
Table Of Results

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Job Number: 08/11223/02/01 **Matrix:** LIQUID
Client: Peter Brett Associates **Location:** GREEN PARK
Client Ref. No.: PLOT 3.2/2942/1013 **Client Contact:** Kevin Burbidge

Sample Identity	BH102	BH104	BH105	BH201	BH202					Method Code	LoD/Units
Depth (m)											
Sample Type	LIQUID	LIQUID	LIQUID	LIQUID	LIQUID						
Sampled Date	25.06.08	25.06.08	25.06.08	25.06.08	25.06.08						
Sample Received Date	26.06.08	26.06.08	26.06.08	26.06.08	26.06.08						
Batch	1	1	1	1	1						
Sample Number(s)	14-19	20-25	26-31	32-37	38-43						
PAH by GCMS											
Naphthalene Aqueous	<100	<100	<100	<100	<100					TM178	<100 ng/l
Acenaphthylene Aqueous	<11	<11	<11	<11	<11					TM178	<11 ng/l
Acenaphthene Aqueous	<15	<15	<15	<15	<15					TM178	<15 ng/l
Fluorene Aqueous	<14	<14	<14	<14	19					TM178	<14 ng/l
Phenanthrene Aqueous	<22	<22	<22	<22	47					TM178	<22 ng/l
Anthracene Aqueous	<15	<15	<15	<15	<15					TM178	<15 ng/l
Fluoranthene Aqueous	<17	<17	<17	<17	<17					TM178	<17 ng/l
Pyrene Aqueous	<15	<15	<15	<15	16					TM178	<15 ng/l
Benz(a)anthracene Aqueous	<17	<17	<17	<17	<17					TM178	<17 ng/l
Chrysene Aqueous	<13	<13	<13	<13	<13					TM178	<13 ng/l
Benzo(b)fluoranthene Aqueous	<23	<23	<23	<23	<23					TM178	<23 ng/l
Benzo(k)fluoranthene Aqueous	<27	<27	<27	<27	<27					TM178	<27 ng/l
Benzo(a)pyrene Aqueous	<9	<9	<9	<9	<9					TM178	<9 ng/l
Indeno(123cd)pyrene Aqueous	<14	<14	<14	<14	<14					TM178	<14 ng/l
Dibenzo(ah)anthracene Aqueous	<16	<16	<16	<16	<16					TM178	<16 ng/l
Benzo(ghi)perylene Aqueous	<16	<16	<16	<16	<16					TM178	<16 ng/l
PAH 16 Total Aqueous	<100	<100	<100	<100	<100					TM178	<100 ng/l

Date 24.07.2008

ALcontrol Laboratories Analytical Services
Table Of Results - Appendix

Job Number: 08/11223/02/01
Client: Peter Brett Associates
Client Ref. No.: PLOT 3.2/2942/1013

Report Key :

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03×10^{-7}

NDP	No Determination Possible	*	Subcontracted test
NFD	No Fibres Detected	»	Result previously reported (Incremental reports only)
#	ISO 17025 accredited	M	MCERTS Accredited
PFD	Possible Fibres Detected	EC	Equivalent Carbon (Aromatics C8-C35)

Note: Method detection limits are not always achievable due to various circumstances beyond our control.

Summary of Method Codes contained within report :

Method No.	Reference	Description	ISO 17025 Accredited	MCERTS Accredited	Wet/Dry Sample [1]	Surrogate Corrected
TM043	Method 2320B, AWWA/APHA, 20th Ed., 1999 / BS 2690: Part109 1984	Determination of alkalinity in aqueous samples	✓		NA	
TM061	Method for the Determination of EPH,Massachusetts Dept.of EP, 1998	Determination of Extractable Petroleum Hydrocarbons by GC-FID (C10-C40)	✓	✓	DRY	
TM062	MEWAM BOOK 124 1988.HMSO/ Method 17.7, Second Site property, March 2003	Determination of Phenolic compounds by HPLC with electro-chemical detection	✓		NA	
TM062	MEWAM BOOK 124 1988.HMSO/ Method 17.7, Second Site property, March 2003	Determination of Phenolic compounds by HPLC with electro-chemical detection	✓	✓	WET	
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)			WET	
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)	✓		WET	
TM089	Modified: US EPA Methods 8020 & 602	Determination of Gasoline Range Hydrocarbons (GRO) and BTEX (MTBE) compounds by Headspace GC-FID (C4-C12)	✓	✓	WET	
TM097	Modified: US EPA Method 325.1 & 325.2	Determination of Chloride using the Kone Analyser	✓		NA	
TM098	Method 4500E, AWWA/APHA, 20th Ed., 1999	Determination of Sulphate using the Kone Analyser	✓		NA	
TM098	Method 4500E, AWWA/APHA, 20th Ed., 1999	Determination of Sulphate using the Kone Analyser	✓	✓	DRY	
TM099	BS 2690: Part 7:1968 / BS 6068: Part2.11:1984	Determination of Ammonium in Water Samples using the Kone Analyser	✓		NA	
TM120	Method 2510B, AWWA/APHA, 20th Ed., 1999 / BS 2690: Part 9:1970	Determination of Electrical Conductivity using a Conductivity Meter	✓		NA	
TM129	Method 3120B, AWWA/APHA, 20th Ed., 1999 / Modified: US EPA Method 3050B	Determination of Metal Cations by IRIS Emission Spectrometer			DRY	
TM129	Method 3120B, AWWA/APHA, 20th Ed., 1999 / Modified: US EPA Method 3050B	Determination of Metal Cations by IRIS Emission Spectrometer	✓	✓	DRY	

[1] Applies to Solid samples only. **DRY** indicates samples have been dried at 35°C. **NA** = not applicable.

ALcontrol Laboratories Analytical Services
Table Of Results - Appendix

Job Number: 08/11223/02/01
Client: Peter Brett Associates
Client Ref. No.: PLOT 3.2/2942/1013

Report Key :

Results expressed as (e.g.) 1.03E-07 is equivalent to 1.03×10^{-7}

NDP	No Determination Possible	*	Subcontracted test
NFD	No Fibres Detected	»	Result previously reported (Incremental reports only)
#	ISO 17025 accredited	M	MCERTS Accredited
PFD	Possible Fibres Detected	EC	Equivalent Carbon (Aromatics C8-C35)

Note: Method detection limits are not always achievable due to various circumstances beyond our control.

Summary of Method Codes contained within report :

Method No.	Reference	Description	ISO 17025 Accredited	MCERTS Accredited	Wet/Dry Sample [1]	Surrogate Corrected
TM132	In - house Method	ELTRA CS800 Operators Guide	✓		DRY	
TM133	BS 1377: Part 3 1990	Determination of pH in Soil and Water using the GLpH pH Meter	✓		NA	
TM133	BS 1377: Part 3 1990	Determination of pH in Soil and Water using the GLpH pH Meter	✓	✓	WET	
TM152	Method 3125B, AWWA/APHA, 20th Ed., 1999	Analysis of Aqueous Samples by ICP-MS	✓		NA	
TM154	In - house Method	Determination of Petroleum Hydrocarbons by EZ Flash GC-FID in the Carbon range C6- C40	✓		WET	
TM172		EPH in Waters	✓		NA	
TM178	Modified: US EPA Method 8100	Determination of Polynuclear Aromatic Hydrocarbons (PAH) by GC-MS in Waters			NA	
TM183	BS EN 23506:2002, (BS 6068-2.74:2002) ISBN 0 580 38924 3	Determination of Trace Level Mercury in Waters and Leachates by PSA Cold Vapour Atomic Fluorescence Spectrometry	✓		NA	
TM213	In-house Method	Rapid Determination of PAHs by GC-FID			WET	

[1] Applies to Solid samples only. **DRY** indicates samples have been dried at 35°C. **NA** = not applicable.

ALcontrol Laboratories Analytical Services
Table Of Results - Appendix

Job Number: 08/11223/02/01
Client: Peter Brett Associates
Client Ref. No.: PLOT 3.2/2942/1013

Summary of Coolbox temperatures

Batch No.	Coolbox Temperature (°C)
1	14.8

APPENDIX

APPENDIX

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA Leach tests, flash point, ammonium as NH_4 by the BRE method, VOC TICS, SVOC TICS, TOF-MS SCAN/SEARCH and TOF-MS TICS.
2. Samples will be run in duplicate upon request, but an additional charge may be incurred.
3. If sufficient sample is received a sub sample will be retained free of charge for 30 days after analysis is completed (e-mailed) for both soil jars, tubs and volatile jars. All waters and vials will be discarded 10 days after the analysis is completed (e-mailed). All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALcontrol Laboratories reserve the right to charge for samples received and stored but not analysed.
4. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.
5. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.
6. When requested, an asbestos screen is done in-house on soils and if no fibres are found will be reported as NFD – no fibres detected. If asbestos is detected, then identification is carried out by ALcontrol Shutler. If a sample is suspected of containing asbestos, then further preparation and analysis will be suspended on that sample until the asbestos result is known. If asbestos is present, then no further analysis will be undertaken.
7. If no separate volatile sample is supplied by the client, the integrity of the data may be compromised if the laboratory is required to create a sub-sample from the bulk sample – similarly, if a headspace or sediment is present in the volatile sample. This will be flagged up as an invalid VOC on the test schedule or recorded on the log sheet.
8. If appropriate preserved bottles are not received preservation will take place on receipt. Howaver, the integrity of the data may be compromised.
9. NDP – No determination possible due to insufficient/unsuitable sample.
10. Metals in water are performed on a filtered sample, and therefore represent dissolved metals – total metals must be requested separately.
11. A table containing the date of analysis for each parameter is not routinely included with the report, but is available upon request.
12. **Surrogate recoveries** – Currently the only analysis, which is surrogate corrected, is PAHs on soils. For EPH on soils the result is not surrogate corrected, but a percentage recovery is quoted.
13. **Product analyses** – Organic analyses on products can only be semi-quantitative due to the matrix effects and high dilution factors employed.
14. Phenols monohydric by HPLC include phenol, cresols (2-Methylphenol, 3-Methylphenol and 4-Methylphenol) and Xylenols (2,3 Dimethylphenol, 2,4 Dimethylphenol, 2,5 Dimethylphenol, 2,6 Dimethylphenol, 3,4 Dimethyphenol, 3,5 Dimethylphenol).
15. Total of 8 speciated phenols by HPLC includes Resorcinol, Catechol, Phenol, Napthol, 2,3,5-Trimethyl Phenol, 2-Isopropylphenol, Cresols and Xylenols (as detailed in 14).
16. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.
17. Our MCERTS accreditation for PAHs by GCMS applies to all product types apart from Kerosene, where naphthalene only is not accredited.
18. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.
19. Mercury results quoted on soils will not include volatile mercury as the analysis is performed on a dried and crushed sample.
20. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.
21. For all leachate preparations (NRA, DIN, TCLP, BSEN 12457-1, 2, 3) volatile loss may occur, as we do not employ zero headspace extraction.
22. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials – whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

LIQUID MATRICES EXTRACTION SUMMARY

ANALYSIS	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
PAH MS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC MS
EPH	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
EPH CWG	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
MINERAL OIL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC FID
PCB 7 CONGENERS	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GC MS
PCB TOTAL	HEXANE	STIRRED EXTRACTION (STIR-BAR)	GS MS
SVOC	DCM	LIQUID/LIQUID SHAKEN SVOC	GC MS
FREE SULPHUR	DCM	SOLID PHASE EXTRACTION	HPLC
PEST OCP/OPP	DCM/EA	SOLID PHASE EXTRACTION	GC MS
TRIAZINE HERBS	DCM/EA	SOLID PHASE EXTRACTION	GC MS
PHENOLS MS	DCM	SOLID PHASE EXTRACTION	GC MS
TPH by INFRA RED (IR)	TCE	LIQUID/LIQUID EXTRACTION	HPLC
MINERAL OIL by IR	TCE	LIQUID/LIQUID EXTRACTION	HPLC
SAPONIFIABLE	TCE	LIQUID/LIQUID EXTRACTION	HPLC
UNSAPONIFIABLE	TCE	LIQUID/LIQUID EXTRACTION	HPLC
GLYCOLS	DCM	LIQUID/LIQUID EXTRACTION	EZ FLASH

SOLID MATRICES EXTRACTION SUMMARY

ANALYSIS	D/C OR WET	EXTRACTION SOLVENT	EXTRACTION METHOD	ANALYSIS
Solvent Extractable Matter	D&C	DCM	SOXTHERM	GRAVIMETRIC
Cyclohexanes Ext. Matter	D&C	CYCLOHEXANE	SOXTHERM	GRAVIMETRIC
Thin Layer Chromatography	D&C	DCM	SOXTHERM	IATROSCAN
Elemental Sulphur	D&C	DCM	SOXTHERM	HPLC
Phenols by GCMS	WET	DCM	SOXTHERM	GC-MS
Herbicides	D&C	HEXANE:ACETONE	SOXTHERM	GC-MS
Pesticides	D&C	HEXANE:ACETONE	SOXTHERM	GC-MS
EPH (DRO)	D&C	HEXANE:ACETONE	END OVER END	GC-FID
EPH (Min oil)	D&C	HEXANE:ACETONE	END OVER END	GC-FID
EPH (Cleaned up)	D&C	HEXANE:ACETONE	END OVER END	GC-FID
EPH CWG by GC	D&C	HEXANE:ACETONE	END OVER END	GC-FID
PCB tot / PCB con	D&C	HEXANE:ACETONE	END OVER END	GC-MS
Polyaromatic Hydrocarbons (MS)	D&C	HEXANE:ACETONE	END OVER END	GC-MS
Polyaromatic Hydrocarbons (FID)	D&C	HEXANE:ACETONE	END OVER END	GC-FID
C8-C40 (C6-C40)EZ Flash	WET	HEXANE:ACETONE	SHAKER	GC-EZ
Polyaromatic Hydrocarbons Rapid GC	WET	HEXANE:ACETONE	SHAKER	GC-EZ
Semi Volatile Organic compounds	WET	DCM:ACETONE	SONICATE	GC-MS

Last updated June 2008

APPENDIX 5

PBA Methodology for Assessment of Potentially Contaminated Land

1 Introduction

This document defines the approach adopted by PBA in relation to the assessment of potentially contaminated land in England. The aim is for the approach to (i) be systematic and objective, (ii) provide for the assessment of uncertainty and (iii) provide a rational, consistent, transparent framework.

When preparing our methodology we have made reference to various technical guidance documents and legislation referenced in Section 7 of which the principal documents are Contaminated Land Statutory Guidance (Defra 2012) the Model Procedures for the Management of Contamination (CLR 11) (EA 2004) Contaminated land risk assessment: A guide to good practice (C552) (CIRIA 2001) and the National Planning Policy Framework (DCLG 2012).

2 Dealing with Land Contamination

UK legislation aims to help address the problem of historic contamination of land and the risks it can pose to people's health, controlled water and the environment by determining if a contaminant linkage exists. This requires the three elements of receptor; pathway and source (hazard) to be present.

There are several ways in which land contamination can be addressed. For example, voluntarily where action is taken independently by landowners, when land is developed (or redeveloped) under the planning system, during the building control process using building regulations, or, forced remediation under the Part 2A regime. Other legislative regimes may also provide a means of dealing with land contamination issues, such as the regimes for waste, water, environmental permitting, and environmental damage. Further, the law of statutory nuisance may result in contaminants being unacceptable to third parties whilst not attracting action under Part 2A or other environmental legislation.

2.1 Part 2A

The Environment Act 1995 introduced Part 2A into the Environmental Protection Act 1990. Part 2A, its accompanying regulations and original Statutory Guidance came into force in England in April 2000. The legislation was extended in August 2006 to include radiological hazards.

Revised Statutory Guidance was issued April 2012. (Defra 2012) to clarify how the regime should operate. The guidance states that enforcing authorities should seek to use Part 2A only where no appropriate alternative solution exists.

Part 2A defines contaminated land as "*land which appears to the Local Authority in whose area it is situated to be in such a condition that, by reason of substances in, on or under the land that significant harm is being caused, or there is a significant possibility that such harm could be caused, or pollution of controlled waters is being, or likely to be, caused*".

Harm is defined as "*harm to the health of living organisms or other interference with the ecological systems of which they form part, and in the case of man, includes harm to his property*".

For the purposes of Part 2A, land is contaminated if it poses a significant possibility of significant harm (SPOSH).

Part 2A provides a means of dealing with unacceptable risks posed by land contamination to human health and the environment, and under the guidance enforcing authorities should seek to find and deal with such land. It states that "*under Part 2A the starting point should be that land is not contaminated land unless there is reason to consider otherwise. Only land where unacceptable risks are clearly identified, after a risk assessment has been undertaken in accordance with the Guidance, should be considered as meeting the Part 2A definition of contaminated land*". Further the guidance makes it clear that *"regulatory decisions should be based on what is reasonably likely, not what is hypothetically possible".*

The overarching objectives of the Government's policy on contaminated land and the Part 2A regime are:

"(a) To identify and remove unacceptable risks to human health and the environment.
(a) To seek to ensure that contaminated land is made suitable for its current use.
(b) To ensure that the burdens faced by individuals, companies and society as a whole are proportionate, manageable and compatible with the principles of sustainable development".

In accordance with the guidance, the enforcing authority may need to decide whether and how to act in situations where decisions are not straightforward, and where there is uncertainty. "*In so doing, the authority should use its judgement to strike a reasonable balance between: (a) dealing with risks raised by contaminants in land and the benefits of remediating land to remove or reduce those risks; and (b) the potential impacts of regulatory intervention including financial costs to whoever will pay for remediation, health and environmental impacts of taking action, property blight, and burdens on affected people".* The authority is required to "*take a precautionary approach to the risks raised by contamination, whilst avoiding a disproportionate approach given the circumstances of each case".* The aim is "*that the regime produces net benefits, taking account of local circumstances*".

The guidance recognises that *"normal levels of contaminants in soils should not be considered to cause land to qualify as contaminated land, unless there is a particular reason to consider otherwise".*

Normal levels are quoted as:
"a) natural presence of contaminants' such as from underlying geology *'that have not been shown to pose an unacceptable risk to health and the environment*
b) …low level diffuse pollution, and common human activity…"

Similarly the guidance states that significant pollution of controlled waters is required for land to be considered contaminated and the "*fact that substances are merely entering water*" or "*where discharge from land is not discernible at a location immediately downstream"* does not constitute contaminated land.

The guidance considers four categorisations to establish if land is contaminated by either presenting an unacceptable risk to human health or significant pollution of controlled waters (Categories 1 and 2) or where not (Categories 3 and 4).

Category 1: "*unacceptably high probability, supported by robust scientific evidence, that significant harm or significant pollution would occur".* These situations can arise where similar land or exposures are known or strongly suspected to have caused harm.

Category 4: *"no risk or that the level of risk is low".* These situations can arise where no contaminant linkage is established or normal/background levels of contaminants are present, or where the exposure from soil is only a small proportion of what the receptors may be exposed to.

For land that cannot be readily placed into Categories 1 or 4 further assessment is required. If there is a sufficiently strong case that the risks are of sufficient concern to cause significant harm/pollution or have the significant possibility of significant harm/pollution the land is to be placed into Category 2. If the concern is not met land is considered Category 3.

The technical guidance clearly states that the currently published SGV and GAC's represent *"cautious estimates of level of contaminants in soils"* which should be considered *"no risk to health or, at most, a minimal risk"*. These values do not represent the boundary between categories 3 and 4 and "*should be considered to be comfortably within Category 4".*

2.2 Planning

The Local Planning Authority (LPA) is responsible for the control of development, and in doing so it has a duty to take account of all material considerations, including contamination.

Section 11, Paragraph 109 of the National Planning Policy Framework (NPPF) (DCLG 2012) states the planning system should contribute to and enhance the natural and local environment by *"preventing both new and existing developments from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water pollution"* and *"remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate"*. Paragraphs 120 and 121 describe the policy considerations the Government expects LPA to have in regard to land affected by contamination when preparing policies for development plans and in taking decisions on applications.

For planning purposes, the NPPF requires that the assessment of risks arising from contamination and remediation requirements should be considered on the basis of the current environmental setting, the current land use, and the circumstances of its proposed new use.

In most other respects, however, the underlying approach to identifying and dealing with risk, and the overall policy objective of safeguarding human health and the environment, are similar to that outlined in Part 2A.

However, the level at which contamination is deemed to be unacceptable, or, gives rise to adverse effects under a planning context has not been identified but is envisaged to be more precautionary than the level required to detrmine land as contaminated under Part 2A.

The current SGV and GAC are not considered target values for the planning regime. In paragraph 121 the developer is required to ensure that land, after development, is not capable of being determined as contaminated land under Part 2A of the EPA 1990.

The principal planning objective is to ensure that any unacceptable risks to human health, buildings and other property and the natural and historical environment from the contaminated condition of the land are identified so that appropriate action can be considered and taken to address those risks. In order to grant a planning permission the Local Planning Authority (LPA) has to be satisfied that there is sufficient information about the condition of the land, its impacts and the availability of viable remedial options. NPPF Paragraph 21 states that *"planning policies and decisions should also ensure that adequate site investigation information, prepared by a competent person, is presented".* Site investigation information is further defined in the NPPF Glossary page 56 and that also states that investigations should be carried out in accordance with established procedures, including BS10175 (BSI 2011) that in turn links procedure to the requirements of CLR11.

2.3 Building Control

The building control department of the local authority (along with the private sector approved inspectors) are responsible for the operation and enforcement of the Building Regulations 2010 (DCLG 2010) to protect the health, safety and welfare of people in and around buildings and Building Control Regulations Approved Document C. Specifically requires the protection of buildings and associated land from the effects of contamination, to be applied (non-exclusively) in all changes of use from commercial or industrial premises, to residential property.

3 Approach

CLR 11 recommends a phased or tiered approach to risk assessment with the three tiers being:-

- Tier 1 - preliminary – a qualitative assessment forming part of a Phase 1 report,
- Tier 2 - generic - a quantitative assessment using published criteria to screen site specific ground condition data forming part of a Phase 2 report
- Tier 3 - detailed – a quantitative assessment involving the generation of site specific assessment criteria

Each tier of risk assessment comprises the following four stages:-

1. Hazard Identification – identifying potential contaminant sources on and off site;
2. Hazard Assessment – assessing the potential for unacceptable risks by identifying what pathways and receptors could be present, and what pollutant linkages could result (forming the Conceptual Site Model (CSM));

3. Risk Estimation – estimating the magnitude and probability of the possible consequences (what degree of harm might result to a defined receptor and how likely); and

4. Risk Evaluation – evaluating whether the risk needs to be, and can be, managed.

A PBA Phase 1 report normally comprises a desk study, walkover and Tier 1 risk assessment (the project specific offer defines the actual scope of work). This is the minimum requirement as defined by the NPPF, pp56. At Tier 1 the PBA approach to risk estimation involves identifying the magnitude of the potential consequence (taking into account both the potential severity of the hazard and the sensitivity of the receptor) and the magnitude of the likelihood i.e. the probability (taking into account the presence of the hazard and the receptor and the integrity of the pathway). This approach is promoted in current guidance such as R&D 66 (NHBC 2008).

The PBA approach is that if a pollution linkage is identified then it represents a potential risk which requires further consideration and either (1) remediation / direct risk management or (2) further tiers of assessment.

A PBA preliminary Phase 2 report comprises an intrusive investigation to collect site specific information, a Tier 2 quantitative generic risk assessment and a refinement of the CSM using the site specific data. Depending on the findings further investigation and/or progression to Tier 3 risk assessment and the generation of site specific assessment criteria may be required.

The PBA methodology provides an estimate of the level of risk, it does not identify a risk level at which the risk is considered "significant" and/or "unacceptable" as this is dependant on the view of the individual / stakeholder. For example; to a risk adverse stakeholder even a risk level of "very low" may be considered unacceptable and as such this stakeholder may require risk management options to be implemented.

4 Identification of Pollutant Linkages and Conceptual Site Model (CSM)

For all Tiers the underlying principle to ground condition assessment is the identification of *pollutant linkages* in order to evaluate whether the presence of a source of contamination could potentially lead to harmful consequences. A pollutant linkage consists of the following three elements:-

- A source/hazard – a substance or situation which has the potential to cause harm or pollution;
- A pathway – a means by which the hazard moves along / generates exposure; and
- A receptor/target – an entity which is vulnerable to the potential adverse effects of the hazard.

The *Conceptual Site Model* identifies the types and locations of potential contaminant sources/hazards and potential receptors and potential migration/transportation pathway(s). The CSM is refined as the assessment progresses through the Tiers.

4.1 Hazard Identification

A hazard is a substance or situation that has the potential to cause harm. Hazards may be chemical, biological or physical (e.g. explosive gases).

At Tier 1 the potential for hazards to be present is determined from consideration of the previous or ongoing activities on or near to the site in accordance with the criteria presented in the **Table 1**.

Based on the land use information Potential Contaminants of Concern (PCOC) are identified. The PCOC direct the scope of the collection of site specific data and the analytical testing selected for subsequent Tiers.

At Tier 2 the site specific data is screened using published assessment criteria (refer to PBA document entitled Rationale for the Selection of Tier 2 Assessment Criteria). In general, published criteria have been developed using highly conservative assumptions and therefore if the screening criterion is not exceeded then the PCOC is eliminated as a potential Hazard. It should be noted that exceedance does not necessarily indicate that a site is contaminated and/or unsuitable for use only that the PCOC is retained as a potential Hazard. Published criteria are generated using models based on numerous and complex assumptions. Whether or not these assumptions are appropriate in a site-specific context requires confirmation on a project by project basis and would form part of a Tier 3 assessment.

When reviewing or assessing site specific data PBA utilise published guidance on comparing contamination data with a critical concentration (CL:AIRE/CIEH 2008) which presents a structured process for employing statistical techniques for data assessment purposes. The benefit of the statistical tool is uncertainty is quantified and decisions are made knowing the strength of the evidence. Correct decision probability is a function of sample size, difference in the mean and the critical concentration, variation in measured values and the significance level.

4.2 Receptor and Pathway Identification

For all Tiers the potential receptors (for both on site and adjoining land) that will be considered are:

- Human Health – including current and future occupiers, construction and future maintenance workers, and neighbouring properties/third parties;
- Ecological systems; *[1]
- Controlled waters *[2] – including surface water and groundwater;
- Property, Animal or Crop (existing or proposed) - including buildings, service lines and pipes, crops, livestock, pets, woodland; and
- Archaeological sites and ancient monuments.

*[1] International or nationally designated sites (as defined in the statutory guidance (Defra Circular 04/12)) "in the local area" will be identified as potential ecological receptors. A search radius of 1, 2 or 5km will be utilised depending on the site specific circumstances (see also pathway identification). The Environment Agency has published an ecological risk assessment framework (EA 2008) which promotes (as opposed to statutorily enforces) consideration of additional receptors to include locally protected sites and protected or notable species. These additional potential receptors will only be considered if a Phase 1 habitat survey, undertaken in accordance with

guidance (JNCC 1993), is commissioned and the data provided to PBA. It should be noted that without such a survey the Tier 1 risk assessment may conclude that the identification of potential ecological receptors is inconclusive (see Specification).

*[2] the definition of "pollution of controlled water" was amended by the introduction of Section 86 of the Water Act 2003. For the purposes of Part 2A groundwater does not include waters above the saturated zone and our assessment does not therefore address perched water other than where development causes a pathway to develop.

If a receptor is taken forward for further assessment it will be classified in terms of its sensitivity, the criteria for which are presented in **Table 2**. Table 2 has been generated using descriptions of environmental receptor importance/value given in various guidance documents including R&D 66 (NHBC 2008) and Transport Analysis Guidance (based on DETR 2000). Human health and buildings classifications have been generated by PBA using the attribute description for each class.

The exposure pathway and modes of transport that will be considered are presented in **Table 3**.

4.3 Note regarding Ecological Systems

The Environment Agency (EA) has developed an ecological risk assessment framework which aims to provide a structured approach for assessing the risks to ecology from chemical contaminants in soils (EA 2008). In circumstances where contaminants in water represent a potential risk to aquatic ecosystems then risk assessors will need to consider this separately.

The framework consists of a three tiered process:-

- Tier 1 is a screening step where the site soils chemical data is compared to a soil screening value (SSV)
- Tier 2 uses various tools (including surveys and biological testing) to gather evidence for any harm to the ecological receptors
- Tier 3 seeks to attribute the harm to the chemical contamination

Tier 1 is preceded by a desk study to collate information about the site and the nature of the contamination to assess whether pollutant linkages are feasible. The framework presents ten steps for ecological desk studies and development of a conceptual site model as follows.

1 Establish Regulatory Context
2 Collate and Assess Documentary Information
3 Summarise Documentary Information
4 Identify Potential Contaminants of Concern
5 Identify Likely Fate Transport of Contaminants
6 Identify Potential Receptors of Concern
7 Identify Potential Pathways of Concern
8 Create a Conceptual Site Model
9 Identify Assessment and Measurement Endpoints
10 Identify Gaps and Uncertainties

The information in a standard PBA Phase 1 report covers Steps 1 to 4 inclusive. Step 5 considers fate and transport of contaminants and it should be noted that our standard report adopts a simplified approach considering only transport mechanisms. A simplified approach has also been adopted in respect of Steps 6 and 7 receptors (a detailed review of the ecological attributes has not been undertaken) and pathways (a food chain assessment has not been undertaken).
Step 9 is outside the scope of our standard Phase 1 report.

The Tier 1 prepared by PBA as part of a Phase 1 report will assess the viability of the mode of transport given the site specific circumstances not specific pathways. As with receptor identification it should be noted that without a habitat survey the Tier 1 risk assessment may conclude that the risk to potential ecological receptors is inconclusive (see PBA Specification for Phase 1 Assessment of Potentially Contaminated Land).

4.4 Note regarding Water Framework Directive

The Water Framework Directive (WFD) (2000) aims to protect and enhance the quality of surface freshwater, groundwaters and dependent eco systems, estuaries and coastal waters. The WFD was transposed into UK law in 2003 (Statutory Instruments 2003). Member states must aim to reach good chemical and ecological status as defined in the Directive by 2015.

To address the WFD, a River Basin Management Plan (RBMP) has been developed for the 11 River Basin Districts in England and Wales. These were released by Defra in 2009 (Defra 2009).

These RBMP's establish the current status of waters within the catchments of the respective Districts and the current status of adjoining waters identified. As part of a Tier 2 risk assessment water quality data is screened against the WFD assessment criteria. Compare to the RBMP's current status of waters for the catchment under consideration would form part of a Tier 3 assessment.

5 Risk Estimation

Risk estimation classifies what degree of harm might result to a receptor (defined as consequence) and how likely it is that such harm might arise (probability).

At Tier 1 the consequence classification is generated by multiplying the hazard classification score and the receptor sensitivity score. This approach follows that presented in the republished R&D 66 (NHBC 2008).

The criteria for classifying probability are set out in **Table 4** and have been taken directly from Table 6.4 CIRIA C552 (CIRIA 2001). Probability considers the integrity of the exposure pathway.

The consequence classifications detailed in **Table 5** have been adapted from Table 6.3 presented in C552 and R&D 66 (Annex 4 Table A4.3).

The Tier 1 risk classification is estimated for each pollutant linkage using the matrix given in **Table 6** which is taken directly from C552 (Table 6.5).
Subsequent Tiers refine the CSM through retention or elimination of potential hazards and pollutant linkages.

6 Risk Evaluation

In order to put the Tier 1 risk classification into context the likely actions are described in **Table 7** which is taken directly from C552 (Table 6.6). Subsequent Tiers identify potential risk management options through remediation and/or mitigation measures.

7 References

BSI 2007 BS 8485 Code of Practice for characterisation and remediation from ground gas in affected developments.

BSI 2011 BS 10175 (2011) Code of practice - Investigation of potentially contaminated sites

CIRIA 2001: Contaminated land risk assessment – a guide to good practice C552.

CIRIA 2008: Assessing risks posed by hazardous ground gases to buildings C655

CL:AIRE/EIH 2008 Guidance on Company Soil Contamination Data with a Critical Concentration

DCLG 2010 Building Regulations 2010 Approved Document C Site preparation and resistance to contaminants and moisture.

DCLG March 2012. National Planning Policy Framework.

DETR 2000 Methodology for Multi Modal Studies. Volume 2 Section 4. The Environmental Objective.

Defra Circular 01/2006

Defra Circular 04/2012 Environmental Protection Act 1990: Part 2A. Contaminated Land Statutory Guidance.

Defra '2009 Water for Life and Livelihoods. River Basin Management Plan. (11 Districts: Anglia, Dee, Humber, Northumbria, Northwest, Severn, Solway and Tweed, Southeast, Thames, Western Wales) December 2009

EA 2004: The Model Procedures for the Management of Land Contamination CRL 11 published by the Environment Agency (EA).

EA 2008 Ecological Risk Assessment Science Report Series SC070009 published by the Environment Agency (EA).

European Community 2000 Water Framework Directive (2000/60/EC)

JNCC 1993 Handbook for Phase 1 Habitat Survey – A Technical for Environmental Audit prepared by the Joint Nature Conservancy Council (JNCC)

NHBC/EA/CIEH 2008: R&D Publication 66 Guidance for the safe development of housing on land affected by contamination.

Statutory Instrument 2003 No. 3242 Water Resources, England and Wales. The Water Environment (Water Framework Directive) Regulations 2003.

Table 1: Criteria for Classifying Hazards / Potential for Generating Contamination

Classification/Score	Potential for generating contamination/gas based on land use
Very Low 1	Land Use: agriculture, residential, allotment, recent retail or office use Contamination: None or low level residual concentrations. Gas generation potential : Inert Made Ground
Low 2	Land Use: recent small scale industrial, railway tracks, small scale fuel storage (heating). Contamination: Locally or slightly elevated concentrations. Gas generation potential : Shallow thickness of Alluvium
Moderate 3	Land Use: railway yards, collieries, scrap yards, light industry, engineering works. Contamination: Locally elevated concentrations. Gas generation potential : Dock silt and substantial thickness of organic alluvium/peat
High 4	Land Use: gas works, chemical works, heavy industry, non-hazardous landfills. Contamination: Possible widespread elevated concentrations. Gas generation potential : Shallow mine workings Pre 1960's landfill
Very High 5	Land Use: hazardous waste landfills. Contamination: Likely widespread elevated concentrations. Gas generation potential : Domestic landfill post 1960

"Greenfield" is land which has not been developed including not used for crop production or animal husbandry and no contamination source therefore no pollutant linkages.

Table 2: Criteria for Classifying Receptor Sensitivity/Value

Classification/Score	Definition
Very Low 1	Receptor of limited importance Groundwater: Unproductive Surface water: None and/or >250m hydraulically down gradient Ecology: No local designation Buildings: Replaceable Human health: Unoccupied/limited access
Low 2	Receptor of local or county importance with potential for replacement Groundwater: Secondary B Surface water: Tertiary <100m hydraulically down gradient Ecology: local habitat resources Buildings: Local value Human health: Minimum score of 4
Moderate 3	Receptor of local or county importance with potential for replacement Groundwater: Secondary A Surface water: Tertiary <50m or Secondary <100m hydraulically down gradient Ecology: County wildlife sites, Areas of Outstanding Natural Beauty (AONB) Buildings: Area of Historic Character Human health: Commercial
High 4	Receptor of county or regional importance with limited potential for replacement Groundwater: Principal Surface water: Secondary <50m or Primary <100m hydraulically down gradient Ecology: SSSI, National or Marine Nature Reserve (NNR or MNR) Buildings: Conservation Area Human health: Minimum score where human health identified as potential receptor
Very High 5	Receptor of national or international importance Groundwater: Source Protection Zone Surface water: Primary <50m hydraulically down gradient Ecology: Special Areas of Conservation (SAC and candidates), Special Protection Areas (SPA and potentials) or wetlands of international importance (RAMSAR) Buildings: World Heritage site Human health: Residential, open spaces and uses where children are present

Table 3: Exposure Pathway and Modes of Transport

Receptor	Pathway	Mode of transport
Human health	Ingestion	Fruit or vegetable leaf or roots
		Contaminated water
		Soil/dust indoors
		Soil/dust outdoors
	Inhalation	Particles (dust / soil) – outdoor
		Particles (dust / soil) - indoor
		Vapours – outdoor - migration via natural or anthropogenic pathways
		Vapours - indoor - migration via natural or anthropogenic pathways
	Dermal absorption	Direct contact with soil
		Direct contact with waters (swimming / showering)
		Irradiation
Groundwater	Leaching	Gravity / permeation
	Migration	Natural – groundwater as pathway Anthropogenic (e.g. boreholes, culverts, pipelines etc.)
Surface Water	Direct	Runoff or discharges from pipes
	Indirect	Recharge from groundwater
	Indirect	Deposition of wind blown dust
Buildings	Direct contact	Sulphate attack on concrete, hydrocarbon corrosion of plastics
	Gas ingress	Migration via natural or anthropogenic paths
Ecological systems	See Notes	Runoff/discharge to surface water body
	See Notes	Windblown dust
	See Notes	Groundwater migration
	See Notes	At point of contaminant source
Animal and crop	Direct	Wind blown or flood deposited particles / dust / sediments
	Indirect	Plants via root up take or irrigation. Animals through watering
	Inhalation	By livestock / fish - gas / vapour / particulates / dust
	Ingestion	Consumption of vegetation / water / soil by animals

Table 4: Classification of Probability

Classification	Definition
High likelihood	There is a pollution linkage and an event either appears very likely in the short-term and almost inevitable over the long-term, or there is already evidence at the receptor of harm / pollution.
Likely	There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short-term and likely over the long-term.
Low likelihood	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter-term.
Unlikely	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long-term.

Table 5: Classification of Consequence (score = magnitude of hazard Table 1 and sensitivity of receptor Table 2)

Classification / Score	Examples
Severe **20-25**	Human health effect - exposure likely to result in "significant harm". Significant harm to humans is defined in circular 01/2006 as death, disease, serious injury, genetic mutation, birth defects or impairment of reproductive function. Controlled water effect - short-term risk of pollution (note: Water Resources Act contains no scope for considering significance of pollution) of sensitive water resource. Equivalent to EA Category 1 incident (persistent and/or extensive effects on water quality leading to closure of potable abstraction point or loss of amenity, agriculture or commercial value. Major fish kill. Ecological effect - short-term exposure likely to result in a substantial adverse effect. Catastrophic damage to crops, buildings or property
Medium **10-16**	Human health effect - exposure could result in "significant harm". Significant harm to humans is defined in circular 01/2006 as death, disease, serious injury, genetic mutation, birth defects or impairment of reproductive function. Controlled water effect - equivalent to EA Category 2 incident requiring notification of abstractor Ecological effect - short-term exposure may result in a substantial adverse effect. Damage to crops, buildings or property
Mild **6-9**	Human health effect - exposure may result in "significant harm". Significant harm to humans is defined in circular 01/2006 as death, disease, serious injury, genetic mutation, birth defects or impairment of reproductive function. Controlled water effect - equivalent to EA Category 3 incident (short lived and/or minimal effects on water quality). Ecological effect - unlikely to result in a substantial adverse effect. Minor damage to crops, buildings or property. Damage to building rendering it unsafe to occupy (for example foundation damage resulting in instability).
Minor **1-5**	No measurable effect on humans. Protective equipment is not required during site works. Equivalent to insubstantial pollution incident with no observed effect on water quality or ecosystems. Repairable effects to crops, buildings or property. The loss of plants in a landscaping scheme. Discolouration of concrete.

Table 6: Classification of Risk (Combination of Consequence Table 5 and Probability Table 4)

	Consequence			
Probability	***Severe***	***Medium***	***Mild***	***Minor***
High likelihood	Very high	High	Moderate	Low
Likely	High	Moderate	Moderate/low	Low
Low likelihood	Moderate	Moderate/low	Low	Very low
Unlikely	Moderate/low	Low	Very low	Very low

Table 7: Description of Risks and Likely Action Required

Risk Classification	Description
Very high risk	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation is likely to be required in the short term.
High risk	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short-term and are likely over the longer-term.
Moderate risk	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer-term.
Low risk	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
Very low risk	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.

APPENDIX 6

1 Introduction

A Tier 2 Risk Assessment is a quantitative assessment using published generic criteria to "screen" the site-specific contamination testing data and identify potential hazards to specific receptors.

The aim of this document is to present an explanation for the selection of the assessment criteria routinely used by PBA when undertaking a Tier 2 risk assessment. This document is divided into general introductory text and sections on soils, waters and soil gases.

This document should be read in conjunction with another entitled "PBA "Methodology for Assessment of Potentially Contaminated Land" which summarises the legislative regime and our approach to ground contamination and risk assessment.

2 General Notes

Any deviation from the routine criteria and/or selection of criteria for parameters not covered in this document will be described in the report text. The report will also comment on the appropriateness of the routine criteria for project objectives or ground conditions.

Any PBA interpretation of contamination test results is based on a scientific and engineering appraisal. The perceptions of, for example, banks, insurers, lay people etc are not taken into account.

Any summary tables included in this Appendix are produced for ease of reference to the criteria, they do not in any way replace the documents of origin (which are fully referenced) and which should be read to ensure appropriate use and interpretation of the data.

3 Tier 2 Criteria for Assessing Soils

3.1 Potential Harm to Human Health

Defra has yet to produce a comprehensive list of assessment criteria that on its own, would be sufficient to enable the assessment of the potential risks posed by soil contaminants (to human health). A number of industry-driven initiatives have developed to generate contaminated land assessment criteria. This has led to the publication of a series of non-statutory non-Governmental contaminated land assessment criteria. It should be noted that the published DEFRA guidance is also non-statutory.

The criteria routinely used by PBA as Tier 2 soil screening values for the protection of human health are the Governmental Soil Guidance Values (SGVs) and various non-Governmental Generic Assessment Criteria (GAC), these criteria are presented in Table 1.

Both the Governmental and non Governmental sets of criteria have been generated using the Contaminated Land Exposure Assessment model (CLEA) and supporting technical guidance (EA, 2009a, 2009b, 2009c).

PBA has reviewed these publications and consider that the non-Governmental criteria are authoritative and robust, and therefore we will refer to such criteria until such time that DEFRA derive and publish Governmental SGVs to replace the non Governmental GACs.

It is important to note that because the GACs are not published by the UK Government, they may be subject to challenge by a regulatory body or their representative. If the use of the GACs is challenged, it may be necessary to carry out modelling to generate site-specific assessment criteria.

Soil Guideline Values (SGVs) - Governmental

The first series of SGVs were generated using a probabilistic version of the CLEA model. However, on 22 July 2008 DEFRA announced the withdrawal of these SGVs.

Revised SGVs have been calculated using the revised fully deterministic version of the CLEA model. The standard land use scenarios are residential with plant uptake, allotments and industrial/commercial.

Generic Assessment Criteria (GAC) - Non Governmental

SGVs generated for organic compounds are dependent on the amount of organic matter present in the soil (a lower SGV is generated for soils with lower organic matter contents since organic matter acts to immobilise organic contaminants). The SGVs for BTEX compounds and phenol assume that the 'host' soil has 6% organic matter.

UK soils often have organic matter concentrations below 6% and that it may therefore not be conservative to use the published SGVs for BTEX compounds when assessing the potential risks from these chemicals. The on-line Contaminated Land Strategies Digest (CLSD) formed a consortium of ten practitioners (including representatives from local authorities), to prepare generic assessment criteria for a number of contaminants at more conservative organic matter contents of 1% and 3% for the same end uses. The consortium also reproduced the SGVs using the EA's latest CLEA model and latest CLEA guidance and PBA independently verified the results published using CLEA v1.06. These criteria will be used by PBA where appropriate.

In addition the CLSD consortium derived GACs for selected substances for an additional end use, that being residential without plant uptake (CLSD, 2009).

In July 2009, GAC for 82 substances were published by the Chartered Institute of Environmental Health (CIEH) (LQM and CIEH, 2009) using the then current version of the CLEA software v1.04. These GAC replace those generated in 2006 using the original version of the model CLEA UK *beta*.

In January 2010, GAC for 35 substances were published by the Environmental Industries Commission (EIC), Association of Geotechnical and Geoenvironmental Specialists (AGS) and Contaminated Land: Applications in Real Environments (CL:AIRE), (CL:AIRE, 2010) using the then current version of the CLEA software v1.05. These substances are more rarely found to be contaminants of concern during contaminated land investigations and hence are not routinely tested for. The CL:AIRE GAC are not reproduced in Table 1 but may be utilised as required. .

Note on Appropriate Use of SGV/GAC The SGVs and GACs generated using the CLEA model are based on numerous and complex assumptions. The appropriateness of these assumptions in a site-specific context requires confirmation on a project by project basis.

In general, SGVs/GACs have been developed using highly conservative assumptions and exceedance does not indicate that a site is statutorily contaminated and/or necessarily unsuitable for use in the planning context (Defra 04/2012). The SGV/GAC provide an aid to decision-making, but they do not replace the need for sound professional judgement in risk assessment (EA, 2006b).

Note on Mercury and Arsenic Assessment The analytical testing routinely undertaken by PBA determines total concentration, however, the toxicity of Mercury and Arsenic differ depending on the form.

If a source of Mercury or Arsenic is identified or the total concentration exceeds the relevant worst case speciated criteria it will be desirable/necessary to undertake additional speciated testing.

3.2 Potential Harm to the Built Environment

PBA use the following primary guidance to assess the significance of soil chemistry with respect to its potential to harm the built environment.

i) Site Preparation and Resistance to Contaminants and Moisture. Approved Document C (DCLG 2010);

ii) Concrete in aggressive ground SD1 (BRE 2005); and

iii) Technical guidance on the assessment of soil chemistry with respect to its potential to corrode plastic service pipes published by the Water Regulations Advisory Scheme.

iv) Guidance for the selection of water supply pipes to be used in brownfield sites UKWIR 2011

3.3 Potential to Harm Ecosystems, Animals, Crops etc

The criteria routinely used by PBA as Tier 2 screening values to assess the potential of soil chemistry to harm ecosystems are taken from the following guidance and summarised in are given in Table 2.

i) Ecological Risk Assessment (ERA) Science Report Series SC070009, published by the Environment Agency, Bristol (EA, 2008);

ii) The Restoration and Aftercare of Metalliferous Mining Sites for Pasture and Grazing (ICRCL 70/90, 1990); and

iii) Code of Practice for Agricultural Use of Sewage Sludge (DOE, 1993).

4 Tier 2 Screening Values for Assessing Controlled Waters

4.1 Potential Harm to Human Health

The criteria routinely used by PBA as Tier 2 water screening values are taken from the Water Supply (Water Quality) Regulations 2010 Defra 2010 and are given in Table 3.

It should be noted that some of the prescribed concentrations listed in the Water Supply Regulations have been set for reasons other than their potential to cause harm to human health. The concentrations of iron and manganese are controlled because they may taint potable water with an undesirable taste, odour or colour or may potentially deposit precipitates in water supply pipes.

4.2 Potential to Harm Controlled Waters

Controlled Waters are rivers, estuaries, coastal waters, lakes and groundwaters, but not perched waters.

The criteria routinely used by PBA as Tier 2 screening values are taken from the directions to the Environment Agency in regard to the implementation of the Water Framework Directive (EA 2009d) and are given in Tables 3, 4 and 5.

Table 3 presents the criteria for assessing the chemistry of groundwater bodies and Tables 4 and 5 present the criteria for assessing the chemistry of surface water bodies.

The results from any eluted liquids will be compared to appropriate assessment criteria depending on the receptor of concern.

5 Tier 2 Screening Guidance for Assessing Soil Gases

Guidance on the assessment of risks specifically for sites located adjacent to Landfill Sites has been published by the Environment Agency (EA, 2004). A tiered approach to assessing risk is advocated by the guidance. This allows the level of detail in a risk assessment to be proportionate to the nature and complexity of the risk.

The Tier 1 Risk Screening methodology advocated by the Environment Agency (EA) guidance document (EA, 2004) should:

i) Identify complete source-pathway-receptor linkages;

ii) Screen out insignificant risks;

iii) Prioritise the risks and receptors; and

iv) Provide an initial assessment of the potential impacts at a receptor.

A Tier 2 assessment comprises the quantitative analysis of risk following the collection and analysis of soil gas monitoring data.

Guidance on suitable methodologies for the collection of gas monitoring data is provided in CIRIA Report C665 (CIRIA, 2007).

Guidance Available PBA use the following primary guidance to assess the significance of soil gas chemistry with respect to its potential to harm human health.

i) Assessing risks posed by hazardous gases to buildings C665 (CIRIA 2007);

ii) Guidance on evaluation of development proposals on sites where methane and carbon dioxide are present. (NHBC 2007);

iii) Code of practice for the characterization and remediation from ground gas is affected developments (BSI, 2007); and

iv) Waste Management Paper No. 27 (DoE, 1991).

Waste Management Paper No. 27 (DoE, 1991) defines what constitutes a "significant quantity" of gas. WMP27 advises that a site producing (i) Methane concentrations in excess of 1% by volume and with a flow rate of greater than 15 litres per hour; or (ii) Carbon dioxide in excess of 1.5% by volume in air and with a flow rate of greater than 22 litres per hour would be considered as a significant source of soil gas.

Guidance on quantifying the risks from hazardous soil gases to properties and their occupiers is provided in CIRIA, 2007 (commercial developments), NHBC, 2007 (low rise residential developments) and British Standard BS 8485:2007. These documents provide guidance on gas monitoring methods and strategy, the assessment of risk posed by soil gases and mitigating the risks posed by soil gases during site development.

PBA use gas concentrations and borehole flow data in order to obtain the gas screening value (GSV) for methane and carbon dioxide at the site. The GSV can be used to establish the characteristic situation of the site as detailed in CIRIA C665 and in order to make recommendations for gas protection measures for buildings if required.

Radon In addition to the guidance listed above, PBA use the following primary guidance to assess the significance of the radon content of soil gas.

i) Radon: guidance on protective measures for new dwellings. Report BR211 (BRE, 1999); and

ii) Radon Atlas of England, R290 (NRPB, 1996).

6 References

BRE (2005) Concrete in aggressive ground. Special Digest 1, Building Research Establishment, Garston, Herts.

BRE (1999). Radon: guidance on protective measures for new dwellings. Report BR211, Building Research Establishment, Garston, Herts.

BSI (2007) BS 8485:2007 Code of practice for the characterization and remediation from ground gas is affected developments. British Standards Institute, London.

CIRIA (2007) Assessing risks posed by hazardous gases to buildings. C665, Construction Industry Research and Information Association, London.

CL:AIRE (2010). Soil Generic Assessment Criteria for Human Health Risk Assessment. Published in January 2010 by Contaminated Land: Applications in Real Environments, London. ISBN 978-1-905046-20-1.

CLAN2-05 Contaminated land advice note 02 from September 2005. Department for the Environment, Food and Rural Affairs, London.

CLSD (2009) Contaminated-Land-Strategies Digest - 30 Apr 2009 to 1 May 2009 - Special issue (#2009-89). Posting titled: "JISCmail GACs for SGV substances: April 2009 and subsequent postings".

DCLG (2010) Site preparation and resistance to contaminants and moisture. Approved Document C, The Building Regulations 2010.

Defra (2010) The Water Supply (Water Quality) Regulations, 2010. Statutory Instrument 2010 No 944, Department of the Environment, Transport and the Regions, London.

Defra Circular 04/2012 Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance.

DoE (1991) Landfill Gas, Waste Management Paper No. 27. Department of the Environment, London.

DoE (1993) Code of Practice for Agricultural Use of Sewage Sludge. Department of the Environment, London.

EA (2004) Guidance on Assessment of Risks from Landfill Sites. Environment Agency, Bristol.

EA (2006b) CLEA update No. 4. Environment Agency, Bristol.

EA (2008) Ecological Risk Assessment (ERA). Science Report Series SC070009, Environment Agency, Bristol.

EA (2009a) Using Soil Guideline Values. Science Report SC050021/SGV Introduction. Environment Agency, Bristol.

EA (2009b) Updated Technical Background to the CLEA model. Science Report SC050021/SR3 Introduction. Environment Agency, Bristol.

EA (2009c) Human health toxicological assessment of contaminants in soil. Science Report SC050021/SR2. Environment Agency, Bristol.

EA (2009d) River Basin Typology, Standards and Groundwater threshold values (Water Framework Directive) England and Wales) Direction 2009.

ICRCL (1990) The Restoration and Aftercare of Metalliferous Mining Sites for Pasture and Grazing 70/90. Interdepartmental Committee on the Redevelopment of Contaminated Land, London.

LQM & CIEH (2006) Generic Assessment Criteria for Human Health Risk Assessment. Land Quality Management Limited and the Chartered Institute of Environmental Health, London.

LQM & CIEH (2009) The LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment (2nd Edition). Land Quality Press, Nottingham. ISBN 0-9547474-7-X.

NRPB (1996) Radon Atlas of England. R290, National Radiological Protection Board, Didcot, Oxfordshire.

NHBC (2007) Guidance on evaluation of development proposals on sites where methane and carbon dioxide are present. National House Building Council.

UKWIR (2011) Guidance for the selection of Water Pipes to be used in Brownfield Sites.

Table 1: Tier 2 Screening Criteria for the Assessment of Potential Contaminant Concentrations in Soil – Protection of Human Health

Determinand	Allotments	Residential with plant uptake	Residential without plant uptake	Commercial/ Industrial
Metals/Metalloids				
Arsenic (Inorganic)	43[a]	32[a]	35[f]	640[a]
Beryllium	55[c]	51[c]	-	420[c]
Boron	45[c]	291[c]	-	192,000[c]
Cadmium	1.8[a]	10[a]	117[f]	230[a]
Chromium (trivalent)	34,600[c]	3000[c]	-	30,400[c]
Chromium (hexavalent)	2.1[c]	4.3[c]	-	35[c]
Copper	524[c]	2330[c]	-	71,700[c]
Lead	-	450[b]	450[b]	750[b]
Mercury (elemental)	1[a]	26[a]	-	26[a]
Mercury (inorganic)	80[a]	170[a]	235[f]	3600[a]
Methyl Mercury	8[a]	11[a]	-	410[a]
Nickel	230[a]	130[a]	130[f]	1800[a]
Selenium	120[a]	350[a]	595[f]	13000[a]
Vanadium	18[c]	75[c]	-	3160[c]
Zinc	618[c]	3750[c]	-	665,000[c]
BTEX Compounds (1%, 3% and 6% SOM)[d]				
Benzene	0.02[f] / 0.04[f] / 0.07[a]	0.08[f] / 0.18[f] / 0.33[a]	0.27[f] / 0.56[f] / 1.0[f]	28[f] / 57[f] / 95[a]
Toluene	22[f] / 60[f] / 120[a]	120[f] / 320[f] / 610[a]	600[f] / 1500[f] / 2700[f]	870[f] / 2200[f] / 4400[a]
Ethylbenzene	16[f] / 45[f] / 90[a]	65[f] / 180[f] / 350[a]	165[f] / 450[f] / 840[f]	520[f] / 1400[f] / 2800[a]
Xylenes #	28[f] / 80[f] / 160[a]	42[f] / 120[f] / 230[a]	53[f] / 145[f] / 285[f]	475[f] / 1300[f] / 2600[a]
Polycyclic Aromatic Hydrocarbons (1%, 2.5% and 6% SOM)[d]				
Acenaphthene	34[c] / 85[c] / 200[c]	210[c] / 480[c] / 1000[c]	-	85000[c] / 98000[c] / 100000[c]
Acenaphthylene	28[c] / 69[c] / 160[c]	170[c] / 400[c] / 850[c]	-	84000[c] / 97000[c] / 100000[c]
Anthracene	380[c] / 950[c] / 2200[c]	2300[c] / 4900[c] / 9200[c]	-	530000[c] / 540000[c] / 540000[c]
Benzo(a)anthracene	2.5[c] / 5.5[c] / 10[c]	3.1[c] / 4.7[c] / 5.9[c]	-	90[c] / 95[c] / 97[c]
Benzo(a)pyrene	0.60[c] / 1.2[c] / 2.1[c]	0.83[c] / 0.94[c] / 1.0[c]	-	14[c] / 14[c] / 14[c]
benzo(b)fluoranthene	3.5[c] / 7.4[c] / 13[c]	5.6[c] / 6.5[c] / 7.0[c]	-	100[c] / 100[c] / 100[c]
benzo(g,h,i)perylene	70[c] / 120[c] / 160[c]	44[c] / 46[c] / 47[c]	-	650[c] / 660[c] / 660[c]
benzo(k)fluoranthene	6.8[c] / 14[c] / 23[c]	8.5[c] / 9.6[c] / 10[c]	-	140[c] / 140[c] / 140[c]
Chrysene	2.6[c] / 5.8[c] / 12[c]	6.0[c] / 8.0[c] / 9.3[c]	-	140[c] / 140[c] / 140[c]
Dibenzo(a,h)anthracene	0.76[c] / 1.5[c] / 2.3[c]	0.76[c] / 0.86[c] / 0.90[c]	-	13[c] / 13[c] / 13[c]
Fluoranthene	52[c] / 130[c] / 290[c]	260[c] / 460[c] / 670[c]	-	23000[c] / 23000[c] / 23000[c]
Fluorene	27[c] / 67[c] / 160[c]	160[c] / 380[c] / 780[c]	-	64000[c] / 69000[c] / 71000[c]
Indeno(1,2,3-cd)pyrene	1.8[c] / 3.8[c] / 7.1[c]	3.2[c] / 3.9[c] / 4.2[c]	-	60[c] / 61[c] / 61[c]
Naphthalene	4.1[c] / 9.9[c] / 23[c]	1.5[c] / 3.7[c] / 8.7[c]	-	200[c] / 480[c] / 1100[c]
Phenanthrene	16[c] / 38[c] / 90[c]	92[c] / 200[c] / 380[c]	-	22000[c] / 22000[c] / 23000[c]
Pyrene	110[c] / 270[c] / 620[c]	560[c] / 1000[c] / 1600[c]	-	54000[c] / 54000[c] / 54000[c]
Aliphatic/Aromatic Hydrocarbons (1%, 2.5% and 6% SOM)[d]				
TPH Aliphatic >C5-6	740[c] / 1700[c] / 3900[c]	30[c] / 55[c] / 110[c]	-	3400[c] / 6200[c] / 13000[c]
TPH Aliphatic >C6-8	2300[c] / 5600[c] / 13000[c]	73[c] / 160[c] / 370[c]	-	8300[c] / 18000[c] / 42000[c]
TPH Aliphatic >C8-10	320[c] / 770[c] / 1700[c]	19[c] / 46[c] / 110[c]	-	2100[c] / 5100[c] / 12000[c]
TPH Aliphatic >C10-12	2200[c] / 4400[c] / 7300[c]	93[c] / 230[c] / 540[c]	-	10000[c] / 24000[c] / 49000[c]
TPH Aliphatic >C12-16	11000[c] / 13000[c] / 13000[c]	740[c] / 1700[c] / 3000[c]	-	61000[c] / 83000[c] / 91000[c]

Determinand	Allotments	Residential with plant uptake	Residential without plant uptake	Commercial/ Industrial
TPH Aliphatic >C16-35	260000[c] / 270000[c] / 270000[c]	45000[c] / 64000[c] / 76000[c]	-	1600000[c] / 1800000[c] / 1800000[c]
TPH Aliphatic >C35-44	260000[c] / 270000[c] / 270000[c]	45000[c] / 64000[c] / 76000[c]	-	1600000[c] / 1800000[c] / 1800000[c]
TPH Aromatic >C5-7 (benzene)	13[c] / 27[c] / 57[c]	65[c] / 130[c] / 280[c]	-	28000[c] / 49000[c] / 90000[c]
TPH Aromatic >C7-8 (toluene)	22[c] / 51[c] / 120[c]	120[c] / 270[c] / 611[c]	-	59000[c] / 110000[c] / 190000[c]
TPH Aromatic >C8-10	8.6[c] / 21[c] / 51[c]	27[c] / 65[c] / 151[c]	-	3700[c] / 8600[c] / 18000[c]
TPH Aromatic >C10-12	13[c] / 31[c] / 74[c]	69[c] / 160[c] / 346[c]	-	17000[c] / 29000[c] / 34500[c]
TPH Aromatic >C12-16	23[c] / 57[c] / 130[c]	140[c] / 310[c] / 593[c]	-	36000[c] / 37000 /[c] 37800[c]
TPH Aromatic >C16-21	46[c] / 110[c] / 260[c]	250[c] / 480[c] / 770[c]	-	28000[c] / 28000[c] / 28000[c]
TPH Aromatic >C21-35	370[c] / 820[c] / 1600[c]	890[c] / 1100[c] / 1230[c]	-	28000[c] / 28000[c] / 28000[c]
TPH Aromatic >C35-44	370[c] / 820[c] / 1600[c]	890[c] / 1100[c] / 1230[c]	-	28000[c] / 28000[c] / 28000[c]
TPH Aliphatic + Aromatic >C44-70	1200[c] / 2100[c] / 3000[c]	1200[c] / 1300[c] / 1300[c]	-	28000[c] / 28000[c] / 28000[c]
Chlorinated Hydrocarbons (1%, 2.5% and 6% SOM)[d]				
1,2-dichloroethane	0.0046[c] / 0.0083[c] / 0.016[c]	0.0054[c] / 0.0080[c] / 0.014[c]	-	0.71[c] / 1.0[c] / 1.8[c]
1,1,1 Trichloroethane (TCA)	48[c] / 110[c] / 240[c]	6.2[c] / 13[c] / 28[c]	-	700[c] / 1400[c] / 3100[c]
1,1,1,2 Tetrachloroethane	0.79[c] / 1.9[c] / 4.4[c]	0.90[c] / 2.1[c] / 4.8[c]	-	120[c] / 260[c] / 590[c]
1,1,2,2 Tetrachloroethane	0.41[c] / 0.89[c] / 2.0[c]	1.4[c] / 2.9[c] / 6.3[c]	-	290[c] / 580[c] / 1200[c]
Tetrachloroethene (PCE)	1.6[c] / 3.7[c] / 8.7[c]	0.94[c] / 2.1[c] / 4.8[c]	-	130[c] / 290 / 660[c]
Tetrachloromethane	0.16[c] / 0.37[c] / 0.85[c]	0.018[c] / 0.039[c] / 0.089[c]	-	3.0[c] / 6.6 / 15[c]
Trichloroethene (TCE)	0.43[c] / 0.95[c] / 2.2[c]	0.11[c] / 0.22[c] / 0.49[c]	-	12[c] / 25[c] / 55[c]
Trichloromethane/Chloroform	0.36[c] / 0.70[c] / 1.5[c]	0.75[c] / 1.3[c] / 2.7[c]	-	110[c] / 190[c] / 370[c]
Vinyl Chloride/Chloroethene	0.00055[c] / 0.0010[c] / 0.0018[c]	0.00047[c] / 0.00064[c] / 0.00099[c]	-	0.063[c] / 0.081[c] / 0.12[c]
Pesticides and Other Organic Compounds (1%, 2.5% and 6% SOM)[d]				
Aldrin	1.3[c] / 2.6[c] / 4.0[c]	1.7[c] / 2.0[c] / 2.1[c]	-	54[c] / 54[c] / 54[c]
Atrazine	0.037[c] / 0.085[c] / 0.2[c]	0.24[c] / 0.56[c] / 1.3[c]	-	870[c] / 880[c] / 880[c]
Dichlorvos	0.044[c] / 0.091[c] / 0.20[c]	0.29[c] / 0.6[c] / 1.3[c]	-	842[c] / 872[c] / 893[c]
Dieldrin	0.13[c] / 0.32[c] / 0.73[c]	0.69[c] / 1.4[c] / 2.2[c]	-	90[c] / 91[c] / 92[c]
Endosulfan	0.47[c] / 1.2[c] / 2.7[c]	2.9[c] / 7.0[c] / 16[c]	-	2310[c] / 2990[c] / 3390[c]
Carbon Disulphide	4.8[c] / 10[c] / 23[c]	0.10[c] / 0.20[c] / 0.44[c]	-	12[c] / 23[c] / 50[c]
Chlorobenzene	5.9[c] / 14[c] / 32[c]	0.33[c] / 0.73[c] / 1.7[c]	-	59[c] / 130[c] / 310[c]
Hexachloro-1,3-butadiene	0.25[c] / 0.61[c] / 1.4[c]	0.21[c] / 0.51[c] / 1.2[c]	-	32[c] / 69[c] / 120[c]
Hexachlorobenzene	0.18[c] / 0.42[c] / 0.92[c]	0.59[c] / 1.0[c] / 1.4[c]	-	48[c] / 53[c] / 55[c]
Pentachlorobenzene	1.2[c] / 3.1[c] / 7.1[c]	5.2[c] / 10[c] / 17[c]	-	650[c] / 770[c] / 830[c]
Pentachlorophenol	0.084[c] / 0.21[c] / 0.49[c]	0.55[c] / 1.3[c] / 2.96[c]	-	1200[c] / 1300[c] / 1400[c]
Phenol (1, 3, 6% SOM)	66[f] / 158[f] / 280[a]	184[f] / 316[f] / 420[a]	310[f] / 441[f] / 519[f]	3200[a]
Dioxins, Furans and dioxin-like PCBs[e]	0.008[a]	0.008[a]		0.24[a]

Notes

Units mg/kg

\# most conservative of the three isomers selected for each scenario

a Soil Guideline Value (2009) with SOM of 6%

b Soil Guideline Value (2002)

c Generic Assessment Criteria (LQM & CIEH 2009)

d Where three values are presented, SGV/GAC for soils with SOM of 1%, 2.5% and 6% or 1%, 3% and 6% are given as detailed in the table. SOM denotes Soil Organic Matter.

e Refer to Table 2 of the supporting guidance for suite

f Generic Assessment Criteria generated using CLEA v 1.04 by an independent contaminated land working group and independently verified by PBA (CLSD, 2009)

Table 2 Tier 2 Screening Criteria for the Assessment of Potential Contaminant Concentrations in Soil – Protection of Ecological Systems

Parameter	ICRCL 70/90 [a]			Proposed SSVs [b]	Code of Practice for Agricultural Use of Sewage Sludge [c]
	Threshold [d]	Maximum			
		Livestock	Crop Growth		
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Benzo(a)pyrene				0.15	
Arsenic	50	500	1000		50
Cadmium	3	30	50	1.15	3
Chromium				21.1	400
Copper	250	500	250	88.4	80/ 100/ 135/ 200 [e]
Fluoride	500	1000			500
Lead	300	1000		167.9	300
Mercury				0.06	1
Molybdenum					4
Nickel				25.1	50/ 60/ 75/ 110 [e]
Pentachlorobenzene				0.029	
Pentachlorophenol				0.6	
Selenium					3
Tetrachloroethene				0.01	
Toluene				0.3	
Zinc	1000	3000	1000	90.1	200/ 200/ 200/ 300 [e]

Notes

a. Interdepartmental Committee on the Redevelopment of Contaminated Land (ICRCL) 70/90 Restoration and Aftercare of Metalliferous Mining Sites for Pasture and Grazing 1st edition 1990.

b. Proposed Soil Screening Values (SSVs) – Consultation, Environment Agency 2008. Threshold which if exceeded prompts further assessment.

c. Maximum permissible concentration of potentially toxic elements from the Code of Practice for Agricultural Use of Sewage Sludge. Second Edition. DOE 1993.

d. Concentrations are for contamination derived from mine spoil. In other situations the speciation may be more available. Factors include total concentration, speciation, particle size, pH, species of plant, type of animal/grazing habit.

e. Where four values are presented, concentrations are for soils with pH values 5.0-5.5/ 5.5-6.0/ 6.0-7.0/ >7.0

Table 3: Tier 2 Criteria for Screening Selected Contaminants in Groundwater

Parameter	Protection of Human Health	Protection of Controlled Waters			
	Water Supply (Water Quality) Regulations 2000	Test 2 Minimum	Test 2 Maximum	Test 4	Test 5
Metal/Semi Metal:					
Antimony (µg/l)	5				
Arsenic (µg/l)	10	51.6	199	7.5	
Boron (µg/l)	1000			750	
Cadmium (µg/l)	5	0.2	1.1	3.75	
Chromium (µg/l)	50	5	27.6	37.5	
Copper (µg/l)	2000	10.1	57.8	1500	
Iron (µg/l)	200				
Lead (µg/l)	25 (10 from 25/12/13)	7.3	39.8	18.8	
Manganese (µg/l)	50				
Mercury (µg/l)	1			0.75	
Nickel (µg/l)	20	20.2	116	15	
Selenium (µg/l)	10				
Zinc (µg/l)	-	75.8	414	3750	
Other:					
Ammonium NH4 (mg/l)	0.5				
Ammonia NH3 (mg/l)	-	0.3	1.73	0.29	0.29
Chloride (mg/l)	250			188	187.5
Cyanide (ug/l)	50				
Electrical Conductivity (µS/cm)	2500			1880	
pH (pH units)	6.5 to 10				
Nitrate NO3 (mg/l)	50			42	42
Sulphate (mg/l)	250			188	188
Organics:					
Anthracene		0.1	0.55		
Benzene (µg/l)	1	10.1	55.2	0.75	0.75
Benzo(a)pyrene (µg/l)	0.01			0.075	
Chloroform (µg/l)	100 a	2.53	13.8	75	75
1.2-Dichloroethane (µg/l)	3			2.25	2.25
Fluoranthene		0.1	0.6		
Naphthalene (µg/l)	-	2.4	13.2		
Phenol Total (mg/l)	0.5	15.2	82.8		
PAHs (µg/l)	0.1 b				
Pesticides (ug/l)	0.03c				
Toluene (µg/l)	-	50.5	276		
Trichloroethene TCE (µg/l)	10 d	10.1	55.2	7.5	7.5
Tetrachloroethene PCE (µg/l)	10 d	10.1	57.8	7.5	7.5
Tetrachoromethane (ug/l)	3				
Vinyl Chloride (µg/l)	0.5				
Xylene (µg/l)	-	30.3	166		

Notes

TV Threshold Values for each groundwater body are given in the River Basin Management Plans

Test 2 Groundwater Impacts on Surface Water

Test 4 Groundwater Drinking Water Protected Areas – designed to be equivalent to a 95% standard

Test 5 General Quality of Groundwater Body – designed to be equivalent to a 95% standard

a. Sum for Tri-halomethanes – chloroform, bromoform, dibromochloromethane, bromodichloromethane

b. Concentration for sum of benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghi)perylene, indeno(1,2,3-cd)pyrene

c. Sum for Aldrin, Dieldrin, Heptachor and Heptachor epoxide

d. Sum of TCE and PCE

Table 4: Surface Waters - Specific Pollutants – Standards for Ecological Status

Pollutant	Rivers and Freshwater Lakes	Transitional and Coastal Waters
2,4-Dichlorophenoxyacetic acid (2,4-D)	0.3 (1.3)*	0.3 (1.3)*
2,4-Dichlorophenol	20	20
Ammonia (Un-ionised) as Nitrogen	Not applicable	21
Arsenic #	50	25
Chlorine (total available)	2 (5)*	(10)*
Chromium VI	3.4	0.6 (32)*
Chromium III	4.7	(32)*
Copper – standard is hardness dependant for freshwater	1 (CaCO3 <50mg/l) 6 (CaCO3 50-<100mg/l) 10 (CaCO3 100-<250mg/l) 28 (CaCO3 >250mg/l)	5
Cyanide	1 (5)*	1 (5)*
Cypermethrin as ng/l	0.1 (0.4)*	0.1 (0.4)*
Diazinon	0.01 (0.02)*	0.01 (0.1)*
Dimethoate	0.48 (4)*	0.48 (4)*
Iron as mg/l	1	1
Linuron	0.5 (0.9)*	0.5 (0.9)*
Mecoprop	18 (187)*	18 (187)*
Permethrin	(0.01)	(0.01)
Phenol	7.7 (46)*	7.7 (46)*
Toluene	50 (380)*	40 (370)*
Zinc – standard is hardness dependant for freshwater	8 (CaCO3 <50mg/l) 50 (CaCO3 50-<100mg/l) 75 (CaCO3 100-<250mg/l) 125 (CaCO3 >250mg/l)	40

i. All units ug/l unless otherwise stated.
ii. The standard is the annual mean standard over a period of 12 consecutive months unless otherwise stated.
iii. ( ) indicates that this is the 95-percentile standard where the standard is failed if the measured concentration is above the standard for 5% or more of the time.
iv. * indicates that the standard is not to be used for the purpose of classifying the ecological status or potential of bodies of surface water.
v. # indicates that the standard is the dissolved fraction obtained by filtration through a 0.45um filter.

Reproduced from Part 4 of The River Basin Districts Typology, Standards and Groundwater threshold values (Water Framework Directive) (England and Wales) Direction 2009.

Table 5: Surface Waters - Priority Substances – Standards for Chemical Status

Pollutant	*Annual Average*		*Maximum Allowable Concentration*	
	Inland	*Other*	*Inland*	*Other*
Alachlor	0.3	0.3	0.7	0.7
Anthracene	0.1	0.1	0.4	0.4
Atrazine	0.6	0.6	2.0	2.0
Benzene	10	8	50	50
Brominated diphenylether	0.0005	0.0002	NA	NA

Pollutant	*Annual Average*		*Maximum Allowable Concentration*	
	Inland	*Other*	*Inland*	*Other*
Cadmium (and its compounds) # – hardness dependant – refer to Notes for definitions of C1 to C5	<0.08 C1 0.08 C2 0.09 C3 0.15 C4 0.25 C5	0.2	<0.45 C1 0.45 C2 0.6 C3 0.9 C4 1.5 C5	<0.45 C1 0.45 C2 0.6 C3 0.9 C4 1.5 C5
Carbon tetrachloride	12	12	NA	NA
C10-13 Chloroalkanes	0.4	0.4	1.4	1.4
Chlorfenvinphos	0.1	0.1	0.3	0.3
Chlorpyrifos	0.03	0.03	0.1	0.1
Aldrin, Dieldin, Endrin, Isodrin (Sum)	0.01	0.005	NA	NA
DDT Total	0.025	0.25	NA	NA
Para-para-DDT	0.01	0.01	NA	NA
1,2-Dichloroethane	10	10	NA	NA
Dichloromethane	20	20	NA	NA
Di(2-ethylhexyl)-phthalate (DEHP)	1.3	1.3	NA	NA
Diuron	0.2	0.2	1.8	1.8
Endosulfan	0.005	0.005	0.01	0.01
Fluoranthene	0.1	0.1	1	1
Hexachlorobenzene	0.01	0.01	0.05	0.05
Hexachlorobutadiene	0.1	0.1	0.6	0.6
Hexachlorocyclohexane	0.02	0.002	0.04	0.02
Isoproturon	0.3	0.3	1	1
Lead (and its compounds) #	7.2	7.2	NA	NA
Mercury (and its compounds) #	0.05	0.05	0.07	0.07
Naphthalene	2.4	1.2	NA	NA
Nickel (and its compounds) #	20	20	NA	NA
Nonylphenol	0.3	0.3	2	2
Octylphenol	0.1	0.01	NA	NA
Pentachlorobenzene	0.007	0.0007	NA	NA
Pentachlorophenol	0.4	0.4	1	1
Benzo(a)pyrene	0.05	0.05	0.1	0.1
Benzo(b)fluoranthene + Benzo(k)fluoranthene	0.03	0.03	NA	NA
Benzo(ghi)perylene + Indeno(1,2,3-cd)pyrene	0.002	0.002	NA	NA
Simazine	1	1	4	4
Tetrachloroethylene	10	10	NA	NA
Trichloroethylene	10	10	NA	NA
Tributyl tin compounds	0.0002	0.0002	0.0015	0.0015
Trichlorobenzenes	0.4	0.4	NA	NA
Trichloromethane	2.5	2.5	NA	NA
Tifluralin	0.03	0.03	NA	NA

i. The EQS are expressed as total concentrations in the whole water sample except for #.
ii. # indicates that the EQS is dissolved concentration obtained by filtration through 0.45um filter.
iii. Inland = surface waters encompassing rivers and lakes and related artificial or heavily modified water bodies.
iv. Hardness Classifications C1 <40 mg CaCO3/l, C2 40 to <50 mg CaCO3/l, C3 50 to <100 mg CaCO3/l, C4 100 to <200 mg CaCO3/l, C5 200 mg CaCO3/l.

Reproduced from Part 5 of The River Basin Districts Typology, Standards and Groundwater threshold values (Water Framework Directive) (England and Wales) Direction 2009.

APPENDIX 7

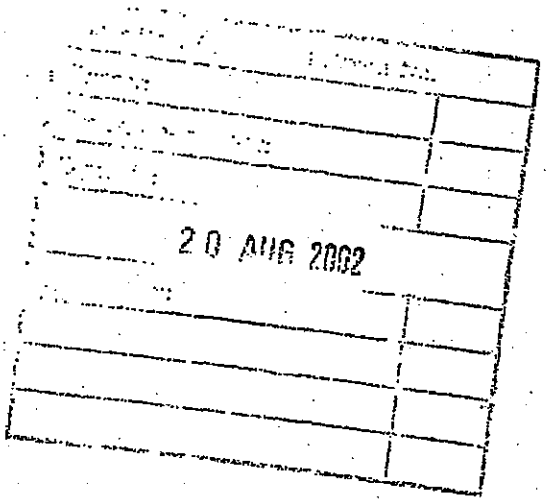
GeoReports

Radon (RPM) Report - Standard

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Report prepared for:

Kevin Burbidge
Peter Brett Associates
66 Tilehurst Road
Reading
Berkshire
RG30 2JH



Radon Protective Measures Site Report – Standard

Advisory report on the requirement for radon protective measures in new dwellings

Stage 2 Geological Assessment for BR211 (1999)

Client's Reference:

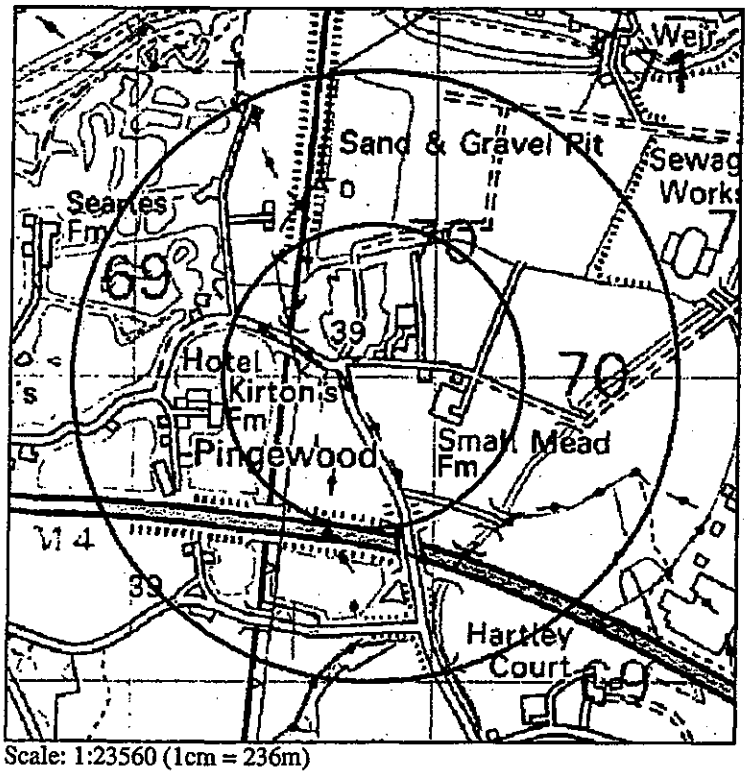
11321/300

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Radon (RPM) Report - Standard

Section 1: Location and extent of report area

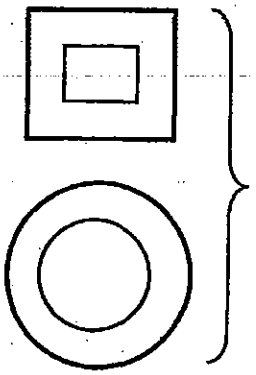
Area centred at: *469800,170000*
Radius of site area: *500 metres*



Scale: 1:23560 (1cm = 236m)

Topography based on the latest 1:50,000 scale Ordnance Survey Maps with the permission of The Controller of Her majesty's Stationery Office, Crown Copyright. Ordnance Survey licence number GD272191/2000. Display scale may vary.

KEY:



INNER RECTANGLE or CIRCLE defines site area (details provided by client).

OUTER LINE shows extent of TOTAL SEARCH AREA comprising the site area and automatically generated buffer zone. The requirement for radon protective measures indicated in Section 2 is based on a geological assessment of the Total Search Area.

Please see Section 4 for details of how the search is carried out

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Section 2: Requirement for radon protective measures

The RPM GIS has determined that:

NO RADON PROTECTIVE MEASURES ARE REQUIRED FOR THE REPORT AREA.

This assessment was derived from 1:250,000 scale data.
Where protective measures are indicated, guidance can be found in BR211(1999) *Radon: guidance on protective measures for new dwellings.*

Important Note: The level of radon protection indicated in Annex A of *BR211 Radon: Guidance on protective measures for new dwellings (1999 edition)* is the minimum requirement for this site. Thus if Annex A indicates basic protection and this RPM Site Report indicates no protection then basic protection should be installed. See Section 4 for more details.

Please see Section 4 for details of how the assessment is carried out

Section 3: Geological units within the search area

Below is a listing, if available, of the possible combinations of Solid Geology units and overlying Drift (Superficial) Geology units within the total search area.

These have been derived (as indicated) from searches of either:

a) Combined 1:250,000 Solid and 1:625,000 Drift geology maps
b) 1:50,000 Solid, Drift and Artificial geology maps

1:250,000 data

1. UPPER CHALK FORMATION(CHALK 4110); Alluvium (inc River Terrace Deposits in Scotland)
2. LONDON CLAY FORMATION(ARGILLACEOUS ROCKS, UNDIFFERENTIATED); River Terrace deposits (mainly sand and gravel)
3. UPPER CHALK FORMATION(CHALK 4110); River Terrace deposits (mainly sand

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and gravel)

4. LAMBETH GROUP(SANDSTONE AND [SUBEQUAL/SUBORDINATE] ARGILLACEOUS ROCKS, INTERBEDDED); River Terrace deposits (mainly sand and gravel)

5. LONDON CLAY FORMATION(ARGILLACEOUS ROCKS, UNDIFFERENTIATED); Alluvium (inc River Terrace Deposits in Scotland)

6. LAMBETH GROUP(SANDSTONE AND [SUBEQUAL/SUBORDINATE] ARGILLACEOUS ROCKS, INTERBEDDED); Alluvium (inc River Terrace Deposits in Scotland)

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Section 4: Determining the level of radon protection.

BR 211 (1999) sets out a two-stage procedure to help determine the level of radon protection required in new dwellings and extensions.

In Stage 1 of the procedure, the 5 km grid square radon potential maps (Appendix A, BR211,1999) produced by the National Radiological Protection Board (NRPB) are used to make the primary determination of the level of radon protection needed. The NRPB maps are based on the average estimated proportion of homes exceeding the radon Action Level for each 5 km square of the Ordnance Survey National Grid.

In Stage 2, a second series of maps produced by the BGS (Appendix B, BR211,1999) is used to decide whether it is necessary to consider upgrading the requirement for protection indicated by Stage 1. This procedure has the objective of avoiding cases of underprotection that might occur had the guidance depended solely on the average radon level in the 5 km grid square indicated by the NRPB maps. The BGS maps in Appendix B (BR211, 1999) show those 5 km grid squares that are underlain, completely or in part, by geological units that require either basic or full protection to be installed in new dwellings.

A geological assessment may need to be carried out where the site falls within a shaded grid square on the BGS map in Annex B of BR211 (1999). The geological assessment checks whether a site is on or close to a geological unit which potentially exceeds the action levels for either basic or full radon protection. Consideration must be given to installing basic or full radon protection if the geological assessment shows that this is indicated. If a site falls within one of the shaded squares, it does not necessarily mean that it must have radon protection. This is because some of the grid squares contain bed rocks and unconsolidated (drift) deposits with lower radon potential than the maximum levels shown on the 5 km grid maps in Appendix B (BR211, 1999).

In many cases the geological radon potential varies considerably within a grid square. In other cases, only a very small area (sometimes only a few hundred square metres) with a radon potential exceeding the thresholds for basic or full protection occurs within the shaded grid square. The level of protection that might be required is thus site specific, and can be determined by reference to the relevant radon potential map in BR211 (1999) followed by a geological assessment of the site.

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The geological assessment in this report is produced by the BGS Radon Protective Measures Geographical Information System (RPM GIS), which has been developed to provide Stage 2 Geological Assessments (RPM Site Reports). The assessment is derived from a geologically based interpretation of radon measurements in dwellings which were provided to the BGS by the NRPB without prejudicing confidentiality undertakings to householders and the Department of the Environment, Transport and the Regions (DETR). The reliability of a geological radon potential assessment is approximately proportional to the number of radon measurements available and the scale of the geological maps.

The RPM GIS currently comprises 1:250,000 scale data with more detailed information for twenty 1:50,000 scale geological map sheets covering the most radon-prone parts of Derbyshire, Northamptonshire, Nottinghamshire, Leicestershire, Lincolnshire, Oxfordshire, Shropshire, Somerset and Yorkshire. The RPM-GIS is being upgraded to 1:50,000 scale over the next 12 months as new digital maps become available through the BGS DIGIMAP programme.

The search area (circle or rectangle) for a site is increased by a buffer zone of 50 m in areas with 1:50,000 scale data and 500m in areas with 1:250,000 scale data. This is to allow for potential inaccuracies in the position of the geological boundaries. In many cases a number of combinations of bed rock and drift with differing geological radon potentials will occur within the total search area. Following the precautionary principle, the requirement for protective measures is derived from the highest geological radon potential encountered within the total search area.

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Section 5: Follow-up Detailed Radon Protective Measures site report

For most parts of the UK, a higher resolution assessment of radon protective measures requirements can also be provided by BGS. This will comprise:

i. Assessment by a qualified geologist of the relevant 10,000, 1:10,560 or 1:50,000 scale geological map(s) covering the total search area from BGS archives.
ii. Precise identification of the level of radon protective measures indicated for all geological units encountered within the site and the immediately surrounding area.

The basic charge for a Detailed Radon Protective Measures Report is **£140 (incl. VAT & Delivery)**. Reports for very large or geologically complex sites may, however, have to be supplemented with additional £40+VAT increments to allow for each extra half-hour of time taken – in such cases, enquiry staff will confirm with the client before proceeding.

The Radon follow-up reports can be ordered from:-
Geological Enquiries, British Geological Survey, Keyworth, Nottingham NG12 5GG; Tel: 0115-936-3192; Fax: 0115-936-3192; e-mail: geohelp@bgs.ac.uk. An on-line ordering facility will be available in the near future from Services on the BGS web site *http://www.bgs.ac.uk*.

Section 6: What is radon ?

Radon is a naturally occurring radioactive gas, which is produced by the radioactive decay of radium which, in turn, is derived from the radioactive decay of uranium. Uranium is found in small quantities in all soils and rocks, although the amount varies from place to place. Radon released from rocks and soils is quickly diluted in the atmosphere. Concentrations in the open air are normally very low and do not present a hazard. Radon that enters poorly ventilated enclosed spaces such as some basements, buildings, caves, mines, and tunnels may reach high concentrations in some circumstances. The construction method and degree of ventilation will influence radon levels in individual buildings. A person's exposure to radon will also vary according to how particular buildings and spaces are used.

Inhalation of the radioactive decay products of radon gas increases the chance of developing lung cancer. If individuals are exposed to high concentrations for significant periods of time, there may be cause for concern. In order to limit the risk to individuals, the Government has adopted an Action Level for radon in homes of 200 becquerels per cubic metre (Bq m^{-3}). The Government advises householders that, where the radon level exceeds the Action Level, measures should be taken to reduce the concentration.

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Section 7: Radon in workplaces

The Ionising Radiation Regulations, 1999, require employers to take action when radon is present above a defined level in the workplace. Advice may be obtained from your local Health and Safety Executive Area Office or the Environmental Health Department of your local authority. The BRE publishes a guide (BR293): **Radon in the workplace.**

BRE publications may be obtained from Construction Research Communications Ltd, 151 Roseberry Avenue, London EC1R 4QX (Tel: 0171 505 6622; Fax: 0171 505 6606).

Section 8: Radon in existing dwellings

Useful information is given in the following free publications which can be obtained by writing to: DETR Free Literature, PO Box 236, Wetherby, West Yorkshire, LS23 7NB.

Radon - A Householder's Guide

Radon - You Can Test for it

Radon - A Guide for Homebuyers and Sellers

Radon - A Guide to Reducing Levels in Your Home

Information in the booklets is also available on the DETR website at:
http://www.environment.detr.gov.uk/radioactivity/index.htm

Householders are recommended to follow advice in **Radon - a householder's guide.** The guide outlines simple solutions for dealing with the radon problem depending on whether or not the home has been tested for radon. In radon affected homes, the problem of radon can usually be tackled with simple, effective and relatively inexpensive measures. These measures are comparable in cost to work such as damp-proofing and timber treatment. You can get practical advice about construction work to reduce radon levels from the Building Research Establishment (BRE) **Radon hotline** on **01923 664707.**

Advice about radon, its health risks and details of how to order the radon test may be obtained from the NRPB **Radon Freephone** on 0800 614529 or by post from **NRPB, Chilton, Didcot, Oxfordshire OX11 0RQ.**

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APPENDIX 8

470192 169764

RECORD OF BOREHOLE No: 1

START DATE: 9TH JUNE 1988
TYPE OF BORING: CABLE PERCUSSION
EQUIPMENT: PILCON WAYFARER

CASING DETAILS: 200mm to 8.45m, 150mm to 22.00m
BOREHOLE DIA: 200mm to 8.45m, 150mm to 25.00m
DRILL FLUID:

SHEET 1 OF 3
ORIENTATION VERTICAL
CO-ORDINATES
E 2196.5 N 2779.0
GROUND LEVEL 38.30

Date & Time	Casing Depth (m)	Water Level -m (Flush Return)	SAMPLE/CORE RECOVERY Depth (m)	Type	No	Core Size	Fracture	DESCRIPTION OF STRATA	Depth -m (Thickness)	Level (m OD)	Strata Symbol
				Total %	ROD (SCR)						
								TOPSOIL	(0/45)		
			0.50	D	1				0.45	37.85	
								Medium dense brown sandy fine to medium angular to subrounded flint GRAVEL			
			1.00	D	2						
			S(22) 1.00	B	3						
			1.50	D	4						
			1.70	W					(2.50)		
			2.00	D	5						
			S(13)								
			2.50	D	7						
			3.00 - 3.45 (0.40m Rec)	U	8				2.95	35.35	
			3.50	D	9			Stiff to hard green mottled red fissured silty CLAY with occasional oxidation along fissure surfaces			
			4.00	D	10						
			S(28) 4.50	D	11						
			5.00 - 5.45 (0.35m Rec)	U	12						
			5.50	D	13						
18.00	6.00		6.00	D	14				(5.50)		
10/6 08.40	6.00	1.30	S(35)								
			6.50	D	15						
			7.00 - 7.45 (0.35m Rec)	U	16						
			7.50	D	17						
			8.00	D	18						
			S(29) 8.75	D	19				8.45	29.85	
								Medium dense, becoming dense and very dense with depth brown fine to medium SAND			
			9.50	D	20				(8.95)		
			S(24) 9.50	B	21						

REMARKS:

Groundwater encountered at 1.70m, rising to 1.59m in 30 minutes
Water added to assist boring from 0.45m to 2.95m

SCALE 1 : 50 (When reduced to A4)

FOUNDATION & EXPLORATION SERVICES

READING BUSINESS PARK

CONTRACT No: 910

FIGURE: 77

RECORD OF BOREHOLE No: 1

START DATE 9TH JUNE 1988
CASING DETAILS 200mm to 8.45m, 100mm to 22.00m
SHEET 2 OF 3
TYPE OF BORING CABLE PERCUSSION
BOREHOLE DIA.
ORIENTATION VERTICAL
CO-ORDINATES E 2196.50 N 2779.00
EQUIPMENT PILCON WAYFARER
DRILL FLUID:
GROUND LEVEL 38.30

Date & Time	Casing Depth (m)	Water Level - m (Flush Return)	SAMPLE/CORE RECOVERY Depth (m)	Type	No	Core Size	Fracture	DESCRIPTION OF STRATA	Depth - m (Thickness)	Level (m O.D.)	Strata Symbol
				Total %	RQD (SCR)						
10/6			10.25	D	22			Medium dense, becoming dense and very dense with depth, brown fine to medium SAND.			
			11.00 S(31)	D	23						
			11.00	B	24						
			11.75	D	25						
			12.50 S(49)	D	26						
			12.50	B	27						
			13.25	D	28						
			14.00 S(50)	D	29				(8.95)		
			14.75	D	30						
			15.50 S(55)	D	31						
			15.50	B	32						
18.00	16.00										
13/6 08.30	16.00	1.22	16.25	D	33						
			17.00 S(67/225mm)	D	34				17.40	20.90	
			17.50 - 17.95 (0.35m Rec)	U	35			Hard dark grey laminated and fissured silty CLAY			
			18.00	D	36						
			18.50 S(78/225mm)	D	37				(4.00)		
			19.25	D	38						

REMARKS:

SCALE 1: 50 (When reduced to A4)

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READING BUSINESS PARK

CONTRACT No: 910

FIGURE: 78

RECORD OF BOREHOLE No: 1

START DATE 9TH JUNE 1988
TYPE OF BORING CABLE PERCUSSION
EQUIPMENT PILCON WAYFARER
CASING DETAILS 200mm to 8.45m, 150mm to 22.00m
BOREHOLE DIA 200mm to 8.45m, 150mm to 25.00m
DRILL FLUID
SHEET 3 OF 3
ORIENTATION VERTICAL
CO-ORDINATES E 2196.50 N 2779.00
GROUND LEVEL 38.30

Date & Time	Casing Depth (m)	Water Level -m (Flush Return)	SAMPLE/CORE RECOVERY Depth (m)	Type	No	Core Size	Fracture	DESCRIPTION OF STRATA	Depth -m (Thickness)	Level (m O D)	Strata Symbol
				Total %	RQD (SCR)						
13/6			20.00 - 20.45 (0.35m Rec)	U	39			Hard dark grey laminated and fissured silty CLAY			
			20.50	D	40				(4.00)		
			21.40	W					21.40	16.90	
			21.50 - 21.95 (0.35m Rec)	U	41			CHALK - recovered as stiff remoulded fissured chalk and coarse gravel fragments of very weak intact chalk.			
			22.00	D	42						
			22.50	D	43			(GRADE II - from Standard Penetration Test result)			
			23.00 S(36)	D	44				(3.60) +		
			23.75	D	45						
			24.50 - 24.95 (0.35m Rec)	U	46						
			25.00	D	47				25.00	13.30	
								END OF BOREHOLE			

REMARKS:

Piezometer installed to 23.40m, with sand response zone from 21.00m to 23.50m
Bentonite cement grout from 23.50m to 25.00m and 21.00m to 3.00m arisings from 3.00m to ground level, plastic cover at ground level

SCALE 1 : 50 (When reduced to A4)

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READING BUSINESS PARK

CONTRACT No: 910

FIGURE: 79

RECORD OF BOREHOLE No: 4

START DATE 6TH JUNE 1988
TYPE OF BORING CABLE PERCUSSION
EQUIPMENT PILCON WAYFARER

CASING DETAILS 200mm to 3.00m
150mm to 20.00m
BOREHOLE DIA. 200mm to 17.45m
150mm to 30.00m
DRILL FLUID

SHEET 1 OF 4
ORIENTATION VERTICAL
CO-ORDINATES
E 2196.5 N 3053.5
GROUND LEVEL 37.98

Date & Time	Casing Depth (m)	Water Level -m (Flush Return)	SAMPLE/CORE RECOVERY Depth (m)	Type	No	Core Size	Fracture	DESCRIPTION OF STRATA	Depth -m (Thickness)	Level (m O.D.)	Strata Symbol
				Total %	RQD (SCR)						
6/6								TOPSOIL overlying firm dark brown yellow sandy silty CLAY with fine to medium GRAVEL.	(0.90)		
			0.50 - 0.95 (0.40m Rec)	U	1				0.90	37.08	
			0.90	D	2			Soft dark brown sandy silty CLAY with fine to medium angular to rounded flint gravel	(0.30)		
			1.20	D	3				1.20	36.78	
	1.50	1.00	1.50 S(13)	D	4			Medium dense grey sandy fine to medium angular to rounded flint GRAVEL	(1.20)		
			2.00	B	5						
			2.40	D	6				2.40	35.58	
			2.50 - 2.95 (0.35m Rec)	U	7			Soft to firm becoming stiff grey mottled brown and red sandy silty CLAY with some fine gravel at 3.50m.			
17.30	3.00	DRY									
7/6 08.00	3.00	2.85	3.00	D	8						
			3.50	U	9				(1.60)		
			4.00	D	10				4.00	33.98	
			4.50	U	11			Stiff to very stiff green grey mottled red fissured silty CLAY			
			5.25	D	12						
	3.00	DRY	6.00 S(36)	D	13				(3.50)		
			6.75	D	14						
			7.50	U	15				7.50	30.48	
								Hard green mottled red silty CLAY			
			8.25	D	16						
	3.00	DRY	9.00 S(47)	D	17				(3.95)		
			9.75	D	18						

REMARKS

1. Groundwater encountered at 1.20m, rising to 1.18m after 20 minutes
2. Water added to assist boring from 1.20m to 2.40m
3. Intermittent small water seepages noted in clay from 4.00m to 11.45m

SCALE 1 : 50 (When reduced to A4)

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READING BUSINESS PARK

CONTRACT No: 910

FIGURE: 84

RECORD OF BOREHOLE No: 4

START DATE 6TH JUNE 1988
TYPE OF BORING CABLE PERCUSSION
EQUIPMENT PILCON WAYFARER

CASING DETAILS 200mm to 3.00m
150mm to 20.00m
BOREHOLE DIA. 200mm to 17.45m
150mm to 30.00m
DRILL FLUID

SHEET 2 OF 4
ORIENTATION VERTICAL
CO-ORDINATES
E 2196.5 N 3053.5
GROUND LEVEL 37.98

Date & Time	Casing Depth (m)	Water Level - m (Flush Return)	SAMPLE/CORE RECOVERY Depth (m)	Type Total %	No ROD (SCR)	Core Size	Fracture	DESCRIPTION OF STRATA	Depth - m (Thickness)	Level (m O.D.)	Strata Symbol
								Hard green mottled grey silty CLAY			
7/6			10.50	U	19				(3.95)		
			11.25	D	20				11.45	26.53	
			11.45	D	21			Light green clayey fine SAND	(0.45)		
			11.90	D	22				11.90	26.08	
	3.00	DRY	12.00 S(79)	D	23			Hard green mottled brown silty CLAY, locally very silty clay and locally fissured. Becoming blue mottled brown below 12.75m			
			12.75	D	24				(2.60)		
			13.50	U	25						
			14.25	D	26				14.50	23.48	
			14.50	D	27			Stiff becoming very stiff dark grey laminated and fissured silty CLAY, with partings of light grey silt			
13.30	3.00	DRY	15.00	D	28						
14.00	3.00	14.80	S(49) 15.00	W	29,30						
			15.75	D	31				(2.95)		
			16.50	U	32						
17.00	3.00	DRY									
8/6 08.00	3.00	2.60	17.25	D	33				17.45	20.53	
			17.45	D	34			Very dense dark green - grey fine to medium SAND containing clayey pockets with shell debris, and fragments of moderately weak dark grey pyritised fine grained sandstone	(1.15)		
	18.00	4.40	18.00 S(83)	D	35						
			18.60	D	36			Dark green sandy clayey SILT with pockets of soft dark grey silty clay	18.60 (0.25)	19.38	
			18.85	D	37				18.85	19.13	
			19.00	W	38,39			Soft dark grey sandy silty CLAY containing fine to coarse flint gravel	(0.60)		
			19.45	D	40				19.45	18.53	
	19.50	5.40	19.50 S(38)	D	41			CHALK - recovered as stiff remoulded chalk and gravel fragments of very weak intact chalk	(11.30) +		

REMARKS.

SCALE 1 : 50 (When reduced to A4)

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READING BUSINESS PARK

CONTRACT No: 910

FIGURE: 85

RECORD OF BOREHOLE No: 4

START DATE 6TH JUNE 1988

DRILLING METHOD CABLE PERCUSSION

EQUIPMENT PILCON WAYFARER

CASING DETAILS 200mm to 3.00m
150mm to 20.00m

BOREHOLE DIA 200mm to 3.00m
150mm to 20.00m

DRILL FLUID:

SHEET 3 OF 4

ORIENTATION VERTICAL

CO-ORDINATES
E 2196.5 N 3053.5

GROUND LEVEL 37.98 m O D

Date & Time	Casing Depth (m)	Water Level-m (Flush Return%)	SAMPLE/CORE RECOVERY Depth (m)	Type	No	Core Size	Fracture	DESCRIPTION OF STRATA	Depth m (Thickness)	Level (m O D)	Strata Symbol
				Total %	RQD (SCR)						
8/6			20.25	D	42			CHALK - recovered as stiff remoulded chalk and gravel fragments of very weak and intact chalk.			
			21.00	U	43			(Grade I - from Standard Penetration Test Results).			
			21.75	D	44						
	20.00	4.80	22.50 S(47)	D	45						
			23.25	D	46						
			24.00	U	47						
			24.00	W	48,49						
			24.75	D	50				(11.30) +		
	20.00	5.00	25.50 S(64)	D	51						
13.00	20.00	5.00									
13.30	20.00	4.90	26.25	D	52						
			27.00	U	53						
			27.75	D	54						
	20.00	4.60	28.50 S(63)	D	55						
			29.25	D	56						

REMARKS.

Logged by	Date
Checked by	
Approved by	

SCALE 1 : 50 (When reduced to A4)

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READING BUSINESS PARK

CONTRACT No: 910

FIGURE: 86

RECORD OF BOREHOLE No: 4

START DATE 6TH JUNE 1988

CASING DETAILS 200mm to 3.00m
150mm to 20.00m

SHEET 4 OF 4

ORIENTATION VERTICAL

TYPE OF BORING. CABLE PERCUSSION

BOREHOLE DIA. 200mm to 17.45m
150mm to 30.00m

CO-ORDINATES
E 2196.5 N 3053.5

EQUIPMENT PILCON WAYFARER

DRILL FLUID.

GROUND LEVEL. 37.98

Date & Time	Casing Depth (m)	Water Level -m (Flush Return)	SAMPLE/CORE RECOVERY Depth (m)	Type / Total %	No / RQD (SCR)	Core Size	Fracture	DESCRIPTION OF STRATA	Depth -m (Thickness)	Level (m O D)	Strata Symbol
6/6			30.00	U	57			CHALK - recovered as stiff remoulded chalk and gravel fragments of very weak intact chalk	(11.30 +		
-			30.75	D	58				30.75	7.23	
								END OF BOREHOLE			

REMARKS:

Standpipe installed at 2.50m on completion, with pea gravel filter and perforations from 1.40m to 2.50m. Backfill from 30.75m to 3.50m, Bentonite seals from 3.50m to 2.50m and 1.40m to 1.00m, and backfill from 1.00m to 0.50m. Concrete from 0.50m to ground level with stopcock cover at ground level.

SCALE 1 : 50 (When reduced to A4)

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CONTRACT No: 910

FIGURE: 87

Appendix B Updated Third Party Database Search

EmapSite

Masdar House, ,
Eversley, RG27 0RP

Groundsure Reference:	EMS-349554_469602
Your Reference:	EMS_349554_469602
Report Date	29 Feb 2016
Report Delivery Method:	Email - pdf

Groundsure Enviroinsight

Address: 400 Longwater Ave,GreenPark,Reading,

Dear Sir/ Madam,

Thank you for placing your order with Groundsure. Please find enclosed the **Groundsure Enviroinsight** as requested.

If you would like further assistance regarding this report then please contact the emapsite customer services team on 0118 9736883 quoting the above report reference number.

Yours faithfully,

emapsite customer services team

Enc.
Groundsure Enviroinsight

Groundsure Enviroinsight

Address:	**400 Longwater Ave,GreenPark,Reading,**
Date:	**29 Feb 2016**
Reference:	**EMS-349554_469602**
Client:	**EmapSite**

NW N NE

W E



SW S SE

Aerial Photograph Capture date:	11-Jul-2013
Grid Reference:	469983,169794
Site Size:	2.78ha

Report Reference: EMS-349554_469602
Client Reference: EMS_349554_469602

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Overview of Findings

For further details on each dataset, please refer to each individual section in the main report as listed. Where the database has been searched a numerical result will be recorded. Where the database has not been searched '-' will be recorded.

Section 1: Historical Industrial Sites	On-site	0-50	51-250	251-500
1.1 Potentially Contaminative Uses identified from 1:10,000 scale mapping	0	0	0	3
1.2 Additional Information – Historical Tank Database	0	0	0	0
1.3 Additional Information – Historical Energy Features Database	0	0	0	0
1.4 Additional Information – Historical Petrol and Fuel Site Database	0	0	0	0
1.5 Additional Information – Historical Garage and Motor Vehicle Repair Database	0	0	0	0
1.6 Potentially Infilled Land	0	0	3	12

Section 2: Environmental Permits, Incidents and Registers	On-site	0-50m	51-250	251-500
2.1 Industrial Sites Holding Environmental Permits and/or Authorisations				
2.1.1 Records of historic IPC Authorisations	0	0	0	0
2.1.2 Records of Part A(1) and IPPC Authorised Activities	0	0	0	0
2.1.3 Records of Red List Discharge Consents	0	0	0	0
2.1.4 Records of List 1 Dangerous Substances Inventory sites	0	0	0	0
2.1.5 Records of List 2 Dangerous Substances Inventory sites	0	0	0	0
2.1.6 Records of Part A(2) and Part B Activities and Enforcements	0	0	0	0
2.1.7 Records of Category 3 or 4 Radioactive Substances Authorisations	0	0	0	0
2.1.8 Records of Licensed Discharge Consents	0	0	2	4
2.1.9 Records of Water Industry Referrals	0	0	0	0
2.1.10 Records of Planning Hazardous Substance Consents and Enforcements within 500m of the study site	0	0	0	0
2.2 Records of COMAH and NIHHS sites	0	0	0	0
2.3 Environment Agency Recorded Pollution Incidents				
2.3.1 National Incidents Recording System, List 2	0	0	0	0
2.3.2 National Incidents Recording System, List 1	0	0	0	0
2.4 Sites Determined as Contaminated Land under Part 2A EPA 1990	0	0	0	0

Section 3: Landfill and Other Waste Sites	On-site	0-50m	51-250	251-500	501-1000	1000-1500
3.1 Landfill Sites						
3.1.1 Environment Agency Registered Landfill Sites	0	0	1	1	1	Not searched
3.1.2 Environment Agency Historic Landfill Sites	0	0	1	1	11	5
3.1.3 BGS/DoE Landfill Site Survey	0	0	0	0	1	1
3.1.4 Records of Landfills in Local Authority and Historical Mapping Records	0	0	0	0	5	2
3.2 Landfill and Other Waste Sites Findings						
3.2.1 Operational and Non-Operational Waste Treatment, Transfer and Disposal Sites	0	0	0	0	Not searched	Not searched
3.2.2 Environment Agency Licensed Waste Sites	0	0	1	5	16	22

Section 4: Current Land Use	On-site	0-50m	51-250	251-500
4.1 Current Industrial Sites Data	0	0	3	Not searched
4.2 Records of Petrol and Fuel Sites	0	0	0	0
4.3 National Grid Underground Electricity Cables	0	0	0	0
4.4 National Grid Gas Transmission Pipelines	0	0	0	0

Section 5: Geology	
5.1 Are there any records of Artificial Ground and Made Ground present beneath the study site?	No
5.2 Are there any records of Superficial Ground and Drift Geology present beneath the study site?	Yes
5.3 For records of Bedrock and Solid Geology beneath the study site see the detailed findings section.	

Section 6: Hydrogeology and Hydrology	0-500m
6.1 Are there any records of Strata Classification in the Superficial Geology within 500m of the study site?	Yes
6.2 Are there any records of Strata Classification in the Bedrock Geology within 500m of the study site?	Yes

	On-site	0-50m	51-250	251-500	501-1000	1000-2000
6.3 Groundwater Abstraction Licences (within 2000m of the study site)	0	0	1	4	5	24
6.4 Surface Water Abstraction Licences (within 2000m of the study site)	0	0	0	2	0	6
6.5 Potable Water Abstraction Licences (within 2000m of the study site)	0	0	0	1	1	18
6.6 Source Protection Zones (within 500m of the study site)	0	0	0	0	Not searched	Not searched
6.7 Source Protection Zones within Confined Aquifer	0	0	0	0	Not searched	Not searched
6.8 Groundwater Vulnerability and Soil Leaching Potential (within 500m of the study site)	2	0	3	5	Not searched	Not searched
	On-site	0-50m	51-250	251-500	501-1000	1000-1500

Section 6: Hydrogeology and Hydrology	0-500m					
6.9 Is there any Environment Agency information on river quality within 1500m of the study site?	No	No	No	No	No	Yes
6.10 Detailed River Network entries within 500m of the site	0	3	7	6	Not searched	Not searched
6.11 Surface water features within 250m of the study site	No	Yes	Yes	Not searched	Not searched	Not searched

Section 7: Flooding	
7.1 Are there any Enviroment Agency Zone 2 floodplains within 250m of the study site?	Yes
7.2 Are there any Environment Agency Zone 3 floodplains within 250m of the study site	Yes
7.3 What is the Risk of flooding from Rivers and the Sea (RoFRaS) rating for the study site?	High
7.4 Are there any Flood Defences within 250m of the study site?	No
7.5 Are there any areas benefiting from Flood Defences within 250m of the study site?	No
7.6 Are there any areas used for Flood Storage within 250m of the study site?	Yes
7.7 What is the maximum BGS Groundwater Flooding susceptibility within 50m of the study site?	Potential at Surface
7.8 What is the BGS confidence rating for the Groundwater Flooding susceptibility areas?	Moderate

Section 8: Designated Environmentally Sensitive Sites	On-site	0-50m	51-250	251-500	501-1000	1000-2000
8.1 Records of Sites of Special Scientific Interest (SSSI)	0	0	0	0	0	0
8.2 Records of National Nature Reserves (NNR)	0	0	0	0	0	0
8.3 Records of Special Areas of Conservation (SAC)	0	0	0	0	0	0
8.4 Records of Special Protection Areas (SPA)	0	0	0	0	0	0
8.5 Records of Ramsar sites	0	0	0	0	0	0
8.6 Records of Ancient Woodlands	0	0	0	0	0	3
8.7 Records of Local Nature Reserves (LNR)	0	0	0	0	0	0
8.8 Records of World Heritage Sites	0	0	0	0	0	0
8.9 Records of Environmentally Sensitive Areas	0	0	0	0	0	0
8.10 Records of Areas of Outstanding Natural Beauty (AONB)	0	0	0	0	0	0

Section 8: Designated Environmentally Sensitive Sites

	On-site	0-50m	51-250	251-500	501-1000	1000-2000
8.11 Records of National Parks	0	0	0	0	0	0
8.12 Records of Nitrate Sensitive Areas	0	0	0	0	0	0
8.13 Records of Nitrate Vulnerable Zones	2	0	2	0	0	0
8.14 Records of Green Belt land	0	0	0	0	0	0

Section 9: Natural Hazards

9.1 What is the maximum risk of natural ground subsidence?	Moderate
9.1.1 What is the maximum Shrink-Swell hazard rating identified on the study site?	Moderate
9.1.2 What is the maximum Landslides hazard rating identified on the study site?	Very Low
9.1.3 What is the maximum Soluble Rocks hazard rating identified on the study site?	Negligible
9.1.4 What is the maximum Compressible Ground hazard rating identified on the study site?	Negligible
9.1.5 What is the maximum Collapsible Rocks hazard rating identified on the study site?	Very Low
9.1.6 What is the maximum Running Sand hazard rating identified on the study site?	Very Low
9.2 Radon	
9.2.1 Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?	The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.
9.2.2 Is the property in an area where Radon Protection are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment?	No radon protective measures are necessary.

Section 10: Mining

10.1 Are there any coal mining areas within 75m of the study site?	No
10.2 Are there any Non-Coal Mining areas within 50m of the study site boundary?	Yes
10.3 Are there any brine affected areas within 75m of the study site?	No

Groundsure
LOCATION INTELLIGENCE

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Using this report

The following report is designed by Environmental Consultants for Environmental Professionals bringing together the most up-to-date market leading environmental data. This report is provided under and subject to the Terms & Conditions agreed between Groundsure and the Client. The document contains the following sections:

1. Historical Industrial Sites

Provides information on past land uses that may pose a risk to the study site in terms of potential contamination from activities or processes. Potentially Infilled Land features are also included. This search is conducted using radii of up to 500m.

2. Environmental Permits, Incidents and Registers

Provides information on Regulated Industrial Activities and Pollution Incidents as recorded by Regulatory Authorities, and sites determined as Contaminated Land. This search is conducted using radii up to 500m.

3. Landfills and Other Waste Sites

Provides information on landfills and other waste sites that may pose a risk to the study site. This search is conducted using radii up to 1500m.

4. Current Land Uses

Provides information on current land uses that may pose a risk to the study site in terms of potential contamination from activities or processes. These searches are conducted using radii of up to 500m. This includes information on potentially contaminative industrial sites, petrol stations and fuel sites as well as high pressure gas pipelines and underground electricity transmission lines.

5. Geology

Provides information on artificial and superficial deposits and bedrock beneath the study site.

6. Hydrogeology and Hydrology

Provides information on productive strata within the bedrock and superficial geological layers, abstraction licenses, Source Protection Zones (SPZs) and river quality. These searches are conducted using radii of up to 2000m.

7. Flooding

Provides information on river and coastal flooding, flood defences, flood storage areas and groundwater flood areas. This search is conducted using radii of up to 250m.

8. Designated Environmentally Sensitive Sites

Provides information on the Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR), Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar sites, Local Nature Reserves (LNR), Areas of Outstanding Natural Beauty (AONB), National Parks (NP), Environmentally Sensitive Areas, Nitrate Sensitive Areas, Nitrate Vulnerable Zones and World Heritage Sites and Scheduled Ancient Woodland. These searches are conducted using radii of up to 2000m.

9. Natural Hazards

Provides information on a range of natural hazards that may pose a risk to the study site. These factors include natural ground subsidence and radon..

10. Mining

Provides information on areas of coal and non-coal mining and brine affected areas.

11. Contacts

This section of the report provides contact points for statutory bodies and data providers that may be able to provide further information on issues raised within this report. Alternatively, Groundsure provide a free Technical Helpline (08444 159000) for further information and guidance.

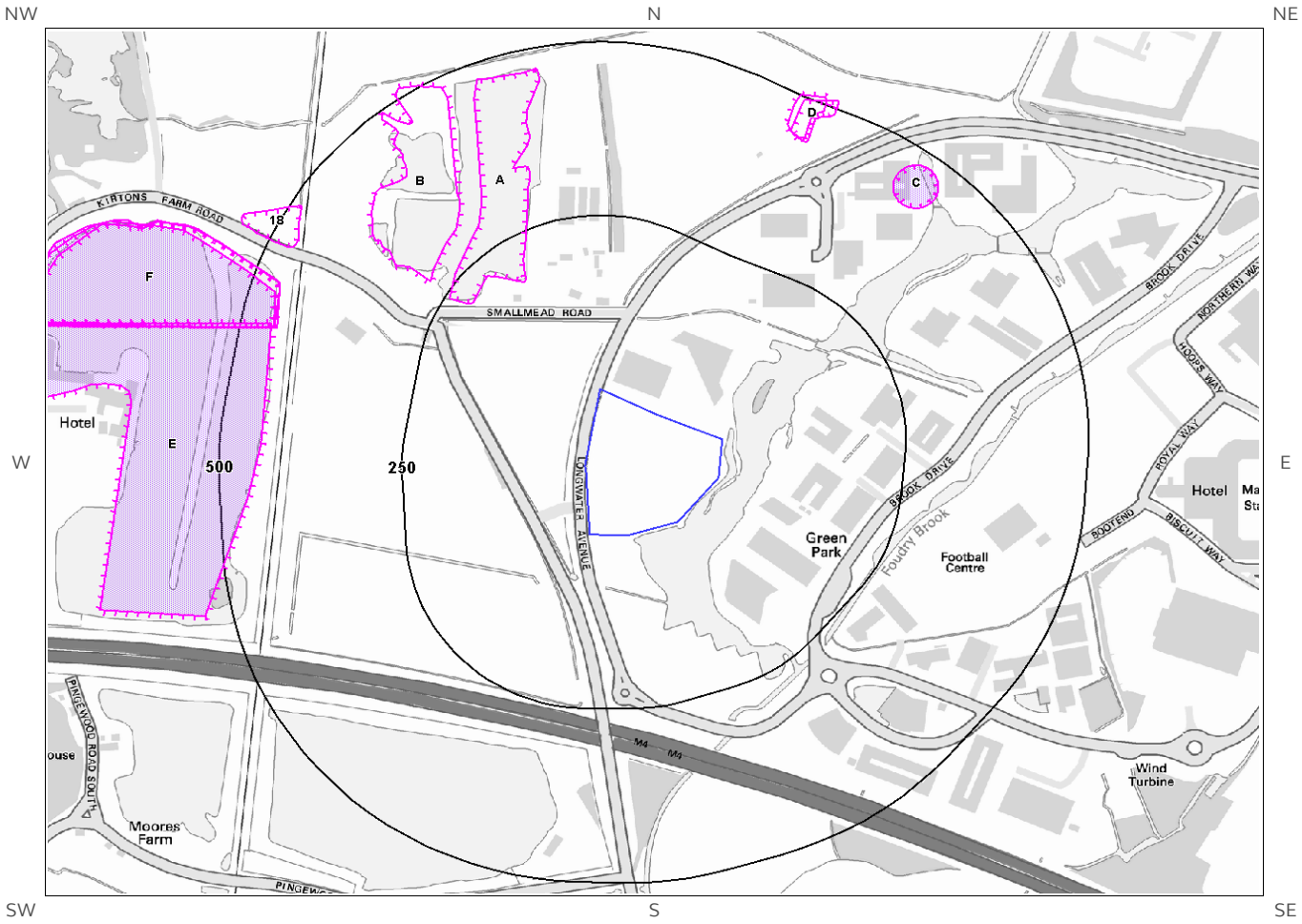
Note: Maps

Only certain features are placed on the maps within the report. All features represented on maps found within this search are given an identification number. This number identifies the feature on the mapping and correlates it to the additional information provided below. This identification number precedes all other information and takes the following format -Id: 1, Id: 2, etc. Where numerous features on the same map are in such close proximity that the numbers would obscure each other a letter identifier is used instead to represent the features. (e.g. Three features which overlap may be given the identifier “A” on the map and would be identified separately as features 1A, 3A, 10A on the data tables provided).

Where a feature is reported in the data tables to a distance greater than the map area, it is noted in the data table as “Not Shown”.

All distances given in this report are in Metres (m). Directions are given as compass headings such as N: North, E: East, NE: North East from the nearest point of the study site boundary.

1. Historical Land Use



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Site Outline

250
500
Search Buffers (m)

Historical 1:10,000 and 1:10,560 scale mapping

Industrial Land Use

Potentially Infilled Land

Historical 1:2,500, 1:1,250 and 1:500 scale mapping

Energy Features

Petrol Stations

Tanks

Garages

1. Historical Industrial Sites

1.1 Potentially Contaminative Uses identified from 1:10,000 scale Mapping

The systematic analysis of data extracted from standard 1:10,560 and 1:10,000 scale historical maps provides the following information:

Records of sites with a potentially contaminative past land use within 500m of the search boundary: 3

ID	Distance [m]	Direction	Use	Date
1C	419	NE	Sewage Farm	1938
2E	443	W	Gravel Pit	1974
3F	455	W	Gravel Pit	1974

1.2 Additional Information – Historical Tank Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical tanks within 500m of the search boundary: 0

Database searched and no data found.

1.3 Additional Information – Historical Energy Features Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical energy features within 500m of the search boundary: 0

Database searched and no data found.

1.4 Additional Information – Historical Petrol and Fuel Site Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical petrol stations and fuel sites within 500m of the search boundary: 0

Database searched and no data found.

1.5 Additional Information – Historical Garage and Motor Vehicle Repair Database

The systematic analysis of data extracted from High Detailed 1:1,250 and 1:2,500 scale historical maps provides the following information.

Records of historical garage and motor vehicle repair sites within 500m of the search boundary: 0

Database searched and no data found.

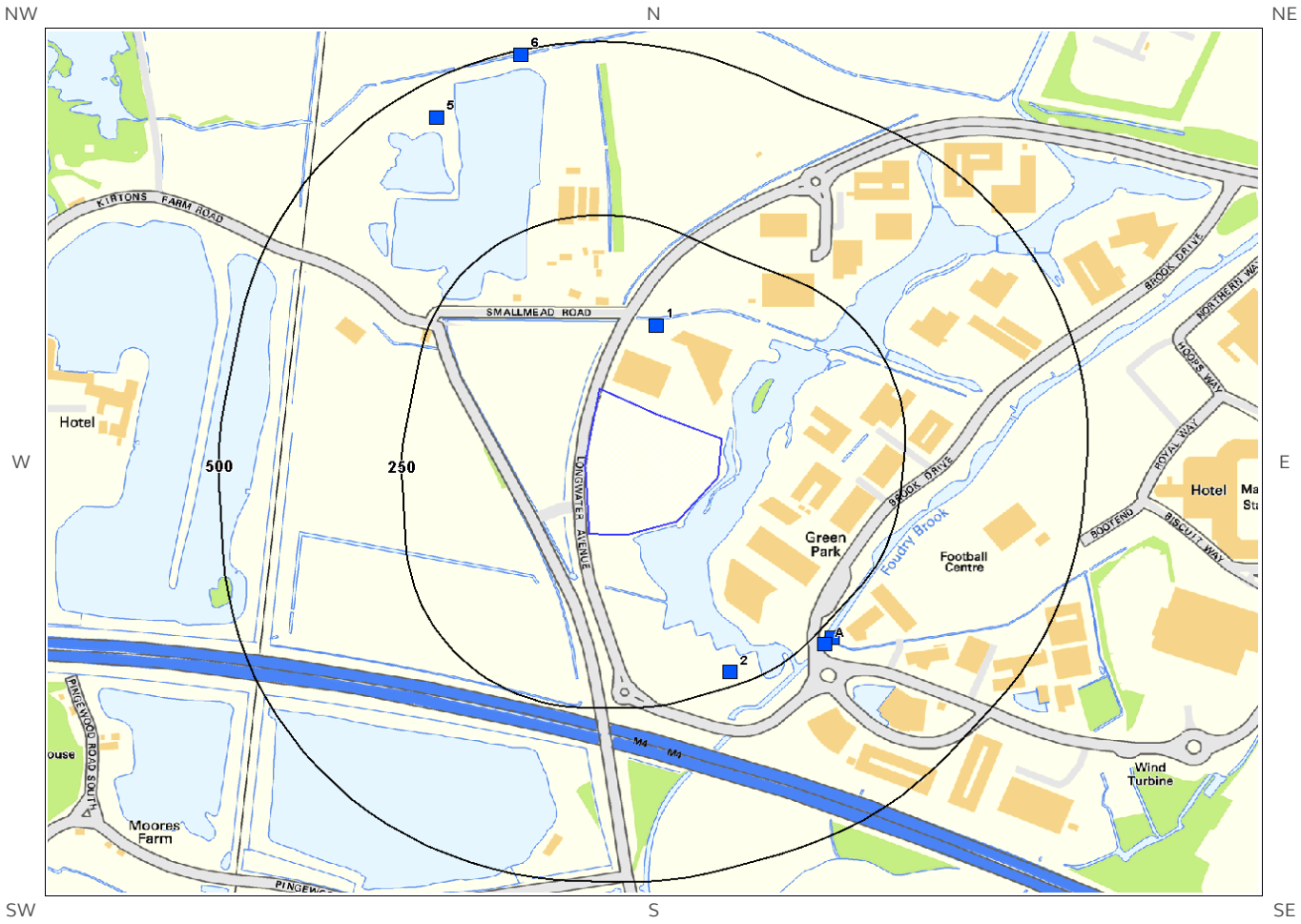
1.6 Potentially Infilled Land

Records of Potentially Infilled Features from 1:10,000 scale mapping within 500m of the study site: 15

The following Historical Potentially Infilled Features derived from the Historical Mapping information is provided by Groundsure:

ID	Distance(m)	Direction	Use	Date
4A	185	NW	Ponds	1974
5A	185	NW	Ponds	1982
6A	185	NW	Ponds	1991
7B	279	NW	Ponds	1974
8B	279	NW	Ponds	1982
9B	279	NW	Ponds	1991
10C	419	NE	Sewage Farm	1938
11D	440	N	Ponds	1938
12D	440	N	Ponds	1898
13E	443	W	Gravel Pit	1974
14D	443	N	Pond	1913
15F	449	W	Water Body	1982
16F	454	W	Water Body	1991
17F	455	W	Gravel Pit	1974
18	464	NW	Pond	1938

2. Environmental Permits, Incidents and Registers Map



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- Site Outline
- Search Buffers (m) 250 / 500
- Recorded Pollution Incident
- Dangerous Substances (List 1)
- Dangerous Substances (List 2)
- Water Industry Referrals
- Licenced Discharge Consents
- Red List Discharge Consents
- RAS 3 & 4 Authorisations
- Part A(1) Authorised Processes and Historic IPC Authorisations
- Part A(2) and Part B Authorised Processes
- COMAH / NIHHS Sites
- Sites Determined as Contaminated Land
- Hazardous Substance Consents and Enforcements

2. Environmental Permits, Incidents and Registers

2.1 Industrial Sites Holding Licences and/or Authorisations

Searches of information provided by the Environment Agency and Local Authorities reveal the following information:

2.1.1 Records of historic IPC Authorisations within 500m of the study site:

0

Database searched and no data found.

2.1.2 Records of Part A(1) and IPPC Authorised Activities within 500m of the study site:

0

Database searched and no data found.

2.1.3 Records of Red List Discharge Consents (potentially harmful discharges to controlled waters) within 500m of the study site:

0

Database searched and no data found.

2.1.4 Records of List 1 Dangerous Substances Inventory Sites within 500m of the study site:

0

Database searched and no data found.

2.1.5 Records of List 2 Dangerous Substance Inventory Sites within 500m of the study site:

0

Database searched and no data found.

2.1.6 Records of Part A(2) and Part B Activities and Enforcements within 500m of the study site:

0

Database searched and no data found.

2.1.7 Records of Category 3 or 4 Radioactive Substances Authorisations:

0

Database searched and no data found.

2.1.8 Records of Licensed Discharge Consents within 500m of the study site:

6

The following Licensed Discharge Consents records are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance (m)	Direction	NGR	Details	
1	115	NE	470000 170000	Address: Winnersh Triangle, Winnersh Triangle, -, -, - Effluent Type: SEWAGE DISCHARGES - PUMPING STATION - WATER COMPANY Permit Number: TEMP.2277 Permit Version: 1	Receiving Water: Status: REVOKED - UNSPECIFIED Issue date: 02/11/1989 Effective Date: 02-Nov-1989 Revocation Date: 27/01/1997
2	229	S	470100 169500	Address: GREEN PARK, SOUTHERN SECTOR, KYBES LANE, PINGEWOOD, READING, BERKSHIRE, RG30 3UR Effluent Type: TRADE DISCHARGES - UNSPECIFIED Permit Number: CAWM.0097 Permit Version: 1	Receiving Water: Status: CONSENT EXPIRED - TIME LIMIT Issue date: 06/12/1999 Effective Date: 13-Oct-1999 Revocation Date: 30/11/1999
3A	268	SE	470230 169540	Address: READING BUSINESS PARK, SMALLMEAD FA, READING BUSINESS PARK, SMALLMEAD, FARM, SMALLMEAD ROAD, PINGEWOOD, , READING,, - Effluent Type: MISCELLANEOUS DISCHARGES - UNSPECIFIED Permit Number: CNTM.2231 Permit Version: 1	Receiving Water: Status: REVOKED - UNSPECIFIED Issue date: 29/03/1996 Effective Date: 29-Mar-1996 Revocation Date: 01/05/1997
4A	269	SE	470240 169550	Address: GREEN PARK (SOUTHERN SECTOR), KYBES LANE, PINGEWOOD, READING, BERKSHIRE, RG30 3UR Effluent Type: MISCELLANEOUS DISCHARGES - UNSPECIFIED Permit Number: CAWM.0210 Permit Version: 1	Receiving Water: Status: REVOKED (WRA 91, S88 & SCHED 10 AS AMENDED BY ENV ACT 1995) Issue date: 20/07/2000 Effective Date: 16-Jun-2000 Revocation Date: 26/02/2001
5	450	NW	469700 170300	Address: SMALLMEAD FARM, BURGHFIELD QUARRY,, SMALLMEAD FARM, BURGHFIELD QUARR, Y, COTTAGE LANE, PINGEWOOD, NR R, EADING, BE, - Effluent Type: TRADE DISCHARGES - MINERAL WORKINGS Permit Number: CTWC.1520 Permit Version: 1	Receiving Water: Status: REVOKED (WRA 91, S88 & SCHED 10 AS AMENDED BY ENV ACT 1995) Issue date: 10/03/1987 Effective Date: 10-Mar-1987 Revocation Date: 02/05/2006

ID	Distance (m)	Direction	NGR	Details	
6	493	N	469815 170390	Address: TROUT LAKES, PINGEWOOD, READING, BERKSHIRE, RG30 3UG Effluent Type: TRADE DISCHARGES - SITE DRAINAGE Permit Number: EPRBB3039DS Permit Version: 1	Receiving Water: Status: NEW ISSUED UNDER EPR 2010 Issue date: 31/05/2012 Effective Date: 31-May-2012 Revocation Date: -

2.1.9 Records of Water Industry Referrals (potentially harmful discharges to the public sewer) within 500m of the study site:

0

Database searched and no data found.

2.1.10 Records of Planning Hazardous Substance Consents and Enforcements within 500m of the study site:

0

Database searched and no data found.

2.2 Dangerous or Hazardous Sites

Records of COMAH & NIHHS sites within 500m of the study site: 0

Database searched and no data found.

2.3 Environment Agency Recorded Pollution Incidents

2.3.1 Records of National Incidents Recording System, List 2 within 500m of the study site:

0

Database searched and no data found.

2.3.2 Records of National Incidents Recording System, List 1 within 500m of the study site:

0

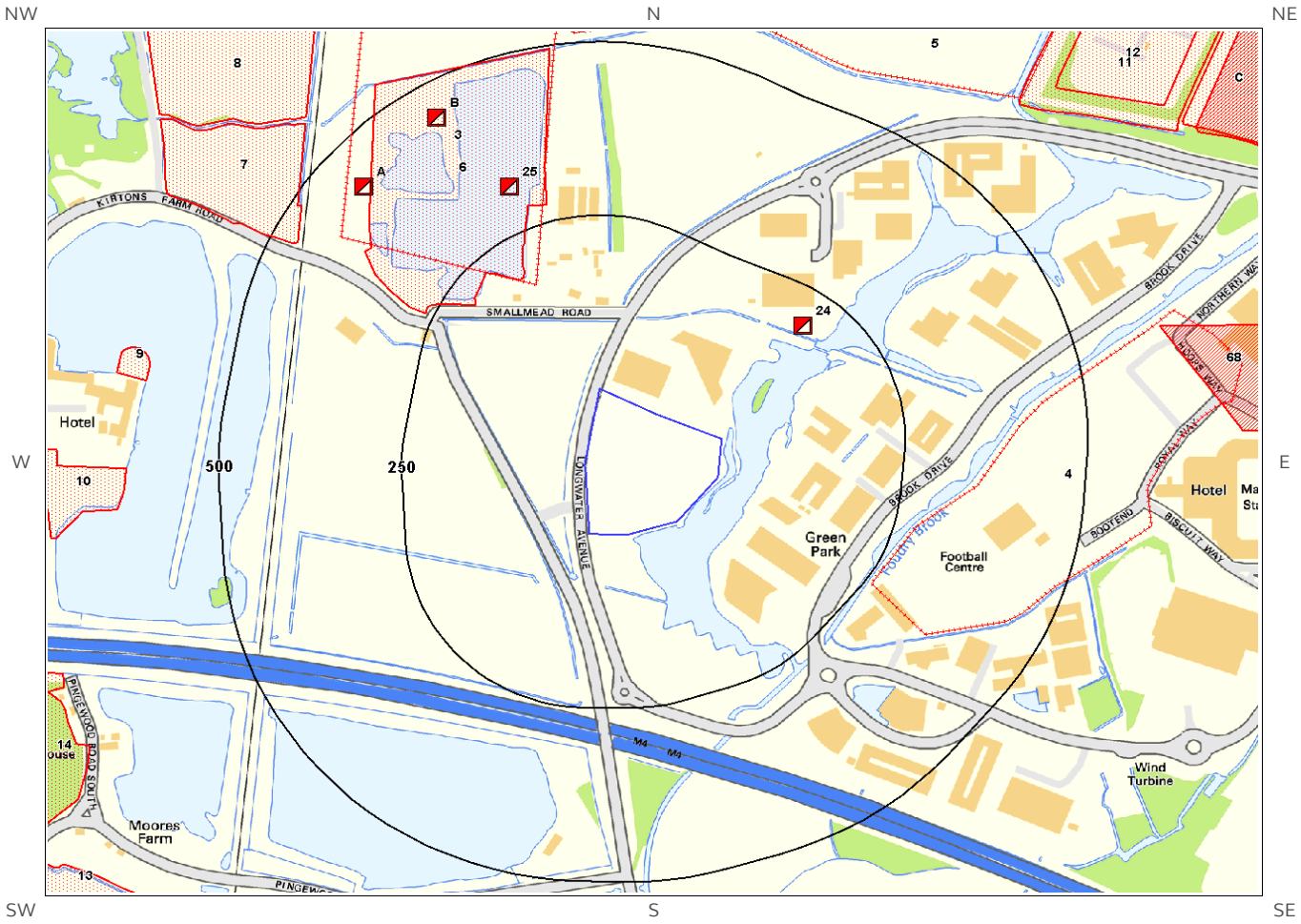
Database searched and no data found.

2.4 Sites Determined as Contaminated Land under Part 2A EPA 1990

How many records of sites determined as contaminated land under Section 78R of the Environmental Protection Act 1990 are there within 500m of the study site? 0

Database searched and no data found.

3. Landfill and Other Waste Sites Map



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Site Outline

250
500
Search Buffers (m)

E.A. Active Landfill

E.A. Historic Landfill

BGS / DoE Survey Landfill

Historic and Planned Waste Sites

E.A. Licensed Waste Site

Local Authority/Historical Mapping Landfill Records

3. Landfill and Other Waste Sites

3.1 Landfill Sites

3.1.1 Records from Environment Agency landfill data within 1000m of the study site:

3

The following Environment Agency landfill records are represented as polygons on the Landfill and Other Waste Sites map:

ID	Distance (m)	Direction	NGR	Details	
3	173	NW	469740 170620	Address: BURGHFIELD LFS, ISLAND ROAD, READING, BERKSHIRE, RG2 0RR Landfill Reference: 86028.0 Environmental Permitting Regulations (Waste) Reference: RMC001 Landfill Type: WASTE LANDFILLING; >10 T/D WITH CAPACITY >25,000T EXCLUDING INERT WASTE	Operator: Cemex UK Materials Limited Status: Effective IPPC Reference: EPR Reference:
4	258	SE	471000 170000	Address: Reading Football Club, Smallmead, Bennet road, Reading, Berkshire, RG2 0JL Landfill Reference: 86039.0 Environmental Permitting Regulations (Waste) Reference: RFC001 Landfill Type: A4 : Household, Commercial & Industrial Waste Landfill	Operator: Reading Football Club Status: Closure IPPC Reference: EPR Reference:
5	514	N	470200 170600	Address: RMC Aggregates (Southern) Ltd, Smallmead Farm, Burghfield, Reading, Berkshire, RG30 3UR Landfill Reference: 86029.0 Environmental Permitting Regulations (Waste) Reference: RMC002 Landfill Type: A4 : Household, Commercial & Industrial Waste Landfill	Operator: R M C Logistics (South East) Ltd Status: Closure IPPC Reference: EPR Reference:

3.1.2 Records of Environment Agency historic landfill sites within 1500m of the study site:

The following landfill records are represented as either points or polygons on the Landfill and Other Waste Sites map:

ID	Distance (m)	Direction	NGR	Details	
6	190	NW	469700 170200	Site Address: Burghfield Area D, Burghfield, Reading, Berkshire Waste Licence: Yes Site Reference: - Waste Type: - Environmental Permitting Regulations (Waste) Reference: TF1/L/RMC006	Licence Issue: 13-Jul-2001 Licence Surrendered: 09-Jun-2003 Licence Hold Address: RMC House, The Square, Lightwater, Surrey Operator: - First Recorded: - Last Recorded: -
7	464	NW	469400 170200	Site Address: Cottage Lane No.1, Pingewood, Berkshire Waste Licence: - Site Reference: TP0162, NEW127 Waste Type: Inert, Industrial Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: Licence Surrendered: Licence Hold Address: - Operator: - First Recorded: 01-Jan-1977 Last Recorded: 31-Dec-1981
8	561	NW	469400 170300	Site Address: Cottage Lane No.2, Pingewood, Berkshire Waste Licence: Yes Site Reference: 54/12/4/17, TP0163, NEW109 Waste Type: Inert Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 22-Nov-1977 Licence Surrendered: 29-Jan-1993 Licence Hold Address: - Operator: - First Recorded: 01-Jan-1977 Last Recorded: 30-Sep-1989
9	610	W	469200 169700	Site Address: Kirtons Farm, Pingewood, Berkshire Waste Licence: Yes Site Reference: 54/12/4/205, TP0164, NEW108, 0340/0288 Waste Type: Inert Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 07-Apr-1987 Licence Surrendered: 01-Jun-1994 Licence Hold Address: - Operator: - First Recorded: 01-Jan-1987 Last Recorded: 31-Dec-1990
10	626	W	469200 169700	Site Address: Kirtons Farm, Pingewood, Berkshire Waste Licence: Yes Site Reference: 54/12/4/205, TP0164, NEW108, 0340/0288 Waste Type: Inert Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 07-Apr-1987 Licence Surrendered: 01-Jun-1994 Licence Hold Address: - Operator: - First Recorded: 01-Jan-1987 Last Recorded: 31-Dec-1990
11	631	NE	470700 170600	Site Address: Island Road Tip, Island Road, Reading, Berkshire Waste Licence: - Site Reference: - Waste Type: Inert, Industrial, Commercial, Liquid sludge Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: Licence Surrendered: Licence Hold Address: - Operator: County Borough of Reading First Recorded: 17-Nov-1970 Last Recorded: 22-Mar-1975
12	682	NE	470700 170500	Site Address: Sludge Beds, Reading, Berkshire Waste Licence: - Site Reference: TP0519, RDG13 Waste Type: - Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: Licence Surrendered: Licence Hold Address: - Operator: - First Recorded: - Last Recorded: -

ID	Distance (m)	Direction	NGR	Details	
13	741	SW	469100 169100	Site Address: Moores Farm, Pingewood, Berkshire Waste Licence: - Site Reference: 54/20/5/18, NEW107, TP0165 Waste Type: Inert, Industrial, Commercial, Household, Liquid sludge Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: Licence Surrendered: Licence Hold Address: - Operator: - First Recorded: 01-Jan-1990 Last Recorded: 31-Dec-1991
14	746	W	468700 169300	Site Address: Pingewood Road, Pingewood, Berkshire Waste Licence: Yes Site Reference: NEW106, 54/20/5/18, TP0226, 54/12/4/77 Waste Type: Inert, Industrial, Commercial, Household, Liquid sludge Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 26-Aug-1981 Licence Surrendered: 13-Nov-1991 Licence Hold Address: High Wycombe Operator: Biffa Waste First Recorded: 01-Mar-1983 Last Recorded: 30-Jun-1991
15C	778	NE	470900 170500	Site Address: Smallmead Stadium, Reading, Berkshire Waste Licence: Yes Site Reference: TP0166, RDG5, 54/12/4/43 Waste Type: Inert Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 31-Dec-1980 Licence Surrendered: Licence Hold Address: - Operator: Hall Aggregates Limited First Recorded: - Last Recorded: -
Not shown	798	E	470900 170100	Site Address: Smallmead Tip, Smallmead Road, Reading, Berkshire Waste Licence: Yes Site Reference: 54/12/5/5 Waste Type: Inert, Industrial, Commercial, Household, Special, Liquid sludge Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 06-Sep-1977 Licence Surrendered: 31-Mar-1981 Licence Hold Address: - Operator: County Borough of Reading First Recorded: 22-Mar-1972 Last Recorded: 31-Mar-1981
Not shown	799	NW	469400 171000	Site Address: Anslow Cottages, Pingewood, Berkshire Waste Licence: Yes Site Reference: NEW110, TP0288, 54/12/4/190 Waste Type: Inert Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 25-Oct-1985 Licence Surrendered: 31-Mar-1993 Licence Hold Address: - Operator: - First Recorded: 01-Jan-1984 Last Recorded: 31-Jul-1992
Not shown	802	NW	469400 170600	Site Address: Anslow Cottages, Pingewood, Berkshire Waste Licence: Yes Site Reference: 54/12/4/190, TP0288, NEW110 Waste Type: Inert Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 25-Oct-1985 Licence Surrendered: 31-Mar-1993 Licence Hold Address: - Operator: - First Recorded: 01-Jan-1984 Last Recorded: 31-Jul-1992
Not shown	1115	NW	469200 170900	Site Address: Anslow Cottages, Pingewood, Berkshire Waste Licence: Yes Site Reference: 54/12/4/190, TP0288, NEW110 Waste Type: Inert Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 25-Oct-1985 Licence Surrendered: 31-Mar-1993 Licence Hold Address: - Operator: - First Recorded: 31-Dec-1984 Last Recorded: 31-Jul-1992

ID	Distance (m)	Direction	NGR	Details	
Not shown	1148	NE	470900 170900	Site Address: Island Road, Reading, Berkshire Waste Licence: Yes Site Reference: RDG9, 54/12/4/23, TP0429, OCC/104 Waste Type: Inert Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 10-Jan-1978 Licence Surrendered: 05-Dec-1984 Licence Hold Address: - Operator: - First Recorded: 31-Dec-1977 Last Recorded: 31-Dec-1985
Not shown	1407	NE	471400 170500	Site Address: Manor Farm, Reading, Berkshire Waste Licence: - Site Reference: TP0104, RDG10 Waste Type: Inert Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: Licence Surrendered: Licence Hold Address: - Operator: - First Recorded: - Last Recorded: -
Not shown	1408	W	468300 169700	Site Address: Knights Farm No.3 (silt Ponds), Burghfield, Reading, Berkshire Waste Licence: Yes Site Reference: 54/12/4/57, TP0432, NEW101 Waste Type: Inert Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 28-Jan-1980 Licence Surrendered: 15-Oct-1993 Licence Hold Address: - Operator: - First Recorded: 31-Dec-1980 Last Recorded: 31-Dec-1987
Not shown	1410	W	468300 169900	Site Address: Knights Farm 4 (restaurant Site), Burghfield, Reading, Berkshire Waste Licence: Yes Site Reference: 54/12/4/168, TP0433, NEW102 Waste Type: Inert Environmental Permitting Regulations (Waste) Reference: -	Licence Issue: 16-Apr-1985 Licence Surrendered: 12-Oct-1988 Licence Hold Address: - Operator: - First Recorded: 31-Dec-1985 Last Recorded: 31-Dec-1988

3.1.3 Records of BGS/DoE non-operational landfill sites within 1500m of the study site:

2

The following landfill records are represented as points on the Landfill and Other Waste Sites map:

ID	Distance (m)	Direction	NGR	Details	
Not shown	811	E	470900.0 169800.0	Address: Smallmead Tip, Smallmead Road, Reading BGS Number: 566.0	Risk: Risk to minor aquifer Waste Type: N/A
Not shown	1197	NE	470800.0 170800.0	Address: Island Road Tip, Island Road, Reading BGS Number: 567.0	Risk: Risk to major and minor aquifer Waste Type: N/A

3.1.4 Records of Landfills from Local Authority and Historical Mapping Records within 1500m of the study site:

7

The following landfill records are represented as points or polygons on the Landfill and Other Waste Sites map:

ID	Distance (m)	Direction	NGR	Site Address	Source	Data Type
68	620	E	470844 169910	Refuse Tip	1974 mapping	Polygon
69C	787	NE	470928 170501	Refuse Tip	1966 mapping	Polygon
Not shown	833	E	470919 170132	Refuse Tip	1985 mapping	Polygon
Not shown	909	E	471010 169906	Refuse Tip	1974 mapping	Polygon
Not shown	925	E	471007 170035	Refuse Tip	1974 mapping	Polygon
Not shown	1071	NE	471003 170451	Refuse Tip	1966 mapping	Polygon
Not shown	1126	NE	471059 170629	Refuse Tip	1965 mapping	Polygon

3.2 Other Waste Sites

3.2.1 Records of waste treatment, transfer or disposal sites within 500m of the study site:

0

Database searched and no data found.

3.2.2 Records of Environment Agency licensed waste sites within 1500m of the study site:

44

The following waste treatment, transfer or disposal sites records are represented as points on the Landfill and Other Waste Sites map:

ID	Distance (m)	Direction	NGR	Details	
24	197	NE	470200 170000	Site Address: Mr A L Clements, Smallmead Farm Yard, Smallmead Road, Pingewood, Reading, Berkshire, RG30 3UR Type: Household, Commercial & Industrial Waste T Stn Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: CLE001 EPR reference: EA/EPR/MP3299EM/S006 Operator: Mr A L Clements Waste Management licence No: 86012 Annual Tonnage: 25000.0	Issue Date: 16/12/1991 Effective Date: - Modified: 24/03/1997 Surrendered Date: 31/03/1999 Expiry Date: - Cancelled Date: - Status: Surrendered Site Name: Smallmead Farm Yard Correspondence Address: -, -

ID	Distance (m)	Direction	NGR	Details	
25	316	NW	469800 170200	Site Address: Trout Lakes, Pingewood, Reading, Berkshire, RG30 3UG Type: Deposit of waste to land as a recovery operation Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: BBG002 EPR reference: EA/EPR/BB3039DS/S003 Operator: Alan Hadley Limited Waste Management licence No: 103168 Annual Tonnage: 0.0	Issue Date: 31/05/2012 Effective Date: - Modified: 17/12/2012 Surrendered Date: 17/06/2013 Expiry Date: - Cancelled Date: - Status: Surrendered Site Name: Trout Lakes Correspondence Address: -, -
26A	435	NW	469600 170200	Site Address: Mr A L Clements_, Lakeside, Smallmead Road, Pingewood, Reading, Berkshire, RG2 0QS Type: Household, Commercial & Industrial Waste T Stn Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: CLE002 EPR reference: EA/EPR/AP3694SM/S003 Operator: Mr A L Clements Waste Management licence No: 86018 Annual Tonnage: 0.0	Issue Date: 12/06/1995 Effective Date: - Modified: 18/09/2006 Surrendered Date: 11/08/2010 Expiry Date: - Cancelled Date: - Status: Surrendered Site Name: Lakeside Correspondence Address: -, -
27A	435	NW	469600 170200	Site Address: Mr A L Clements_, Lakeside, Smallmead Road, Pingewood, Reading, Berkshire, RG2 0QS Type: Household, Commercial & Industrial Waste T Stn Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: CLE002 EPR reference: - Operator: Mr A L Clements Waste Management licence No: 86018 Annual Tonnage: 24900.0	Issue Date: 12/06/1995 Effective Date: - Modified: 18/09/2006 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Modified Site Name: Lakeside Correspondence Address: Mr A L Clements, Pitchkettle Farm, Goodboys Lane, Grazeley Green, Reading, Berkshire, RG7 1ND
28B	450	NW	469700 170300	Site Address: Small Mead Farm Landfill, Island Road, Burghfield, Reading, Berkshire, RG30 3RU Type: Landfill taking Non-Biodegradeable Wastes Size: >= 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: RMC006 EPR reference: - Operator: R M C Aggregates (Southern) Ltd Waste Management licence No: 86253 Annual Tonnage: 200000.0	Issue Date: 13/07/2001 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: Burghfield Area D Correspondence Address: -, R M C House, The Square, Lightwater, Surrey, GU18 5SS
29B	450	NW	469700 170300	Site Address: Small Mead Farm Landfill, Island Road, Burghfield, Reading, Berkshire, RG30 3RU Type: Landfill taking Non-Biodegradeable Wastes Size: >= 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: RMC006 EPR reference: EA/EPR/QP3299EK/S002 Operator: R M C Aggregates (Southern) Ltd Waste Management licence No: 86253 Annual Tonnage: 150000.0	Issue Date: 13/07/2001 Effective Date: - Modified: - Surrendered Date: 09/06/2003 Expiry Date: - Cancelled Date: - Status: Surrendered Site Name: Burghfield Area D Correspondence Address: -, -

ID	Distance (m)	Direction	NGR	Details	
Not shown	744	N	470200 170600	Site Address: RMC Aggregates (Southern) Ltd, Smallmead Farm, Burghfield, Reading, Berks, RG30 3UR Type: Household, Commercial & Industrial Waste Landfill Size: >= 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: RMC002 EPR reference: - Operator: R M C Logistics (South East) Ltd Waste Management licence No: 86029 Annual Tonnage: 90000.0	Issue Date: 23/05/1980 Effective Date: - Modified: 13/06/1995 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Closure Site Name: Smallmead Farm Correspondence Address: RMC Aggregates (Southern) Ltd, R M C House, Coldharbour Lane, Thorpe, Egham, Surrey, TW20 8TD
Not shown	744	N	470200 170600	Site Address: RMC Aggregates (Southern) Ltd, Smallmead Farm, Burghfield, Reading, Berkshire, RG30 3UR Type: Household, Commercial & Industrial Waste Landfill Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: RMC002 EPR reference: EA/EPR/UP3199EH/V002 Operator: R M C Logistics (South East) Ltd Waste Management licence No: 86029 Annual Tonnage: 90000.0	Issue Date: 23/05/1980 Effective Date: - Modified: 13/06/1995 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Closure Site Name: Smallmead Farm Correspondence Address: -, -
Not shown	744	N	470200 170600	Site Address: RMC Aggregates (Southern) Ltd, Smallmead Farm, Burghfield, Reading, Berkshire, RG30 3UR Type: Household, Commercial & Industrial Waste Landfill Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: RMC002 EPR reference: EA/EPR/UP3199EH/V002 Operator: R M C Logistics (South East) Ltd Waste Management licence No: 86029 Annual Tonnage: 90000.0	Issue Date: 23/05/1980 Effective Date: - Modified: 13/06/1995 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Closure Site Name: Smallmead Farm Correspondence Address: -, -
Not shown	744	N	470200 170600	Site Address: RMC Aggregates (Southern) Ltd, Smallmead Farm, Burghfield, Reading, Berks, RG30 3UR Type: Household, Commercial & Industrial Waste Landfill Size: >= 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: RMC002 EPR reference: - Operator: RMC Aggregates (Southern) Ltd Waste Management licence No: 86029 Annual Tonnage: 90000.0	Issue Date: 23/05/1980 Effective Date: - Modified: 13/06/1995 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Closure Site Name: Smallmead Farm Correspondence Address: RMC Aggregates (Southern) Ltd, R M C House, Coldharbour Lane, Thorpe, Egham, Surrey, TW20 8TD
Not shown	776	NW	469420 170500	Site Address: Burghfield Grid Substation, Cottage Lane, Pingewood, Reading, RG30 3UW Type: Storage of electrical insulating oils Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: SEP002 EPR reference: EA/EPR/BB3909GD/A001 Operator: Southern Electric Power Distribution P L C Waste Management licence No: 401715 Annual Tonnage: 0.0	Issue Date: 11/05/2015 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: Burghfield Grid Substation Correspondence Address: -, -

ID	Distance (m)	Direction	NGR	Details	
Not shown	791	N	469900 170700	Site Address: RMC Aggregates (Southern) Ltd, Smallmead Farm, Island Road, Burghfield, Reading, Berks, RG30 3UR Type: Household, Commercial & Industrial Waste Landfill Size: >= 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: RMC001 EPR reference: - Operator: RMC Aggregates (Southern) Ltd Waste Management licence No: 86028 Annual Tonnage: 240000.0	Issue Date: 10/10/1980 Effective Date: - Modified: 17/07/2002 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Modified Site Name: Smallmead Farm Section A Correspondence Address: RMC Aggregates (Southern) Ltd, R M C House, Coldharbour Lane, Thorpe, Egham, Surrey, TW20 8TD
Not shown	791	N	469900 170700	Site Address: RMC Aggregates (Southern) Ltd, Smallmead Farm, Island Road, Burghfield, Reading, Berks, RG30 3UR Type: Household, Commercial & Industrial Waste Landfill Size: >= 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: RMC001 EPR reference: - Operator: Biffa Waste Services Ltd Waste Management licence No: 86028 Annual Tonnage: 240000.0	Issue Date: 10/10/1980 Effective Date: - Modified: 03/07/2003 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: IPPC Site Name: Smallmead Farm Section A Correspondence Address: RMC Aggregates (Southern) Ltd, Coronation Road, Cressex, High Wycombe, Bucks, HP12 3TZ
Not shown	791	N	469900 170700	Site Address: RMC Aggregates (Southern) Ltd, Smallmead Farm, Island Road, Burghfield, Reading, Berks, RG30 3UR Type: Household, Commercial & Industrial Waste Landfill Size: >= 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: RMC001 EPR reference: - Operator: Biffa Waste Services Ltd Waste Management licence No: 86028 Annual Tonnage: 240000.0	Issue Date: 10/10/1980 Effective Date: - Modified: 03/07/2003 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: IPPC Site Name: Smallmead Farm Section A Correspondence Address: RMC Aggregates (Southern) Ltd, Coronation Road, Cressex, High Wycombe, Bucks, HP12 3TZ
Not shown	791	N	469900 170700	Site Address: RMC Aggregates (Southern) Ltd, Smallmead Farm, Island Road, Burghfield, Reading, Berks, RG30 3UR Type: Household, Commercial & Industrial Waste Landfill Size: >= 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: RMC001 EPR reference: - Operator: Biffa Waste Services Ltd Waste Management licence No: 86028 Annual Tonnage: 240000.0	Issue Date: 10/10/1980 Effective Date: - Modified: 03/07/2003 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: IPPC Site Name: Smallmead Farm Section A Correspondence Address: -, Coronation Road, Cressex, High Wycombe, Bucks, HP12 3TZ
Not shown	925	E	471000 170000	Site Address: Reading Football Club, Smallmead, Bennet road, Reading, Berks, RG2 0JL Type: Household, Commercial & Industrial Waste Landfill Size: >= 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: RFC001 EPR reference: - Operator: Reading Football Club Waste Management licence No: 86039 Annual Tonnage: 75000.0	Issue Date: 03/06/1997 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Closure Site Name: Reading Football Club Correspondence Address: Reading Football Club, Madjeski Stadium, Acre Road, Reading, Berks, RG3 2EF

ID	Distance (m)	Direction	NGR	Details	
Not shown	925	E	471000 170000	Site Address: Reading Football Club, Smallmead, Bennet road, Reading, Berkshire, RG2 0JL Type: Household, Commercial & Industrial Waste Landfill Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: RFC001 EPR reference: EA/EPR/XP3199EZ/A001 Operator: Reading Football Club Waste Management licence No: 86039 Annual Tonnage: 75000.0	Issue Date: 03/06/1997 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Closure Site Name: Reading Football Club Correspondence Address: -, -
Not shown	972	NE	470800 170500	Site Address: John Mould, Reading Speedway Stadium, A33 Relief Road, Reading, Berkshire, RG2 0JL Type: Material Recycling Treatment Facility Size: >= 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: MOU001 EPR reference: EA/EPR/CP3698LG/S003 Operator: Mould J Waste Management licence No: 86010 Annual Tonnage: 0.0	Issue Date: 13/05/1992 Effective Date: - Modified: 13/06/1995 Surrendered Date: 28/11/2008 Expiry Date: - Cancelled Date: - Status: Surrendered Site Name: Smallmead Transfer Station Correspondence Address: -, -
Not shown	972	NE	470800 170500	Site Address: John Mould, Island Road, Reading, Berks, RG2 0RP Type: Material Recycling Treatment Facility Size: >= 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: MOU001 EPR reference: - Operator: John Mould Waste Management licence No: 86010 Annual Tonnage: 300000.0	Issue Date: 13/05/1992 Effective Date: - Modified: 13/06/1995 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Modified Site Name: Island Road Transfer Station Correspondence Address: John Mould, Hydecrete Pit, Pingewood Road North, Burghfield, Reading, Berks, RG3 3XN
Not shown	972	NE	470800 170500	Site Address: John Mould, Island Road, Reading, Berks, RG2 0RP Type: Material Recycling Treatment Facility Size: >= 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: MOU001 EPR reference: - Operator: Mould John Waste Management licence No: 86010 Annual Tonnage: 300000.0	Issue Date: 13/05/1992 Effective Date: - Modified: 13/06/1995 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Modified Site Name: Island Road Transfer Station Correspondence Address: John Mould, Hydecrete Pit, Pingewood Road North, Burghfield, Reading, Berks, RG3 3XN
Not shown	980	E	471000 170200	Site Address: SITA, Smallmead Farm Landfill, Bennet Road, Reading, Berks, RG2 0RP Type: Household, Commercial & Industrial Waste T Stn Size: Unknown Environmental Permitting Regulations (Waste) Licence Number: SIT001 EPR reference: - Operator: SITA Waste Management licence No: 86005 Annual Tonnage: 0.0	Issue Date: 28/04/1993 Effective Date: - Modified: 16/01/1997 Surrendered Date: 29/10/1999 Expiry Date: - Cancelled Date: - Status: Surrendered Site Name: Smallmead CA Site Correspondence Address: SITA, The Pickeridge, Stoke Common Road, Fulmer, Bucks, SL3 6HA

ID	Distance (m)	Direction	NGR	Details	
Not shown	980	E	471000 170200	Site Address: SITA, Smallmead Farm Landfill, Bennet Road, Reading, Berkshire, RG2 0RP Type: Household, Commercial & Industrial Waste T Stn Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: SIT001 EPR reference: EA/EPR/MP3099EP/S003 Operator: SITA Waste Management licence No: 86005 Annual Tonnage: 25000.0	Issue Date: 28/04/1993 Effective Date: - Modified: 16/01/1997 Surrendered Date: 29/10/1999 Expiry Date: - Cancelled Date: - Status: Surrendered Site Name: Smallmead CA Site Correspondence Address: -, -
Not shown	1036	NE	470800 170590	Site Address: Reading Sewage Treatment Works, Island Road, Reading, Berkshire, RG2 0RP Type: Landfill Gas Engine (<3 mW) Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: THU134 EPR reference: EA/EPR/MP3338LU/V002 Operator: Thames Water Utilities Limited Waste Management licence No: 400034 Annual Tonnage: 0.0	Issue Date: 03/04/2013 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: Reading Combined Heat And Power Plant Correspondence Address: -, -
Not shown	1091	NE	470600 170800	Site Address: Reading Borough Council, Smallmead CAS, Island road, Reading, Berks, RG2 0RP Type: Household, Commercial & Industrial Waste T Stn Size: >= 25000 tonnes < 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: REA004 EPR reference: - Operator: Reading Borough Council Waste Management licence No: 86007 Annual Tonnage: 0.0	Issue Date: 23/03/1993 Effective Date: 22/01/2000 Modified: 31/05/2000 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Modified Site Name: Smallmead Ca Site 2 Correspondence Address: Mr Andrew Withy c/o Reading CC, Civic Centre, Reading, Berkshire, RG1 7TD
Not shown	1091	NE	470600 170800	Site Address: Reading Borough Council, Smallmead Civic Amenity Site, Island Road, Reading, Berkshire, RG2 0RP Type: Household Waste Amenity Site Size: >= 25000 tonnes < 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: RE3001 EPR reference: EA/EPR/MP3999EA/S007 Operator: R E 3 Ltd Waste Management licence No: 86007 Annual Tonnage: 0.0	Issue Date: 23/03/1993 Effective Date: 13/01/2007 Modified: 12/12/2003 Surrendered Date: 01/02/2013 Expiry Date: - Cancelled Date: - Status: Surrendered Site Name: Smallmead Civic Amenity Site Correspondence Address: -, -
Not shown	1091	NE	470600 170800	Site Address: Reading Borough Council, Smallmead Ca Site, Island road, Reading, Berks, RG2 0RP Type: Household, Commercial & Industrial Waste T Stn Size: >= 25000 tonnes < 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: RE3001 EPR reference: - Operator: R E 3 Ltd Waste Management licence No: 86007 Annual Tonnage: 0.0	Issue Date: 23/03/1993 Effective Date: 13/01/2007 Modified: 12/12/2003 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Transferred Site Name: Smallmead C A Site 2 Correspondence Address: -, Ground Floor West, Pavilion Drive, Northampton Business Park, Northampton, Northants, NN4 7RG

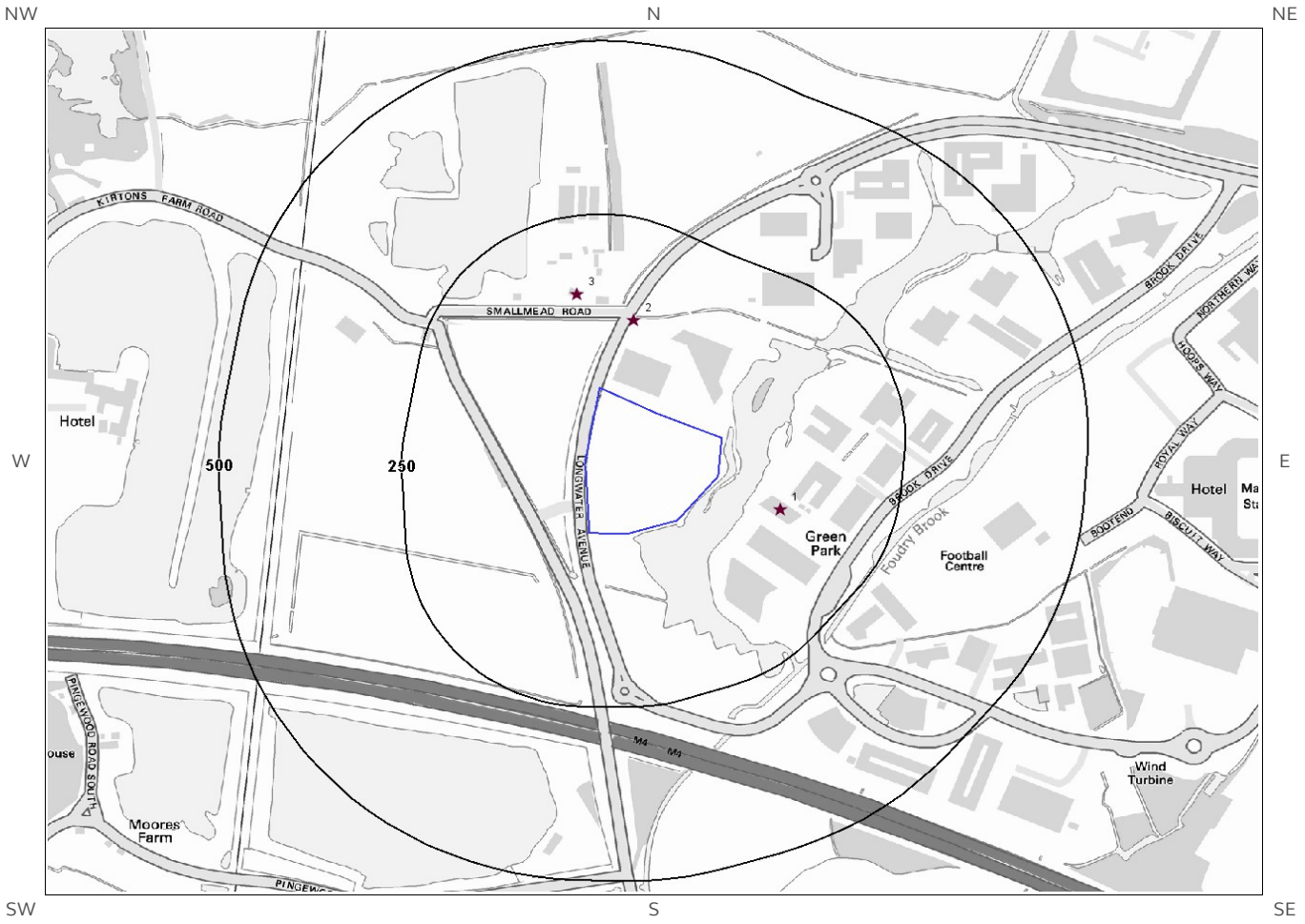
ID	Distance (m)	Direction	NGR	Details	
Not shown	1123	NE	470625 170823	Site Address: Land/premises At, Island Road, Reading, Berkshire, RG2 0RP Type: Household, Commercial & Industrial Waste T Stn Size: >= 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: WRG001 EPR reference: EA/EPR/BP3298EE/A001 Operator: W R G Berkshire Ltd Waste Management licence No: 100243 Annual Tonnage: 295000.0	Issue Date: 31/03/2008 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: Smallmead Waste Management Centre Correspondence Address: -, -
Not shown	1123	NE	470625 170823	Site Address: Smallmead Waste Management Centre, Island Road, Reading, Berkshire, RG2 0RP Type: Household, Commercial & Industrial Waste T Stn Size: >= 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: WRG001 EPR reference: EA/EPR/BP3298EE/V002 Operator: F C C Environment (Berkshire) Limited Waste Management licence No: 100243 Annual Tonnage: 295000.0	Issue Date: 31/03/2008 Effective Date: - Modified: 12/11/2012 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Modified Site Name: Smallmead Waste Management Centre Correspondence Address: -, -
Not shown	1123	NE	470625 170823	Site Address: Land/premises At, Island Road, Reading, Berkshire, RG2 0RP Type: HCI Waste TS + treatment + asbestos Size: >= 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: WRG001 EPR reference: BP3298EE/A001 Operator: W R G Berkshire Ltd Waste Management licence No: 100243 Annual Tonnage: 0.0	Issue Date: 31/03/2008 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: Smallmead Waste Management Centre Correspondence Address: -, -
Not shown	1126	NE	470600 170840	Site Address: RMC Aggregates (Southern) Ltd, Smallmead Farm, Island Road, Burghfield, Reading, Berkshire, RG30 3UR Type: Household, Commercial & Industrial Waste Landfill Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: RMC001 EPR reference: EA/EPR/UP3699ED/V006 Operator: Biffa Waste Services Ltd Waste Management licence No: 86028 Annual Tonnage: 250000.0	Issue Date: 10/10/1980 Effective Date: - Modified: 03/07/2003 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: To PPC Site Name: Burghfield Landfill Correspondence Address: -, -
Not shown	1133	NE	471112 170324	Site Address: Unit 1, Smallmead Road, Reading, Berkshire, RG2 0QS Type: Household, Commercial & Industrial Waste T Stn Size: >= 25000 tonnes < 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: CLE009 EPR reference: EA/EPR/AP3394SJ/A001 Operator: Clements Austin Leslie Waste Management licence No: 86410 Annual Tonnage: 75000.0	Issue Date: 15/12/2006 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Expired Site Name: Clembins Skip Hire Correspondence Address: -, -

ID	Distance (m)	Direction	NGR	Details	
Not shown	1144	SW	469200 168800	Site Address: Moores Farm, Pingewood, Reading, Berkshire, RG30 3UH Type: Deposit of waste to land as a recovery operation Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: CAV009 EPR reference: EA/EPR/DB3532AY/A001 Operator: Caversham Project Management Ltd Waste Management licence No: 103620 Annual Tonnage: 31000.0	Issue Date: 26/06/2012 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: Moores Farm Correspondence Address: -, -
Not shown	1264	E	471300 170200	Site Address: Reading Borough Council, Contract Services, 6, Darwin Close, Reading, Berkshire, RG2 0SG Type: Household, Commercial & Industrial Waste T Stn Size: >= 25000 tonnes < 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: REA002 EPR reference: EA/EPR/MP3499EK/V003 Operator: Reading Borough Council Waste Management licence No: 86011 Annual Tonnage: 32000.0	Issue Date: 29/06/1992 Effective Date: - Modified: 28/09/2001 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Modified Site Name: Darwin Close Transfer Station Correspondence Address: -, -
Not shown	1264	E	471300 170200	Site Address: Reading Borough Council, Contract Services, 6, Darwin Close, Reading, Berkshire, RG2 0SG Type: Clinical Waste Transfer Station Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: REA003 EPR reference: EA/EPR/DP3799EU/V003 Operator: Reading Borough Council Waste Management licence No: 86204 Annual Tonnage: 504.0	Issue Date: 19/10/1998 Effective Date: - Modified: 30/08/2005 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: Darwin Close Ts2 Correspondence Address: -, -
Not shown	1306	W	468600 169700	Site Address: John Mould, Reading Quarry, Berry's Lane, Pingewood, Reading, Berkshire, RG30 3XA Type: Landfill taking Non-Biodegradeable Wastes Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: MOU003 EPR reference: EA/EPR/XP3799EB/V002 Operator: Mould John Waste Management licence No: 86040 Annual Tonnage: 4999.0	Issue Date: 21/10/1997 Effective Date: - Modified: 14/07/2004 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Closure Site Name: Reading Quarry Correspondence Address: -, -
Not shown	1306	W	468600 169700	Site Address: John Mould, Reading Quarry, Berry's Lane, Pingewood, Reading, Berkshire, RG30 3XA Type: Landfill taking Non-Biodegradeable Wastes Size: >= 25000 tonnes < 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: MOU003 EPR reference: - Operator: Mould John Waste Management licence No: 86040 Annual Tonnage: 74000.0	Issue Date: 21/10/1997 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Closure Site Name: Reading Quarry Correspondence Address: John Mould, Hyde Crete Pit, Pingewood Road North, Reading, Berkshire, RG30 3XN

ID	Distance (m)	Direction	NGR	Details	
Not shown	1306	W	468600 169700	Site Address: John Mould, Reading Quarry, Berry's Lane, Pingewood, Reading, Berkshire, RG30 3XA Type: Landfill taking Non-Biodegradeable Wastes Size: >= 25000 tonnes < 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: MOU003 EPR reference: - Operator: John Mould Waste Management licence No: 86040 Annual Tonnage: 74000.0	Issue Date: 21/10/1997 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Closure Site Name: Reading Quarry Correspondence Address: John Mould, Hyde Crete Pit, Pingewood Road North, Reading, Berkshire, RG30 3XN
Not shown	1306	W	468600 169700	Site Address: Berry Lane, Pingewood, Reading, Berkshire, RG30 3XA Type: Physical Treatment Facility Size: >= 25000 tonnes < 75000 tonnes Environmental Permitting Regulations (Waste) Licence Number: MOU008 EPR reference: - Operator: Mould John Waste Management licence No: 86347 Annual Tonnage: 24999.0	Issue Date: 24/03/2005 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: Reading Quarry Correspondence Address: Eric Howell, 1, Pingewood Close, Pingewood Road North, Reading, Berkshire, RG30 3XT
Not shown	1306	W	468600 169700	Site Address: Reading Quarry, Berry's Lane, Pingewood, Reading, Berkshire, RG30 3XA Type: Physical Treatment Facility Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: MOU008 EPR reference: EA/EPR/LP3295ER/V002 Operator: Mould John Waste Management licence No: 86347 Annual Tonnage: 0.0	Issue Date: 24/03/2005 Effective Date: - Modified: 26/01/2012 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Expired Site Name: Reading Quarry Correspondence Address: -, -
Not shown	1339	E	471361 170258	Site Address: 6, Commercial Road, Reading, Berkshire, RG2 0QZ Type: Clinical Waste Transfer Station Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: DAN029 EPR reference: EA/EPR/CP3394SP/V003 Operator: Daniels Corporation International Ltd Waste Management licence No: 86277 Annual Tonnage: 499.0	Issue Date: 10/01/2003 Effective Date: 27/11/2008 Modified: 12/07/2011 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Modified Site Name: The Daniels Corporation International Ltd Correspondence Address: -, -
Not shown	1339	E	471361 170258	Site Address: White Rose Environmental, 6, Commercial Road, Reading, Reading, Berkshire, RG2 0QZ Type: Clinical Waste Transfer Station Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: WHI067 EPR reference: - Operator: Sterile Technologies (Newcastle) Ltd Waste Management licence No: 86277 Annual Tonnage: 4999.0	Issue Date: 10/01/2003 Effective Date: 09/01/2008 Modified: 12/07/2004 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Transferred Site Name: White Rose Environmental Correspondence Address: -, 2nd Floor Apex House, London Road, Northfleet, Kent, DA11 9PD

ID	Distance (m)	Direction	NGR	Details	
Not shown	1428	E	471463 170230	Site Address: Select Environmental Services, 5 - 7, Bennet Road, Reading, Berkshire, RG2 0QX Type: Clinical Waste Transfer Station Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: SEL019 EPR reference: EA/EPR/CP3099VG/A001 Operator: Select Environmental Services Ltd Waste Management licence No: 100913 Annual Tonnage: 74999.0	Issue Date: 21/05/2009 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: Select Environmental Services Correspondence Address: -, -
Not shown	1484	E	471500 170300	Site Address: Select Environmental, Commercial Road, Reading, Reading, Berkshire, RG2 9ST Type: Clinical Waste Transfer Station Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: SEL008 EPR reference: - Operator: Select Environmental Services Ltd Waste Management licence No: 86277 Annual Tonnage: 0.0	Issue Date: 10/01/2003 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: Select Environmental Services Ltd Correspondence Address: -, 6, Commercial Road, Reading, Berkshire, RG2 0QZ
Not shown	1484	E	471500 170300	Site Address: Healthcare Waste, Commercial Road, Reading, Reading, Berkshire, RG2 9ST Type: Clinical Waste Transfer Station Size: < 25000 tonnes Environmental Permitting Regulations (Waste) Licence Number: SEL008 EPR reference: - Operator: Healthcare Waste Limited Waste Management licence No: 86277 Annual Tonnage: 0.0	Issue Date: 10/01/2003 Effective Date: - Modified: 12/07/2004 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Modified Site Name: Healthcare Waste Limited Correspondence Address: -, 6, Commercial Road, Reading, Berkshire, RG2 0QZ

4. Current Land Use Map



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Site Outline

Search Buffers (m)
250
500

Current Industrial Sites

Petrol & Fuel Sites

Electricity Transmission Cables

Gas Transmission Pipelines

4. Current Land Uses

4.1 Current Industrial Data

Records of potentially contaminative industrial sites within 250m of the study site: 3

The following records are represented as points on the Current Land Uses map.

ID	Distance (m)	Direction	Company	NGR	Address	Activity	Category
1	97	SE	Cloud Distribution	470169 169733	450, Brook Drive, Reading, RG2 6UU	Distribution and Haulage	Transport, Storage and Delivery
2	108	NE	Electricity Sub Station	469969 170007	RG30	Electrical Features	Infrastructure and Facilities
3	139	N	Polish Car	469891 170044	Pingemead Farm, Pingewood, Reading, RG30 3UR	Vehicle Repair, Testing and Servicing	Repair and Servicing

4.2 Petrol and Fuel Sites

Records of petrol or fuel sites within 500m of the study site: 0

Database searched and no data found.

4.3 National Grid High Voltage Underground Electricity Transmission Cables

This dataset identifies the high voltage electricity transmission lines running between generating power plants and electricity substations. The dataset does not include the electricity distribution network (smaller, lower voltage cables distributing power from substations to the local user network). This information has been extracted from databases held by National Grid and is provided for information only with no guarantee as to its completeness or accuracy. National Grid do not offer any warranty as to the accuracy of the available data and are excluded from any liability for any such inaccuracies or errors.

Records of National Grid high voltage underground electricity transmission cables within 500m of the study site: 0

Database searched and no data found.

4.4 National Grid High Pressure Gas Transmission Pipelines

This dataset identifies high-pressure, large diameter pipelines which carry gas between gas terminals, power stations, compressors and storage facilities. The dataset does not include the Local Transmission System (LTS) which supplies gas directly into homes and businesses. This information has been extracted from databases held by National Grid and is provided for information only with no guarantee as to its completeness or accuracy. National Grid do not offer any warranty as to the accuracy of the available data and are excluded from any liability for any such inaccuracies or errors.

Records of National Grid high pressure gas transmission pipelines within 500m of the study site: 0

Database searched and no data found.

5. Geology

5.1 Artificial Ground and Made Ground

Database searched and no data found.

The database has been searched on site, including a 50m buffer.

5.2 Superficial Ground and Drift Geology

The database has been searched on site, including a 50m buffer.

Lex Code	Description	Rock Type
BGGR	BEENHAM GRANGE GRAVEL MEMBER	SAND AND GRAVEL [UNLITHIFIED DEPOSITS CODING SCHEME]

5.3 Bedrock and Solid Geology

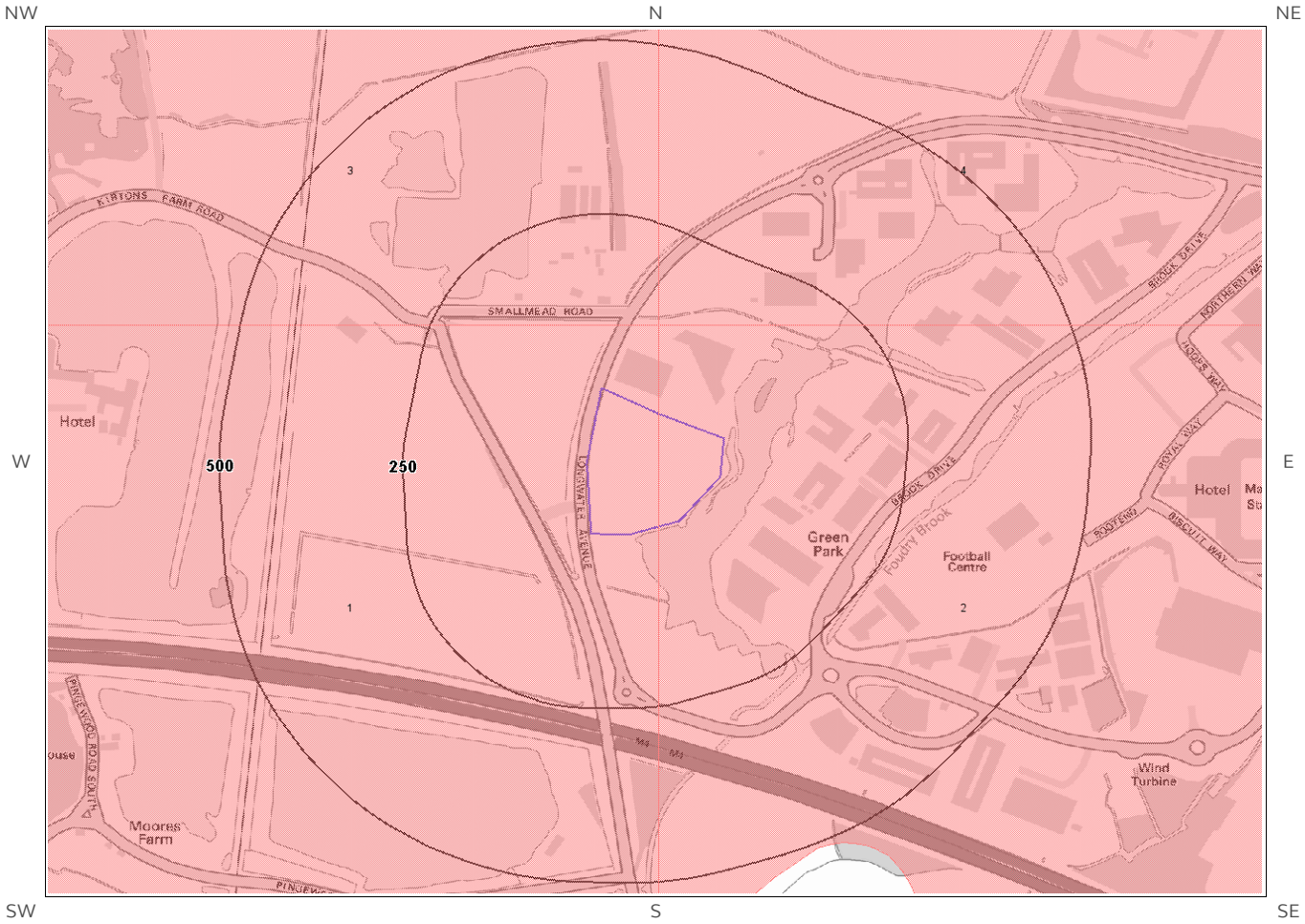
The database has been searched on site, including a 50m buffer.

Lex Code	Description	Rock Type
LMBE-CLSISA	LAMBETH GROUP	CLAY, SILT AND SAND

(Derived from the BGS 1:50,000 Digital Geological Map of Great Britain)

6 Hydrogeology and Hydrology

6a. Aquifer Within Superficial Geology



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Site Outline

250
500
Search Buffers (m)

Principal Aquifer

Secondary (A) Aquifer - Permeable Layers

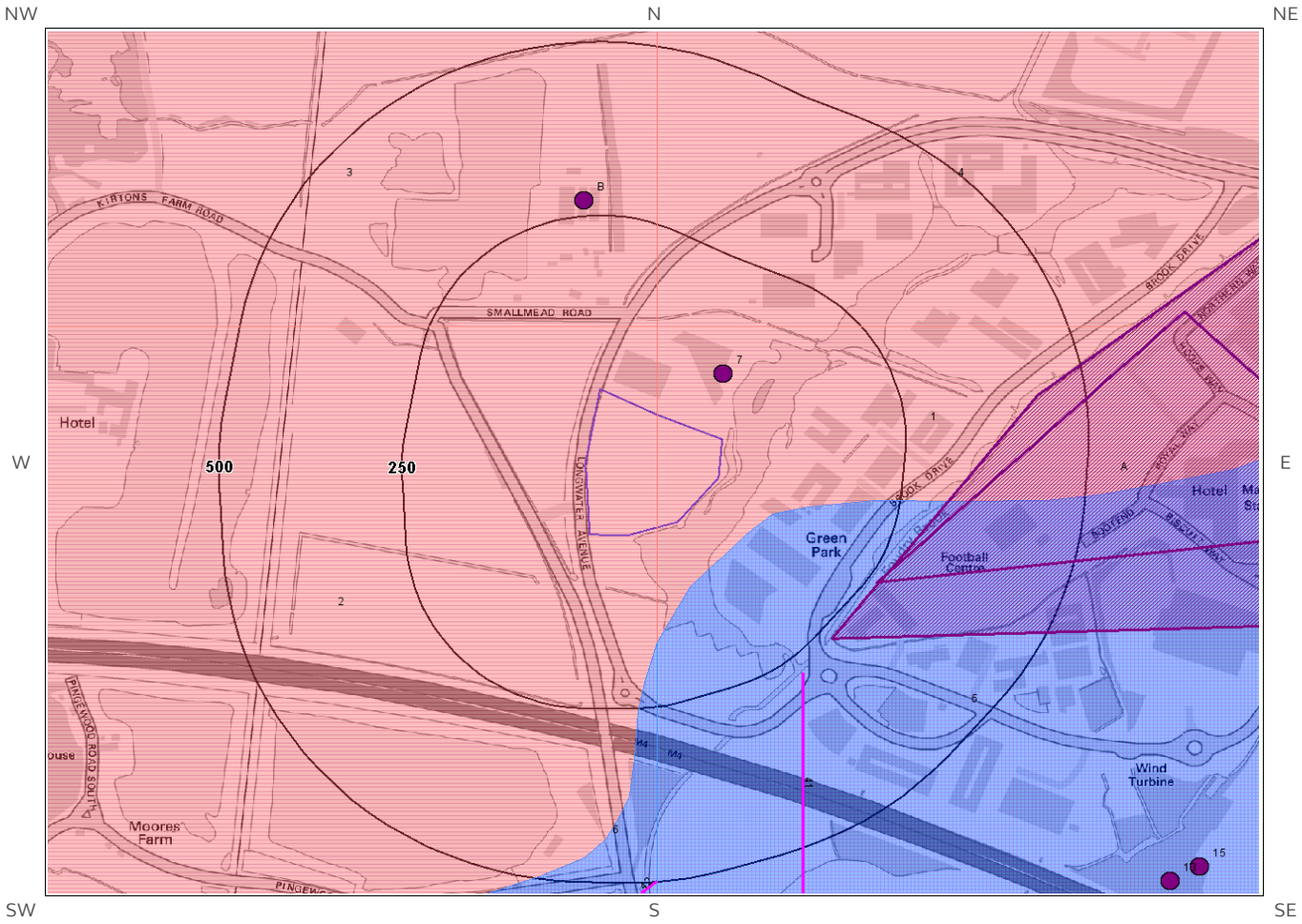
Secondary (B) Aquifer - Lower Permeability Layers

Secondary Aquifer - Undifferentiated Layers

Unproductive

Unknown (lakes and landslip)

6b. Aquifer Within Bedrock Geology and Abstraction Licenses



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Site Outline

250
500
Search Buffers (m)

Principal Aquifer

Secondary (A) Aquifer - Permeable Layers

Secondary (B) Aquifer - Lower Permeability Layers

Groundwater Abstraction Licence

Secondary Aquifer - Undifferentiated Layers

Unproductive

Unknown (lakes and landslip)

Surface Water Abstraction Licence

6c. Hydrogeology – Source Protection Zones and Potable Water Abstraction Licenses



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Site Outline

250
500
Search Buffers (m)

Source Protection Zone 1 - Inner Catchment

Source Protection Zone 2 - Outer Catchment

Source Protection Zone 3 - Total Catchment

Source Protection Zone 4 - Zone of Special Interest

Potable Water Abstraction Licence

6d. Hydrogeology – Source Protection Zones within confined aquifer



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Site Outline

250
500
Search Buffers (m)

Source Protection Zone 1 - Inner Catchment

Source Protection Zone 2C - Outer Catchment within Confined Aquifer

Source Protection Zone 3C - Total Catchment within Confined Aquifer

Potable Water Abstraction Licence

6e. Hydrology – Detailed River Network and River Quality



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Site Outline

250
500
Search Buffers (m)

Primary River
Secondary River
Tertiary River
Lake/Reservoir
Underground River (inferred)
General Quality Assessment: Biology
General Quality Assessment: Chemistry

Canal
Canal Tunnel
Culvert
Multiple Channel Culvert
Underground River (Potential Sewer)
Underground River (local knowledge)

6.Hydrogeology and Hydrology

6.1 Aquifer within Superficial Deposits

Are there records of strata classification within the superficial geology at or in proximity to the property? Yes

From 1 April 2010, the Environment Agency's Groundwater Protection Policy has been using aquifer designations consistent with the Water Framework Directive. For further details on the designation and interpretation of this information, please refer to the Groundsure Enviroinsight User Guide.

The following aquifer records are shown on the Aquifer within Superficial Geology Map (6a):

ID	Distance (m)	Direction	Designation	Description
1	0	On Site	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
2	0	On Site	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
3	91	N	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
4	115	NE	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers

6.2 Aquifer within Bedrock Deposits

Are there records of strata classification within the bedrock geology at or in proximity to the property? Yes

From 1 April 2010, the Environment Agency's Groundwater Protection Policy has been using aquifer designations consistent with the Water Framework Directive. For further details on the designation and interpretation of this information, please refer to the Groundsure Enviroinsight User Guide.

The following aquifer records are shown on the Aquifer within Bedrock Geology Map (6b):

ID	Distance (m)	Direction	Designation	Description
1	0	On Site	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
2	0	On Site	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
5	78	SE	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow
3	91	N	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers
4	115	NE	Secondary A	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers

ID	Distance (m)	Direction	Designation	Description
6	159	S	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow

6.3 Groundwater Abstraction Licences

Are there any Groundwater Abstraction Licences within 2000m of the study site? Yes

The following Abstraction Licences records are represented as points, lines and regions on the Aquifer within Bedrock Geology Map (6b):

ID	Distance (m)	Direction	NGR	Details	
7	87	N	470090 169930	Status: Historical Licence No: 28/39/22/0276 Details: Spray Irrigation - Direct Direct Source: Thames Groundwater Point: Smallmead Farm, Pingewood Data Type: Point Name: THE PRUDENTIAL ASSUR. COM. LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: 9/1/1967 Expiry Date: - Issue No: 101 Version Start Date: 30/7/1999 Version End Date:
8A	263	SE	470720 170020	Status: Active Licence No: 28/39/22/0644 Details: General Use Relating To Secondary Category (Low Loss) Direct Source: Thames Groundwater Point: Madejski Stadium Complex - 424 Wellpoints Data Type: Region Name: READING FOOTBALL CLUB PLC	Annual Volume (m^3): 189735 Max Daily Volume (m^3): 518.4 Original Application No: WRW/A/1220 Original Start Date: 28/7/2008 Expiry Date: 31/3/2023 Issue No: 1 Version Start Date: 28/7/2008 Version End Date:
9A	265	SE	470520 169900	Status: Historical Licence No: 28/39/22/0578 Details: General Use Relating To Secondary Category (Low Loss) Direct Source: Thames Groundwater Point: Madejski Stadium Wellpoints Data Type: Region Name: READING FOOTBALL CLUB PLC	Annual Volume (m^3): 189734.4 Max Daily Volume (m^3): 518.4 Original Application No: WRA/6539 Original Start Date: 8/6/1998 Expiry Date: 30/6/2008 Issue No: 100 Version Start Date: 8/6/1998 Version End Date:
10B	272	N	469900 170180	Status: Active Licence No: 28/39/22/0463 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Household Direct Source: Thames Groundwater Point: Pingewood Business Estate, Smallmead Road, Reading Data Type: Point Name: KENNET VALLEY PARK LTD	Annual Volume (m^3): 6819 Max Daily Volume (m^3): 22.73 Original Application No: - Original Start Date: 29/7/1980 Expiry Date: - Issue No: 101 Version Start Date: 1/4/2008 Version End Date:
11B	272	N	469900 170180	Status: Active Licence No: 28/39/22/0463 Details: General Farming & Domestic Direct Source: Thames Groundwater Point: Pingewood Business Estate, Smallmead Road, Reading Data Type: Point Name: KENNET VALLEY PARK LTD	Annual Volume (m^3): 6819 Max Daily Volume (m^3): 22.73 Original Application No: - Original Start Date: 29/7/1980 Expiry Date: - Issue No: 101 Version Start Date: 1/4/2008 Version End Date:

ID	Distance (m)	Direction	NGR	Details	
Not shown	789	NW	469400 170500	Status: Historical Licence No: 28/39/22/0432 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Thames Groundwater Point: Seb Cottage Lane, Burghfield Data Type: Point Name: SOUTHERN ELECTRICITY BOARD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: WRA/1450/38 Original Start Date: 28/7/1976 Expiry Date: - Issue No: 100 Version Start Date: 28/7/1976 Version End Date:
13	846	SE	470700 169200	Status: Historical Licence No: 28/39/22/0556 Details: General use relating to Secondary Category (Medium Loss) Direct Source: Thames Groundwater Point: Berkshire Brewery Point 'd' Data Type: Point Name: SCOTTISH COURAGE BREWING LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: WRA/6342 Original Start Date: - Expiry Date: 31/12/2001 Issue No: 100 Version Start Date: 9/5/2000 Version End Date:
Not shown	862	S	470300 168900	Status: Historical Licence No: 28/39/22/0166 Details: General Farming & Domestic Direct Source: Thames Groundwater Point: Hartley Court Farm, Three Mile Cross Data Type: Point Name: HEWISON	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: WRA/1763/1 Original Start Date: 5/9/1966 Expiry Date: - Issue No: 100 Version Start Date: 21/11/1985 Version End Date:
15	862	SE	470740 169220	Status: Historical Licence No: 28/39/22/0614 Details: Process Water Direct Source: Thames Groundwater Point: Berkshire Brewery Point 'd' Data Type: Point Name: Heineken UK Ltd	Annual Volume (m^3): 3000000 Max Daily Volume (m^3): 9550 Original Application No: NPS/WR/002635 Original Start Date: 1/1/2002 Expiry Date: 31/12/2011 Issue No: 4 Version Start Date: 23/11/2009 Version End Date:
Not shown	987	SE	470800 169100	Status: Historical Licence No: 28/39/22/0556 Details: General use relating to Secondary Category (Medium Loss) Direct Source: Thames Groundwater Point: Berkshire Brewery Point 'c' Data Type: Point Name: SCOTTISH COURAGE BREWING LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: WRA/6342 Original Start Date: - Expiry Date: 31/12/2001 Issue No: 100 Version Start Date: 9/5/2000 Version End Date:
Not shown	1023	E	471100 169650	Status: Historical Licence No: 28/39/22/0614 Details: Process Water Direct Source: Thames Groundwater Point: Berkshire Brewery - Point 'e' Data Type: Point Name: Heineken UK Ltd	Annual Volume (m^3): 3000000 Max Daily Volume (m^3): 9550 Original Application No: NPS/WR/002635 Original Start Date: 1/1/2002 Expiry Date: 31/12/2011 Issue No: 4 Version Start Date: 23/11/2009 Version End Date:
Not shown	1054	SE	470890 169100	Status: Historical Licence No: 28/39/22/0614 Details: Process Water Direct Source: Thames Groundwater Point: Berkshire Brewery - Point 'c' Data Type: Point Name: Heineken UK Ltd	Annual Volume (m^3): 3000000 Max Daily Volume (m^3): 9550 Original Application No: NPS/WR/002635 Original Start Date: 1/1/2002 Expiry Date: 31/12/2011 Issue No: 4 Version Start Date: 23/11/2009 Version End Date:
Not shown	1311	SE	471130 168990	Status: Historical Licence No: 28/39/22/0614 Details: Process Water Direct Source: Thames Groundwater Point: Berkshire Brewery - Point 'a' Data Type: Point Name: Heineken UK Ltd	Annual Volume (m^3): 3000000 Max Daily Volume (m^3): 9550 Original Application No: NPS/WR/002635 Original Start Date: 1/1/2002 Expiry Date: 31/12/2011 Issue No: 4 Version Start Date: 23/11/2009 Version End Date:

ID	Distance (m)	Direction	NGR	Details	
Not shown	1335	NE	471300 170400	Status: Historical Licence No: 28/39/22/0525 Details: Laundry Use Direct Source: Thames Groundwater Point: Darwin Close, Whitley, Reading Data Type: Point Name: CLEAN LINEN SERVICES LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: - Original Start Date: - Expiry Date: 31/12/2001 Issue No: 101 Version Start Date: 1/4/2000 Version End Date:
Not shown	1344	SE	471100 168900	Status: Historical Licence No: 28/39/22/0556 Details: General use relating to Secondary Category (Medium Loss) Direct Source: Thames Groundwater Point: Berkshire Brewery Point 'a' Data Type: Point Name: SCOTTISH COURAGE BREWING LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: WRA/6342 Original Start Date: - Expiry Date: 31/12/2001 Issue No: 100 Version Start Date: 9/5/2000 Version End Date:
Not shown	1345	N	470300 171200	Status: Active Licence No: 28/39/22/0132 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Fobney Pumping Station 'bh E' Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): 1500000 Max Daily Volume (m^3): 30000 Original Application No: NPS/WR/008557 Original Start Date: 5/9/1966 Expiry Date: 31/3/2023 Issue No: 101 Version Start Date: 1/1/2013 Version End Date:
Not shown	1345	N	470300 171200	Status: Historical Licence No: 28/39/22/0132 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Fobney Pumping Station Bh 'e' Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): 1500000 Max Daily Volume (m^3): 30000 Original Application No: RG952 Original Start Date: 5/9/1966 Expiry Date: - Issue No: 100 Version Start Date: 11/6/1998 Version End Date:
Not shown	1370	N	470380 171200	Status: Active Licence No: 28/39/22/0132 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Fobney Pumping Station 'bh F' Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): 1500000 Max Daily Volume (m^3): 30000 Original Application No: NPS/WR/008557 Original Start Date: 5/9/1966 Expiry Date: 31/3/2023 Issue No: 101 Version Start Date: 1/1/2013 Version End Date:
Not shown	1370	N	470380 171200	Status: Historical Licence No: 28/39/22/0132 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Fobney Pumping Station Bh 'f' Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): 1500000 Max Daily Volume (m^3): 30000 Original Application No: RG952 Original Start Date: 5/9/1966 Expiry Date: - Issue No: 100 Version Start Date: 11/6/1998 Version End Date:
Not shown	1394	NE	471360 170410	Status: Active Licence No: 28/39/22/0612 Details: Laundry Use Direct Source: Thames Groundwater Point: Darwin Close, Whitley, Reading, Berkshire Data Type: Point Name: CLEAN LINEN SERVICES LTD	Annual Volume (m^3): 181840 Max Daily Volume (m^3): 655 Original Application No: WRW/A/1085 Original Start Date: 1/1/2002 Expiry Date: 31/3/2017 Issue No: 1 Version Start Date: 1/1/2002 Version End Date:
Not shown	1414	NE	470660 171130	Status: Historical Licence No: 28/39/22/0132 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Fobney Pumping Station Bh 'h' Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): 1500000 Max Daily Volume (m^3): 30000 Original Application No: RG952 Original Start Date: 5/9/1966 Expiry Date: - Issue No: 100 Version Start Date: 11/6/1998 Version End Date:

ID	Distance (m)	Direction	NGR	Details	
Not shown	1414	NE	470660 171130	Status: Active Licence No: 28/39/22/0132 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Fobney Pumping Station 'bh H' Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): 1500000 Max Daily Volume (m^3): 30000 Original Application No: NPS/WR/008557 Original Start Date: 5/9/1966 Expiry Date: 31/3/2023 Issue No: 101 Version Start Date: 1/1/2013 Version End Date:
Not shown	1487	N	470610 171230	Status: Historical Licence No: 28/39/22/0132 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Fobney Pumping Station Bh 'g' Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): 1500000 Max Daily Volume (m^3): 30000 Original Application No: RG952 Original Start Date: 5/9/1966 Expiry Date: - Issue No: 100 Version Start Date: 11/6/1998 Version End Date:
Not shown	1487	N	470610 171230	Status: Active Licence No: 28/39/22/0132 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Fobney Pumping Station 'bh G' Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): 1500000 Max Daily Volume (m^3): 30000 Original Application No: NPS/WR/008557 Original Start Date: 5/9/1966 Expiry Date: 31/3/2023 Issue No: 101 Version Start Date: 1/1/2013 Version End Date:
Not shown	1506	NE	470770 171180	Status: Active Licence No: 28/39/22/0132 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Fobney Pumping Station 'bh B' Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): 1500000 Max Daily Volume (m^3): 30000 Original Application No: NPS/WR/008557 Original Start Date: 5/9/1966 Expiry Date: 31/3/2023 Issue No: 101 Version Start Date: 1/1/2013 Version End Date:
Not shown	1514	NE	470680 171230	Status: Historical Licence No: 28/39/22/0132 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Fobney Pumping Station Bh 'c' Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): 1500000 Max Daily Volume (m^3): 30000 Original Application No: RG952 Original Start Date: 5/9/1966 Expiry Date: - Issue No: 100 Version Start Date: 11/6/1998 Version End Date:
Not shown	1514	NE	470680 171230	Status: Active Licence No: 28/39/22/0132 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Fobney Pumping Station 'bh C' Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): 1500000 Max Daily Volume (m^3): 30000 Original Application No: NPS/WR/008557 Original Start Date: 5/9/1966 Expiry Date: 31/3/2023 Issue No: 101 Version Start Date: 1/1/2013 Version End Date:
Not shown	1524	NE	470770 171200	Status: Historical Licence No: 28/39/22/0132 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Fobney Pumping Station Bh 'b' Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): 1500000 Max Daily Volume (m^3): 30000 Original Application No: RG952 Original Start Date: 5/9/1966 Expiry Date: - Issue No: 100 Version Start Date: 11/6/1998 Version End Date:
Not shown	1539	NE	470840 171180	Status: Active Licence No: 28/39/22/0132 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Fobney Pumping Station 'bh A' Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): 1500000 Max Daily Volume (m^3): 30000 Original Application No: NPS/WR/008557 Original Start Date: 5/9/1966 Expiry Date: 31/3/2023 Issue No: 101 Version Start Date: 1/1/2013 Version End Date:

ID	Distance (m)	Direction	NGR	Details	
Not shown	1553	SE	471320 168840	Status: Historical Licence No: 28/39/22/0601 Details: Make-Up or Top Up Water Direct Source: Thames Groundwater Point: Reading International Business Park Data Type: Point Name: AKELER DEVELOPMENTS LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: WRW/A/1049 Original Start Date: 10/11/2000 Expiry Date: - Issue No: 1 Version Start Date: 10/11/2000 Version End Date:
Not shown	1561	NE	470850 171200	Status: Historical Licence No: 28/39/22/0132 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Fobney Pumping Station Bh 'a' Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): 1500000 Max Daily Volume (m^3): 30000 Original Application No: RG952 Original Start Date: 5/9/1966 Expiry Date: - Issue No: 100 Version Start Date: 11/6/1998 Version End Date:
Not shown	1590	NE	470970 171160	Status: Historical Licence No: 28/39/22/0132 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Fobney Pumping Station Bh 'd' Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): 1500000 Max Daily Volume (m^3): 30000 Original Application No: RG952 Original Start Date: 5/9/1966 Expiry Date: - Issue No: 100 Version Start Date: 11/6/1998 Version End Date:
Not shown	1590	NE	470970 171160	Status: Active Licence No: 28/39/22/0132 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Fobney Pumping Station 'bh D' Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): 1500000 Max Daily Volume (m^3): 30000 Original Application No: NPS/WR/008557 Original Start Date: 5/9/1966 Expiry Date: 31/3/2023 Issue No: 101 Version Start Date: 1/1/2013 Version End Date:
Not shown	1820	N	469600 171700	Status: Historical Licence No: 28/39/22/0266 Details: General use relating to Secondary Category (Medium Loss) Direct Source: Thames Groundwater Point: Railtrack Property, Southcote, Reading Data Type: Point Name: NETWORK RAIL INFRASTR LTD	Annual Volume (m^3): 250035 Max Daily Volume (m^3): 909.22 Original Application No: - Original Start Date: 12/12/1966 Expiry Date: - Issue No: 101 Version Start Date: 3/2/2003 Version End Date:

6.4 Surface Water Abstraction Licences

Are there any Surface Water Abstraction Licences within 2000m of the study site? Yes

The following Surface Water Abstraction Licences records are represented as points, lines and regions on the Aquifer within Bedrock Geology Map (6b):

ID	Distance (m)	Direction	NGR	Details	
41	277	SE	470200 168600	Status: Active Licence No: 28/39/22/0232 Details: Spray Irrigation - Direct Direct Source: Thames Surface Water - Non Tidal Point: Foudry Brook At Hartley Court Farm Data Type: Line Name: HEWISON	Annual Volume (m^3): 18184 Max Daily Volume (m^3): 681.91 Application No: WRA/1763 Original Start Date: 14/11/1966 Expiry Date: - Issue No: 100 Version Start Date: 10/3/1969 Version End Date:

ID	Distance (m)	Direction	NGR	Details	
42	500	S	469500 168800	Status: Active Licence No: 28/39/22/0232 Details: Spray Irrigation - Direct Direct Source: Thames Surface Water - Non Tidal Point: Burghfield Brook At Hartley Court Farm Data Type: Line Name: HEWISON	Annual Volume (m^3): 18184 Max Daily Volume (m^3): 681.91 Application No: WRA/1763 Original Start Date: 14/11/1966 Expiry Date: - Issue No: 100 Version Start Date: 10/3/1969 Version End Date:
Not shown	1196	W	468710 169695	Status: Active Licence No: TH/039/0022/001 Details: Process Water Direct Source: Thames Surface Water - Non Tidal Point: Avago Lake, Burghfield, Reading Data Type: Point Name: Tarmac Trading Limited	Annual Volume (m^3): 23320 Max Daily Volume (m^3): 80 Application No: NPS/WR/020813 Original Start Date: 10/9/2009 Expiry Date: 31/3/2017 Issue No: 3 Version Start Date: 26/10/2015 Version End Date:
Not shown	1328	N	470420 171140	Status: Historical Licence No: 28/39/22/0527 Details: Fish Farm/Cress Pond Throughflow Direct Source: Thames Surface Water - Non Tidal Point: Fobney Fish Farm Intakes Data Type: Line Name: ENVIRONMENT AGENCY	Annual Volume (m^3): - Max Daily Volume (m^3): - Application No: WRA/5618 Original Start Date: - Expiry Date: - Issue No: 100 Version Start Date: 11/8/1993 Version End Date:
Not shown	1328	N	470420 171140	Status: Historical Licence No: 28/39/22/0527 Details: Fish Farm/Cress Pond Throughflow Direct Source: Thames Surface Water - Non Tidal Point: Kennet And Avon Canal At Fobney Fish Farm Intakes Data Type: Line Name: ENVIRONMENT AGENCY	Annual Volume (m^3): 2382154 Max Daily Volume (m^3): 12730 Application No: WRA/5618 Original Start Date: 11/8/1993 Expiry Date: - Issue No: 100 Version Start Date: 11/8/1993 Version End Date:
Not shown	1334	NE	470460 171130	Status: Historical Licence No: 28/39/22/0527 Details: Fish Farm/Cress Pond Throughflow Direct Source: Thames Surface Water - Non Tidal Point: Kennet And Avon Canal At Fobney Fish Farm Intakes Data Type: Line Name: ENVIRONMENT AGENCY	Annual Volume (m^3): 1800000 Max Daily Volume (m^3): 5000 Application No: - Original Start Date: 11/8/1993 Expiry Date: 31/3/2011 Issue No: 101 Version Start Date: 10/10/2006 Version End Date:
Not shown	1345	N	470300 171200	Status: Historical Licence No: 28/39/22/0435 Details: Potable Water Supply - Direct Direct Source: Thames Surface Water - Non Tidal Point: Fobney Waterworks Intake Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Application No: S228 Original Start Date: 5/4/1977 Expiry Date: - Issue No: 100 Version Start Date: 5/4/1977 Version End Date:
Not shown	1345	N	470300 171200	Status: Active Licence No: 28/39/22/0435 Details: Potable Water Supply - Direct Direct Source: Thames Surface Water - Non Tidal Point: Kennet And Avon Canal At Fobney Waterworks Intake Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): 26621933 Max Daily Volume (m^3): 72737.52 Application No: S228 Original Start Date: 5/4/1977 Expiry Date: - Issue No: 100 Version Start Date: 5/4/1977 Version End Date:

6.5 Potable Water Abstraction Licences

Are there any Potable Water Abstraction Licences within 2000m of the study site? Yes

The following Potable Water Abstraction Licences records are represented as points, lines and regions on the SPZ and Potable Water Abstraction Licences Map (6c):

ID	Distance (m)	Direction	NGR	Details	
1	272	N	469900 170180	Status: Active Licence No: 28/39/22/0463 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Household Direct Source: Thames Groundwater Point: Pingewood Business Estate, Smallmead Road, Reading Data Type: Point Name: KENNET VALLEY PARK LTD	Annual Volume (m^3): 6819 Max Daily Volume (m^3): 22.73 Original Application No: - Original Start Date: 29/7/1980 Expiry Date: - Issue No: 101 Version Start Date: Version End Date:
Not shown	789	NW	469400 170500	Status: Historical Licence No: 28/39/22/0432 Details: Drinking, Cooking, Sanitary, Washing, (Small Garden) - Commercial/Industrial/Public Services Direct Source: Thames Groundwater Point: Seb Cottage Lane, Burghfield Data Type: Point Name: SOUTHERN ELECTRICITY BOARD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: WRA/1450/38 Original Start Date: 28/7/1976 Expiry Date: - Issue No: 100 Version Start Date: Version End Date:
Not shown	1345	N	470300 171200	Status: Active Licence No: 28/39/22/0132 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Fobney Pumping Station 'bh E' Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): 1500000 Max Daily Volume (m^3): 30000 Original Application No: NPS/WR/008557 Original Start Date: 5/9/1966 Expiry Date: 31/3/2023 Issue No: 101 Version Start Date: Version End Date:
Not shown	1345	N	470300 171200	Status: Active Licence No: 28/39/22/0435 Details: Potable Water Supply - Direct Direct Source: Thames Surface Water - Non Tidal Point: Kennet And Avon Canal At Fobney Waterworks Intake Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): 26621933 Max Daily Volume (m^3): 72737.52 Original Application No: S228 Original Start Date: 5/4/1977 Expiry Date: - Issue No: 100 Version Start Date: Version End Date:
Not shown	1345	N	470300 171200	Status: Historical Licence No: 28/39/22/0435 Details: Potable Water Supply - Direct Direct Source: Thames Surface Water - Non Tidal Point: Fobney Waterworks Intake Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): - Max Daily Volume (m^3): - Original Application No: S228 Original Start Date: 5/4/1977 Expiry Date: - Issue No: 100 Version Start Date: Version End Date:
Not shown	1345	N	470300 171200	Status: Historical Licence No: 28/39/22/0132 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Fobney Pumping Station Bh 'e' Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): 1500000 Max Daily Volume (m^3): 30000 Original Application No: RG952 Original Start Date: 5/9/1966 Expiry Date: - Issue No: 100 Version Start Date: Version End Date:

ID	Distance (m)	Direction	NGR	Details	
Not shown	1370	N	470380 171200	Status: Active Licence No: 28/39/22/0132 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Fobney Pumping Station 'bh F' Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): 1500000 Max Daily Volume (m^3): 30000 Original Application No: NPS/WR/008557 Original Start Date: 5/9/1966 Expiry Date: 31/3/2023 Issue No: 101 Version Start Date: Version End Date:
Not shown	1370	N	470380 171200	Status: Historical Licence No: 28/39/22/0132 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Fobney Pumping Station Bh 'f' Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): 1500000 Max Daily Volume (m^3): 30000 Original Application No: RG952 Original Start Date: 5/9/1966 Expiry Date: - Issue No: 100 Version Start Date: Version End Date:
Not shown	1414	NE	470660 171130	Status: Historical Licence No: 28/39/22/0132 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Fobney Pumping Station Bh 'h' Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): 1500000 Max Daily Volume (m^3): 30000 Original Application No: RG952 Original Start Date: 5/9/1966 Expiry Date: - Issue No: 100 Version Start Date: Version End Date:
Not shown	1414	NE	470660 171130	Status: Active Licence No: 28/39/22/0132 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Fobney Pumping Station 'bh H' Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): 1500000 Max Daily Volume (m^3): 30000 Original Application No: NPS/WR/008557 Original Start Date: 5/9/1966 Expiry Date: 31/3/2023 Issue No: 101 Version Start Date: Version End Date:
Not shown	1487	N	470610 171230	Status: Historical Licence No: 28/39/22/0132 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Fobney Pumping Station Bh 'g' Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): 1500000 Max Daily Volume (m^3): 30000 Original Application No: RG952 Original Start Date: 5/9/1966 Expiry Date: - Issue No: 100 Version Start Date: Version End Date:
Not shown	1487	N	470610 171230	Status: Active Licence No: 28/39/22/0132 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Fobney Pumping Station 'bh G' Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): 1500000 Max Daily Volume (m^3): 30000 Original Application No: NPS/WR/008557 Original Start Date: 5/9/1966 Expiry Date: 31/3/2023 Issue No: 101 Version Start Date: Version End Date:
Not shown	1506	NE	470770 171180	Status: Active Licence No: 28/39/22/0132 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Fobney Pumping Station 'bh B' Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): 1500000 Max Daily Volume (m^3): 30000 Original Application No: NPS/WR/008557 Original Start Date: 5/9/1966 Expiry Date: 31/3/2023 Issue No: 101 Version Start Date: Version End Date:
Not shown	1514	NE	470680 171230	Status: Historical Licence No: 28/39/22/0132 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Fobney Pumping Station Bh 'c' Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): 1500000 Max Daily Volume (m^3): 30000 Original Application No: RG952 Original Start Date: 5/9/1966 Expiry Date: - Issue No: 100 Version Start Date: Version End Date:

ID	Distance (m)	Direction	NGR	Details	
Not shown	1514	NE	470680 171230	Status: Active Licence No: 28/39/22/0132 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Fobney Pumping Station 'bh C' Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): 1500000 Max Daily Volume (m^3): 30000 Original Application No: NPS/WR/008557 Original Start Date: 5/9/1966 Expiry Date: 31/3/2023 Issue No: 101 Version Start Date: Version End Date:
Not shown	1524	NE	470770 171200	Status: Historical Licence No: 28/39/22/0132 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Fobney Pumping Station Bh 'b' Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): 1500000 Max Daily Volume (m^3): 30000 Original Application No: RG952 Original Start Date: 5/9/1966 Expiry Date: - Issue No: 100 Version Start Date: Version End Date:
Not shown	1539	NE	470840 171180	Status: Active Licence No: 28/39/22/0132 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Fobney Pumping Station 'bh A' Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): 1500000 Max Daily Volume (m^3): 30000 Original Application No: NPS/WR/008557 Original Start Date: 5/9/1966 Expiry Date: 31/3/2023 Issue No: 101 Version Start Date: Version End Date:
Not shown	1561	NE	470850 171200	Status: Historical Licence No: 28/39/22/0132 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Fobney Pumping Station Bh 'a' Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): 1500000 Max Daily Volume (m^3): 30000 Original Application No: RG952 Original Start Date: 5/9/1966 Expiry Date: - Issue No: 100 Version Start Date: Version End Date:
Not shown	1590	NE	470970 171160	Status: Active Licence No: 28/39/22/0132 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Fobney Pumping Station 'bh D' Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): 1500000 Max Daily Volume (m^3): 30000 Original Application No: NPS/WR/008557 Original Start Date: 5/9/1966 Expiry Date: 31/3/2023 Issue No: 101 Version Start Date: Version End Date:
Not shown	1590	NE	470970 171160	Status: Historical Licence No: 28/39/22/0132 Details: Potable Water Supply - Direct Direct Source: Thames Groundwater Point: Fobney Pumping Station Bh 'd' Data Type: Point Name: THAMES WATER UTILITIES LTD	Annual Volume (m^3): 1500000 Max Daily Volume (m^3): 30000 Original Application No: RG952 Original Start Date: 5/9/1966 Expiry Date: - Issue No: 100 Version Start Date: Version End Date:

6.6 Source Protection Zones

Are there any Source Protection Zones within 500m of the study site? No

Database searched and no data found.

6.7 Source Protection Zones within Confined Aquifer

Are there any Source Protection Zones within the Confined Aquifer within 500m of the study site? No

Historically, Source Protection Zone maps have been focused on regulation of activities which occur at or near the ground surface, such as prevention of point source pollution and bacterial contamination of water supplies. Sources in confined aquifers were often considered to be protected from these surface pressures due to the presence of a low permeability confining layer (e.g. glacial till, clay). The increased interest in subsurface activities such as onshore oil and gas exploration, ground source heating and cooling requires protection zones for confined sources to be marked on SPZ maps where this has not already been done.

Database searched and no data found.

6.8 Groundwater Vulnerability and Soil Leaching Potential

Is there any Environment Agency information on groundwater vulnerability and soil leaching potential within 500m of the study site? Yes

Distance (m)	Direction	Classification	Soil Vulnerability Category	Description
0	On Site	Minor Aquifer/High Leaching Potential	H1	Soils which readily transmit liquid discharges because they are shallow or susceptible to rapid flow directly to rock, gravel or groundwater.
0	On Site	Minor Aquifer/High Leaching Potential	H1	Soils which readily transmit liquid discharges because they are shallow or susceptible to rapid flow directly to rock, gravel or groundwater.
91	N	Minor Aquifer/High Leaching Potential	H1	Soils which readily transmit liquid discharges because they are shallow or susceptible to rapid flow directly to rock, gravel or groundwater.
115	NE	Minor Aquifer/High Leaching Potential	H1	Soils which readily transmit liquid discharges because they are shallow or susceptible to rapid flow directly to rock, gravel or groundwater.
231	NW	Major Aquifer/High Leaching Potential	H1	Soils which readily transmit liquid discharges because they are shallow or susceptible to rapid flow directly to rock, gravel or groundwater.
298	N	Major Aquifer/High Leaching Potential	H1	Soils which readily transmit liquid discharges because they are shallow or susceptible to rapid flow directly to rock, gravel or groundwater.
353	W	Major Aquifer/High Leaching Potential	H1	Soils which readily transmit liquid discharges because they are shallow or susceptible to rapid flow directly to rock, gravel or groundwater.
468	W	Minor Aquifer/High Leaching Potential	HU	Soil information for urban areas and restored mineral workings. These soils are therefore assumed to be highly permeable in the absence of site-specific information.
475	SW	Minor Aquifer/High Leaching Potential	H3	Coarse textured or moderately shallow soils which readily transmit non-adsorbed pollutants and liquid discharges but have some ability to attenuate adsorbed pollutants because of their clay or organic matter content.
483	W	Major Aquifer/High Leaching Potential	HU	Soil information for urban areas and restored mineral workings. These soils are therefore assumed to be highly permeable in the absence of site-specific information.

6.9 River Quality

Is there any Environment Agency information on river quality within 1500m of the study site? Yes

6.9.1 Biological Quality:

Database searched and no data found.

6.9.2 Chemical Quality:

Chemical quality data is based on the General Quality Assessment Headline Indicators scheme (GQAHI). In England, each chemical sample is measured for ammonia and dissolved oxygen. In Wales, the samples are measured for biological oxygen demand (BOD), ammonia and dissolved oxygen. The results are graded from A ('Very Good') to F ('Bad').

The following Chemical Quality records are shown on the Hydrology Map (6e):

					Chemical Quality Grade				
ID	Distance (m)	Direction	NGR	River Quality Grade	2005	2006	2007	2008	2009
Not shown	1331	N	470333 171175	River Name: Kennet Reach: Sulhamstead Stream - Foudry Brook End/Start of Stretch: Sample Point NGR	A	A	A	A	A

6.10 Detailed River Network

Are there any Detailed River Network entries within 500m of the study site? Yes

The following Detailed River Network records are represented on the Hydrology Map (6e):

ID	Distance (m)	Direction	Details	
1	22	W	River Name: - Welsh River Name: - Alternative Name: -	River Type: Tertiary River Main River Status: Currently Undefined
2	31	SE	River Name: - Welsh River Name: - Alternative Name: -	River Type: Secondary River Main River Status: Currently Undefined
3	48	SW	River Name: - Welsh River Name: - Alternative Name: -	River Type: Secondary River Main River Status: Currently Undefined
4	63	S	River Name: - Welsh River Name: - Alternative Name: -	River Type: Secondary River Main River Status: Currently Undefined
5	103	N	River Name: - Welsh River Name: - Alternative Name: -	River Type: Secondary River Main River Status: Currently Undefined
6	116	S	River Name: - Welsh River Name: - Alternative Name: -	River Type: Secondary River Main River Status: Currently Undefined
7	216	W	River Name: Drain Welsh River Name: - Alternative Name: -	River Type: Secondary River Main River Status: Currently Undefined

ID	Distance (m)	Direction	Details	
8	216	W	River Name: - Welsh River Name: - Alternative Name: -	River Type: Secondary River Main River Status: Currently Undefined
9	235	NW	River Name: - Welsh River Name: - Alternative Name: -	River Type: Secondary River Main River Status: Currently Undefined
10	246	SE	River Name: Foudry Brook Welsh River Name: - Alternative Name: -	River Type: Primary River Main River Status: Currently Undefined
11	268	SE	River Name: Foudry Brook Welsh River Name: - Alternative Name: -	River Type: Primary River Main River Status: Currently Undefined
12	320	S	River Name: Drain Welsh River Name: - Alternative Name: -	River Type: Tertiary River Main River Status: Currently Undefined
13	353	S	River Name: Foudry Brook Welsh River Name: - Alternative Name: -	River Type: Primary River Main River Status: Currently Undefined
14	477	SE	River Name: - Welsh River Name: - Alternative Name: -	River Type: Secondary River Main River Status: Currently Undefined
15	488	NW	River Name: - Welsh River Name: - Alternative Name: -	River Type: Secondary River Main River Status: Currently Undefined
16	493	N	River Name: - Welsh River Name: - Alternative Name: -	River Type: Secondary River Main River Status: Currently Undefined

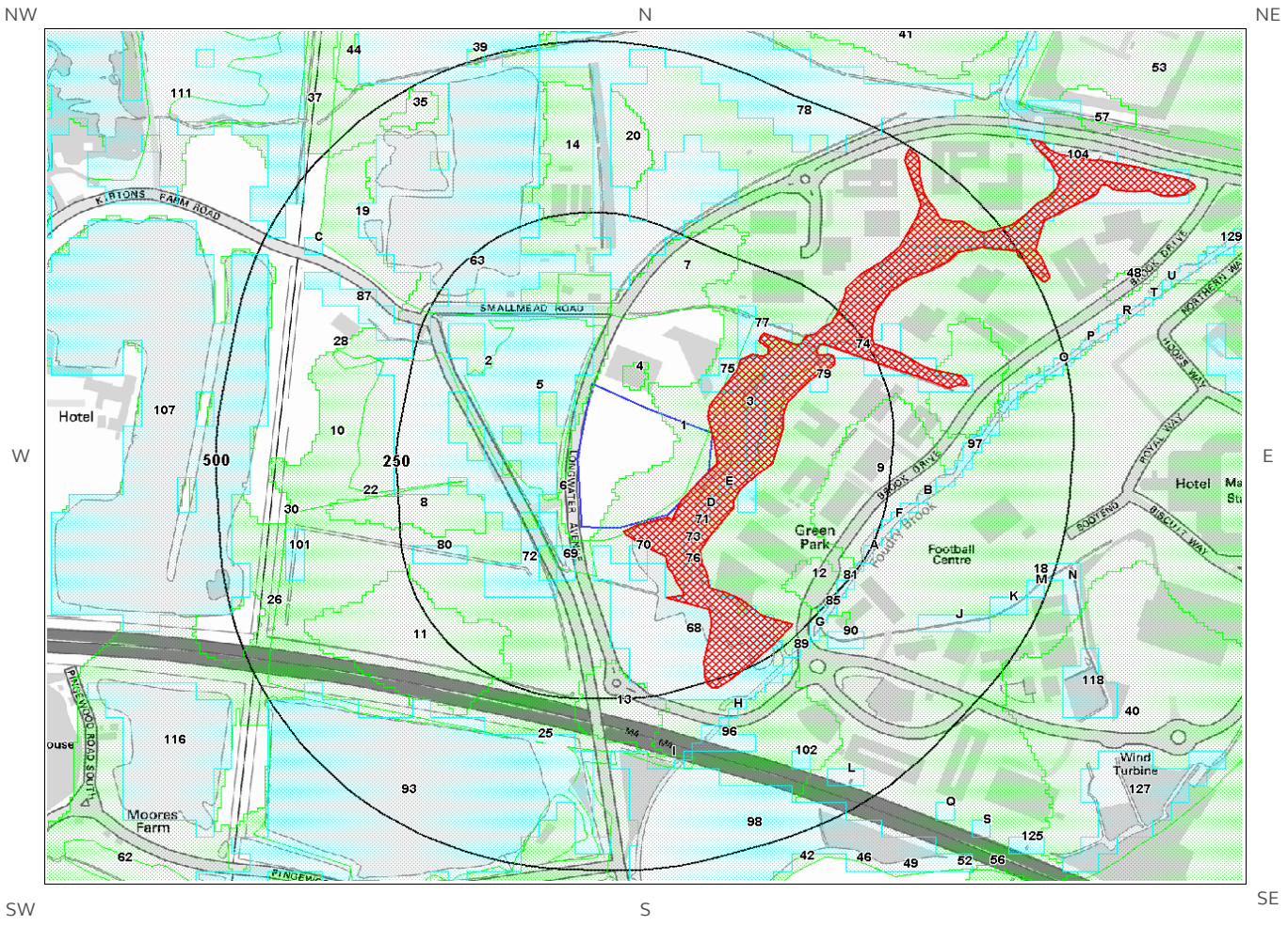
6.11 Surface Water Features

Are there any surface water features within 250m of the study site? Yes

The following surface water records are not represented on mapping:

Distance (m)	Direction
1	SE
22	W
30	W
48	SW
67	W
70	W
95	SW
113	NE
126	N
153	NE
176	NE
191	NW
199	N
223	W
237	SE
245	NE

7a. Environment Agency Flood Map for Planning (from rivers and the sea)



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Site Outline

100
250
Search Buffers (m)

Zone 2 Floodplain

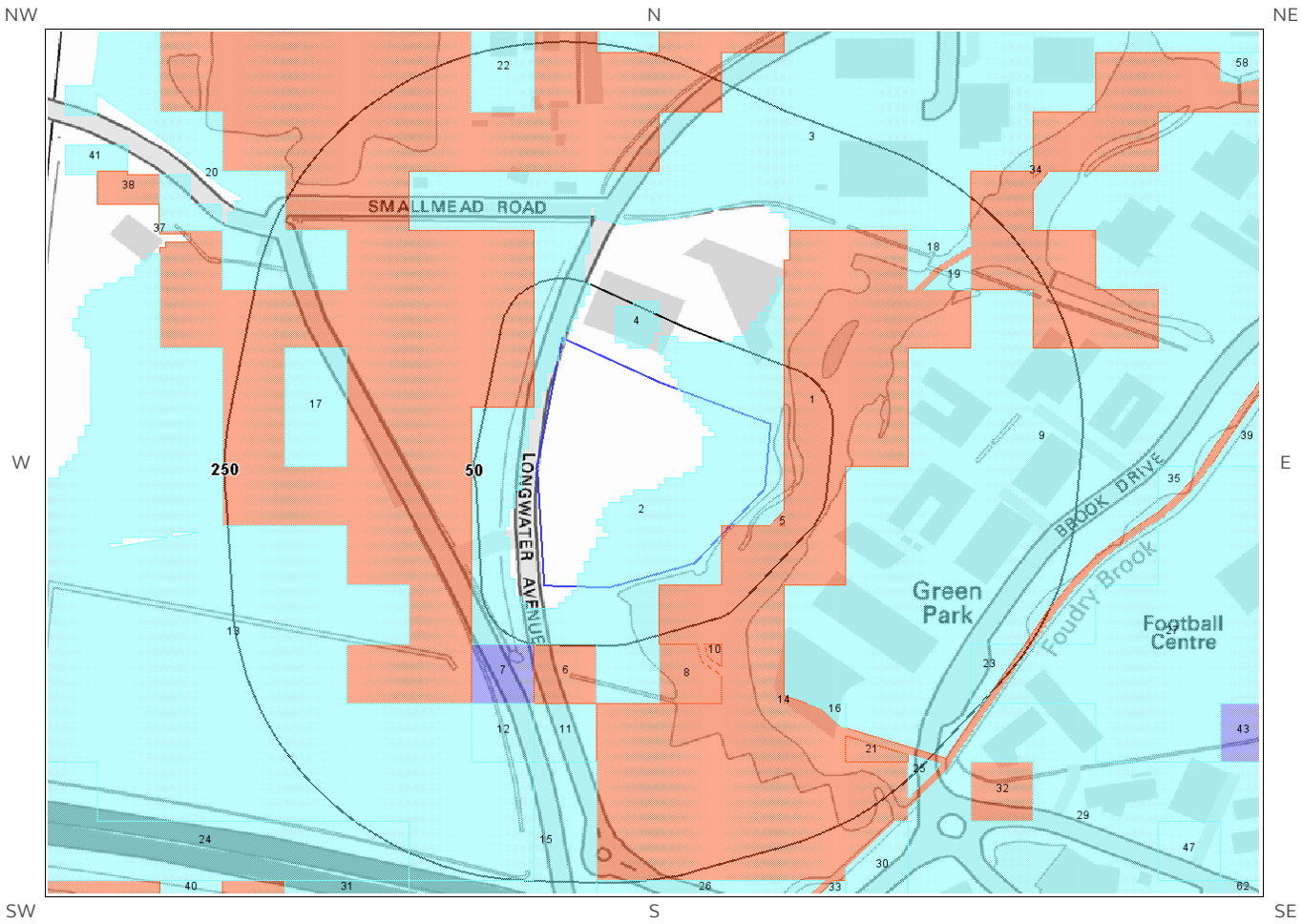
Zone 3 Floodplain

Flood Defences

Area used for Flood Storage

Area Benefiting from Flood Defences

7b. Environment Agency Risk of Flooding from Rivers and the Sea (RoFRaS) Map



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Site Outline

100
250
Search Buffers (m)

RoFRaS Rating

- Very Low
- Low
- Medium
- High

7 Flooding

7.1 River and Coastal Zone 2 Flooding

Is the site within 250m of an Environment Agency Zone 2 floodplain? Yes

Environment Agency Zone 2 floodplains estimate the annual probability of flooding as between 1 in 1000 (0.1%) and 1 in 100 (1%) from rivers and between 1 in 1000 (0.1%) and 1 in 200 (0.5%) from the sea. Any relevant data is represented on Map 7a – Flood Map for Planning:

ID	Distance (m)	Direction	Update	Type
1	0	On Site	08-Feb-2016	Zone 2 - (Fluvial /Tidal Models)
2	0	On Site	08-Feb-2016	Zone 2 - (Fluvial /Tidal Models)
3	0	On Site	08-Feb-2016	Zone 2 - (Fluvial /Tidal Models)
4	14	NE	08-Feb-2016	Zone 2 - (Fluvial /Tidal Models)
5	17	W	08-Feb-2016	Zone 2 - (Fluvial /Tidal Models)
6	28	W	08-Feb-2016	Zone 2 - (Fluvial /Tidal Models)
7	104	N	08-Feb-2016	Zone 2 - (Fluvial /Tidal Models)
8	132	W	08-Feb-2016	Zone 2 - (Fluvial /Tidal Models)
9	147	E	08-Feb-2016	Zone 2 - (Fluvial /Tidal Models)
10	158	W	08-Feb-2016	Zone 2 - (Fluvial /Tidal Models)
11	177	SW	08-Feb-2016	Zone 2 - (Fluvial /Tidal Models)
12	180	SE	08-Feb-2016	Zone 2 - (Fluvial /Tidal Models)
13	193	S	08-Feb-2016	Zone 2 - (Fluvial /Tidal Models)
14	232	N	08-Feb-2016	Zone 2 - (Fluvial /Tidal Models)
15A	240	SE	08-Feb-2016	Zone 2 - (Fluvial /Tidal Models)
16F	242	E	08-Feb-2016	Zone 2 - (Fluvial /Tidal Models)
17A	242	SE	08-Feb-2016	Zone 2 - (Fluvial /Tidal Models)
18	249	SE	08-Feb-2016	Zone 2 - (Fluvial /Tidal Models)

7.2 River and Coastal Zone 3 Flooding

Is the site within 250m of an Environment Agency Zone 3 floodplain? Yes

Zone 3 shows the extent of a river flood with a 1 in 100 (1%) or greater chance of occurring in any year or a sea flood with a 1 in 200 (0.5%) or greater chance of occurring in any year. Any relevant data is represented on Map 7a – Flood Map for Planning.

ID	Distance (m)	Direction	Update	Type
1	12	W	12-Feb-2016	Zone 3 - (Fluvial Models)
2	23	SE	12-Feb-2016	Zone 3 - (Fluvial Models)
3	24	SE	12-Feb-2016	Zone 3 - (Fluvial Models)
4	25	SE	12-Feb-2016	Zone 3 - (Fluvial Models)
5	26	E	12-Feb-2016	Zone 3 - (Fluvial Models)
6	26	S	12-Feb-2016	Zone 3 - (Fluvial Models)
7	28	S	12-Feb-2016	Zone 3 - (Fluvial Models)
8	29	S	12-Feb-2016	Zone 3 - (Fluvial Models)
9	30	SE	12-Feb-2016	Zone 3 - (Fluvial Models)
10	33	W	12-Feb-2016	Zone 3 - (Fluvial Models)
11	39	SE	12-Feb-2016	Zone 3 - (Fluvial Models)
12	47	E	12-Feb-2016	Zone 3 - (Fluvial Models)
13	51	N	12-Feb-2016	Zone 3 - (Fluvial Models)
14	74	S	12-Feb-2016	Zone 3 - (Fluvial Models)
15A	116	N	12-Feb-2016	Zone 3 - (Fluvial Models)
16F	140	N	12-Feb-2016	Zone 3 - (Fluvial Models)
17A	147	NE	12-Feb-2016	Zone 3 - (Fluvial Models)
18	161	W	12-Feb-2016	Zone 3 - (Fluvial Models)
	238	SE	12-Feb-2016	Zone 3 - (Fluvial Models)
	240	SE	12-Feb-2016	Zone 3 - (Fluvial Models)
	242	E	12-Feb-2016	Zone 3 - (Fluvial Models)
	242	SE	12-Feb-2016	Zone 3 - (Fluvial Models)

7.3 Risk of Flooding from Rivers and the Sea (RoFRaS) Flood Rating

What is the highest risk of flooding onsite? High

The Environment Agency RoFRaS database provides an indication of river and coastal flood risk at a national level on a 50m grid with the flood rating at the centre of the grid calculated and given above. The data considers the probability that the flood defences will overtop or breach by considering their location, type, condition and standard of protection.

RoFRaS data for the study site indicates the property is in an area with a High (1 in 30 or greater) chance of flooding in any given year.

Any relevant data within 250m is represented on the RoFRaS Flood map. Data to 50m is reported in the table below.

ID	Distance (m)	Direction	RoFRas flood Risk
1	0.0	On Site	High
2	0.0	On Site	Low
3	0.0	On Site	Low
4	14.0	NE	Low
5	29.0	SE	High
6	48.0	S	High
7	50.0	S	Medium

7.4 Flood Defences

Are there any Flood Defences within 250m of the study site? No

Database searched and no data found.

7.5 Areas benefiting from Flood Defences

Are there any areas benefiting from Flood Defences within 250m of the study site? No

7.6 Areas benefiting from Flood Storage

Are there any areas used for Flood Storage within 250m of the study site? Yes

7.7 Groundwater Flooding Susceptibility Areas

7.7.1 Are there any British Geological Survey groundwater flooding susceptibility areas within 50m of the boundary of the study site? Yes

Does this relate to Clearwater Flooding or Superficial Deposits Flooding? Superficial Deposits Flooding

Notes: Groundwater flooding may either be associated with shallow unconsolidated sedimentary aquifers which overlie unproductive aquifers (Superficial Deposits Flooding), or with unconfined aquifers (Clearwater Flooding).

7.7.2 What is the highest susceptibility to groundwater flooding in the search area based on the underlying geological conditions?

Potential at Surface

Where potential for groundwater flooding to occur at surface is indicated, this means that given the geological conditions in the area groundwater flooding hazard should be considered in all land-use planning decisions. It is recommended that other relevant information e.g. records of previous incidence of groundwater flooding, rainfall, property type, and land drainage information be investigated in order to establish relative, but not absolute, risk of groundwater flooding.

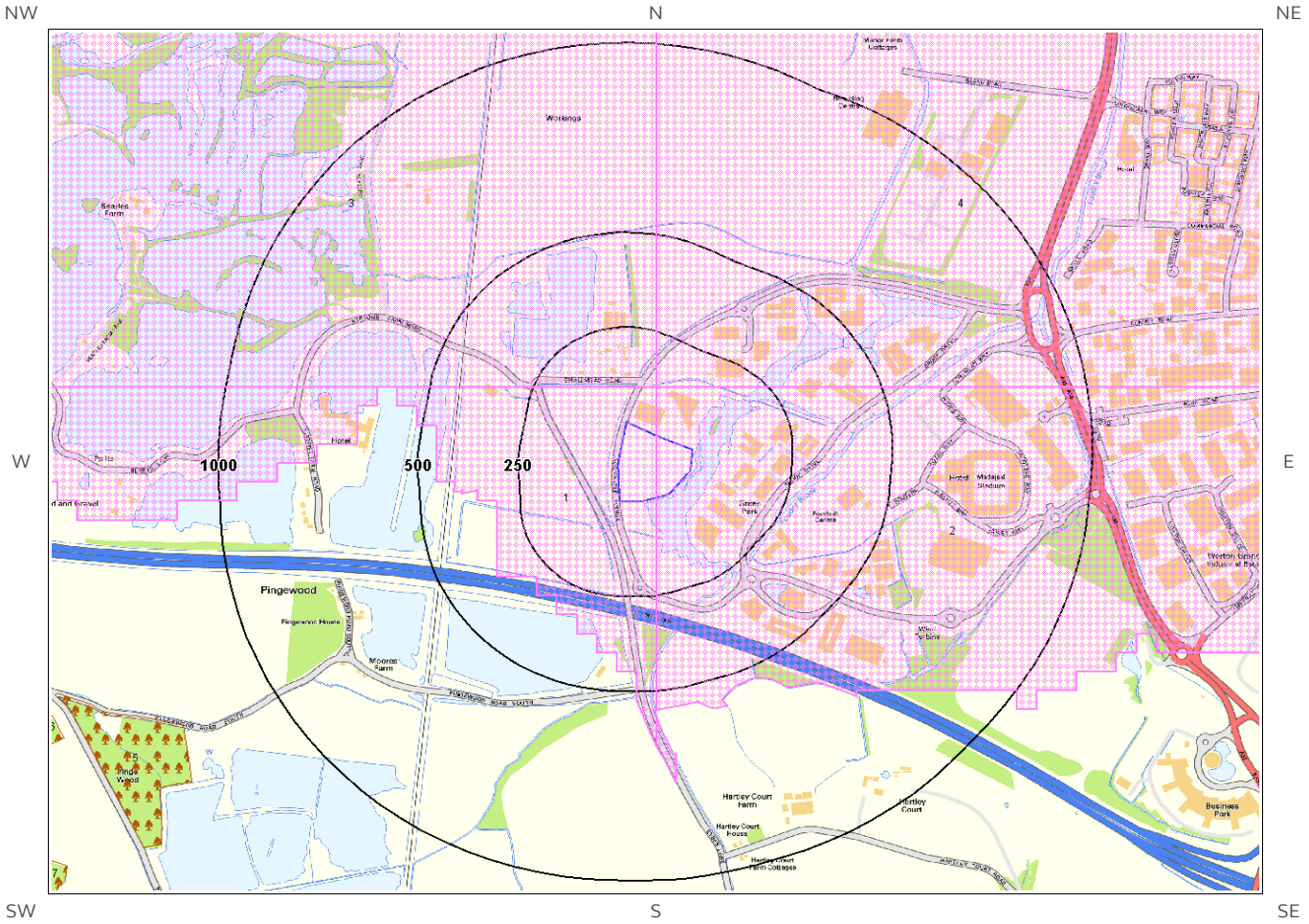
7.8 Groundwater Flooding Confidence Areas

What is the British Geological Survey confidence rating in this result? Moderate

Notes: Groundwater flooding is defined as the emergence of groundwater at the ground surface or the rising of groundwater into man-made ground under conditions where the normal range of groundwater levels is exceeded.

The confidence rating is on a threefold scale - Low, Moderate and High. This provides a relative indication of the BGS confidence in the accuracy of the susceptibility result for groundwater flooding. This is based on the amount and precision of the information used in the assessment. In areas with a relatively lower level of confidence the susceptibility result should be treated with more caution. In other areas with higher levels of confidence the susceptibility result can be used with more confidence.

8. Designated Environmentally Sensitive Sites Map



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8. Designated Environmentally Sensitive Sites

Presence of Designated Environmentally Sensitive Sites within 2000m of the study site?	Yes

8.1 Records of Sites of Special Scientific Interest (SSSI) within 2000m of the study site:

0

Database searched and no data found.

8.2 Records of National Nature Reserves (NNR) within 2000m of the study site:

0

Database searched and no data found.

8.3 Records of Special Areas of Conservation (SAC) within 2000m of the study site:

0

Database searched and no data found.

8.4 Records of Special Protection Areas (SPA) within 2000m of the study site:

0

Database searched and no data found.

8.5 Records of Ramsar sites within 2000m of the study site:

0

Database searched and no data found.

8.6 Records of Ancient Woodland within 2000m of the study site:

3

The following records of Designated Ancient Woodland provided by Natural England/Natural Resources Wales are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	Ancient Woodland Name	Data Source
5	1242	SW	UNKNOWN	Ancient and Semi-Natural Woodland
6	1525	SW	UNKNOWN	Ancient and Semi-Natural Woodland
7	1684	SW	UNKNOWN	Ancient and Semi-Natural Woodland

8.7 Records of Local Nature Reserves (LNR) within 2000m of the study site:

0

Database searched and no data found.

8.8 Records of World Heritage Sites within 2000m of the study site:

0

Database searched and no data found.

8.9 Records of Environmentally Sensitive Areas within 2000m of the study site:

0

Database searched and no data found.

8.10 Records of Areas of Outstanding Natural Beauty (AONB) within 2000m of the study site:

0

Database searched and no data found.

8.11 Records of National Parks (NP) within 2000m of the study site:

0

Database searched and no data found.

8.12 Records of Nitrate Sensitive Areas within 2000m of the study site:

0

Database searched and no data found.

8.13 Records of Nitrate Vulnerable Zones within 2000m of the study site:

4

The following Nitrate Vulnerable Zone records produced by DEFRA are represented as polygons on the Designated Environmentally Sensitive Sites Map:

ID	Distance (m)	Direction	NVZ Name	Data Source
1	0	On Site	Existing	DEFRA
2	0	On Site	Existing	DEFRA
3	91	N	Existing	DEFRA
4	115	NE	Existing	DEFRA

8.14 Records of Green Belt land within 2000m of the study site:

0

Database searched and no data found.

9. Natural Hazards Findings

9.1 Detailed BGS GeoSure Data

BGS GeoSure Data has been searched to 50m. The data is included in tabular format. If you require further information on geology and ground stability, please obtain a Groundsure GeoInsight, available from our website. The following information has been found:

9.1.1 Shrink Swell

What is the maximum Shrink-Swell* hazard rating identified on the study site? Moderate

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Ground conditions predominantly high plasticity. Do not plant or remove trees or shrubs near to buildings without expert advice about their effect and management. For new build, consideration should be given to advice published by the National House Building Council (NHBC) and the Building Research Establishment (BRE). There is a probable increase in construction cost to reduce potential shrink-swell problems. For existing property, there is a probable increase in insurance risk during droughts or where vegetation with high moisture demands is present.

9.1.2 Landslides

What is the maximum Landslide* hazard rating identified on the study site? Very Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Slope instability problems are unlikely to be present. No special actions required to avoid problems due to landslides. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with landslides.

9.1.3 Soluble Rocks

What is the maximum Soluble Rocks* hazard rating identified on the study site? Negligible

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Soluble rocks are present, but unlikely to cause problems except under exceptional conditions. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with soluble rocks.

* This indicates an automatically generated 50m buffer and site.

9.1.4 Compressible Ground

What is the maximum Compressible Ground* hazard rating identified on the study site? Negligible

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
No indicators for compressible deposits identified. No special actions required to avoid problems due to compressible deposits. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with compressible deposits.

9.1.5 Collapsible Rocks

What is the maximum Collapsible Rocks* hazard rating identified on the study site? Very Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Deposits with potential to collapse when loaded and saturated are unlikely to be present. No special ground investigation required or increased construction costs or increased financial risk due to potential problems with collapsible deposits.

9.1.6 Running Sand

What is the maximum Running Sand*[*] hazard rating identified on the study site? Very Low

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Very low potential for running sand problems if water table rises or if sandy strata are exposed to water. No special actions required, to avoid problems due to running sand. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with running sand.

9.2 Radon

9.2.1 Radon Affected Areas

Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level? The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.

* This indicates an automatically generated 50m buffer and site.

9.2.2 Radon Protection

Is the property in an area where Radon Protection are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment?	No radon protective measures are necessary.

10. Mining

10.1 Coal Mining

Are there any coal mining areas within 75m of the study site? No

Database searched and no data found.

10.2 Non-Coal Mining

Are there any Non-Coal Mining areas within 50m of the study site boundary? Yes

The following non-coal mining information is provided by the BGS:

Distance (m)	Direction	Name	Commodity	Assessment of likelihood
0.0	On Site	Not available	Chalk	Rare and localised small scale mining may have occurred.
0.0	On Site	Not available	Chalk	Rare and localised small scale mining may have occurred.

Past underground mine workings may occur. The rock types present in these areas are such that small mineral veins may be present on which it is possible that small scale mining has been undertaken and/or it is possible that limited underground extraction of other materials may have occurred. All such occurrences are likely to be of minor localised extent and infrequent. It should be noted, however, that there is always the possibility of the existence of other sub-surface excavations, such as wells, cess pits, follies, air raid shelters/bunkers and other military structures etc. that could affect surface ground stability but which are outside the scope of this dataset. However, if in a coalfield area you should still consider a Coal Authority mining search for the area of interest.

10.3 Brine Affected Areas

Are there any brine affected areas within 75m of the study site? No
Guidance: No Guidance Required.

Contact Details

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sales@emapsite.com

British Geological Survey Enquiries
Kingsley Dunham Centre
Keyworth, Nottingham NG12 5GG
Tel: 0115 936 3143.
Fax: 0115 936 3276.
Email:
Web:**www.bgs.ac.uk**
BGS Geological Hazards Reports and general geological enquiries:
enquiries@bgs.ac.uk

Environment Agency
National Customer Contact Centre, PO Box 544
Rotherham, S60 1BY
Tel: 08708 506 506
Web:**www.environment-agency.gov.uk**
Email:**enquiries@environment-agency.gov.uk**

Public Health England
Public information access office
Public Health England, Wellington House
133-155 Waterloo Road, London, SE1 8UG
www.gov.uk/phe
Email:**enquiries@phe.gov.uk**
Main switchboard**: 020 7654 8000**

The Coal Authority
200 Lichfield Lane
Mansfield
Notts NG18 4RG
Tel: 0345 7626 848
DX 716176 Mansfield 5
www.coal.gov.uk

Ordnance Survey
Adanac Drive, Southampton
SO16 0AS
Tel: 08456 050505

Local Authority
Authority: Reading Borough Council
Phone: 0118 937 3787
Web: http://beta.reading.gov.uk/
Address: Civic Offices, Bridge Street, Reading, RG1 2LU

Gemapping PLC
Virginia Villas, High Street, Hartley Witney,
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Tel: 01252 845444

Acknowledgements: Site of Special Scientific Interest, National Nature Reserve, Ramsar Site, Special Protection Area, Special Area of Conservation data is provided by, and used with the permission of, Natural England who retain the Copyright and Intellectual Property Rights for the data.
PointX © Database Right/Copyright, Thomson Directories Limited © Copyright Link Interchange Network Limited © Database Right/Copyright and Ordnance Survey © Crown Copyright and/or Database Right. All Rights Reserved. Licence Number [03421028].
This report has been prepared in accordance with the Groundsure Ltd standard Terms and Conditions of business for work of this nature.

Standard Terms and Conditions

1 Definitions

I**n these terms and conditions unless the context otherwise requires:**

"Beneficiary" means the person or entity for whose benefit the Client has obtained the Services.

"Client" means the party or parties entering into a Contract with Groundsure.

"Commercial" means any building or property which is not Residential.

"Confidential Information" means the contents of this Contract and all information received from the Client as a result of, or in connection with, this Contract other than

(i) information which the Client can prove was rightfully in its possession prior to disclosure by Groundsure and

(ii) any information which is in the public domain (other than by virtue of a breach of this Contract).

"Support Services" means Support Services provided by Groundsure including, without limitation, interpreting third party and in-house environmental data, providing environmental support advice, undertaking environmental audits and assessments, Site investigation, Site monitoring and related items.

"Contract" means the contract between Groundsure and the Client for the provision of the Services, and which shall incorporate these terms and conditions, the Order, and the relevant User Guide.

"Third Party Data Provider" means any third party providing Third Party Content to Groundsure.

"Data Reports" means reports comprising factual data with no accompanying interpretation.

"Fees" has the meaning set out in clause 5.1.

"Groundsure" means Groundsure Limited, a company registered in England and Wales under number 03421028.

"Groundsure Materials" means all materials prepared by Groundsure and provided as part of the Services, including but not limited to Third Party Content, Data Reports, Mapping, and Risk Screening Reports.

"Intellectual Property" means any patent, copyright, design rights, trade or service mark, moral rights, data protection rights, know-how or trade mark in each case whether registered or not and including applications for the same or any other rights of a similar nature anywhere in the world.

"Mapping" means a map, map data or a combination of historical maps of various ages, time periods and scales.

"Order" means an electronic, written or other order form submitted by the Client requesting Services from Groundsure in respect of a specified Site.

"Ordnance Survey" means the Secretary of State for Business, Innovation and Skills, acting through Ordnance Survey, Adanac Drive, Southampton, SO16 0AS, UK.

"Order Website" means the online platform through which Orders may be placed by the Client and accepted by Groundsure.

"Report" means a Risk Screening Report or Data Report for Commercial or Residential property.

"Residential" means any building or property used as or intended to be used as a single dwelling.

"Risk Screening Report" means a risk screening report comprising factual data with an accompanying interpretation by Groundsure.

"Services" means any Report, Mapping and/or Support Services which Groundsure has agreed to provide by accepting an Order pursuant to clause 2.6.

"Site" means the area of land in respect of which the Client has requested Groundsure to provide the Services.

"Third Party Content" means data, database information or other information which is provided to Groundsure by a Third Party Data Provider.

"User Guide" means the user guide, as amended from time to time, available upon request from Groundsure and on the website (www.Groundsure.com) and forming part of this Contract.

2 Scope of Services, terms and conditions, requests for insurance and quotations

2.1 Groundsure agrees to provide the Services in accordance with the Contract.

2.2 Groundsure shall exercise reasonable skill and care in the provision of the Services.

2.3 Subject to clause 7.3 the Client acknowledges that it has not relied on any statement or representation made by or on behalf of Groundsure which is not set out and expressly agreed in writing in the Contract and all such statements and representations are hereby excluded to the fullest extent permitted by law.

2.4 The Client acknowledges that terms and conditions appearing on a Client's order form, printed stationery or other communication, or any terms or conditions implied by custom, practice or course of dealing shall be of no effect, and that this Contract shall prevail over all others in relation to the Order.

2.5 If the Client or Beneficiary requests insurance in conjunction with or as a result of the Services, Groundsure shall use reasonable endeavours to recommend such insurance, but makes no warranty that such insurance shall be available from insurers or that it will be offered on reasonable terms. Any insurance purchased by the Client or Beneficiary shall be subject solely to the terms of the policy issued by insurers and Groundsure will have no liability therefor. In addition you acknowledge and agree that Groundsure does not act as an agent or broker for any insurance providers. The Client should take (and ensure that the Beneficiary takes) independent advice to ensure that the insurance policy requested or offered is suitable for its requirements.

2.6 Groundsure's quotations or proposals are valid for a period of 30 days only unless an alternative period of time is explicitly stipulated by Groundsure. Groundsure reserves the right to withdraw any quotation or proposal at any time before an Order is accepted by Groundsure. Groundsure's acceptance of an Order shall be binding only when made in writing and signed by Groundsure's authorised representative or when accepted through the Order Website.

3 The Client's obligations

3.1The Client shall comply with the terms of this Contract and

(i) procure that the Beneficiary or any third party relying on the Services complies with and acts as if it is bound by the Contract and

(ii) be liable to Groundsure for the acts and omissions of the Beneficiary or any third party relying on the Services as if such acts and omissions were those of the Client.

3.2 The Client shall be solely responsible for ensuring that the Services are appropriate and suitable for its and/or the Beneficiary's needs.

3.3 The Client shall supply to Groundsure as soon as practicable and without charge all requisite information (and the Client warrants that such information is accurate, complete and appropriate), including without limitation any environmental information relating to the Site and shall give such assistance as Groundsure shall reasonably require in the provision of the Services including, without limitation, access to the Site, facilities and equipment.

3.4 Where the Client's approval or decision is required to enable Groundsure to carry out work in order to provide the Services, such approval or decision shall be given or procured in reasonable time and so as not to delay or disrupt the performance of the Services.

3.5 Save as expressly permitted by this Contract the Client shall not, and shall procure that the Beneficiary shall not, re-sell, alter, add to, or amend the Groundsure Materials, or use the Groundsure Materials in a manner for which they were not intended. The Client may make the Groundsure Materials available to a third party who is considering acquiring some or all of, or providing funding in relation to, the Site, but such third party cannot rely on the same unless expressly permitted under clause 4.

3.6 The Client is responsible for maintaining the confidentiality of its user name and password if using the Order Website and the Client acknowledges that Groundsure accepts no liability of any kind for any loss or damage suffered by the Client as a consequence of using the Order Website.

4 Reliance

4.1The Client acknowledges that the Services provided by Groundsure consist of the presentation and analysis of Third Party Content and other content and that information obtained from a Third Party Data Provider cannot be guaranteed or warranted by Groundsure to be reliable.

4.2 In respect of Data Reports, Mapping and Risk Screening Reports, the following classes of person and no other are entitled to rely on their contents;

(i) the Beneficiary,

(ii) the Beneficiary's professional advisers, (iii) any person providing funding to the Beneficiary in relation to the Site (whether directly or as part of a lending syndicate),

(iv) the first purchaser or first tenant of the Site, and

(v) the professional advisers and lenders of the first purchaser or tenant of the Site.

4.3 In respect of Support Services, only the Client, Beneficiary and parties expressly named in a Report and no other parties are entitled to rely on its contents.

4.4 Save as set out in clauses 4.2 and 4.3 and unless otherwise expressly agreed in writing, no other person or entity of any kind is entitled to rely on any Services or Report issued or provided by Groundsure. Any party considering such Reports and Services does so at their own risk.

5 Fees and Disbursements

5.1Groundsure shall charge and the Client shall pay fees at the rate and

frequency specified in the written proposal, Order Website or Order acknowledgement form, plus (in the case of Support Services) all proper disbursements incurred by Groundsure. The Client shall in addition pay all value added tax or other tax payable on such fees and disbursements in relation to the provision of the Services (together "Fees").

5.2 The Client shall pay all outstanding Fees to Groundsure in full without deduction, counterclaim or set off within 30 days of the date of Groundsure's invoice or such other period as may be agreed in writing between Groundsure and the Client ("Payment Date"). Interest on late payments will accrue on a daily basis from the Payment Date until the date of payment (whether before or after judgment) at the rate of 8% per annum.

5.3 The Client shall be deemed to have agreed the amount of any invoice unless an objection is made in writing within 28 days of the date of the invoice. As soon as reasonably practicable after being notified of an objection, without prejudice to clause 5.2 a member of Groundsure's management team will contact the Client and the parties shall then use all reasonable endeavours to resolve the dispute within 15 days.

6 Intellectual Property and Confidentiality

6.1 Subject to

(i) full payment of all relevant Fees and

(ii) compliance with this Contract, the Client is granted (and is permitted to sub-licence to the Beneficiary) a royalty-free, worldwide, non-assignable and (save to the extent set out in this Contract) non-transferable licence to make use of the Groundsure Materials.

6.2 All Intellectual Property in the Groundsure Materials are and shall remain owned by Groundsure or Groundsure's licensors (including without limitation the Third Party Data Providers) the Client acknowledges, and shall procure acknowledgement by the Beneficiary of, such ownership. Nothing in this Contract purports to transfer or assign any rights to the Client or the Beneficiary in respect of such Intellectual Property.

6.3 Third Party Data Providers may enforce any breach of clauses 6.1 and 6.2 against the Client or Beneficiary.

6.4 The Client shall, and shall procure that any recipients of the Groundsure Materials shall:

(i) not remove, suppress or modify any trade mark, copyright or other proprietary marking belonging to Groundsure or any third party from the Services;

(ii) use the information obtained as part of the Services in respect of the subject Site only, and shall not store or reuse any information obtained as part of the Services provided in respect of adjacent or nearby sites;

(iii) not create any product or report which is derived directly or indirectly from the Services (save that those acting in a professional capacity to the Beneficiary may provide advice based upon the Services);

(iv) not combine the Services with or incorporate such Services into any other information data or service;

(v) not reformat or otherwise change (whether by modification, addition or enhancement), the Services (save that those acting for the Beneficiary in a professional capacity shall not be in breach of this clause 6.4(v) where such reformatting is in the normal course of providing advice based upon the Services);

(vi) where a Report and/or Mapping contains material belonging to Ordnance Survey, acknowledge and agree that such content is protected by Crown Copyright and shall not use such content for any purpose outside of receiving the Services; and

(vii) not copy in whole or in part by any means any map prints or run-on copies containing content belonging to Ordnance Survey (other than that contained within Ordnance Survey's OS Street Map) without first being in possession of a valid Paper Map Copying Licence from Ordnance Survey,

6.5 Notwithstanding clause 6.4, the Client may make reasonable use of the Groundsure Materials in order to advise the Beneficiary in a professional capacity. However, Groundsure shall have no liability in respect of any advice, opinion or report given or provided to Beneficiaries by the Client.

6.6 The Client shall procure that any person to whom the Services are made available shall notify Groundsure of any request or requirement to disclose, publish or disseminate any information contained in the Services in accordance with the Freedom of Information Act 2000, the Environmental Information Regulations 2004 or any associated legislation or regulations in force from time to time.

7.Liability: Particular Attention Should Be Paid To This Clause

7.1 This Clause 7 sets out the entire liability of Groundsure, including any liability for the acts or omissions of its employees, agents, consultants, subcontractors and Third Party Content, in respect of:

(i) any breach of contract, including any deliberate breach of the Contract by Groundsure or its employees, agents or subcontractors;

(ii) any use made of the Reports, Services, Materials or any part of them; and

(iii) any representation, statement or tortious act or omission (including negligence) arising under or in connection with the Contract.

7.2 All warranties, conditions and other terms implied by statute or common law are, to the fullest extent permitted by law, excluded from the Contract.

7.3 Nothing in the Contract limits or excludes the liability of the Supplier for death or personal injury resulting from negligence, or for any damage or liability incurred by the Client or Beneficiary as a result of fraud or fraudulent misrepresentation.

7.4 Groundsure shall not be liable for

(i) loss of profits;

(ii) loss of business;

(iii) depletion of goodwill and/or similar losses;

(iv) loss of anticipated savings;

(v) loss of goods;

(vi) loss of contract;

(vii) loss of use;

(viii) loss or corruption of data or information;

(ix) business interruption;

(x) any kind of special, indirect, consequential or pure economic loss, costs, damages, charges or expenses;

(xi) loss or damage that arise as a result of the use of all or part of the Groundsure Materials in breach of the Contract;

(xii) loss or damage arising as a result of any error, omission or inaccuracy in any part of the Groundsure Materials where such error, omission or inaccuracy is caused by any Third Party Content or any reasonable interpretation of Third Party Content;

(xiii) loss or damage to a computer, software, modem, telephone or other property; and

(xiv) loss or damage caused by a delay or loss of use of Groundsure's internet ordering service.

7.5 Groundsure's total liability in relation to or under the Contract shall be limited to £10 million for any claim or claims.

7.6 Groundsure shall procure that the Beneficiary shall be bound by limitations and exclusions of liability in favour of Groundsure which accord with those detailed in clauses 7.4 and 7.5 (subject to clause 7.3) in respect of all claims which the Beneficiary may bring against Groundsure in relation to the Services or other matters arising pursuant to the Contract.

8 Groundsure's right to suspend or terminate

8.1 If Groundsure reasonably believes that the Client or Beneficiary has not provided the information or assistance required to enable the proper provision of the Services, Groundsure shall be entitled to suspend all further performance of the Services until such time as any such deficiency has been made good.

8.2 Groundsure shall be entitled to terminate the Contract immediately on written notice in the event that:

(i) the Client fails to pay any sum due to Groundsure within 30 days of the Payment Date; or

(ii) the Client (being an individual) has a bankruptcy order made against him or (being a company) shall enter into liquidation whether compulsory or voluntary or have an administration order made against it or if a receiver shall be appointed over the whole or any part of its property assets or undertaking or if the Client is struck off the Register of Companies or dissolved; or

(iii) the Client being a company is unable to pay its debts within the meaning of Section 123 of the Insolvency Act 1986 or being an individual appears unable to pay his debts within the meaning of Section 268 of the Insolvency Act 1986 or if the Client shall enter into a composition or arrangement with the Client's creditors or shall suffer distress or execution to be levied on his goods; or

(iv) the Client or the Beneficiary breaches any term of the Contract (including, but not limited to, the obligations in clause 4) which is incapable of remedy or if remediable, is not remedied within five days of notice of the breach.

9. Client's Right to Terminate and Suspend

9.1 Subject to clause 10.1, the Client may at any time upon written notice terminate or suspend the provision of all or any of the Services.

9.2 In any event, where the Client is a consumer (and not a business) he/she hereby expressly acknowledges and agrees that:

(i) the supply of Services under this Contract (and therefore the performance of this Contract) commences immediately upon Groundsure's acceptance of the Order; and

(ii) the Reports and/or Mapping provided under this Contract are

(a) supplied to the Client's specification(s) and in any event

(b) by their nature cannot be returned.

10 Consequences of Withdrawal, Termination or Suspension

10.1 Upon termination of the Contract:

(i) Groundsure shall take steps to bring to an end the Services in an orderly manner, vacate any Site with all reasonable speed and shall deliver to the Client and/or Beneficiary any property of the Client and/or Beneficiary in Groundsure's possession or control; and

(ii) the Client shall pay to Groundsure all and any Fees payable in respect of the performance of the Services up to the date of termination or suspension. In respect of any Support Services provided, the Client shall also pay Groundsure any additional costs incurred in relation to the termination or suspension of the Contract.

11 Anti-Bribery

11.1 The Client warrants that it shall:

(i) comply with all applicable laws, statutes and regulations relating to anti-bribery and anti-corruption including but not limited to the Bribery Act 2010;

(ii) comply with such of Groundsure's anti-bribery and anti-corruption policies as are notified to the Client from time to time; and

(iii) promptly report to Groundsure any request or demand for any undue financial or other advantage of any kind received by or on behalf of the Client in connection with the performance of this Contract.

11.2 Breach of this Clause 11 shall be deemed a material breach of this Contract.

12 General

12.1 The Mapping contained in the Services is protected by Crown copyright and must not be used for any purpose other than as part of the Services or as specifically provided in the Contract.

12.2 The Client shall be permitted to make one copy only of each Report or Mapping Order. Thereafter the Client shall be entitled to make unlimited copies of the Report or Mapping Order only in accordance with an Ordnance Survey paper map copy license available through Groundsure.

12.3 Groundsure reserves the right to amend or vary this Contract. No amendment or variation to this Contract shall be valid unless signed by an authorised representative of Groundsure.

12.4 No failure on the part of Groundsure to exercise, and no delay in exercising, any right, power or provision under this Contract shall operate as a waiver thereof.

12.5 Save as expressly provided in this Contract, no person other than the persons set out therein shall have any right under the Contract (Rights of Third Parties) Act 1999 to enforce any terms of the Contract.

12.6 The Secretary of State for Business, Innovation and Skills ("BIS") or BIS' successor body, as the case may be, acting through Ordnance Survey may enforce a breach of clause 6.4(vi) and clause 6.4(vii) of these terms and conditions against the Client in accordance with the provisions of the Contracts (Rights of Third Parties) Act 1999.

12.7 Groundsure shall not be liable to the Client if the provision of the Services is delayed or prevented by one or more of the following circumstances:

(i) the Client or Beneficiary's failure to provide facilities, access or information;

(ii) fire, storm, flood, tempest or epidemic;

(iii) Acts of God or the public enemy;

(iv) riot, civil commotion or war;

(v) strikes, labour disputes or industrial action;

(vi) acts or regulations of any governmental or other agency;

(vii) suspension or delay of services at public registries by Third Party Data Providers;

(viii) changes in law; or

(ix) any other reason beyond Groundsure's reasonable control.

In the event that Groundsure is prevented from performing the Services (or any part thereof) in accordance with this clause 12.6 for a period of not less than 30 days then Groundsure shall be entitled to terminate this Contract immediately on written notice to the Client.

12.8 Any notice provided shall be in writing and shall be deemed to be properly given if delivered by hand or sent by first class post, facsimile or by email to the address, facsimile number or email address of the relevant party as may have been notified by each party to the other for such purpose or in the absence of such notification the last known address.

12.9 Such notice shall be deemed to have been received on the day of delivery if delivered by hand, facsimile or email (save to the extent such day is not a working day where it shall be deemed to have been delivered on the next working day) and on the second working day after the day of posting if sent by first class post.

12.10 The Contract constitutes the entire agreement between the parties and shall supersede all previous arrangements between the parties relating to the subject matter hereof.

12.11 Each of the provisions of the Contract is severable and distinct from the others and if one or more provisions is or should become invalid, illegal or unenforceable, the validity and enforceability of the remaining provisions shall not in any way be tainted or impaired.

12.12 This Contract shall be governed by and construed in accordance with English law and any proceedings arising out of or connected with this Contract shall be subject to the exclusive jurisdiction of the English courts.

12.13 Groundsure is an executive member of the Council of Property Search Organisation (CoPSO) and has signed up to the Search Code administered by the Property Codes Compliance Board (PCCB). All Risk Screening Reports shall be supplied in accordance with the provisions of the Search Code.

12.14 If the Client or Beneficiary has a complaint about the Services, written notice should be given to the Compliance Officer at Groundsure who will respond in a timely manner. In the event you are not satisfied with Groundsure's complaints handling process or you are unable to resolve the complaint, at your discretion you may refer the complaint to The Property Ombudsman Scheme at the following URL/email: website www.tpos.co.uk or email: admin@tpos.co.uk

12.15 The Client agrees that it shall, and shall procure that each Beneficiary shall, treat in confidence all Confidential Information and shall not, and shall procure that each Beneficiary shall not (i) disclose any Confidential Information to any third party other than in accordance with the terms of this Contract; and (ii) use Confidential Information for a purpose other than the exercise of its rights and obligations under this Contract. Subject to clause 6.6, nothing shall prevent the Client or any Beneficiary from disclosing Confidential Information to the extent required by law. **© Groundsure Limited June 2013**

Appendix C PBA Methodology (2016)

PBA Methodology for Assessing Land Contamination in England

1 Introduction

This document defines the approach adopted by PBA in relation to the assessment of land contamination in England. The aim is for the approach to (i) be systematic and objective, (ii) provide for the assessment of uncertainty and (iii) provide a rational, consistent, transparent framework.

When preparing our methodology we have made reference to various technical guidance documents and legislation referenced in Section 7 of which the principal documents are (i) Contaminated Land Statutory Guidance (Defra 2012), (ii) the Model Procedures for the Management of Contamination (CLR 11) (EA 2004), (iii) Contaminated land risk assessment: A guide to good practice (C552) (CIRIA 2001) and (iv) National Planning Policy Framework (DCLG 2012).

2 Dealing with Land Contamination

Government policy on land contamination aims to prevent new contaminated land from being created and promotes a risk based approach to addressing historical contamination. With regard to historical contamination, regulatory intervention is held in reserve for land that meets the legal definition and cannot be dealt with through any other means, including through planning. Land is only considered to be "contaminated land" in the legal sense if it poses an unacceptable risk.

UK legislation on contaminated land is principally contained in Part 2A of the Environmental Protection Act, 1990 (which was inserted into the 1990 Act by section 57 of the Environment Act 1995). Part 2A was introduced in England on 1 April 2000 and provides a risk-based approach to the identification and remediation of land where contamination poses an unacceptable risk to human health or the environment. In 2004 the Model Procedures for the Management of Contamination (CLR 11) were published providing guidance on how the statutory requirements were to be delivery. The approach, concepts and principles for land contamination management promoted by CLR 11 are applied to the determination of planning applications.

Other legislative regimes may also provide a means of dealing with land contamination issues, such as the regimes for waste, water, environmental permitting, and environmental damage. Further, the law of statutory nuisance may result in contaminants being unacceptable to third parties whilst not attracting action under Part 2A or other environmental legislation.

2.1 Part 2A

The Regulations and Statutory Guidance that accompanied the Act, including the Contaminated Land (England) Regulations 2006, has been revised with the issue of The Contaminated Land (England) (Amendment) Regulations 2012 (SI 2012/263) and the Contaminated Land Statutory Guidance for England 2012.

Part 2A defines contaminated land as "*land which appears to the Local Authority in whose area it is situated to be in such a condition that, by reason of substances in, on or under the land that significant harm is being caused, or there is a significant possibility that such harm could be caused, or pollution of controlled waters is being, or likely to be, caused*".

Harm is defined as "*harm to the health of living organisms or other interference with the ecological systems of which they form part, and in the case of man, includes harm to his property*".

For the purposes of Part 2A, land is contaminated if it poses a significant possibility of significant harm (SPOSH).

Part 2A provides a means of dealing with unacceptable risks posed by land contamination to human health and the environment, and under the guidance enforcing authorities should seek to find and deal with such land. It states that "*under Part 2A the starting point should be that land is not contaminated land unless there is reason to consider otherwise. Only land where unacceptable risks are clearly identified, after a risk assessment has been undertaken in accordance with the Guidance, should be considered as meeting the Part 2A definition of contaminated land*". Further the guidance makes it clear that *"regulatory decisions should be based on what is reasonably likely, not what is hypothetically possible".*

The overarching objectives of the Government's policy on contaminated land and the Part 2A regime are:

"(a) To identify and remove unacceptable risks to human health and the environment.
(a) To seek to ensure that contaminated land is made suitable for its current use.
(b) To ensure that the burdens faced by individuals, companies and society as a whole are proportionate, manageable and compatible with the principles of sustainable development".

The enforcing authority may need to decide whether and how to act in situations where decisions are not straight forward, and where there is uncertainty. "*In so doing, the authority should use its judgement to strike a reasonable balance between: (a) dealing with risks raised by contaminants in land and the benefits of remediating land to remove or reduce those risks; and (b) the potential impacts of regulatory intervention including financial costs to whoever will pay for remediation, health and environmental impacts of taking action, property blight, and burdens on affected people".* The authority is required to "*take a precautionary approach to the risks raised by contamination, whilst avoiding a disproportionate approach given the circumstances of each case".* The aim is "*that the regime produces net benefits, taking account of local circumstances*".

The guidance recognises that *"normal levels of contaminants in soils should not be considered to cause land to qualify as contaminated land, unless there is a particular reason to consider otherwise".*

Normal levels are quoted as:
"a) natural presence of contaminants' such as from underlying geology *'that have not been shown to pose an unacceptable risk to health and the environment*
b) …low level diffuse pollution, and common human activity…"

Similarly the guidance states that significant pollution of controlled waters is required for land to be considered contaminated and the "*fact that substances are merely entering water"* or "*where discharge from land is not discernible at a location immediately downstream"* does not constitute contaminated land.

To help achieve a more targeted approach to identifying and managing contaminated land in relation to the risk (or possibility) of harm to human health, the revised Statutory Guidance presented a new four category system for considering land under Part 2A, ranging from Category 4, where there is no risk that land poses a significant possibility of significant harm (SPOSH), or the level of risk is low, to Category 1, where the risk that land poses a significant possibility of significant harm (SPOSH) is unacceptably high.

For land that cannot be readily placed into Categories 1 or 4 further assessment is required. If there is a sufficiently strong case that the risks are of sufficient concern to cause significant harm/pollution or have the significant possibility of significant harm/pollution the land is to be placed into Category 2. If the concern is not met land is considered Category 3.

The technical guidance clearly states that the currently published SGV and GAC's represent *"cautious estimates of level of contaminants in soils"* which should be considered *"no risk to health or, at most, a minimal risk"*. These values do not represent the boundary between categories 3 and 4 and "*should be considered to be comfortably within Category 4".*

At the end of 2013 technical guidance in support of Defra's revised Statutory Guidance (SG) was published (CL:AIRE 2013) which provided:

- A methodology for deriving C4SLs for four generic land-uses comprising residential, commercial, allotments and public open space; and
- A demonstration of the methodology, via the derivation of C4SLs for six substances – arsenic, benzene, benzo(a)pyrene, cadmium, chromium (VI) and lead.

2.2 Planning

The Local Planning Authority (LPA) is responsible for the control of development, and in doing so it has a duty to take account of all material considerations, including contamination.

Section 11, Paragraph 109 of the National Planning Policy Framework (NPPF) (DCLG 2012) states the planning system should contribute to and enhance the natural and local environment by *"preventing both new and existing developments from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water pollution"* and *"remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate"*. Paragraphs 120 and 121 describe the policy considerations the Government expects LPA to have in regard to land affected by contamination when preparing policies for development plans and in taking decisions on applications.

For planning purposes, the NPPF requires that the assessment of risks arising from contamination and remediation requirements should be considered on the basis of the current environmental setting, the current land use, and the circumstances of its proposed new use The NPPF stipulates that planning policies and decisions should ensure that "the site is suitable for its new use taking account of ground conditions and land instability, including from natural hazards or former activities from previous uses and any proposals for mitigation including land remediation or impacts on the natural environment arising from that remediation"; and that "after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part 2A of the Environmental Protection Act 1990; and adequate site investigation information, prepared by a competent person, is presented."

The level at which contamination is deemed to be unacceptable, or, gives rise to adverse effects under a planning context has not been identified but is envisaged to be more precautionary than the level required to detrmine land as contaminated under Part 2A.

In paragraph 121 the developer is required to ensure that land, after development, is not capable of being determined as contaminated land under Part 2A of the EPA 1990.

The principal planning objective is to ensure that any unacceptable risks to human health, buildings and other property and the natural and historical environment from the contaminated condition of the land are identified so that appropriate action can be considered and taken to address those risks. In order to grant a planning permission the Local Planning Authority (LPA) has to be satisfied that there is sufficient information about the condition of the land, its impacts and the availability of viable remedial options. NPPF Paragraph 21 states that *"planning policies and decisions should also ensure that adequate site investigation information, prepared by a competent person, is presented".* Site investigation information is further defined in the NPPF Glossary page 56 and that also states that investigations should be carried out in accordance with established procedures, including BS10175 (BSI 2011) that in turn links procedure to the requirements of CLR11.

A key distinction between the Soil Guideline Values (SGVs) and the C4SLs is the level of risk that they describe. As described by the Environment Agency (2009a):

"SGVs are guidelines on the level of long-term human exposure to individual chemicals in soil that, unless stated otherwise, are tolerable or pose a minimal risk to human health."

A letter from Lord de Mauley dated 3rd September 2014 provides more explicit direction to local authorities on the use of the C4SL in a planning context. The letter identifies four key points:

1) that the screening values were developed expressly with the planning regime in mind
2) their use is recommended in DCLG's planning guidance
3) soil concentrations below a C4SL limit are considered to be 'definitely not contaminated' under Part llA of the 1990 Environmental Protection Act and pose at most a 'low level of toxicological concern' and
4) exceedance of a C4SL screening value does not mean that land is definitely contaminated, just that further investigation may be warranted.

2.3 Building Control

The building control department of the local authority or private sector approved inspectors are responsible for the operation and enforcement of the Building Regulations (DCLG 2010) to protect the health, safety and welfare of people in and around buildings. Approved Document C requires the protection of buildings and associated land from the effects of contamination, to be applied (non-exclusively) in all changes of use from commercial or industrial premises, to residential property.

3 Approach

CLR 11 recommends a phased or tiered approach to risk assessment with the three tiers being:-

- Tier 1 - preliminary – a qualitative assessment forming part of a Phase 1 report,
- Tier 2 - generic - a quantitative assessment using published criteria to screen site specific ground condition data forming part of a Phase 2 report
- Tier 3 - detailed – a quantitative assessment involving the generation of site specific assessment criteria

Each tier of risk assessment comprises the following four stages:-

1. Hazard Identification – identifying potential contaminant sources on and off site;
2. Hazard Assessment – assessing the potential for unacceptable risks by identifying what pathways and receptors could be present, and what pollutant linkages could result (forming the Conceptual Site Model (CSM));
3. Risk Estimation – estimating the magnitude and probability of the possible consequences (what degree of harm might result to a defined receptor and how likely); and
4. Risk Evaluation – evaluating whether the risk needs to be, and can be, managed.

A PBA Phase 1 report normally comprises a desk study, walkover and Tier 1 risk assessment (the project specific offer defines the actual scope of work). This is the minimum requirement as defined by the NPPF, pp56. At Tier 1 the PBA approach to risk estimation involves identifying the magnitude of the potential consequence (taking into account both the potential severity of the hazard and the sensitivity of the receptor) and the magnitude of the likelihood i.e. the probability (taking into account the presence of the hazard and the receptor and the integrity of the pathway). This approach is promoted in current guidance such as R&D 66 (NHBC 2008).

The PBA approach is that if a pollution linkage is identified then it represents a potential risk which requires further consideration and either (1) remediation / direct risk management or (2) further tiers of assessment.

A PBA preliminary Phase 2 report comprises an intrusive investigation to collect site specific information, a Tier 2 quantitative generic risk assessment and a refinement of the CSM using the site specific data. Depending on the findings further investigation and/or progression to Tier 3 risk assessment and the generation of site specific assessment criteria may be required.

The PBA methodology provides an estimate of the level of risk, it does not identify a risk level at which the risk is considered “significant” and/or “unacceptable” as this is dependant on the view of the individual / stakeholder. For example; to a risk adverse stakeholder even a risk level of “very low” may be considered unacceptable and as such this stakeholder may require risk management options to be implemented.

4 Identification of Pollutant Linkages and Conceptual Site Model (CSM)

For all Tiers the underlying principle to ground condition assessment is the identification of *pollutant linkages* in order to evaluate whether the presence of a source of contamination could potentially lead to harmful consequences. A pollutant linkage consists of the following three elements:-

- A source/hazard – a substance or situation which has the potential to cause harm or pollution;
- A pathway – a means by which the hazard moves along / generates exposure; and
- A receptor/target – an entity which is vulnerable to the potential adverse effects of the hazard.

The *Conceptual Site Model* identifies the types and locations of potential contaminant sources/hazards and potential receptors and potential migration/transportation pathway(s). The CSM is refined as the assessment progresses through the Tiers.

4.1 Hazard Identification

A hazard is a substance or situation that has the potential to cause harm. Hazards may be chemical, biological or physical (e.g. explosive gases).

At Tier 1 the potential for hazards to be present is determined from consideration of the previous or ongoing activities on or near to the site in accordance with the criteria presented in the **Table 1**.

Based on the land use information Potential Contaminants of Concern (PCOC) are identified. The PCOC direct the scope of the collection of site specific data and the analytical testing selected for subsequent Tiers.

At Tier 2 the site specific data is screened using published assessment criteria (refer to PBA document entitled Rationale for the Selection of Tier 2 Assessment Criteria). In general, published criteria have been developed using highly conservative assumptions and therefore if the screening criterion is not exceeded then the PCOC is eliminated as a potential Hazard. It should be noted that exceedance does not necessarily indicate that a site is contaminated and/or unsuitable for use only that the PCOC is retained as a potential Hazard. Published criteria are generated using models based on numerous and complex assumptions. Whether or not these assumptions are appropriate in a site-specific context requires confirmation on a project by project basis and would form part of a Tier 3 assessment.

When reviewing or assessing site specific data PBA utilise published guidance on comparing contamination

data with a critical concentration (CL:AIRE/CIEH 2008) which presents a structured process for employing statistical techniques for data assessment purposes. The benefit of the statistical tool is uncertainty is quantified and decisions are made knowing the strength of the evidence. Correct decision probability is a function of sample size, difference in the mean and the critical concentration, variation in measured values and the significance level.

4.2 Receptor and Pathway Identification

For all Tiers the potential receptors (for both on site and adjoining land) that will be considered are:

- Human Health – including current and future occupiers, construction and future maintenance workers, and neighbouring properties/third parties;
- Ecological systems; *[1]
- Controlled waters *[2] – including surface water and groundwater;
- Property, Animal or Crop (existing or proposed) - including buildings, service lines and pipes, crops, livestock, pets, woodland; and
- Archaeological sites and ancient monuments.

*[1] International or nationally designated sites (as defined in the statutory guidance (Defra Circular 04/12)) "in the local area" will be identified as potential ecological receptors. A search radius of 1, 2 or 5km will be utilised depending on the site specific circumstances (see also pathway identification). The Environment Agency has published an ecological risk assessment framework (EA 2008) which promotes (as opposed to statutorily enforces) consideration of additional receptors to include locally protected sites and protected or notable species. These additional potential receptors will only be considered if a Phase 1 habitat survey, undertaken in accordance with guidance (JNCC 1993), is commissioned and the data provided to PBA. It should be noted that without such a survey the Tier 1 risk assessment may conclude that the identification of potential ecological receptors is inconclusive (refer to PBA Specification for Phase 1).

*[2] the definition of "pollution of controlled water" was amended by the introduction of Section 86 of the Water Act 2003. For the purposes of Part 2A groundwater does not include waters above the saturated zone and our assessment does not therefore address perched water other than where development causes a pathway to develop.

If a receptor is taken forward for further assessment it will be classified in terms of its sensitivity, the criteria for which are presented in **Table 2**. Table 2 has been generated using descriptions of environmental receptor importance/value given in various guidance documents including R&D 66 (NHBC 2008) and Transport Analysis Guidance (based on DETR 2000). Human health and buildings classifications have been generated by PBA using the attribute description for each class.

The exposure pathway and modes of transport that will be considered are presented in **Table 3**.

4.3 Note regarding Ecological Systems

The Environment Agency (EA) has developed an ecological risk assessment framework which aims to provide a structured approach for assessing the risks to ecology from chemical contaminants in soils (EA 2008). In circumstances where contaminants in water represent a potential risk to aquatic ecosystems then risk assessors will need to consider this separately.

The framework consists of a three tiered process:-

- Tier 1 is a screening step where the site soils chemical data is compared to a soil screening value (SSV)
- Tier 2 uses various tools (including surveys and biological testing) to gather evidence for any harm to the ecological receptors
- Tier 3 seeks to attribute the harm to the chemical contamination

Tier 1 is preceded by a desk study to collate information about the site and the nature of the contamination to assess whether pollutant linkages are feasible. The framework presents ten steps for ecological desk studies and development of a conceptual site model as follows.

1 Establish Regulatory Context
2 Collate and Assess Documentary Information
3 Summarise Documentary Information
4 Identify Potential Contaminants of Concern
5 Identify Likely Fate Transport of Contaminants
6 Identify Potential Receptors of Concern
7 Identify Potential Pathways of Concern
8 Create a Conceptual Site Model
9 Identify Assessment and Measurement Endpoints
10 Identify Gaps and Uncertainties

The information in a standard PBA Phase 1 report covers Steps 1 to 4 inclusive. Step 5 considers fate and transport of contaminants and it should be noted that our standard report adopts a simplified approach considering only transport mechanisms. A simplified approach has also been adopted in respect of Steps 6 and 7 receptors (a detailed review of the ecological attributes has not been undertaken) and pathways (a food chain assessment has not been undertaken).
Step 9 is outside the scope of our standard Phase 1 report.

It should be noted that the Tier 1 assessment for ecological systems (i.e. where designated sites are identified) as part of a Phase 1 report will assess the viability of the mode of transport given the site specific circumstances not specific pathways.

The Tier 1 risk assessment may conclude that the risk to potential ecological receptors is inconclusive (see PBA Specification for Phase 1).

4.4 Note regarding Controlled Waters

Controlled Waters are rivers, estuaries, coastal waters, lakes and groundwaters, but not perched waters.

The Water Framework Directive (WFD) (2000) aims to protect and enhance the quality of surface freshwater, groundwaters and dependent eco systems, estuaries and coastal waters. The WFD was transposed into UK law in 2003 (Statutory Instruments 2003). Member states must aim to reach good chemical and ecological status as defined in the Directive by 2015.

The Ground Water Daughter Directive (GWDD) was enacted by the Groundwater Regulations (2009), which were subsumed by the Environmental Permitting Regulations (2010) which provide essential clarification including on the four objectives specifically for groundwater quality in the WFD:-

- Achieve 'Good' groundwater chemical status by 2015, commonly referred to as 'status objective';
- Achieve Drinking Water Protected Area Objectives;
- Implement measures to reverse any significant and sustained upward trend in groundwater quality, referred to as 'trend objective'; and
- Prevent or limit the inputs of pollutants into groundwater, commonly referred to as 'prevent or limit' objectives

The Water Act 2003 (Commencement No.11) Order 2012 amends the test for 'contaminated land' which relates to water pollution so that pollution of controlled waters must now be "significant" to meet the definition of contaminated land.

River Basin Management Plans (RBMP) have been developed for the 11 River Basin Districts in England and Wales. These were released by Defra in 2009 (Defra 2009).

These RBMP's establish the current status of waters within the catchments of the respective Districts and the current status of adjoining waters identified. As part of a Tier 2 risk assessment water quality data is screened against the WFD assessment criteria. Compare to the RBMP's current status of waters for the catchment under consideration would form part of a Tier 3 assessment.

5 Risk Estimation

Risk estimation classifies what degree of harm might result to a receptor (defined as consequence) and how likely it is that such harm might arise (probability).

At Tier 1 the consequence classification is generated by multiplying the hazard classification score and the receptor sensitivity score. This approach follows that presented in the republished R&D 66 (NHBC 2008).

The criteria for classifying probability are set out in **Table 4** and have been taken directly from Table 6.4 CIRIA C552 (CIRIA 2001). Probability considers the integrity of the exposure pathway.

The consequence classifications detailed in **Table 5** have been adapted from Table 6.3 presented in C552 and R&D 66 (Annex 4 Table A4.3).

The Tier 1 risk classification is estimated for each pollutant linkage using the matrix given in **Table 6** which is taken directly from C552 (Table 6.5). Subsequent Tiers refine the CSM through retention or elimination of potential hazards and pollutant linkages.

6 Risk Evaluation

In order to put the Tier 1 risk classification into context the likely actions are described in **Table 7** which is taken directly from C552 (Table 6.6). Subsequent Tiers identify potential risk management options through remediation and/or mitigation measures.

Unless the initial assessment clearly demonstrates that the risk from contamination can be satisfactorily reduced to an acceptable level, further site investigations and risk assessment will be needed before the application can be determined.

7 References

BSI 2007 BS 8485 Code of Practice for characterisation and remediation from ground gas in affected developments.
BSI 2011 BS 10175 (2011) Code of practice - Investigation of potentially contaminated sites

CIRIA 2001: Contaminated land risk assessment – a guide to good practice C552.

CIRIA 2008: Assessing risks posed by hazardous ground gases to buildings C655

CL:AIRE/EIH 2008 Guidance on Company Soil Contamination Data with a Critical Concentration. Published by Contaminated Land: Applications in Real Environments (CL:AIRE)

CL:AIRE 2013 SP1010 – Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination. Final Project Report published by Contaminated Land: Applications in Real Environments (CL:AIRE) 20th December 2013

DCLG 2010 Building Regulations 2010 Approved Document C Site preparation and resistance to contaminants and moisture.

DCLG 2012 National Planning Policy Framework.

DETR 2000 Methodology for Multi Modal Studies. Volume 2 Section 4. The Environmental Objective.

Defra Circular 01/2006

Defra Circular 04/2012 Environmental Protection Act 1990: Part 2A. Contaminated Land Statutory Guidance.

DEFRA, 2006 The Contaminated Land (England) Regulations 2006.

DEFRA, 2012 The Contaminated Land (England) (Amendment) Regulations 2012 (SI2012/263).

DEFRA, 2012 Environmental Protection Act 1990: Part 2A. Contaminated Land Statuary Guidance. April 2012.

DEFRA, 2013 Environmental Damage (Prevention and Remediation) Regulations 2009: Guidance for England and Wales

Defra '2009 Water for Life and Livelihoods. River Basin Management Plan. (11 Districts: Anglia, Dee, Humber, Northumbria, Northwest, Severn, Solway and Tweed, Southeast, Thames, Western Wales) December 2009

EA 2004: The Model Procedures for the Management of Land Contamination CRL 11 published by the Environment Agency (EA).

EA 2008 Ecological Risk Assessment Science Report Series SC070009 published by the Environment Agency (EA).

European Community 2000 Water Framework Directive (2000/60/EC)

JNCC 1993 Handbook for Phase 1 Habitat Survey – A Technical for Environmental Audit prepared by the Joint Nature Conservancy Council (JNCC)

NHBC/EA/CIEH 2008: R&D Publication 66 Guidance for the safe development of housing on land affected by contamination.

Statutory Instrument 2003 No. 3242 Water Resources, England and Wales. The Water Environment (Water Framework Directive) Regulations 2003.

Table 1: Criteria for Classifying Hazards / Potential for Generating Contamination

Classification/Score	Potential for generating contamination/gas based on land use
Very Low 1	Land Use: greenfield Contamination: None. Gas generation potential : Inert Made Ground
Low 2	Land Use: residential, retail or office use, recent small scale industrial. Contamination: None or locally slightly elevated concentrations. Gas generation potential : Shallow thickness of Alluvium
Moderate 3	Land Use: railway yards, collieries, scrap yards, light industry, engineering works. Contamination: Locally elevated concentrations. Gas generation potential : Dock silt and substantial thickness of organic alluvium/peat
High 4	Land Use: gas works, chemical works, heavy industry, non-hazardous landfills. Contamination: Possible widespread elevated concentrations. Gas generation potential : Shallow mine workings Pre 1960's landfill
Very High 5	Land Use: hazardous waste landfills. Contamination: Likely widespread elevated concentrations. Gas generation potential : Domestic landfill post 1960

"Greenfield" is land which has not been developed including not used for crop production or animal husbandry and no contamination source therefore no pollutant linkages.

Table 2: Criteria for Classifying Receptor Sensitivity/Value

Classification/Score	Definition
Very Low 1	Receptor of limited importance Groundwater: Non aquifer Surface water: GQA Grade F Ecology: No local designation Buildings: Replaceable Human health: Unoccupied/limited access
Low 2	Receptor of local or county importance with potential for replacement Groundwater: Secondary aquifer Surface water: GQA Grade D/E Ecology: local habitat resources Buildings: Local value Human health: Minimum score 4 where human health identified as potential receptor
Moderate 3	Receptor of local or county importance with potential for replacement Groundwater: Principal aquifer Surface water: GQA Grade B/C Ecology: County wildlife sites, Areas of Outstanding Natural Beauty (AONB) Buildings: Area of Historic Character Human health: Minimum score 4 where human health identified as potential receptor
High 4	Receptor of county or regional importance with limited potential for replacement Groundwater: Source Protection Zone 2 Surface water: GQA Grade A Ecology: SSSI, National or Marine Nature Reserve (NNR or MNR) Buildings: Conservation Area Human health: Minimum score 4 where human health identified as potential receptor
Very High 5	Receptor of national or international importance Groundwater: Source Protection Zone 1 Surface water: GQA Grade A Ecology: Special Areas of Conservation (SAC and candidates), Special Protection Areas (SPA and potentials) or wetlands of international importance (RAMSAR) Buildings: World Heritage site Human health: Residential, open spaces and uses where children are present

Table 3: Exposure Pathway and Modes of Transport

Receptor	Pathway	Mode of transport
Human health	Ingestion	Fruit or vegetable leaf or roots
		Contaminated water
		Soil/dust indoors
		Soil/dust outdoors
	Inhalation	Particles (dust / soil) – outdoor
		Particles (dust / soil) - indoor
		Vapours – outdoor - migration via natural or anthropogenic pathways
		Vapours - indoor - migration via natural or anthropogenic pathways
	Dermal absorption	Direct contact with soil
		Direct contact with waters (swimming / showering)
		Irradiation
Groundwater	Leaching	Gravity / permeation
	Migration	Natural – groundwater as pathway Anthropogenic (e.g. boreholes, culverts, pipelines etc.)
Surface Water	Direct	Runoff or discharges from pipes
	Indirect	Recharge from groundwater
	Indirect	Deposition of wind blown dust
Buildings	Direct contact	Sulphate attack on concrete, hydrocarbon corrosion of plastics
	Gas ingress	Migration via natural or anthropogenic paths
Ecological systems	See Notes	Runoff/discharge to surface water body
	See Notes	Windblown dust
	See Notes	Groundwater migration
	See Notes	At point of contaminant source
Animal and crop	Direct	Wind blown or flood deposited particles / dust / sediments
	Indirect	Plants via root up take or irrigation. Animals through watering
	Inhalation	By livestock / fish - gas / vapour / particulates / dust
	Ingestion	Consumption of vegetation / water / soil by animals

Table 4: Classification of Probability

Classification	Definition
High likelihood	There is a pollution linkage and an event either appears very likely in the short-term and almost inevitable over the long-term, or there is already evidence at the receptor of harm / pollution.
Likely	There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short-term and likely over the long-term.
Low likelihood	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter-term.
Unlikely	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long-term.

Table 5: Classification of Consequence (score = magnitude of hazard Table 1 and sensitivity of receptor Table 2)

Classification / Score	Examples
Severe **20-25**	Human health effect - exposure likely to result in "significant harm". Significant harm to humans is defined in circular 01/2006 as death, disease, serious injury, genetic mutation, birth defects or impairment of reproductive function. Controlled water effect - short-term risk of pollution (note: Water Resources Act contains no scope for considering significance of pollution) of sensitive water resource. Equivalent to EA Category 1 incident (persistent and/or extensive effects on water quality leading to closure of potable abstraction point or loss of amenity, agriculture or commercial value. Major fish kill. Ecological effect - short-term exposure likely to result in a substantial adverse effect. Catastrophic damage to crops, buildings or property
Medium **13-19**	Human health effect - exposure could result in "significant harm". Significant harm to humans is defined in circular 01/2006 as death, disease, serious injury, genetic mutation, birth defects or impairment of reproductive function. Controlled water effect - equivalent to EA Category 2 incident requiring notification of abstractor Ecological effect - short-term exposure may result in a substantial adverse effect. Damage to crops, buildings or property
Mild **6-12**	Human health effect - exposure may result in "significant harm". Significant harm to humans is defined in circular 01/2006 as death, disease, serious injury, genetic mutation, birth defects or impairment of reproductive function. Controlled water effect - equivalent to EA Category 3 incident (short lived and/or minimal effects on water quality). Ecological effect - unlikely to result in a substantial adverse effect. Minor damage to crops, buildings or property. Damage to building rendering it unsafe to occupy (for example foundation damage resulting in instability).
Minor **1-5**	No measurable effect on humans. Protective equipment is not required during site works. Equivalent to insubstantial pollution incident with no observed effect on water quality or ecosystems. Repairable effects to crops, buildings or property. The loss of plants in a landscaping scheme. Discolouration of concrete.

Table 6: Classification of Risk (Combination of Consequence Table 5 and Probability Table 4)

	Consequence			
Probability	***Severe***	***Medium***	***Mild***	***Minor***
High likelihood	Very high	High	Moderate	Low
Likely	High	Moderate	Moderate/low	Low
Low likelihood	Moderate	Moderate/low	Low	Very low
Unlikely	Moderate/low	Low	Very low	Very low

Table 7: Description of Risks and Likely Action Required

Risk Classification	Description
Very high risk	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation is likely to be required in the short term.
High risk	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short-term and are likely over the longer-term.
Moderate risk	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer-term.
Low risk	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
Very low risk	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.

Appendix D PBA Rationale for Selection of Assessment Criteria (2016)

1 Introduction

The aim of this document is to present an explanation for the selection of the assessment criteria routinely used by PBA when undertaking a Tier 2 contamination risk assessment. Any deviation from the routine criteria and/or selection of criteria for parameters not covered in this document will be described in the report text.

A Tier 2 assessment is a quantitative assessment using published criteria to screen the site-specific contamination testing data and identify potential hazards to specific receptors. Generic criteria are typically cautious in derivation and exceedance does not indicate that a site is statutorily contaminated and/or necessarily unsuitable for use in the planning context. These criteria are used to identify situations where further assessment and/or action may be required.

This document is divided into general introductory text and sections on soils, waters and gases.

2 General Notes

This document should be read in conjunction with another entitled "PBA Methodology for Assessment of Land Contamination" which summarises the legislative regime and our approach to ground contamination and risk assessment.

Any PBA interpretation of contamination test results is based on a scientific and engineering appraisal. The perceptions of, for example, banks, insurers, lay people etc are not taken into account.

Any tables included in this document are produced for ease of reference to the criteria, they do not in any way replace the documents of origin (which are fully referenced) and which should be read to ensure appropriate use and interpretation of the data.

Generic criteria provide an aid to decision-making, but they do not replace the need for sound professional judgement in risk assessment (EA, 2006b). The criteria are based on numerous and complex assumptions. The appropriateness of these assumptions in a site-specific context requires confirmation on a project by project basis. Our interpretative report will comment on the appropriateness of the routine criteria for project objectives or ground conditions. It is important to note that if the use of the published criteria is challenged, it may be necessary to carry out modelling to generate site-specific assessment criteria.

3 Criteria for Assessing Soil Results

3.1 Potential Harm to Human Health

The criteria routinely used by PBA as Tier 2 soil screening values for the protection of human health are:-

- Suitable 4 Use Levels (S4ULs) published in 2015 which adopt a minimal or tolerable risk as described in SR2 (EA 2009c).
- Category 4 Screening Levels (C4SLs) published in 2014 which adopt a "low level of toxicological concern" (LLTC) as the toxicological benchmark.

The criteria have been generated using the Contaminated Land Exposure Assessment model (CLEA) and supporting technical guidance (EA, 2009a, 2009b, 2009c). The CLEA model uses generic assumptions about the fate and transport of chemicals in the environment and a generic conceptual model for site conditions and human behaviour to estimate child and adult exposures to soil contaminants for those potentially living, working, and/or playing on contaminated sites over long time periods (EA, 2009b).

The handbook (EA 2009e) referring to version 1.05 is still valid for the 1.071 software. An update (1.071) to the software was published on 04/09/2015. The update includes the library data sets from the DEFRA research project SP1010 (Development of Category 4 Screening Levels for assessment of land affected by contamination). It also fixes a problem in version 1.07 with the adding of new chemicals.).

The CLEA model uses ten exposure pathways (Ingestion (outdoor soil, indoor dust, homegrown vegetables and soil attached to homegrown vegetables), Dermal Contact (outdoor soil and indoor dust) and Inhalation (outdoor dust, indoor dust, outdoor vapours and indoor vapours)). There are exposure pathways not included in the CLEA model such as the permeation of organics into plastic water supply pipes.

The presence and/or significance of each of the potential exposure pathways is dependent on the land use being considered. The model uses standard land use scenarios as follows:-

Residential – habitation of a dwelling up to two storeys high with various default material and design parameters, access to either private or nearby community open space with soil track back to form indoor dust. Assumes ingestion of homegrown produce.

Allotments – the model has default parameters for use and consumption of vegetables but not animals or their products (eggs).

Industrial/commercial – assumes office or light physical work in a permanent three storey structure with breaks taken outside and that the site is NOT covered in hardstanding.

The assessment criteria generated using CLEA can be used as a starting point for evaluating long-term risks to human health from chemicals in soil. It is important to note that the model does not assess all the potential exposure risks for example risk to workers in excavations (short term exposure), inhalation of vapours generated from contaminants in groundwater, diffusion of contaminants through drinking water pipes.

Recent guidance (DEFRA 2012) introduces a four stage classification system where Category 1 sites are obviously contaminated and Category 4 sites uncontaminated as defined by EPA 1990. Outside of these categories further specific risk assessment is required to determine if the site should fall into Category 2 contaminated or Category 3 uncontaminated. Category 4 screening values are considered to be more pragmatic than the current published SGV/GAC criteria but still strongly precautionary with the aim of allowing rapid identification of sites where the risk is above minimal but still low/acceptable (within the context of Part 2A).

At the end of 2013 technical guidance in support of DEFRA's revised Statutory Guidance (SG) was published (CL:AIRE 2013) which provided:

- A methodology for deriving C4SLs for the standard land-uses and two new public open space scenarios using the updated assumptions relating to the modelling of human exposure to soil contaminants; and
- A demonstration of the methodology, via the derivation of C4SLs for six substances – arsenic, benzene, benzo(a)pyrene, cadmium, chromium (VI) and lead.

Following issue of an Erratum in December 2014 a Policy Companion Document was published (DEFRA 2014B).

Soil Guideline Values (SGVs)

The first series of SGVs were generated using a probabilistic version of the CLEA model. However, on 22 July 2008 DEFRA announced the withdrawal of these SGVs and revised SGVs were calculated for all substances except lead using a deterministic version of the CLEA model (v1.05). Table 1 presents the SGVs which have not been withdrawn but it should be noted that they were developed using assumptions for body weight and inhalation rates that have been revised since publication.

Category 4 Screening Levels (C4SLs)

A letter from Lord de Mauley dated 3rd September 2014 provides more explicit direction to local authorities on the use of the C4SL in a planning context. The letter identifies four key points:

1) that the screening values were developed expressly with the planning regime in mind
2) their use is recommended in DCLG's planning guidance
3) soil concentrations below a C4SL limit are considered to be 'definitely not contaminated' under Part IIA of the 1990 Environmental Protection Act and pose at most a 'low level of toxicological concern' and
4) exceedance of a C4SL screening value does not mean that land is definitely contaminated, just that further investigation may be warranted. Table 6 summarises the C4SL (DEFRA 2014B) for each of the six substances. PBA uses the criterion for lead and may use the other criteria, depending on site specific conditions.

Suitable 4 Use Levels (S4ULs)

In July 2009, Generic Assessment Criteria (GACs) for 82 substances were published by the Chartered Institute of Environmental Health (CIEH) (LQM and CIEH, 2009) using the then current version of the CLEA software v1.04 and replacing those generated in 2006 using the original version of the model CLEA UK *beta*. In 2015 S4ULs were published by LQM/CIEH to replace the second edition GACs. Table 5 summarises the S4ULs.

Note on Mercury, Chromium and Arsenic Assessment The analytical testing routinely undertaken by PBA determines total concentration, however, the toxicity depends on the form of the contaminant.

If a source of Mercury, Chromium or Arsenic is identified or the total concentration exceeds the relevant worst case speciated criteria it will be desirable/necessary to undertake additional speciated testing and further assessment.

Note on Polycyclic Aromatic Hydrocarbons Polycyclic Aromatic Hydrocarbons (PAHs) are a family of hundreds of different congeners whose chemical structures contain 2 or more fused aromatic rings. Whilst it is recognised that there is an ongoing debate on the most appropriate method to assess health effects of PAH mixtures in 2010 the Health Protection Agency recommended the use of benzo[a]pyrene (BaP) as a surrogate marker approach in the assessment of carcinogenic risks posed by PAHs in soils.

In most cases, BaP is chosen as the surrogate marker (SM) due to its ubiquitous nature and the vast amount of data available and has been used by various authoritative bodies to assess the carcinogenic risk of PAHs in food. The SM approach estimates the toxicity of a mixture of PAHs in an environmental matrix by using toxicity data for a PAH mixture for which the composition is known.

Exposure to the SM is assumed to represent exposure to all PAHs in that matrix therefore the toxicity of the SM represents the toxicity of the mixture. The SM approach relies on a number of assumptions (HPA 2010).

- The SM (BaP) must be present in all the samples.
- The profile of the different PAH relative to BaP should be similar in all samples.
- The PAH profile in the soil samples should be sufficiently similar to that used in the pivotal toxicity study on which HBGV was based i.e. the Culp study (Culp et al. (1998)).

In order to justify the use of a surrogate marker assessment criterion (C4SL for benzo(a)pyrene and S4UL coal tar) the LQM PAH Profiling Tool is used by PBA to assess the similarity of the PAH profile in a soil sample to that of the toxicity study. The spreadsheet that calculates the relative proportions of the genotoxic PAHs and plots them on the two charts relative to composition of the two coal mixtures used by Culp et al. (the plus/minus an order of magnitude limits suggested by HPA).

Note on Asbestos

Asbestos in soil and made ground is currently under review by a number of bodies. There are no current published guidance values for asbestos in soil other than the waste classification values given in the EA's Technical Guidance WM3, Hazardous Waste – Interpretation of the definition and classification of hazard waste (3d Edition, 2015). This guidance is only appropriate for soils that are being discarded as waste.

Testing for asbestos will be carried out on selected samples of made ground encountered during investigation, initially samples will be subjected to an asbestos screen and, if asbestos is found to be present, subjected to quantification depending on the project specific requirements. The reader is directed to the report text for guidance on the approach adopted in respect to any asbestos found to be present. Further guidance is also available in the 2014 CIRIA publication C733, Asbestos in soil and made ground: a guide to understanding and managing risks.

3.2 Potential Harm to the Built Environment

Land contamination can pose risks to buildings, building materials and services (BBM&S) in a number of ways. Volatile contaminants and gases can accumulate and cause explosion or fire. Foundations and buried services can be damaged by corrosive substances and contaminants such as steel slags can create unstable ground conditions through expansion causing structural damage.

PBA use the following primary guidance to assess the significance of soil chemistry with respect to its potential to harm the built environment.

i) Approved Document C - Site Preparation and Resistance to Contaminants and Moisture. (DCLG 2010);

ii) Concrete in aggressive ground SD1 (BRE 2005);

iii) Guidance for the selection of water supply pipes to be used in brownfield sites (UKWIR 2011);

iv) Protocols published by agreement between Water UK and the Home Builders Federation providing supplementary guidance which includes the Risk Assessment for Water Pipes (the 'RA') (Water UK 2014).

v) Performance of Building Materials in Contaminated Land report BR255 (BRE 1994).

vi) Risks of Contaminated Land to Buildings, Building Materials and Services. A Literature Review - Technical Report P331 (EA 2000).

vii) Guidance on assessing and managing risks to buildings from land contamination - Technical Report P5 035/TR/01 (EA 2001).

3.3 Potential to Harm Ecosystems, Animals, Crops etc

The criteria routinely used by PBA as Tier 2 screening values to assess the potential of soil chemistry to harm ecosystems are taken from the following guidance and summarised in are given in Table 2.

i) Ecological Risk Assessment (ERA) Science Report Series SC070009, published by the Environment Agency, Bristol (EA, 2008);

ii) The Restoration and Aftercare of Metalliferous Mining Sites for Pasture and Grazing (ICRCL 70/90, 1990); and

iii) Code of Practice for Agricultural Use of Sewage Sludge 2nd Edition (DOE, 2006).

iv) BS 3882:2015 Specification for topsoil and requirements for use.

Unless stated in the report the assessment is solely for phytotoxic parameters and additional assessment is required to determine suitability as a growing medium.

4 Criteria for Assessing Liquid Results

4.1 Potential Harm to Human Health

The criteria routinely used by PBA as Tier 2 water screening values (Table 3) are taken from the Water Supply (Water Quality) Regulations (DEFRA 2010).

It should be noted that some of the prescribed concentrations listed in the Water Supply Regulations have been set for reasons other than their potential to cause harm to human health. The concentrations of iron and manganese are controlled because they may taint potable water with an undesirable taste, odour or colour or may potentially deposit precipitates in water supply pipes.

4.2 Potential to Harm Controlled Waters

Controlled Waters are rivers, estuaries, coastal waters, lakes and groundwaters. Water in the unsaturated zone is not groundwater but does come within the scope of the term "ground waters" as used and defined in the Water Resources Act 1991. It will continue to be a technical decision for the Environment Agency to determine what is groundwater in certain circumstances for the purposes of the Regulations. The approach adopted by PBA considers the objectives of the Water Framework Diredctive (WFD) and the Groundwater Daughter Directive (GWDD) (refer to PBA Methodology).

When assessing ground condition data the aim is to identify whether there could be an environmentally significant input to groundwater. An environmentally insignificant input into groundwater would be one that could not have any effect on (i) any of the receptors noted in the Water Framework/GWDD definition of pollution (ii) the chemical status of a groundwater body; or (iii) could give rise to a significant and sustained rising trend in the concentrations of pollutants in groundwater as noted in those directives. PBA uses the approach presented in Groundwater Protection Policy and Practice (GP3) (EA 2013).

The Priority Substances Directive set environmental quality standards (EQS) for the substances in surface waters (river, lake, transitional and coastal) and confirmed their designation as priority or priority hazardous substances (PS), the latter being a subset of particular concern. Environmental Quality Standards for PS are determined at the European level and apply to all Member States. Member States identify and develop standards for 'Specific Pollutants'. Specific Pollutants (SP) are defined as substances that can have a harmful effect on biological quality.

The 2014 Water Framework Directive implementation in England and Wales: new and updated standards to protect the water environment - Directions to the Environment Agency relating to the Groundwater Directive (Directive 2006/118/EC) informs interested parties of the new and updated environmental standards to be used in the second cycle of Water Framework Directive (2000/60/EC) river basin management planning process in England and Wales.

It also presents new and updated assessment criteria for biological elements that must be monitored to assess the ecological status of surface water bodies. The criteria routinely used by PBA as Tier 2 screening values (Table 3).

5 Criteria for Assessing Gas Results

PBA use the following primary guidance on gas monitoring methods and strategy, the assessment of risk posed by soil gases (including Volatile Organic Compounds (VOCs)) and mitigation measures/risk reduction during site development.

i) BS 8576:2013 – Guidance on Ground Gas Investigations: Permanent gases and Volatile Organic Compounds (VOCs) (BSI 2013);

ii) A pragmatic approach to Ground Gas Risk Assessment. CL:AIRE Research Bulletin RB17 (Card 2012);

iii) The VOCs Handbook. C682 (CIRIA 2009).

iv) Assessing risks posed by hazardous gases to buildings C665 (CIRIA 2007);

v) Guidance on evaluation of development proposals on sites where methane and carbon dioxide are present. (NHBC 2007); and

vi) BS 8485:2015 - Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings (BSI 2015).

Gas and borehole flow data are used to obtain the gas screening value (GSV) for methane and carbon dioxide. The GSV is used to establish the characteristic situation and to make recommendations for gas protection measures for buildings if required.

Radon

PBA use the following primary guidance to assess the significance of the radon content of soil gas.

i) Radon: guidance on protective measures for new dwellings. Report BR211 (BRE, 2015); and

ii) Radon Atlas of England, R290 (NRPB, 1996).

6 References

BRE (2005) Concrete in aggressive ground. Special Digest 1, Building Research Establishment, Garston, Herts.

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DCLG (2013) Approved Document C - Site preparation and resistance to contaminates and moisture (2004 Edition incorporating 2010 and 2013 amendments).

DEFRA (2010) The Water Supply (Water Quality) Regulations, 2010. Statutory Instrument 2010 No 944, Department of the Environment, Transport and the Regions, London.

DEFRA (2012) Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance.

DEFRA (2014) Water Framework Directive implementation in England and Wales: new and updated standards to protect the water environment

DEFRA (2014B) SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document. Department for Environment, Food and Rural Affairs December 2014

DoE (2006) Code of Practice for Agricultural Use of Sewage Sludge. Department of the Environment, London.

EA (2004) Guidance on Assessment of Risks from Landfill Sites. Environment Agency, Bristol.

EA (2006b) CLEA update No. 4. Environment Agency, Bristol.

EA (2008) Ecological Risk Assessment (ERA). Science Report Series SC070009, Environment Agency, Bristol.

EA (2009a) Using Soil Guideline Values. Science Report SC050021/SGV Introduction. Environment Agency, Bristol.

EA (2009b) Updated Technical Background to the CLEA model. Science Report SC050021/SR3 Introduction. Environment Agency, Bristol.

EA (2009c) Human health toxicological assessment of contaminants in soil. Science Report SC050021/SR2. Environment Agency, Bristol.

EA (2009d) Compilation data for priority organic contaminants for derivation of soil guideline values Science Report SC50021/SR7

EA (2009e) CLEA Software (Version 1.05) Handbook Science Report SC050021/SR4

EA (2013) Groundwater Protection Policy and Practice (GP3) August 2013 Version 1.1

EA (2015) Guidance on the classification and assessment of waste (3rd edition 2015) - Technical Guidance WM3

EA (2015) The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015.

ICRCL (1990) The Restoration and Aftercare of Metalliferous Mining Sites for Pasture and Grazing 70/90. Interdepartmental Committee on the Redevelopment of Contaminated Land, London.

LQM & CIEH (2015) The LQM/CIEH S4ULs for Human Health Risk Assessment. Land Quality Press, Nottingham.

NRPB (1996) Radon Atlas of England. R290, National Radiological Protection Board, Didcot, Oxfordshire.

NHBC (2007) Guidance on evaluation of development proposals on sites where methane and carbon dioxide are present. National House Building Council.

UKWIR (2011) Guidance for the selection of Water Pipes to be used in Brownfield Sites.

Water UK 2014 Contaminated Land Assessment Guidance

Table 1: Category 4 Screening Levels (C4SL) – Table taken from SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document (Department for Environment, Food and Rural Affairs December 2014)

	Residential (with home-grown produce)	Residential (without home-grown produce)	Allotments	Commercial	Public Open Space 1	Public Open Space 2
Arsenic	37	40	49	640	79	170
Benzene	0.87	3.3	0.18	98	140	230
Benzo(a)pyrene	5.0	5.3	5.7	77	10	21
Cadmium	22	150	3.9	410	220	880
Chromium VI	21	21	170	49	21	250
Lead	200	310	80	2300	630	1300

Units mg/kg
Public Open Space 1 – for grassed area adjacent to residential housing
Public Open Space 2 - Park Type Public Open Space Scenario

Table 2: Tier 2 Criteria for the Assessment of Soils – Protection of Ecological Systems

Parameter	ICRCL 70/90 [a] Maximum		Proposed SSVs [b]	Code of Practice for Agricultural Use of Sewage Sludge [c]	BS 3882:2015 Specification for topsoil and requirements for use Phytotoxic contaminants
	Livestock	Crop Growth			
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kgDS
Benzo(a)pyrene			0.15		
Arsenic	500	1000		50	
Cadmium	30	50	1.15	3	
Chromium			21.1	400	
Copper	500	250	88.4	80/ 100/ 135/ 200 [d]	<100/<135/<200 [e]
Fluoride	1000			500	
Lead	1000		167.9	300	
Mercury			0.06	1	
Molybdenum				4	
Nickel			25.1	50/ 60/ 75/ 110 [d]	<60/<75/<110 [e]
Pentachlorobenzene			0.029		
Pentachlorophenol			0.6		
Selenium				3	
Tetrachloroethene			0.01		
Toluene			0.3		
Zinc	3000	1000	90.1	200/200/200/300 [d]	<200/<200/<300 [e]

a. Interdepartmental Committee on the Redevelopment of Contaminated Land (ICRCL) 70/90 Restoration and Aftercare of Metalliferous Mining Sites for Pasture and Grazing 1st edition 1990.
b. Proposed Soil Screening Values (SSVs) – Consultation, Environment Agency 2008. Threshold which if exceeded prompts further assessment.
c. Maximum permissible concentration of potentially toxic elements from the Code of Practice for Agricultural Use of Sewage Sludge. Second Edition. DOE 2006.
d. Where four values are presented, concentrations are for soils with pH values 5.0-5.5/ 5.5-6.0/ 6.0-7.0/ >7.0
e. Where three values are presented, concentrations are for soils with pH values <6.0/ 6.0-7.0/ >7.0

Table 3: Suitable 4 Use Levels (S4UL) - units are mg/kg Dry Weight

Determinand	Allotment	$R_{w}HP$	$R_{wo}HP$	Commercial/ Industrial	POSresi	POSpark
Metals						
Arsenic (**Inorganic**)[a, b, c]	43	37	40	640	79	170
Beryllium [a, b, d, e]	35	1.7	1.7	12	2.2	63
Boron [a, b, d]	45	290	11000	240000	21000	46000
Cadmium (**pH6-8**) [a, b, d, f]	1.9	11	85	190	120	560
Chromium (trivalent) [a, b, d, g]	18000	910	910	8600	1500	33000
Chromium (hexavalent) [a, b, c]	1.8[h]	6[i]	6[i]	33[i]	7.7[i]	220[i]
Copper [a, b, c]	520	2400	7100	68000	12000	44000
Mercury (elemental) [a, b, c, j]	21	1.2	1.2	58[vap] (25.8)	16	30[vap] (25.8)
Mercury (inorganic) [a, b, c]	19	40	56	1100	120	240
Methylmercury [a, b, c]	6	11	15	320	40	68
Nickel [a, b, c]	53[k]	130[e]	180[e]	980[e]	230[e]	800[k]
Selenium [a, b, c]	88	250	430	12000	1100	1800
Vanadium [a, b, c, i, j]	91	410	1200	9000	2000	5000
Zinc [a, b, c]	620	3700	40000	730000	81000	170000
BTEX Compounds (SOM 1%/ 2.5%/ 6%)						
Benzene [a, b, l, m]	0.017/0.034/ 0.075	0.087/0.17/ 0.37	0.38/0.7/1.4	27 / 47 / 90	72 / 72 / 73	90 / 100 / 110
Toluene [a, b, l, m]	22 / 51 / 120	130 / 290 / 660	800[vap] (869) /1900/3900	56000[vap] (869) / 110000[vap] 1920)/ 180000[vap] (4360)	56000 / 56000 / 56000	87000[vap](869)/ 95000[vap](1920)/ 100000[vap](4360)
Ethylbenzene [a, b, l, m]	16 / 39 / 91	47 / 110 / 260	83 / 190 / 440	5700[vap] (518) / 13000[vap] (1220) / 27000[vap] (2840)	24000 / 24000 / 25000	17000[vap] (518) / 22000[vap](1220) / 27000[vap] (2840)
O – Xylene [a, b, l, m, n]	28 / 67 / 160	60 / 140 / 330	88 / 210 / 480	6600[sol] (478) / 15000[sol] (1120) / 33000[sol] (2620)	41000 / 42000 / 43000	17000[sol] (478) / 24000[sol] (1120) / 33000[sol] (2620)
M – Xylene [a, b, l, m, n]	31 / 74 / 170	59 / 140 / 320	82 / 190 / 450	6200[vap] (625) / 14000[vap] (1470) / 31000[vap] (3460)	41000 / 42000 / 43000	17000[vap] (625) / 24000[vap](1470) / 32000[vap] (3460)
P – Xylene [a, b, l, m, n]	29 / 69 / 160	56 / 130 / 310	79 / 180 / 430	5900[sol] (576) / 14000[sol] (1350) / 30000[sol] (3170)	41000 / 42000 / 43000	17000[sol] (576) / 23000[sol] (1350) / 31000[sol] (3170)
Polycyclic Aromatic Hydrocarbons (SOM 1%/ 2.5%/ 6%) [a, b, l, p]						
Acenaphthene	34 / 85 / 200	210 / 510 / 1100	3000[sol](57.0)/ 4700[sol] (141)/ 6000[sol] (336)	84000[sol] (57.0)/ 97000[sol] (141)/ 100000	15000 / 15000 / 15000	29000/ 30000/ 30000
Acenaphthylene	28 / 69 / 160	170 / 420 / 920	2900[sol](86.1)/ 4600[sol] (212)/ 6000[sol] (506)	83000[sol] (86.1)/ 97000[sol] (212)/ 100000	15000 / 15000 / 15000	29000 / 30000 / 30000
Anthracene	380 / 950 / 2200	2400 / 5400 / 11000	31000[sol](1.17 /35000/ 37000	520000/ 540000/ 540000	74000 / 74000 / 74000	150000 / 150000 / 150000
Benzo(a)anthracene	2.9 / 6.5 / 13	7.2 / 11 / 13	11 / 14 / 15	170 / 170 / 180	29 / 29 / 29	49 / 56 / 62
Benzo(a)pyrene (Bap)	0.97 / 2.0 / 3.5	2.2 / 2.7 / 3.0	3.2 / 3.2 / 3.2	35 / 35 / 36	5.7/ 5.7/5.7	11 / 12 / 13
Benzo(b)fluoranthene	0.99 / 2.1 / 3.9	2.6 / 3.3 / 3.7	3.9 / 4.0 / 4.0	44 / 44 / 45	7.1/7.2/7.2	13 / 15 / 16
Benzo(g,h,i)perylene	290 / 470 / 640	320 / 340 / 350	360/360 / 360	3900/4000/ 4000	640/640/640	1400/1500/ 1600
Benzo(k)fluoranthene	37 / 75 / 130	77 / 93 / 100	110/ 110 / 110	1200/ 1200/1200	190/190/190	370 / 410 / 440
Chrysene	4.1 / 9.4 / 19	15 / 22 / 27	30 / 31 / 32	350 / 350 / 350	57 / 57 / 57	93 / 110 / 120
Dibenzo(ah)anthracene	0.14 / 0.27 / 0.43	0.24 / 0.28 / 0.3	0.31/0.32/ 0.32	3.5 / 3.6 / 3.6	0.57/0.57/0.58	1.1 / 1.3 / 1.4
Fluoranthene	52 / 130 / 290	280 / 560 / 890	1500/1600/ 1600	23000/23000/ 23000	3100/3100/ 3100	6300 / 6300 / 6400
Fluorene	27 / 67 / 160	170 / 400 / 860	2800[sol](30.9) /3800[sol](76.5) /4500[sol] (183)	63000[sol] (30.9) / 68000 / 71000	9900 / 9900 / 9900	20000 / 20000 / 20000
Indeno(1,2,3-cd)pyrene	9.5 / 21 / 39	27 / 36 / 41	45 / 46 / 46	500 / 510 / 510	82 / 82 / 82	150 / 170 / 180
Naphthalene [q]	4.1 / 10 / 24	2.3 / 5.6 / 13	2.3 / 5.6 / 13	190[sol] (76.4) / 460[sol] (183) / 1100[sol] (432)	4900/ 4900/ 4900	1200[sol] (76.4) / 1900[sol] (183) / 3000
Phenanthrene	15 / 38 / 90	95 / 220 / 440	1300[sol](36.0)/ 1500/1500	22000 / 22000 / 23000	3100 / 3100 / 3100	6200 / 6200 / 6300
Pyrene	110 / 270 / 620	620 / 1200 / 2000	3700 / 3800 / 3800	54000 / 54000 / 54000	7400 / 7400 / 7400	15000 / 15000 / 15000
Coal Tar (Bap as surrogate marker)	0.32 / 0.67 / 1.2	0.79 / 0.98 / 1.1	1.2 / 1.2 / 1.2	15 / 15 / 15	2.2 / 2.2 / 2.2	4.4 / 4.7 / 4.8
Explosives [a, b, l, p]						
2, 4, 6 Trinitrotoluene	0.24 / 0.58 / 1.40	1.6 / 3.7 / 8.0	65 / 66 / 66	1000/1000/1000	130/130 / 130	260 / 270 / 270
RDX (Royal Demolition Explosive $C_3H_6N_6O_6$)	17 / 38 / 85	120 / 250 / 540	13000 / 13000 / 13000	210000 / 210000 / 210000	26000/26000/ 27000	49000[sol] (18.7) / 51000 / 53000
HMX (High Melting Explosive $C_4H_8N_8O_8$)	0.86 / 1.9 / 3.9	5.7 / 13 / 26	6700 / 6700 / 6700	110000 / 110000 / 110000	13000 / 13000 / 13000	23000[vap] (0.35) /23000[vap] (0.39) /24000[vap] (0.48)

Determinand	Allotment	$R_{\underline{W}}HP$	$R_{\underline{WO}}HP$	Commercial/ Industrial	POSresi	POSpark
Petroleum Hydrocarbons (SOM 1%/ 2.5%/ 6%) [a, b, l, m]						
Aliphatic EC 5-6	730 / 1700 / 3900	42 / 78 / 160	42 / 78 / 160	3200[sol] (304) / 5900[sol] (558) / 12000[sol] (1150)	570000[sol](304 590000 / 600000	95000[sol] (304) / 130000[sol] (558)/ 180000[sol](1150)
Aliphatic EC >6-8	2300 / 5600 / 13000	100 / 230 / 530	100 / 230 / 530	7800[sol] (144) / 17000[sol] (322) / 40000[sol] (736)	600000 / 610000 / 620000	150000[sol] (144) 220000[sol] (322)/ 320000[sol] (736)
Aliphatic EC >8-10	320 / 770 / 1700	27 / 65 / 150	27 / 65 / 150	2000[sol] (78) / 4800[vap] (190) / 11000[vap] (451)	13000 / 13000 / 13000	14000[sol] (78) / 18000[vap] (190) / 21000[vap] (451)
Aliphatic EC >10-12	2200 / 4400 / 7300	130v[ap] (48) / 330[vap] (118) / 760[vap] (283)	130v[ap] (48) / 330[vap] (118) / 770[vap] (283)	9700[sol] (48) / 23000[vap] (118) / 47000[vap] (283)	13000 / 13000 / 13000	21000[sol] (48) / 23000[vap] (118) / 24000[vap] (283)
Aliphatic EC >12-16	11000 / 13000 / 13000	1100[sol] (24) / 2400[sol] (59) / 4300[sol] (142)	1100[sol] (24) / 2400[sol] (59) / 4400[sol] (142)	59000[sol] (24) / 82000[sol] (59) / 90000[sol] (142)	13000 / 13000 / 13000	25000[sol] (24) / 25000[sol] (59) / 26000[sol] (142)
Aliphatic EC >16-35 [o]	260000 / 270000 / 270000	65000[sol](8.48 92000[sol] (21) 110000	65000[sol] (8.48 92000[sol] (21) 110000	1600000 / 1700000 / 1800000	250000 / 250000 / 250000	450000 / 480000 / 490000
Aliphatic EC >35-44 [o]	260000 / 270000 / 270000	65000[sol](8.48 92000[sol] (21) / 110000	65000[sol](8.48 92000[sol] (21) 110000	1600000 / 1700000 / 1800000	250000 / 250000 / 250000	450000 / 480000 / 490000
Aromatic EC 5-7 (benzene)	13 / 27 / 57	70 / 140 / 300	370 / 690 / 1400	26000[sol] (1220) / 46000[sol] (2260) / 86000[sol] (4710)	56000 / 56000 / 56000	76000[sol] (1220) /84000[sol](2260)/ 92000[sol] (4710)
Aromatic EC >7-8 (toluene)	22 / 51 / 120	130 / 290 / 660	860 / 1800 / 3900	56000[vap] (869)/ 110000[sol] (1920)/ 180000[vap] (4360)	56000 / 56000 / 56000	87000[vap](869) / 95000[sol] (1920)/ 100000[vap](4360)
Aromatic EC >8-10	8.6 / 21 / 51	34 / 83 / 190	47 / 110 / 270	3500[vap] (613) / 8100[vap] (1500) / 17000[vap] (3580)	5000 / 5000 / 5000	7200[vap](613) / 8500[vap] (1500) / 9300[vap] (3580)
Aromatic EC >10-12	13 / 31 / 74	74 / 180 / 380	250 / 590 / 1200	16000[sol] (364) / 28000[sol](899) / 34000[sol] (2150)	5000 / 5000 / 5000	9200[sol] (364) / 9700[sol] (899) / 10000
Aromatic EC >12-16	23 / 57 / 130	140 / 330 / 660	1800 / 2300[sol] (419) / 2500	36000[sol] (169) / 37000 / 38000	5100 / 5100 / 5000	10000 / 10000 / 10000
Aromatic EC >16-21 [o]	46 / 110 / 260	260 / 540 / 930	1900 / 1900 / 1900	28000 / 28000 / 28000	3800 / 3800 / 3800	7600 / 7700 / 7800
Aromatic EC >21-35 [o]	370 / 820 / 1600	1100 / 1500 / 1700	1900 / 1900 / 1900	28000 / 28000 / 28000	3800 / 3800 / 3800	7800 / 7800 / 7900
Aromatic EC >35-44 [o]	370 / 820 / 1600	1100 / 1500 / 1700	1900 / 1900 / 1900	28000 / 28000 / 28000	3800 / 3800 / 3800	7800 / 7800 / 7900
Aliphatic+Aromatic EC >44-70 [o]	1200 / 2100 / 3000	1600 / 1800 / 1900	1900 / 1900 / 1900	28000 / 28000 / 28000	3800 / 3800 / 3800	7800 / 7800 / 7900
Chloroalkanes & Chloroalkenes (SOM 1%/ 2.5%/ 6%) [a, b, l, p]						
1,2-Dichloroethane	0.0046 / 0.0083 / 0.016	0.0071 / 0.011 / 0.019	0.0092 / 0.013 / 0.023	0.67 / 0.97 / 1.7	29 / 29 / 29	21 / 24 / 28
1,1,1 Trichloroethane (TCA)	48 / 110 / 240	8.8 / 18 / 39	9.0 / 18 / 40	660 / 1300 / 3000	140000 / 140000 / 140000	57000[vap](1425) 76000[vap](2915)/ 100000[vap](6392
1,1,1,2 Tetrachloroethane	0.79 / 1.9 / 4.4	1.2 / 2.8 / 6.4	1.5 / 3.5 / 8.2	110 / 250 / 560	1400 / 1400 / 1400	1500 / 1800 / 2100
1,1,2,2 Tetrachloroethane	0.41 / 0.89 / 2.0	1.6 / 3.4 / 7.5	3.9 / 8.0 / 17	270 / 550 / 1100	1400 / 1400 / 1400	1800 / 2100 / 2300
Tetrachloroethene (PCE)	0.65 / 1.5 / 3.6	0.18 / 0.39 / 0.90	0.18 / 0.4 / 0.92	19 / 42 / 95	1400 / 1400 / 1400	810[sol](424)/1100 [sol] (951)/1500
Tetrachloromethane (Carbon Tetrachloride)	0.45 / 1.0 / 2.4	0.026 / 0.056 / 0.13	0.026 / 0.056 / 0.13	2.9 / 6.3 / 14	890 / 920 / 950	190 / 270 / 400
Trichloroethene (TCE)	0.041 / 0.091 / 0.21	0.016 / 0.034 / 0.075	0.017 / 0.036 / 0.080	1.2 / 2.6 / 5.7	120 / 120 / 120	70 / 91 / 120
Trichloromethane (Chloroform)	0.42 / 0.83 / 1.7	0.91 / 1.7 / 3.4	1.2 / 2.1 / 4.2	99 / 170 / 350	2500 / 2500 / 2500	2600 / 2800 / 3100
Chloroethene (Vinyl Chloride)	0.00055/ 0.001/ 0.0018	0.00064 / 0.00087/ 0.0014	0.00077 / 0.001 / 0.0015	0.059 / 0.077 / 0.12	3.5 / 3.5 / 3.5	4.8 / 5.0 / 5.4
Phenol & Chlorophenols [a, b, l, p]						
Phenol	23 /42 / 83	120 / 200/380	440/690 /1200	440[dir] (26000) / 690[dir] (30000) / 1300[dir] (34000)	440[dir] (10000)/ 690[dir](10000) 1300[dir](10000)	440[dir] (7600) / 690[dir] (8300) / 1300[dir] (93000)
Chlorophenols (excluding PCP) [r]	0.13[s] / 0.3 / 0.7	0.87[s] / 2.0 / 4.5	94 / 150 / 210	3500 / 4000 / 4300	620/ 620 / 620	1100/1100/ 1100
Pentachlorophenol (PCP)	0.03 / 0.08 / 0.19	0.22/ 0.52 / 1.2	27[vap] (16.4) / 29 / 31	400 / 400 / 400	60 / 60 / 60	110 / 120 / 120
Other [a, b, l, p]						
Carbon Disulphide	4.8 / 10 / 23	0.14/0.29 /0.62	0.14/0.29 /0.62	11 / 22 / 47	11000 / 11000 / 12000	1300 / 1900 / 2700
Hexachlorobutadiene (HCBD)	0.25/0.61/1.4	0.29/0.7/1.6	0.32/0.78/1.8	31 / 66 / 120	25 / 25 / 25	48 / 50 / 51

Determinand	Allotment	R_WHP	$R_{WO}HP$	Commercial/ Industrial	POSresi	POSpark
Pesticides (SOM 1%/ 2.5%/ 6%) [a, b, l, p]						
Aldrin	3.2 / 6.1 / 9.6	5.7/ 6.6 /7.1	7.3 / 7.4 / 7.5	170 / 170 / 170	18 / 18 / 18	30 / 31 / 31
Atrazine	0.5 / 1.2 / 2.7	3.3/7.6/17.4	610/ 620 / 620	9300 / 9400 / 9400	1200/1200 /1200	2300 / 2400 / 2400
Dichlorvos	0.0049/0.010/ 0.022	0.032/0.066 /0.14	6.4 / 6.5 / 6.6	140 / 140 / 140	16 / 16 / 16	26 / 26 / 27
Dieldrin	0.17/0.41/0.96	0.97/ 2 / 3.5	7.0 / 7.3 / 7.4	170 / 170 / 170	18 / 18 / 18	30 / 30 / 31
Alpha - Endosulfan	1.2 / 2.9 / 6.8	7.4 / 18 / 41	160[vap] (0.003)/ 280[vap] (0.007)/ 410[vap] (0.016)	5600[vap] (0.003) / 7400[vap] (0.007) / 8400[vap] (0.016)	1200 / 1200 / 1200	2400 / 2400 / 2500
Beta - Endosulfan	1.1 / 2.7 / 6.4	7.0 / 17 / 39	190[vap](0.00007) /320[vap](0.0002) /440[vap](0.0004)	6300[vap](0.00007) /7800[vap](0.0002) / 8700	1200 / 1200 / 1200	2400 / 2400 / 2500
Alpha-Hexachlorocyclohexane	0.035/0.087/ 0.21	0.23/0.55 / 1.2	6.9 / 9.2 / 11	170 / 180 / 180	24 / 24 / 24	47 / 48 / 48
Beta - Hexachlorocyclohexane	0.013/0.032/ 0.077	0.085 / 0.2/ 0.46	3.7 / 3.8 / 3.8	65 / 65 / 65	8.1 / 8.1 / 8.1	15 / 15 / 16
Gamma – Hexachlorocyclohexane	0.0092 / 0.023 / 0.054	0.06/0.14/ 0.33	2.9 / 3.3 / 3.5	67 / 69 / 70	8.2 / 8.2 / 8.2	14 / 15 / 15
Chlorobenzenes [a, b, l, p]						
Chlorobenzene	5.9 / 14 / 32	0.46 / 1.0 / 2.4	0.46 / 1.0 / 2.4	56 / 130 / 290	11000 / 13000 / 14000	1300[sol](675)/ 2000[sol](1520)/ 2900
1,2-dichlorobenzene (1,2-DCB)	94 / 230 / 540	23 / 55 / 130	24 / 57 / 130	2000[sol] (571) / 4800[sol] (1370) / 11000[sol] (3240)	90000 / 95000 / 98000	24000[sol] (571) / 36000[sol] (1370) /51000[sol] (3240)
1,3-dichlorobenzene (1,3-DCB)	0.25 / 0.6 / 1.5	0.4 / 1.0 / 2.3	0.44/1.1 / 2.5	30 / 73 / 170	300/ 300 / 300	390 / 440 / 470
1-4-dichlorobenzene (1,4-DCB)	15[i] / 37[i] / 88 [i]	61[q] / 150[q] /350 [q]	61[q]/150[q]/350[q]	4400[vap,q] (224) / 10000[vap,q] (540) / 25000[vap,q] (1280)	17000[i] / 17000[i] / 17000[i]	36000[vap,i] (224) 36000[vap, i](540)/ 36000[vap,i](1280)
1,2,3-Trichlorobenzene	4.7 / 12 / 28	1.5 / 3.6 / 8.6	1.5 / 3.7 / 8.8	102 / 250 / 590	1800 / 1800 / 1800	770[vap] (134) / 1100[vap] (330) / 1600[vap] (789)
1,2,4- Trichlorobenzene	55 / 140 / 320	2.6 / 6.4 / 15	2.6 / 6.4 / 15	220 / 530 / 1300	15000 / 17000 / 19000	1700[vap] (318) / 2600[vap] (786) / 4000[vap] (1880)
1,3,5- Trichlorobenzene	4.7 / 12 / 28	0.33 / 0.81 / 1.9	0.33 / 0.81 / 1.9	23 / 55 / 130	1700 / 1700 / 1800	380[vap] (36.7) / 580[vap] (90.8) / 860[vap] (217)
1,2,3,4-Tetrachlorobenzene	4.4 / 11 / 26	15 / 36 / 78	24 / 56 / 120	1700[vap] (122) / 3080[vap] (304) / 4400[vap] (728)	830 / 830 / 830	1500[vap] (122) / 1600 / 1600
1,2,3,5- Tetrachlorobenzene	0.38 / 0.90 / 2.2	0.66 / 1.6 / 3.7	0.75 / 1.9 / 4.3	49[vap] (39.4) / 120[vap] (98.1) / 240[vap] (235)	78 / 79 / 79	110[vap] (39) / 120 / 130
1,2,4,5- Tetrachlorobenzene	0.06 / 0.16 / 0.37	0.33 / 0.77 / 1.6	0.73 / 1.7 / 3.5	42[sol] (19.7) / 72[sol] (49.1) / 96	13 / 13 / 13	25 / 26 / 26
Pentachlorobenzene (P_ECB)	1.2 / 3.1 / 7.0	5.8 / 12 / 22	19 / 30 / 38	640[sol] (43.0) / 770[sol] (107) / 830	100 / 100 / 100	190 / 190 / 190
Hexachlorobenzene (HCB)	0.47 / 1.1 / 2.5	1.8[vap] (0.20) / 3.3[vap] (0.5) / 4.9	4.1[vap] (0.20) / 5.7[vap] (0.5) / 6.7[vap] (1.2)	110[vap] (0.20) / 120 / 120	16 / 16 / 16	30 / 30 / 30

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R_WHP Residential with homegrown produce
$R_{WO}HP$ Residential without homegrown produce
POSresi public open spaces near residential housing
POSpark public open space for recreational use but not dedicated sports pitches
SOM Soil Organic Matter – ***the S4UL for all organic compounds will vary according to SOM***

a Based on a sandy loam soil as defined in SR3 (Environment Agency, 2009b) and 6% soil organic matter (SOM)
b Figures rounded to two significant figures
c Based only on a comparison of oral and dermal soil exposure with oral Index Dose
d The background ADE is limited to being no larger than the contribution from the relevant soil ADE
e Based on comparison of inhalation exposure with inhalation TDI only
f Based on a lifetime exposure via the oral, dermal and inhalation pathways
g Based on localised effects comparing inhalation exposure with inhalation ID only
h Based on comparison of inhalation exposure with inhalation ID
i Based on comparison of oral and dermal exposure with oral TDI
j Based on comparison of oral, dermal and inhalation exposure with inhalation TDI
k Based on comparison of all exposure pathways with oral TDI
l S4ULs assume that free phase contamination is not present
m S4ULs based on a sub-surface soil to indoor air correction factor of 10
n The HCV applied is based on the intake of total Xylene and therefore exposure should not consider an isomer in isolation
o Oral, dermal and inhalation exposure compared with oral HCV
p S4ULs based on a sub-surface soil to indoor air correction factor of 1
q Based on a comparison of inhalation exposure with the inhalation TDI for localised effects
r Based on 2,4-dichlorophenol unless otherwise stated
s Based on 2,3,4,6-tetrachlorophenol
vap S4UL presented exceeded the vapour saturation limit, which is presented in brackets
sol S4UL presented exceeds the solubility saturation limit, which is presented in brackets
dir S4ULs based on a threshold protective of direct skin contact, guideline in brackets based on the health effects following long term exposure provided for illustration only

Table 4: Tier 2 Criteria for Screening Liquids
Determinant in **bold** are hazardous substances PS = Priority Substances SP = Specific Pollutants

Determinant	Screening Concentration (mg/l)			
	Minimum Reporting Value	Protection of Human Health	Protection of Environmental Waters	
			Freshwater Long Term	Transitional and Coastal Waters
Metals				
Arsenic SP	-	0.01	0.05 (2)	0.025 (2)
Cadmium (hardness dependant) PS	0.0001	0.005	≤0.00008, 0.00008, 0.00009, 0.00015, 0.00025	0.0002
Chromium (total)	-	0.05	-	-
Chromium (III) SP	-	-	0.0047	-
Chromium (VI) SP	-	-	0.0034	0.0006
Copper SP	-	2	0.001 bioavailable	0.00376 bioavailable
Iron SP	-	0.2	0.001	0.001
Lead PS	-	0.01	0.0012 bioavailable	0.0013 bioavailable
Mercury PS	0.00001	0.001	0.00007 max	0.00007 max
Manganese SP	-	0.05	0.123 bioavailable	-
Nickel PS	-	0.02	0.004 bioavailable	0.0086 bioavailable
Selenium	-	0.01	-	-
Zinc SP	-	5(3)	0.0109 bioavailable (13)	0.068 bioavailable (13)
Chlorinated Solvents				
C10-13 chloroalkanes PS	-	-	0.0004	0.0004
Dichloromethane PS	-	-	0.02	0.02
Trichloroethene PS	0.0001	0.01(5)	0.01	0.01
Tetrachloroethene PS	0.0001	0.01(5)	0.01	0.01
1,1,1-Trichloroethane	0.0001	-	-	-
1,1,2-Trichloroethane	0.0001	-	-	-
Tetrachloromethane PS	0.0001	0.003	0.012	0.012
Tetrachloroethane SP			0.140	
1,2-Dichloroethane PS	0.001	0.003	0.01	0.01
Vinyl chloride	-	0.00005	-	-
Trichloromethanes PS	-	0.1(1)	0.0025	0.0025
Polycyclic Aromatic Hydrocarbons				
Acenaphthene	-	-	-	-
Acenaphthylene	-	-	-	-
Anthracene PS	-	-	0.0001	0.0001
Benzo(a)anthracene	-	-	-	-
Benzo(b)fluoranthene PS	-	0.0001	0.000017 max	0.000017 max
Benzo(a)pyrene PS	-	0.00001	0.00000017	0.00000017
Benzo(k)fluoranthene PS		-	0.0000082 max	0.00000082 max
Benzo(g,h,i)perylene PS	-	-	0.000017 max	0.000017 max
Indeno(1,2,3-cd)pyrene PS	-	-	-	-
Chrysene	-	-	-	-
Dibenzo(a,h)anthracene	-	-	-	-
Fluoranthene PS	-	-	0.0000063	0.0000063
Fluorene	-	-	-	-
Phenanthrene	-	-	-	-
Pyrene	-	-	-	-
Naphthalene PS	-	-	0.002	0.002
Poly Aromatic Hydrocarbons		0.0001(10)		

Determinant	Screening Concentration (mg/l)			
	Minimum Reporting Value	Protection of Human Health	Protection of Environmental Waters	
			Freshwater Long Term	Transitional and Coastal Waters
Petroleum hydrocarbons				
Total petroleum hydrocarbons	-	0.01[3]	-	-
Benzene PS	0.001	0.001	0.01	0.008
Toluene SP	0.004	0.7[9]	0.074	0.074
Ethylbenzene	-	0.3[9]	-	-
Xylene	0.003[4]	0.5[9]	0.03	0.03
Methyl tert-butyl ether (MTBE)	-	0.015[7]	-	-
Pesticides and Herbicides (16)				
Alachlor PS	-	-	0.0003	0.0003
Aldrin PS	0.000003	0.000013	0.00001[8]	0.000005[8]
Dieldrin PS	0.000003	0.00003		
Endrin PS	0.000003	0.0006[9]		
Isodrin	0.000003	-	-	-
Heptachlor	-	0.00003	-	
2,4 dichlorophenol SP	-	-	0.0042	0.0042
2,4 D ester SP	0.0001	-	0.0003	0.0003
op and pp DDT (each) PS	0.000002	0.001[6]	0.000025	0.000025
op and pp DDE (each)	0.000002			
op and pp TDE (each)	0.000002			
Dimethoate SP	0.00001	-	0.00048	0.00048
Endosulfan PS	0.000005	-	0.000005	0.0000005
Hexachlorobenzene PS	0.000001		0.00005 max	0.00005 max
Permethrin SP	0.000001	-	0.000001	0.0000002
Atrazine PS	0.00003	-	0.0006	0.0006
Simazine PS	0.00003	-	0.001	0.001
Linuron SP	0.0001	-	0.0005	0.0005
Mecoprop SP	0.00004	-	0.018	0.018
Trifluralin PS	0.00001	-	0.00003	0.00003
Miscellaneous				
Ammonium (as NH4+)	-	0.5	-	
Unionised Ammonia (NH3) SP	-	-	-	0.021
Chlorine SP	-	250	0.002	0.01 max
Cyanide SP (hydrogen cyanide)	-	0.05	0.001	0.001
Chloronitrotoluenes(CNT)[11]	0.0001	-	-	-
Hexachlorobutadiene PS	0.000005	-	0.0006 max	0.0006 max
Hexachlorocyclohexanes (HCH) PS	0.000001	-	0.00002	0.000002
Nitrate (as NO_3)	-	50	-	-
Nitrate (as NO_2)	-	0.1	-	-
Phenol SP	-	0.5	0.0077	0.0077
Pentachlorophenol PS	0.0001	-	0.0004	0.0004
PCBs (individual congeners)	0.000001	-	-	-
Sodium	-	200	-	-
Sulphate	-	250		-
Tributyl and triphenyl tin compounds (each) PS	0.000001	-	0.0000002	0.0000002
Trichlorobenzene (TCB) PS	0.00001	-	0.0004	0.0004
Di(2-ethylhexyl)-phthalate (DEPH) PS	-	-	0.0013	0.0013

- Screening concentrations as Minimum Reporting Values are taken from Annex J Groundwater of Horizontal Guidance Note H1 (H1 Environmental Risk Assessment Framework, Environment Agency, April 2011 v2.1).
- Screening concentrations for Protection of Human Health are taken from Statutory Instrument 2000 No. 3184. The water Supply (Water Quality) Regulations 2000 unless indicated
- Screening concentrations for protection of environmental waters are taken from The River Basin Districts Typology, Standards and Groundwater Threshold Values (Water Framework Directive) (England and Wales) Directions 2015

Notes:

1. Concentration for trihalomethanes is the sum of chloroform, bromoform, dibromochloromethane and bromodichloromethane.
2. Concentration is the dissolved fraction of a water sample obtained by filtration through a 0.45um filter.
3. Concentration is taken from Statutory Instrument 1989 No. 1147. The Water Supply (Water Quality) Regulations 1989, as amended.
4. Concentration for xylenes is 0.003mg/l each for o-xylene and m/p xylene.
5. Concentration is the Sum of TCE and PCE.
6. Concentration is for Total DDT. Para para DDT on its own has a target concentration of 0.00001mg/l.
7. Concentration for MTBE is taken from Environment Agency guidance, dated 2006.
8. Concentration is the sum of aldrin, dieldrin, endrin.
9. Concentration is taken from WHO (2004) guidelines for drinking-water quality.
10. Sum of benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(ghi)perylene, indeno(1,2,3-cd)pyrene
11. Concentration is for 2,6-CNT, 4,2-CNT, 4,3-CNT, 2,4-CNT, 2,5-CNT
12. Concentration for other herbicides are 2,4 D, 2,4-dichlorophenol, 2-chlorophenol and 4-chloro-3-methylphenol
13. Concentration plus ambient background concentration (dissolved)
14. '-' screening concentration is not available
15. 'max' – maximum allowable concentration
16. This is only a list of the more common parameters and the directions contain a number of other chemicals

Appendix E Monitoring Records 2008

FIELDWORK - Insitu Groundwater Monitoring

Project GreenPark, Reading Plot 3.2 **Engineer** Peter Brett Associates LLP **Project No** 02942/1013

Client Prupim **Project Team** Geo **Date** 25.06.08

Borehole	Water Level to cover (m)	Depth to cover (m)	Volume Purged (Ltrs)	pH	Conductivity [mS]	Temperature [°C]	Redox mV	Comments
BH102	2.00	4.20	30.0	7.8	145	14.4	-094	Clear colour, no odour
BH104	2.23	4.40	33.0	7.4	346	13.8	-053	Clear colour, no odour
BH105	2.20	4.80	40.0	7.3	545	14.5	-075	Slight sandy yellow colour, no odour
BH201	2.14	7.00	70.0	8.8	268	12.6	-125	Sandy, gravel yellow colour, no odour, very silty.
BH202	5.40	9.40	60.0	10.5	671	17.4	-472	Yellow/brown, sandy clay colour, no odour, very silty

Remarks

(1) All dip reduced to ground level

(2) Weather/Site Conditions: Ground dry, areas of worked ground, grass and undergrowth. Sunny, blue skies, mild, strong breeze - scale 6

POST FIELDWORK MONITORING RECORD (PBA 1) Page..1..of…2.

Job Title	GreenPark Plot 3.2
Job No	02942/1013
Date	01/08/2008
Operator	G. Miles

CALIBRATION			
	Limits (%)	Cal Gas *Start/ End*	Air *Start/ End*
CH4 (5%)	4.5 - 5.5	4.6/4.9	0.0/0.0
CO2 (5%)	4.5 - 5.5	4.8/5.0	0.0/0.0
02 (6%)	5.0 - 7.0	5.6/5.5	21.0/20.8

Instrument (type/serial no) and date of last manufacturers service	**LMSxi serial number 5225, serviced June 08**

Atmospheric Pressure	Time	- 48 hrs	- 24 hrs	0	+ 24 hrs	+ 48 hrs	Comment
	mbar	1017	1011	1011	1013	1017	Data from BBC website

Ground conditions	Area's of worked ground, grass and undergrowth. Dry.

Weather	Dry, sunny, warm, overcast. Moderate breeze - scale 4.

Borehole identification and construction 101 50mm, bung and tap, raised Top Hat cover with padlock

Comment/Condition All ok

Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	0.8	1008	1.2	4.8	20.9/4.8	11.4	<1		
1 to 2	1.1	1007	1.2/1.0	4.8/4.7	4.8/4.6	11.4	<1		
2 to 3	1.1/1.0	1007	1.0	4.8	4.7	11.4/11.3	<1	2.48	4.30

Borehole identification and construction 102 50mm, bung and tap, raised Top Hat cover with padlock

Comment/Condition All ok

Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	-0.2	1007	2.5	1.5	20.9/15.2	30.8	<1		
1 to 2	-1.5	1007	3.8	2.1	15.2/12.4	20.7	<1		
2 to 3	-0.7	1007	4.0	2.2	12.4/11.9	20.7	<1	2.13	4.20

Borehole identification and construction 103 50mm, bung and tap, raised Top Hat cover with padlock

Comment/Condition All ok

Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	-5.2	1007	6.9	3.2	20.7/11.2	>150	<1		
1 to 2	-5.6	1007	7.6	3.6	11.2/9.8	>150	<1		
2 to 3	-4.9	1007	8.5	4	9.8/8.7	>150	<1	2.48	4.50

Borehole identification and construction 104 50mm, bung and tap, raised Top Hat cover with padlock

Comment/Condition All ok

Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	0.0	1007	4.2	3.4	20.9/13.8	69.8	<1		
1 to 2	0.8	1007	4.2/1.6	3.4/1.1	18.0	69.8/30.5	<1		
2 to 3	0.8/0.7	1007	1.6/1.1	1.1/0.8	18.7	30.5/19.1	<1	2.34	4.40

Borehole identification and construction 105 50mm, bung and tap, raised Top Hat cover with padlock

Comment/Condition All ok

Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	-0.6	1007	<0.1	<0.1	20.8/20.7	<0.1	<1		
1 to 2	0.2	1007	<0.1	<0.1	20.7	<0.1	<1	2.33	4.80
2 to 3									

Typed By: G.Miles Date 05.08.08 Checked By: Date

POST FIELDWORK MONITORING RECORD (PBA 1) Page..2..of…2

Borehole identification and construction			201		50mm, bung and tap, raised Top Hat cover with padlock				
Comment/Condition	All ok								
Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	0.0	1007	<0.1	<0.1	20.9/20.8	<0.1	<1		
1 to 2			<0.1	<0.1	20.8	<0.1	<1	2.27	7.00
2 to 3									

Borehole identification and construction			202		50mm, bung and tap, raised Top Hat cover with padlock				
Comment/Condition	All ok								
Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	-0.2	1007	<0.1	<0.1	20.8	<0.1	<1		
1 to 2	-1.6	1007	<0.1	<0.1	20.8	<0.1	<1		
2 to 3	-0.7	1007	<0.1	<0.1	20.8	<0.1	<1	4.10	9.40

Borehole identification and construction									
Comment/Condition									
Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1									
1 to 2									
2 to 3									

Borehole identification and construction									
Comment/Condition									
Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1									
1 to 2									
2 to 3									

Borehole identification and construction									
Comment/Condition									
Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1									
1 to 2									
2 to 3									

Borehole identification and construction									
Comment/Condition									
Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1									
1 to 2									
2 to 3									

Typed By:	G.Miles	Date	05.08.08	Checked By:	Date

POST FIELDWORK MONITORING RECORD (PBA 1) Page..1..of…2.

Job Title	GreenPark Plot 3.2
Job No	02942\1013
Date	02/07/2008
Operator	G. Miles

CALIBRATION			
	Limits (%)	Cal Gas *Start/ End*	Air *Start/ End*
CH4 (5%)	4.5 - 5.5	4.6/4.4	0.0/0.0
CO2 (5%)	4.5 - 5.5	5.2/4.9	0.0/0.0
02 (6%)	5.0 - 7.0	6.0/5.9	21.0/20.8

Instrument (type/serial no) and date of last manufacturers service	**LMSxi serial number 5225, serviced June 08**

Atmospheric Pressure	Time	- 48 hrs	- 24 hrs	0	+ 24 hrs	+ 48 hrs	Comment
	mbar						Data from BBC website

Ground conditions	Dry, worked ground, area's of grass and undergrowth.
Weather	Warm, overcast, light rain turning to heavy rain. Gentle breeze - scale 3

Borehole identification and construction 101 50mm, bung and tap, raised Top Hat cover with padlock

Comment/Condition All ok

Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	0.0	1006	<0.1	0.5	20.7/20.1	<0.1	<1		
1 to 2	0.0	1006	<0.1	0.5	20.1	<0.1	<1	2.20	4.30
2 to 3									

Borehole identification and construction 102 50mm, bung and tap, raised Top Hat cover with padlock

Comment/Condition All ok

Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	0.0	1005	2.8	3.2	19.7/10.0	38.6	<1		
1 to 2	-0.1	1006	2.8/2.4	3.2/3.1	10.1	38.6/33.0	<1		
2 to 3	0	1006	2.4/2.1	3.1/3.0	10.3	33.0/28.9	<1	2.04	4.20

Borehole identification and construction 103 50mm, bung and tap, raised Top Hat cover with padlock

Comment/Condition All ok

Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	0.2/0.1	1006	<0.1	0.4	20.7/20.6	<0.1	<1		
1 to 2	0.7/0.2	1005	<0.1	0.4	20.6	<0.1	<1	2.15	4.50
2 to 3	0.2/0.0	1005							

Borehole identification and construction 104 50mm, bung and tap, raised Top Hat cover with padlock

Comment/Condition All ok

Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	0.0	1005	11.5	2.6	18.6/12.8	>100	<1		
1 to 2			11.5	2.6/2.5	13.7	>100	<1		
2 to 3			11.5/10.0	2.5/2.1	14.8	>100	<1	2.28	4.40

Borehole identification and construction 105 50mm, bung and tap, raised Top Hat cover with padlock

Comment/Condition All ok

Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	0.2	1012	7.9	6.0	19.8/10.4	>100	<1		
1 to 2			7.9	6	10.4	>100	<1		
2 to 3			7.9/7.7	6.0/5.9	10.4/10.2	>100	<1	2.24	4.80

Typed By: G.Miles Date 04.07.08 Checked By: Date

POST FIELDWORK MONITORING RECORD (PBA 1)

Borehole identification and construction			201		50mm, bung and tap, raised Top Hat cover with padlock				
Comment/Condition	All ok								
Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	0.0	1006	<0.1	0.2/0.1	20.7/20.5	<0.1	<1		
1 to 2			<0.1	0.1/<0.1	20.6	<0.1	<1	2.16	7.00
2 to 3									

Borehole identification and construction			202		50mm, bung and tap, raised Top Hat cover with padlock				
Comment/Condition	All ok								
Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	-0.1	1006	<0.1	<0.1	20.9/20.7	<0.1	4.2		
1 to 2	-0.1/0.0	1006	<0.1	<0.1	20.7	<0.1	4.2/2.7		
2 to 3	0	1006	<0.1	<0.1	20.7	<0.1	2.7/2.2	4.28	9.40

Borehole identification and construction									
Comment/Condition									
Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1									
1 to 2									
2 to 3									

Borehole identification and construction									
Comment/Condition									
Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1									
1 to 2									
2 to 3									

Borehole identification and construction									
Comment/Condition									
Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1									
1 to 2									
2 to 3									

Borehole identification and construction									
Comment/Condition									
Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1									
1 to 2									
2 to 3									

Typed By:	G.Miles	Date	04.07.08	Checked By:	Date

POST FIELDWORK MONITORING RECORD (PBA 1) Page..1..of…2.

Job Title	GreenPark Plot 3.2
Job No	02942/1013
Date	10/07/2008
Operator	G. Miles

CALIBRATION			
	Limits (%)	Cal Gas *Start/ End*	Air *Start/ End*
CH4 (5%)	4.5 - 5.5	4.6/4.9	0.0/0.0
CO2 (5%)	4.5 - 5.5	4.8/5.0	0.0/0.0
02 (6%)	5.0 - 7.0	5.6/5.5	21.0/20.8

Instrument (type/serial no) and date of last manufacturers service	**LMSxi serial number 5225, serviced June 08**

Atmospheric Pressure	Time	- 48 hrs	- 24 hrs	0	+ 24 hrs	+ 48 hrs	Comment
	mbar	1009	1011	1007	1005	1010	Data from BBC website

Ground conditions	Area's of worked ground, grass and undergrowth. Wet, muddy and ponded water in places.

Weather	Light and heavy rain showers. Mild, overcast, strong breeze - scale 6.

Borehole identification and construction 101 50mm, bung and tap, raised Top Hat cover with padlock

Comment/Condition All ok

Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	>30	1003	5.8	0.6	20.7/3.5	48.1	<1		
1 to 2	>30	1003	6.2	1.3	3.5/3.0	50.2	<1		
2 to 3	>30	1003	6.5	1.8	3.0/2.6	51.3	<1	2.01	4.30

Borehole identification and construction 102 50mm, bung and tap, raised Top Hat cover with padlock

Comment/Condition All ok

Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	>30	1003	34.0	5.5	20.1/1.5	>100	<1		
1 to 2	>30/28.2	1003	34.0/31.5	5.5/5.0	3.2	>100	<1		
2 to 3	28.2/18.4	1003	31.5/27.5	5.0/4.5	5.5	>100	<1	1.87	4.20

Borehole identification and construction 103 50mm, bung and tap, raised Top Hat cover with padlock

Comment/Condition All ok

Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	0.2/0.1	1003	<0.1	0.3	20.6	<0.1	<1		
1 to 2	0.3/0.2	1003	<0.1	0.3	20.6	<0.1	<1	1.92	4.50
2 to 3									

Borehole identification and construction 104 50mm, bung and tap, raised Top Hat cover with padlock

Comment/Condition All ok

Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	1.1	1003	55.0/37.0	19.0/14.0	18.5/8.0	>100	<1		
1 to 2			37.0/24.0	14.0/9.1	12.0	>100	<1		
2 to 3			24.0/21.5	9.1/8.1	13.1	>100	<1	2.08	4.40

Borehole identification and construction 105 50mm, bung and tap, raised Top Hat cover with padlock

Comment/Condition All ok

Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	4.7/3.5	1003	14.0/11.0	10.0/7.8	20.8/5.5	>100	<1		
1 to 2	3.5/2.4	1003	11.0/8.1	7.8/6.0	9.3	>100/92.1	<1		
2 to 3	2.4/2.2	1003	8.1/5.8	6.0/4.0	12.2	92.1/89.0	<1	1.84	4.80

Typed By: G.Miles Date 11.07.08 Checked By: Date

POST FIELDWORK MONITORING RECORD (PBA 1)

Borehole identification and construction			201		50mm, bung and tap, raised Top Hat cover with padlock				
Comment/Condition	All ok								
Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	0.0	1003	<0.1	0.3	20.7/20.4	<0.1	<1		
1 to 2			<0.1	0.3/<0.1	20.8	<0.1	<1	2.09	7.00
2 to 3									

Borehole identification and construction			202		50mm, bung and tap, raised Top Hat cover with padlock				
Comment/Condition	All ok								
Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	-0.3	1003	<0.1	<0.1	20.8/20.7	<0.1	<1		
1 to 2	<0.1	1003	<0.1	<0.1	20.7	<0.1	<1		
2 to 3	-0.1/<0.1	1003	<0.1	<0.1	20.8	<0.1	<1	4.14	9.4

Borehole identification and construction									
Comment/Condition									
Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1									
1 to 2									
2 to 3									

Borehole identification and construction									
Comment/Condition									
Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1									
1 to 2									
2 to 3									

Borehole identification and construction									
Comment/Condition									
Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1									
1 to 2									
2 to 3									

Borehole identification and construction									
Comment/Condition									
Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1									
1 to 2									
2 to 3									

Typed By:	G.Miles	Date	11.07.08	Checked By:	Date

POST FIELDWORK MONITORING RECORD (PBA 1) Page..1..of…2.

Job Title	GreenPark Plot 3.2
Job No	02942/1013
Date	21/07/2008
Operator	G. Miles

CALIBRATION			
	Limits (%)	Cal Gas *Start/ End*	Air *Start/ End*
CH4 (5%)	4.5 - 5.5	4.3/4.5	0.0/0.0
CO2 (5%)	4.5 - 5.5	5.2/5.3	0.0/0.0
02 (6%)	5.0 - 7.0	6.5/6.5	21.2/21.1

Instrument (type/serial no) and date of last manufacturers service	**LMSxi serial number 5225, serviced June 08**

Atmospheric Pressure	Time	- 48 hrs	- 24 hrs	0	+ 24 hrs	+ 48 hrs	Comment
	mbar	1023	1022	1025	1024	1023	Data from BBC website

Ground conditions	Area's of worked ground, grass and undergrowth. Dry.

Weather	Dry, warm, sunny, little cloud. Moderate breeze - scale 4.

Borehole identification and construction 101 50mm, bung and tap, raised Top Hat cover with padlock

Comment/Condition All ok

Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	-8.9	1020	<0.1	0.7	20.8/18.2	<0.1	<1		
1 to 2	-9.1	1020	<0.1	2.2	18.2/13.2	<0.1	<1		
2 to 3	-9.5	1020	<0.1	2.7	13.2/12.3	<0.1	<1	2.23	4.30

Borehole identification and construction 102 50mm, bung and tap, raised Top Hat cover with padlock

Comment/Condition All ok

Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	-2.7	1020	<0.1	1.8	20.8/8.4	<0.1	<1		
1 to 2	-2.2	1020	<0.1	2.3	8.4/4.9	<0.1	<1		
2 to 3	-2.6	1020	<0.1	2.5	4.9/4.4	<0.1	<1	2.11	4.20

Borehole identification and construction 103 50mm, bung and tap, raised Top Hat cover with padlock

Comment/Condition All ok

Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	-9.7	1020	<0.1	<0.1	20.9	<0.1	<1		
1 to 2	-8.6	1020	<0.1	<0.1	20.9	<0.1	<1	2.23	4.50
2 to 3									

Borehole identification and construction 104 50mm, bung and tap, raised Top Hat cover with padlock

Comment/Condition All ok

Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	0.0	1020	<0.1	0.3	20.0/20.6	<0.1	<1		
1 to 2	0	1020	<0.1	0.3/0.2	20.7	<0.1	<1		
2 to 3			<0.1	0.2/<0.1	20.8	<0.1	<1	2.32	4.40

Borehole identification and construction 105 50mm, bung and tap, raised Top Hat cover with padlock

Comment/Condition All ok

Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	-2.1	1020	<0.1	<0.1	21.0	<0.1	<1		
1 to 2	-2.0	1020	<0.1	<0.1	21.0	<0.1	<1	2.30	4.80
2 to 3	-2.1	1020	<0.1						

Typed By: G.Miles Date 29.07.08 Checked By: Date

POST FIELDWORK MONITORING RECORD (PBA 1) Page..2..of…2

Borehole identification and construction			201		50mm, bung and tap, raised Top Hat cover with padlock				
Comment/Condition	All ok								
Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	0.0	1020	<0.1	<0.1	20.7	<0.1	<1		
1 to 2	-0.2	1021	<0.1	<0.1	20.7	<0.1	<1	2.24	7.00
2 to 3									

Borehole identification and construction			202		50mm, bung and tap, raised Top Hat cover with padlock				
Comment/Condition	All ok								
Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	-0.2	1020	<0.1	<0.1	20.9	<0.1	<1		
1 to 2	0.0	1020	<0.1	<0.1	20.9/20.8	<0.1	<1	3.89	9.40
2 to 3	-0.1	1020							

Borehole identification and construction									
Comment/Condition									
Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1									
1 to 2									
2 to 3									

Borehole identification and construction									
Comment/Condition									
Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1									
1 to 2									
2 to 3									

Borehole identification and construction									
Comment/Condition									
Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1									
1 to 2									
2 to 3									

Borehole identification and construction									
Comment/Condition									
Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1									
1 to 2									
2 to 3									

Typed By:	G.Miles	Date	29.07.08	Checked By:	Date

POST FIELDWORK MONITORING RECORD (PBA 1) Page..1..of…2.

Job Title	GreenPark Plot 3.2
Job No	02942\1013
Date	25/06/2008
Operator	G. Miles

CALIBRATION			
	Limits (%)	Cal Gas *Start/ End*	Air *Start/ End*
CH4 (5%)	4.5 - 5.5	4.6/4.4	0.0/0.0
CO2 (5%)	4.5 - 5.5	5.2/4.9	0.0/0.0
02 (6%)	5.0 - 7.0	6.0/5.9	21.0/20.8

Instrument (type/serial no) and date of last manufacturers service	**LMSxi serial number 5225, serviced June 08**

Atmospheric Pressure	Time	- 48 hrs	- 24 hrs	0	+ 24 hrs	+ 48 hrs	Comment
	mbar						Data from BBC website

Ground conditions	Dry, worked ground, area's of grass and undergrowth.
Weather	Dry, sunny, blue skies, mild. Strong breeze - scale 6

Borehole identification and construction 101 50mm, bung and tap, raised Top Hat cover with padlock

Comment/Condition All ok

Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	0.0	1012	<0.1	<0.1	20.7	<0.1	<1	2.16	4.3
1 to 2									
2 to 3									

Borehole identification and construction 102 50mm, bung and tap, raised Top Hat cover with padlock

Comment/Condition All ok

Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	0.4	1012	0.8	1.4	20.8/17.1	16.0	<1		
1 to 2			0.8/0.7	1.4/1.2	17.2	16.0/12.2	<1		
2 to 3			0.7/0.6	1.2/1.1	17.4	12.2/9.9	<1	2.00	4.20

Borehole identification and construction 103 50mm, bung and tap, raised Top Hat cover with padlock

Comment/Condition All ok

Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	0.0	1012	<0.1	<0.1	20.8	<0.1	<1		
1 to 2			<0.1	<0.1	20.8	<0.1	<1	2.08	4.50
2 to 3									

Borehole identification and construction 104 50mm, bung and tap, raised Top Hat cover with padlock

Comment/Condition All ok

Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	0.0	1012	25.5/18.0	2.3	20.9/3.0	>100	<1		
1 to 2			18.0/15.0	2.3/2.0	14.0	>100	<1		
2 to 3			15.0/14.5	2.0/1.8	14.5	>100	<1	2.23	4.40

Borehole identification and construction 105 50mm, bung and tap, raised Top Hat cover with padlock

Comment/Condition All ok

Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	0.0	1012	2.9	1.6	20.8/14.9	53.4	<1		
1 to 2			2.9/2.4	1.6/1.4	15.8	42.2	<1		
2 to 3			2.4/1.8	1.4/0.7	17.3	32.1	<1	2.20	4.80

Typed By: G.Miles Date 27.06.08 Checked By: Date

POST FIELDWORK MONITORING RECORD (PBA 1)

Borehole identification and construction			201		50mm, bung and tap, raised Top Hat cover with padlock				
Comment/Condition		All ok							
Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	0.0	1012	<0.1	<0.1	20.6	<0.1	<1	2.14	7.00
1 to 2									
2 to 3									

Borehole identification and construction			202		50mm, bung and tap, raised Top Hat cover with padlock				
Comment/Condition		All ok							
Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	0.0	1011	<0.1	<0.1	20.5	<0.1	<1	5.4	9.40
1 to 2									
2 to 3									

Borehole identification and construction									
Comment/Condition									
Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1									
1 to 2									
2 to 3									

Borehole identification and construction									
Comment/Condition									
Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1									
1 to 2									
2 to 3									

Borehole identification and construction									
Comment/Condition									
Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1									
1 to 2									
2 to 3									

Typed By:	G.Miles	Date	27.06.08	Checked By:	Date

POST FIELDWORK MONITORING RECORD (PBA 1) Page..1..of…2.

Job Title	GreenPark Plot 3.2
Job No	02942/1013
Date	28/07/2008
Operator	G. Miles

CALIBRATION			
	Limits (%)	Cal Gas *Start/ End*	Air *Start/ End*
CH4 (5%)	4.5 - 5.5	4.6/4.9	0.0/0.0
CO2 (5%)	4.5 - 5.5	4.8/5.0	0.0/0.0
02 (6%)	5.0 - 7.0	5.6/5.5	21.0/20.8

Instrument (type/serial no) and date of last manufacturers service	**LMSxi serial number 5225, serviced June 08**

Atmospheric Pressure	Time	- 48 hrs	- 24 hrs	0	+ 24 hrs	+ 48 hrs	Comment
	mbar	1009	1011	1013	1012	1017	Data from BBC website

Ground conditions	Area's of worked ground, grass and undergrowth. Dry.

Weather	Very warm, humid, dry, sunny, cloudy. Light breeze - scale 2.

Borehole identification and construction 101 50mm, bung and tap, raised Top Hat cover with padlock

Comment/Condition All ok

Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	3.6	1007	1.8	6.5	20.7/1.0	12.6	<1		
1 to 2	3.2	1007	1.8/1.7	6.5	1.0/0.7	12.6/11.3	<1		
2 to 3	3.6	1007	1.7/1.6	6.7	0.7/0.6	11.3/10.4	<1	2.53	4.30

Borehole identification and construction 102 50mm, bung and tap, raised Top Hat cover with padlock

Comment/Condition All ok

Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	0.0	1009	<0.1	<0.1	20.8	<0.1	<1		
1 to 2			<0.1	<0.1	20.8	<0.1	<1		
2 to 3			<0.1	<0.1	20.8	<0.1	<1	2.37	4.20

Borehole identification and construction 103 50mm, bung and tap, raised Top Hat cover with padlock

Comment/Condition All ok

Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	4.2	1009	11.5	6.4	20.7	93.0	<1		
1 to 2	4.4	1009	13.5	8.7	20.7/0.5	95.5	<1		
2 to 3	4.4	1009	13.5	8.7/8.5	0.5	95.5/92.9	<1	2.51	4.50

Borehole identification and construction 104 50mm, bung and tap, raised Top Hat cover with padlock

Comment/Condition All ok

Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	0.0	1010	<0.1	4.2/2.6	20.8/14.3	<0.1	<1		
1 to 2			<0.1	2.6/1.3	18.5	<0.1	<1		
2 to 3			<0.1	1.3/0.9	19.0	<0.1	<1	2.36	4.40

Borehole identification and construction 105 50mm, bung and tap, raised Top Hat cover with padlock

Comment/Condition All ok

Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	0.0	1010	0.6	11.7	20.9/19.3	13.1	<1		
1 to 2	0.0	1010	1.1	11.7/0.2	17.1	33.1	<1		
2 to 3			1.6	0.2	17.1/16.7	39.7	<1	2..13	4.80

Typed By: G.Miles Date 29.07.08 Checked By: Date

POST FIELDWORK MONITORING RECORD (PBA 1) Page..2..of…2

Borehole identification and construction			201		50mm, bung and tap, raised Top Hat cover with padlock				
Comment/Condition	All ok								
Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	0.0	1007	<0.1	<0.1	20.8	<0.1	<1		
1 to 2	0.0	1007	<0.1	<0.1	20.8	<0.1	<1	2.47	7.00
2 to 3									

Borehole identification and construction			202		50mm, bung and tap, raised Top Hat cover with padlock				
Comment/Condition	All ok								
Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1	0.0	1009	<0.1	<0.1	20.8	<0.1	<1		
1 to 2			<0.1	<0.1	20.8	<0.1	<1		
2 to 3			<0.1	<0.1	20.8	<0.1	<1	4.12	9.40

Borehole identification and construction									
Comment/Condition									
Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1									
1 to 2									
2 to 3									

Borehole identification and construction									
Comment/Condition									
Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1									
1 to 2									
2 to 3									

Borehole identification and construction									
Comment/Condition									
Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1									
1 to 2									
2 to 3									

Borehole identification and construction									
Comment/Condition									
Start time with pump time (minutes)	Flow (l/hr) Peak/Steady	Pressure (mb) Peak/Steady	CH4 (%v/v) Peak/Steady	CO2 (%v/v) Peak/Steady	O2 (%v/v) Peak/Steady	CH4 (%LEL) Peak/Steady	H2S (ppm) Peak/Steady	Groundwater Level Level (mBGL)	Depth to base (mBGL)
0 to 1									
1 to 2									
2 to 3									

Typed By:	G.Miles	Date	29.07.08	Checked By:	Date

Plot 3.2 GreenPark, Reading

01/08/2008

Post Fieldwork Monitoring - Photo-ionisation Detector (PID)

BH101	Peak (ppm)	Steady (ppm)
0-1 min	<0.1	<0.1
1-2 min	<0.1	<0.1
2-3 min	<0.1	<0.1
BH102	Peak (ppm)	Steady (ppm)
0-1 min	2.8	2.8
1-2 min	2.7	2.7
2-3 min	2.7	2.7
BH103	Peak (ppm)	Steady (ppm)
0-1 min	<0.1	<0.1
1-2 min	<0.1	<0.1
2-3 min	<0.1	<0.1
BH104	Peak (ppm)	Steady (ppm)
0-1 min	<0.1	<0.1
1-2 min	<0.1	<0.1
2-3 min	<0.1	<0.1

BH105	Peak (ppm)	Steady (ppm)
0-1 min	<0.1	<0.1
1-2 min	<0.1	<0.1
2-3 min	<0.1	<0.1
BH201	Peak (ppm)	Steady (ppm)
0-1 min	<0.1	<0.1
1-2 min	<0.1	<0.1
2-3 min	<0.1	<0.1
BH202	Peak (ppm)	Steady (ppm)
0-1 min	1.1	1.1
1-2 min	1.1	1.1
2-3 min	1.1	1.1

Calibrated before commencing = 98.6 ppm

Calibrated on completion = 101.2 ppm

Calibration gas = isobutylene

Plot 3.2 GreenPark, Reading

21/07/2008

Post Fieldwork Monitoring - Photo-ionisation Detector (PID)

BH101	Peak (ppm)	Steady (ppm)
0-1 min	<0.1	<0.1
1-2 min	<0.1	<0.1
2-3 min	<0.1	<0.1
BH102	Peak (ppm)	Steady (ppm)
0-1 min	<0.1	<0.1
1-2 min	<0.1	<0.1
2-3 min	<0.1	<0.1
BH103	Peak (ppm)	Steady (ppm)
0-1 min	<0.1	<0.1
1-2 min	<0.1	<0.1
2-3 min	<0.1	<0.1
BH104	Peak (ppm)	Steady (ppm)
0-1 min	3.8	3.8
1-2 min	3.8	3.8
2-3 min	3.8	3.8

BH105	Peak (ppm)	Steady (ppm)
0-1 min	<0.1	<0.1
1-2 min	<0.1	<0.1
2-3 min	<0.1	<0.1
BH201	Peak (ppm)	Steady (ppm)
0-1 min	0.7	0.7
1-2 min	0.7	0.7
2-3 min	0.7	0.7
BH202	Peak (ppm)	Steady (ppm)
0-1 min	1.5	1.5
1-2 min	1.5	1.5
2-3 min	1.5	1.5

Calibrated before commencing = 102.6 ppm

Calibrated on completion = 103 ppm

Calibration gas = isobutylene

Plot 3.2 GreenPark, Reading

28/07/2008

Post Fieldwork Monitoring - Photo-ionisation Detector (PID)

BH101	Peak (ppm)	Steady (ppm)
0-1 min	<0.1	<0.1
1-2 min	<0.1	<0.1
2-3 min	<0.1	<0.1
BH102	Peak (ppm)	Steady (ppm)
0-1 min	2.8	2.8
1-2 min	2.8	2.8
2-3 min	2.8	2.8
BH103	Peak (ppm)	Steady (ppm)
0-1 min	2.2	2.2
1-2 min	2.2	2.2
2-3 min	2.2	2.2
BH104	Peak (ppm)	Steady (ppm)
0-1 min	<0.1	<0.1
1-2 min	<0.1	<0.1
2-3 min	<0.1	<0.1

BH105	Peak (ppm)	Steady (ppm)
0-1 min	<0.1	<0.1
1-2 min	<0.1	<0.1
2-3 min	<0.1	<0.1
BH201	Peak (ppm)	Steady (ppm)
0-1 min	<0.1	<0.1
1-2 min	<0.1	<0.1
2-3 min	<0.1	<0.1
BH202	Peak (ppm)	Steady (ppm)
0-1 min	1.4	1.4
1-2 min	1.4	1.4
2-3 min	1.4	1.4

Calibrated before commencing = 112 ppm

Calibrated on completion = 114 ppm

Calibration gas = isobutylene

Appendix F Table summarising gas data and characteristic situation calculations

400 Longwater Avenue, GreenPark, Reading

Summary of Gas Data and Borehole Hazardous Gas Calculations with Associated Characteristic Situation

Round	BH101					BH102					BH103					BH104					BH105				
	CH4	CO2	flow	Qhg1	Qhg2	CH4	CO2	flow	Qhg1	Qhg2	CH4	CO2	flow	Qhg1	Qhg2	CH4	CO2	flow	Qhg1	Qhg2	CH4	CO2	flow	Qhg1	Qhg2
1	0.1	0.1	0.1	0.00	0.00	0.8	1.4	0.4	0.00	0.00	0.1	0.1	0.1	0.00	0.00	25.5	2.3	0.1	0.03	0.00	2.9	1.6	0.1	0.00	0.00
2	0.1	0.2	0.1	0.00	0.00	2.8	3.2	0.1	0.00	0.00	0.1	0.4	0.7	0.00	0.00	11.5	2.6	0.1	0.01	0.00	7.9	6	0.1	0.01	0.00
3	6.5	1.8	30	1.95	0.04	27.5	5.5	18.4	5.06	0.28	0.1	0.3	0.2	0.00	0.00	55	14	0.9	0.50	0.07	14	10	4.7	0.66	0.07
4	0.1	2.7	-9.5	-0.01	0.00	0.1	1.8	-2.7	0.00	0.00	0.1	0.1	-9.7	-0.01	0.00	0.1	0.3	0.1	0.00	0.00	0.1	0.1	-2.1	0.00	0.00
5	1.8	6.5	3.6	0.06	0.00	0.1	1.7	0.4	0.00	0.00	11.5	6.4	4.2	0.48	0.03	0.1	4.2	0.1	0.00	0.00	0.6	11.7	0.1	0.00	0.00
6	1.2	4.8	0.1	0.00	0.00	2.5	1.5	0.2	0.01	0.00	6.9	3.2	-5.2	-0.36	-0.01	4.2	3.4	0.1	0.00	0.00	0.1	0.1	-0.6	0.00	0.00
7	5.3	3.6	0.1	0.01	0.00	0.1	0.9	0.2	0.00	0.00	31.5	13	2.1	0.66	0.09	6.4	12	2.4	0.15	0.02	4.2	3.4	0.2	0.01	0.00
8	4.6	3.1	2.4	0.11	0.00	14.3	4.4	0.8	0.11	0.01	22.5	9.6	4.2	0.95	0.09	17.5	11	10	1.75	0.19	9.3	0.7	1.1	0.10	0.00
9	6.8	2.2	6	0.41	0.01	0.1	0.1	0.1	0.00	0.00	18	9.7	4.9	0.88	0.09	10	6	0.4	0.04	0.00	0.1	0.4	0.2	0.00	0.00
10	7	2.1	2.9	0.20	0.00	0.1	0.1	-0.3	0.00	0.00	14.5	9	-0.8	-0.12	-0.01	2.5	1.7	0.1	0.00	0.00	10	1.4	-0.7	-0.07	0.00
11	6.8	1.8	30	2.04	0.04	0.1	0.1	0.7	0.00	0.00	6.5	6.8	0.1	0.01	0.00	0.1	1.1	-0.2	0.00	0.00	0.1	0.1	-0.1	0.00	0.00
12	4.3	1.9	0.5	0.02	0.00	0.1	0.1	0.1	0.00	0.00	17.5	8.7	-0.3	-0.05	0.00	0.1	6.1	1.3	0.00	0.00	0.1	0.2	-0.1	0.00	0.00
MAX	7	6.5	30	2.10	0.14	27.5	5.5	18.4	5.06	0.28	31.5	13	-9.7	-3.06	-0.40	55	14	10	5.50	0.77	14	11.7	4.7	0.66	0.08

All less than limit of detection (LOD) are presented as the LOD

CS 1	<0.07
CS 2	0.07 to <0.7
CS 3	0.7 to <3.5
CS 4	3.5 to <15

Qhg1 Borehole hazardous gas flow rate for methane

Qhg2 Borehole hazardous gas flow rate for carbon dioxide

MAX Maximum reading from the 12 rounds