

McCARTHY & STONE RETIREMENT LIFESTYLES LIMITED

38-44 LONDON ROAD, PURBROOK, WATERLOOVILLE, HAMPSHIRE, PO7 5LJ

SITE INVESTIGATION REPORT

The Granary
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CONTENTS

1. INTRODUCTION
2. THE SITE
3. PUBLISHED GEOLOGY
4. DESK STUDY ENQUIRIES
5. GROUND CONDITIONS AND GEOLOGICAL MODEL
6. PROPOSED DEVELOPMENT
7. ASSESSMENT OF POTENTIAL CONTAMINATION AND GROUND GASES
8. ASSESSMENT OF MINING, QUARRYING AND OVERALL GROUND STABILITY
9. FOUNDATION RECOMMENDATIONS
10. TEMPORARY WORKS
11. ASSESSMENT OF SOAKAWAY DRAINAGE
12. ROAD PAVEMENTS
13. ASSESSMENT OF MATERIALS FOR WASTE DISPOSAL
14. RECOMMENDATIONS FOR SUPPLEMENTARY GROUND INVESTIGATIONS
15. RECOMMENDED SUPERVISION AND MONITORING
16. SUMMARY

REFERENCES

GENERAL NOTES

TABLE 1	-	Conceptual Site Model
TABLE 2	-	Summary of Analytical Test Data: Soils – Potential Risks to Human Health
TABLE 3	-	Assessment of Pollutant Linkages
FIGURE 1	-	Site Location Plan
FIGURE 2	-	Site Plan
APPENDIX I	-	Extracts of Historical Maps
APPENDIX II	-	Desk Study Information
APPENDIX III	-	Ground Investigation
APPENDIX IV	-	Quantitative Risk Assessment: Human Health
APPENDIX V	-	Basis of Geotechnical Assessment for Foundations

1. INTRODUCTION

McCarthy & Stone Retirement Lifestyles Limited proposes to redevelop a site at 38-44 London Road, Purbrook, Waterlooville, Hampshire, PO7 5LJ for residential purposes. The site is currently occupied by a builder's merchant, a used car dealership and workshop garages. The proposed development comprises a two to two-and-a-half-storey (possibly locally three-storey) block of sheltered apartments together with car parking and amenity areas of managed soft landscaping. Occupants of the apartments will be of retirement age.

Crossfield Consulting Limited has been commissioned to undertake an investigation of the site to identify potential constraints to redevelopment relating to the ground conditions and including a risk-based environmental assessment and recommendations for remediation works, foundations, road pavement design and general construction advice in the context of the above development proposals.

This report presents the information obtained from a desk study and ground investigation. Sections 2 to 5 of the report, together with the associated Figures and Appendices, provides a Ground Investigation Report (GIR), as defined in BS EN 1997-1:2004 and BS EN 1997-2:2007.

A risk-based assessment of potential contamination is included in Section 7 of the report. This assessment makes reference to the desk study, ground investigation information and a Conceptual Site Model. It is considered that the report complies with National Planning Policy Framework and is in general accordance with guidance published by the Environment Agency and the NHBC.

The report also includes information required to form a Geotechnical Design Report as defined in BS EN 1997-1:2004, and the salient information, assessments and recommendations are presented in Sections 9 to 15 of the report, together with the associated Figures and Appendices.

It is considered that the report is suitable for submission in support of a planning application and the report is appropriate to assist in an appraisal of development solutions and costs, together with the preparation of engineering designs for the development. The report also complies with the published guidance relating to the requirements of a Building Control authority.

2. THE SITE

2.1 Location

The site is located to the east of London Road (A3), and lies approximately 3 km south from Waterlooville town centre, as shown on Figure 1. The National Grid Reference for the site is SU 6735 0796. The site is bounded by Stakes Road to the north and London Road (A3) to the west. To the east lies Purbrook Methodist Church. To the south, the site is bounded by commercial and residential properties. The general topography of the site and the surrounding area appears to slope gently down towards the south. From available information, it appears that the area immediately surrounding the site is a mix of commercial and residential premises.

2.2 Site Description

The site description is based on observations made at the time of the ground investigation in May 2015.

The site comprises an irregularly shaped plot of land with an area of approximately 0.4 ha. The site is relatively level but with a very slight fall to the south. Several landuses are present on the site. These include

a builders' merchant in the northern part of the property and a car dealership, a vehicle servicing workshop and a tyre workshop in the southern part of the site. A two-storey sales office building of brick and flint-clad construction is present within the northwestern corner and is associated with the builders' yard. This building appears to be of considerable age. The remainder of the northern part of the site comprises a concrete-surfaced yard area containing a car parking area and roofing materials.

Within the southern half of the site, there is a small one-storey sales office, associated with the car dealership, in the western part of the area. Within the southeastern corner, a warehouse associated with storage for the builders' yard is present, adjacent to an MOT/servicing garage and tyre workshop. These buildings appear to be possibly associated with asbestos construction materials. Several oil drums are stacked on top of a stand adjacent to the northern boundary of the garage area. No staining was noted on the ground surface in the area of these drums. The remaining external areas comprise, gravel, concrete and tarmacadam surfacing. The external area is used for displaying cars for sale.

Some semi-mature to mature trees are noted immediately outside the site's southern boundary. There are also a limited number of small trees on the western boundary of the builders' yard area.

There is anecdotal information to suggest that Japanese Knotweed has grown on the site in the past and that the current owners have undertaken some eradication works. The exact nature of the works and the location(s) of the Knotweed are not known.

2.3 Site History

The site history has been researched with reference to old editions of the County Series and National Grid Ordnance Survey Plans obtained from Emapsite. Extracts from a selection of these plans are presented in Appendix I. The plans indicate the following development has taken place on and around the site.

The 1859-1860 map edition shows the site to comprise several buildings. The buildings appear to be of residential type, possibly with some outbuildings. The surrounding area also appears to be predominantly associated with residential developments with these largely being present along the road that is now the present-day London Road. Approximately 100 m to the south, an area of land referred to as 'The Bog' is shown and there are some surface watercourses or surface water drains around this area of land.

The 1897 map shows some of the previous buildings on site had been removed and one of the larger buildings, in the northwestern corner, is referred to as a 'vicarage'. Approximately 40 m to the west of the site a church with a small grave yard is shown. A property immediately to the south of the site is noted to have been a smithy at this time.

The 1909 map edition shows additional small structures within the southern part of the site. It is likely that these structures are associated with the nearby residential properties.

The subsequent map, dated 1932 shows the site area to be unchanged with some minor additions to the buildings in the southern part of the site. Within 100 m to the east, further residential development had occurred. The smithy to the south is no longer marked at this time.

The 1937-1939 plan shows a Methodist church has been constructed to the east of the site directly adjacent to the site boundary. There had also been some further minor additions and removals of structures in the southern part of the site but no apparent change in land use.

The 1952 map edition shows that several buildings had been demolished in the southern part of the site and two elongated structures had been built. These new features were probably associated with commercial or

industrial usage. A structure that appears to be a possible petrol filling station, although not labelled as such, had been constructed 40 m to the southwest of the site.

The 1959-1964 map shows the site to remain unchanged. The grave yard, located 40 m to the west of the site, is no longer labelled and had probably reached capacity by this time.

By 1971-1974, the majority of structures in the southern area had been demolished and two large structures had been constructed in the southeastern part of the site. These new structures are referred to as a works and a depository.

By 1989-1993, the northern part of the site is referred to as a Builder's Yard and several square structures are shown on site (including in the southern area), which appear to have been storage structures. All original structures in the southern area had been demolished by this time leaving the works, the depository and the new small storage structures. A car park had been constructed to the southeast of the site at this time. The suspected earlier petrol filling station to the southwest was certainly in operation by this time as new construction had provided a clearly defined canopy and forecourt area.

Sometime prior to the present day, the works and the depository became associated with a tyre-fitting workshop and a servicing workshop, respectively. One of the small structures in the western part of the southern area became office space for a used car sales business. It also appears, from 2010 and 2014 map editions, that the petrol filling station to the southwest had been demolished some time prior to 2010.

3. PUBLISHED GEOLOGY

The 1:50,000 Scale Solid and Drift Geology map of Fareham (Sheet 316), together with the digital map published by the British Geological Survey, indicates that there are no superficial deposits beneath the site.

The solid geology comprises the London Clay Formation. This stratum is expected to comprise predominantly clays with subordinate silt and sand. The map also indicates that Wittering Formation strata (mainly sands with some silt and clay) may extend into the northern corner of the site.

4. DESK STUDY ENQUIRIES

Enquiries were made to the GroundSure Environmental Database regarding the site and surrounding area. In addition, reference has been made to published information on radon potential. Information obtained from these enquiries is presented in Appendix II and summarised below.

There is one record of a site with a Local Authority Pollution Prevention and Controls permit located 123 m to the southwest and associated with petrol vapour recovery. This record is likely to relate to the now defunct filling station noted in Section 2.3. There are two records of businesses with Licenced Discharge Consents within 250 m of the site and the nearest of these is 214 m to the east of the site. This permit relates to sewage discharges from a water company. There are no other licensed/permitted processes or hazardous substance consents within 250 m of the site.

There are no recorded pollution events at the site nor within 250 m and no land in close proximity to the site, has been determined as Contaminated Land under Part 2A of the Environmental Protection Act 1990.

There is one historical landfill recorded within 250 m of the site. The facility, listed as 'Fielders Park, Purbrook', is located from approximately 185 m to the northeast of the site. The possible waste type is recorded as

‘Household’. There are no recorded dates of waste deposition and it is possible that the landfill was only planned and never put into operation. Historical maps indicate that the area was first known as Fielders Park in 1952 (having been a nursery prior to this) and was a landscaped park by the early 1970s.

Information on current land uses indicates there are several industrial features noted on site and in the immediate area. On site features include the car dealership, builders’ yard (construction and roofing supplies), vehicle repair workshop and tyre-fitting workshop. The nearest off site feature is approximately 16 m to the north of the site and relate to vehicle repair, testing and servicing.

There is a record of a petrol filling station approximately 29 m to the west of the site. However, its status is recorded as being ‘obsolete’ and is considered to refer to the feature noted in Section 2.4.

Hydrogeological information indicates that the solid strata are classified as Unproductive (that is, non-aquifer strata). However, within the northwestern corner of the site, the solid strata are classified as a Secondary (A) Aquifer. There are no groundwater abstraction licences for potable supply within 1 km of the site. The site is not situated within a groundwater Source Protection Zone with respect to shallow strata (there is a confined aquifer designated as a being within a Source Protection Zone but this will be located at considerable depth).

Hydrological information indicates that the closest surface watercourse to the site is within a culvert, and is approximately 104 m to the southeast of the site. The proposed development property is not located on an indicative floodplain, as defined by the Environment Agency.

The site is within a nitrate vulnerable zone, although such a classification is largely related to farming restrictions. There are no other environmentally sensitive land classifications within the site or the immediate surrounding area.

Reference to the Building Research Establishment Document *BR211 – Radon: Guidance on Protective Measures for new buildings* (2007) indicates that the site is not within an area where radon precautions are required in new dwellings. Information published on the UKradon website confirms that the site is not located within a radon affected area.

5. GROUND CONDITIONS AND GEOLOGICAL MODEL

5.1 Ground Investigation

Details of the rationale and scope of the ground investigation and laboratory testing, together with exploratory hole logs, monitoring, in situ and laboratory test results, are given in Appendix III. The investigation has identified the presence of the following, below the site.

5.2 Buried Foundations and Services

Buried foundations and services were not encountered within the investigated area of the site. However, foundations and services associated with the existing and historical properties should be expected at the site.

5.3 Strata Encountered

Made Ground

A cover of Made Ground is present across the site. The materials generally comprise concrete surfacing over a sand and gravel sub-base. Beneath the sub-base materials there is typically a layer of reworked natural strata

comprising gravelly silt with rare ashy deposits and brick fragments. Made Ground depths of between 1.0 m and 2.0 m have been identified.

Wittering Formation

Below the Made Ground, a horizon of medium strength, soft to firm consistency, greenish grey mottled orange, sandy, silty clay was encountered to depths of between 3.0 m (southern end of site) and 4.0 m (northern end).

London Clay Formation

Dark grey, clayey silt or silty clay, which is considered to be London Clay strata, has been identified beneath the Wittering Formation. This horizon was proven to 5.0 m depth (the maximum depth investigated).

Standard penetration tests undertaken within both Wittering and London Clay Formations recorded 'N' values of between 0 and 16. However, due to the combination of some shallow water and the silty nature of the soils encountered, it is likely that these N values are not a true representation of the soil density/strength.

5.4 Groundwater

Water was encountered within all the holes investigated at approximately 1.0 m depth. However, it is likely that this is perched water within Made Ground or sandier horizons of the Wittering Formation. Based on desk study information, groundwater is likely to be at depths below 5 m (but possibly less than 10 m depth).

The groundwater conditions are based on observations made at the time of the fieldwork. It should be noted that groundwater levels may vary due to seasonal and other effects.

6. PROPOSED DEVELOPMENT

The proposed development includes the following buildings and other structures:

- o Two to two-and-a-half-storey (possibly locally three-storey) building of conventional construction with load-bearing brick walls for sheltered apartments
- o A hardstanding car park
- o Amenity areas of managed soft landscaping

The development will be exclusively for end users of retirement age. The development includes some areas of managed soft landscaping, maintained by contractors. Residents will be precluded from undertaking gardening activities at the development.

7. ASSESSMENT OF POTENTIAL CONTAMINATION AND GROUND GASES

7.1 Assessment Criteria

Assessment of potential contamination and ground gases has been undertaken using a risk assessment based approach, as recommended within the Environmental Protection Act (1990), CLR11 (2004) CLEA Model (2004-2009), BS 10175 (2011), CIRIA C552 (2001) and NHBC R&D Report 66 (2008). This approach considers the likely source of contamination, given the history and location of the site, and the possible migration pathways by which these potentially hazardous substances may reach likely receptors, such as end users of the site, controlled waters or the wider environment, in the context of the proposed development.

Part IIA of the Environmental Protection Act (1990) states that

“Contaminated Land is any land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substances in, on or under the land, that –

- (a) significant harm is being caused or there is a significant possibility of such harm being caused; or
- (b) significant pollution of controlled waters is being caused or there is significant possibility of such pollution being caused;”

All risk assessments carried out as part of this investigation have been carried out with respect to the definition of “contaminated land” within Part IIA of the Environmental Protection Act (1990) and have considered the site both before and on completion of the development. The basis of the risk assessment is the Conceptual Site Model, which is derived from the desk study and initial information and identifies potential pollutant linkages that could affect receptors relevant to the site and the wider environment. The Conceptual Site Model is presented in Table 1.

Based on the model, a ground investigation was designed to obtain relevant information to assess further the identified pollutant linkages. Where relevant this included the recovery of representative samples and subsequent analytical laboratory testing. The rationale for the sampling and testing is set out in Appendix III. The results of the analytical testing are presented in Appendix III and summarised in Table 2. On the basis of the conceptual site model and the results of the analytical laboratory testing (together with any quantitative risk assessment, if applicable, as presented in Appendix IV), an assessment of the identified pollutant linkages is presented in Table 3.

7.2 Potential Sources of Contamination

The earliest recorded site usage appears to be largely related to residential properties. Therefore, there is limited contamination potential from such a usage, although there is a possibility of localised ash deposits from domestic fires. Such ashy deposits can be associated with toxic and phytotoxic metals and polyaromatic hydrocarbons (PAHs).

Following the residential site usage, the property became associated with a works and a depository. The depository should not be associated with potential contamination issues. The exact nature of the works is not known but typical potential contaminants include metals and PAHs. Petroleum hydrocarbons may also have been used as fuels and also associated with oils and greases. Depending on the nature of the works, there is a possibility that solvents and other volatile compounds may have been used. Volatile compounds entering the ground as a result of the works are likely to have degraded by the present day such that there is a limited source potential.

Present day uses of the site include a vehicle repair/servicing workshop and a tyre-fitting workshop. The workshops may be associated with toxic and phytotoxic metals, petroleum hydrocarbons, PAHs and volatile organic compounds (VOCs) associated with sprays, solvents and similar chemicals. The quantities of potential contaminants are likely to be limited so that impactation of the ground would be expected to be localised. Concrete floor slabs in the workshops would act as a barrier against contaminants entering the soils, although there is a possibility that they could enter the ground from leaky drainage. A stack of oil drums are located on a stand in the garage area of the site. Based on the absence of staining on hardstanding below and around this area, it is unlikely that oil has leaked into the shallow soils from these drums. The car dealership area of the site is unlikely to be a significant potential source of contaminants although, if washing of vehicle stock is undertaken then there is a possibility that washings could contain oils and greases that could locally enter the shallow soils by direct infiltration through cracks in the surfacing or via leaky drains.

Based on available information, including environmental database records and historical maps, there is no evidence to suggest that the southern part of the site has been associated with fuel sales or bulk fuel storage.

The northern part of the site has, most recently, been associated with a builders' yard that specialises in roofing materials. Available information indicates that the yard is associated with the storage of, and subsequent sale of, stock and there is no evidence of manufacturing or treatment works being undertaken at the business. Enquiries were made to the site operator about the presence of a fuel tank, which revealed that there are no fuel tanks within this part of the site. Therefore, there is negligible contaminant potential associated with the builders' yard.

The existing buildings on site, most notably the workshops, may be associated with asbestos construction materials (ACM). Prior to demolition, a survey of potential ACM should be undertaken and, if identified, demolition works should be carried out, in accordance with statutory requirements, in a controlled manner by a contractor experienced and regulated for the handling of asbestos materials. This would minimise the potential for asbestos materials to enter the ground and become a future potential source of contamination. It is possible that demolition of former structures at the site could have caused asbestos or ACM to have entered the ground.

With regards to potential off-site sources of contamination, it appears that the only realistic potential source of mobile contaminants is a petrol filling station that formerly operated approximately 40 m to the southwest of the site. However, if there had been a significant loss of fuel to the ground at this facility, the expected low permeability London Clay strata across the area would have inhibited lateral migration through the unsaturated zone. If fuels had migrated downwards into groundwater then, based on plans showing watercourses in the area, it is probable that groundwater flow would be to the west or south (that is, away from the site). Therefore, it is considered that there is negligible potential for the former petrol filling station to have had an adverse effect on the ground conditions beneath the proposed development site.

Table 2 provides a summary of the analytical testing undertaken on soil samples recovered from the site and compares the results with human health generic assessment criteria (GAC) that are relevant for the proposed development type (residential without plant uptake). The results identify that recorded concentrations of potential contaminants are generally below the GAC. However, lead has been recorded above the GAC. The risks to end users of the site are discussed further in Section 7.3.1. Asbestos has been identified in the samples tested.

Elevated sulphates have been recorded within the Made Ground and fuels/chemicals may have been stored on the site in the past. The risk and implications to buried concrete and potable water supply pipe materials are discussed in Section 7.3.2.

Based on the available information, there is evidence that elevated concentrations of the phytotoxic metal zinc are present within the shallow soils. Potential risk to plantings within proposed landscaped areas are discussed in Section 7.3.3.

Metals, long-chain aromatic petroleum hydrocarbons and PAHs have been recorded within the Made Ground materials at the site. Potential risks to controlled waters are discussed in Section 7.3.4.

No putrescible material has been identified at the site. The property is not within a radon affected area. Therefore, there appears to be no realistic potential source of ground gases at the site. There is a record of a historical landfill located from a distance of 185 m to the northeast of the site. However, the available information is not definitive that the landfill actually operated and it may just have been a planned feature. Historical map evidence suggests that the only realistic period in which a landfill could have operated is the 1950s and 1960s. Household wastes at this time were typically dominated by ash materials whilst

putrescible wastes were limited. Notwithstanding this, a significant period of time has elapsed from the early 1970s (the time when the Fielders Park area had been landscaped and could not be associated with further landfilling) to the present day. Therefore, if putrescible materials were deposited at the indicated landfill location, gas generation would, realistically, be expected to have completed by the present day such that there would be no active source of ground gases. In addition, the low permeability strata expected in the area would inhibit lateral ground gas migration and make it more likely that gas would migrate to the surface in the Fielders Park area as it is unsurfaced. A historical grave yard has historically operated to the west of the site. However, given the time that has elapsed since burials ceased, it is considered that this feature is no longer a valid potential source of ground gas. On this basis, it is considered that there is negligible potential for an off-site source of ground gases to be present that could affect the site. Therefore, it is considered that there are no sources of hazardous ground gases at the site and ground gas protection is not required for the proposed development.

7.3 Pollutant Linkages – Solids and Liquids

Based on the Conceptual Site Model, consideration is given below to identified pollutant linkages and a risk evaluation is undertaken of each possible source-pathway-receptor linkage that may occur at the site. The risk evaluation considers the potential consequences and probability of occurrence in accordance with CIRIA C552 (2001). Where risks are identified as “negligible”, then by implication such risks are within normally accepted levels for the proposed development, and the further reduction of such risks by remediation works is considered unnecessary. Where risks are identified that are “low” as defined in CIRIA C552 (2001), or worse, then consideration is given to the management of the identified risks, with appropriate recommended actions that may include engineering solutions / remediation works as described in the following sections.

7.3.1 Human Health

A possible pollutant linkage to site end users, through dust exposure pathways of material impacted by lead within the shallow soil, has been identified. These recorded concentrations are above the GAC for a residential development without plant uptake end use. Asbestos has also been identified as loose fibres and as ACM.

Elevated concentrations of lead have been recorded both within the proposed building footprint and the proposed managed landscaping areas. The proposed buildings will provide an effective barrier between end users of the site and contaminants present within the shallow soils such that there will be no valid pollutant linkage in such areas. Within managed landscaping areas, residents will not be permitted to dig or cultivate. However, root and earth worm activity may enable impacted soils to return to the surface, if a limited thickness of topsoil is placed.

It is noted that the GAC used for the preliminary assessment of human health risk are based on end users up to the age of 6 years old. The proposed development is for residents of retirement age and the GAC are considered to be excessively conservative for the proposed development. Therefore, site specific assessment criteria (SSAC) for lead has been generated for the proposed development. The CLEA Model v1.06 software has been used to generate the SSAC. Details of the model used and the outputs obtained are presented in Appendix IV.

The maximum concentration of lead did not exceed the SSAC. Therefore, there are no remediation measures required in relation to lead as no unacceptable risks to end users are indicated.

Traces of chrysotile asbestos have been identified within shallow soils. Regarding site end users, the proposed buildings and hardstanding areas will provide an effective barrier between residents and possible traces of asbestos fibres and a capping layer/barrier of soil in other areas should ensure that there is no remaining

pollutant linkage. Thicknesses of 450 mm for planted areas and 300 mm for lawned areas would typically be acceptable for a development of sheltered apartments, although this will require to be confirmed by appropriate investigation.

It appears that the builders' yard area of the site is not associated with a fuel tank for refuelling delivery vehicles. However, the southern half of the site is associated with potential sources of fuels, oils and solvents/sprays/paints. Due to limited access for investigation, it would be prudent to assume, at this stage, that there may be localised impactation of the shallow soils beneath the footprints of the workshop buildings. This may include localised impactation by potentially volatile compounds. Therefore, it may be prudent to make allowance for a limited area of the proposed building to use a hydrocarbon-resistant membrane within the ground floor slab. The ground investigation that has been possible indicates that potential contamination issues associated with the site are not widespread and there is no evidence of significant migration of potential contamination across the site.

Groundworkers involved in construction of the new development may be exposed to the potential contaminants identified above. However, it is unlikely that concentrations would be sufficiently high to exceed short-term exposure limits. Notwithstanding this, it is recommended that appropriate personal protective equipment (PPE) be worn and high level of personal hygiene be maintained by groundworkers. To prevent shallow soils migrating off site via aerial migration pathways, and subsequently becoming a risk or nuisance to neighbours or the general public, it is recommended that soil dampening be undertaken when earth-moving operations are being undertaken in dry weather.

7.3.2 Durability of Buried Structures and Services

In view of the elevated soluble sulphate content of the shallow soils at the site and based on guidance within *BRE Special Digest 1* (2005), the specified DC Class of concrete for buried structures and foundations should be suitable for an ACEC site classification of AC-2.

The site has been associated with past fuel and/or chemical storage and, therefore, would be considered to be 'brownfield' under the definition provided by UKWIR (2010) with respect to the assessment of ground for water supply pipes. Based on the guidance provided by UKWIR, there would be a requirement to test appropriate soil samples from the line of proposed potable water supply pipes and to compare the test results with published criteria before consideration could be given to using conventional plastic materials for potable supply pipes. It would be prudent, therefore, to make allowance for the use of multi-layer barrier pipes. If the Client wishes to use conventional plastic materials, testing can be undertaken once the potable supply layout has been finalised. Alternatively, the decision can be made to provide the barrier pipe materials without undertaking additional testing.

It should be noted that individual water companies may have in-house requirements for the assessment of ground conditions for potable water supply pipes and these requirements may be in addition to, or may contradict, the guidance provided by UKWIR. Therefore, it is recommended that the relevant water supply company be consulted prior to finalising the potable water supply design.

7.3.3 Landscape and Garden Areas

There is evidence of the phytotoxic metal zinc within the shallow soils. It is also noted that the site is devoid of topsoil/soils for a suitable growing medium. Therefore, there will be a requirement to import topsoil to provide a growing medium for plants. The topsoil quality requirements for the imported materials should consider both the proposed planting and the requirements set out in Section 7.4.

7.3.4 Controlled Waters

Metals, long-chain aromatic petroleum hydrocarbons and PAHs have been recorded at the site. Such potential contaminants, at typical soil temperatures, are generally of low solubility and, hence, relatively immobile. There is also a possibility that more mobile organic contaminants could be present beneath the workshop areas of the site. The perched water that has been identified beneath the site is unlikely to be in hydraulic continuity with surface watercourses or with groundwater in aquifer strata. Therefore, despite the shallow nature of the perched water, there should not be a viable pathway to controlled waters. In addition to this the strata beneath the site generally comprise low permeability strata, which are likely to preclude the downward migration of potential contaminants to controlled waters. Therefore, it is considered unlikely that potential contaminants would be mobilised from the shallow soils into controlled waters.

On the basis of the above, it is considered that there are no unacceptable risks to controlled waters associated with the ground conditions at the site.

7.4 Recommended Remedial Works

It is recommended that a topsoil/subsoil capping layer be used in managed landscaping areas. The capping layer within this area should have a minimum thickness layer of 450 mm in planted areas and 300 mm in lawned areas. Any imported soils should be verified with documentation/laboratory test reports as suitable for use within a residential development.

There may be a requirement for a limited area of the proposed building to use a hydrocarbon-resistant membrane within the ground floor slab.

There may also be a requirement to provide multi-barrier pipes for potable water supply.

The above works should be undertaken in accordance with a Remediation Implementation Plan, which should detail the work to be carried out and how it can be verified such that a Remediation Verification Report can be prepared on completion.

7.5 Potential Liabilities

It is considered that these should not be environmental liabilities associated with site ownership. Following the completion of recommended remediation works, there should be no potential liabilities associated with the site after development.

8. ASSESSMENT OF MINING, QUARRYING AND OVERALL GROUND STABILITY

The site is not in an area of underground mining or other mineral extraction processes and, based on historical map evidence, there does not appear to have been quarrying activities in the vicinity of the site. On the basis of the available information, it is considered that the proposed development should not be constrained by issues associated with poor ground stability.

With reference to published information provided by the British Geological Survey, and in the context of the low sensitivity of the proposed structure to very minor background seismic events recorded in the UK, it is considered that the foundation solution should not be constrained by potential ground vibrations from natural sources and that more detailed assessment is not necessary.

9. FOUNDATION RECOMMENDATIONS

9.1 Design Approach

In compliance with the requirements of the National Annex of BS EN 1997-1:2004 the geotechnical design assessment is based on Design Approach 1 (as defined in BS EN 1997-1:2004). As the structural loads for the proposed building are well defined, uncertainty and risks of potential unfavourable conditions (or deviations from characteristic values) are primarily associated with the ground conditions.

Consideration is given to the assessment of ultimate limit state (ULS) conditions, where full collapse or failure conditions are considered, and relevant design information is presented in Appendix V in this regard. In addition, the assessment considers serviceability limit states (SLS), to ensure that the recommended design parameters are compatible with an acceptably low risk of serviceability criteria being exceeded during the standard design life of the structure. It is noted that the SLS has a greater influence on the design parameters in comparison to ULS conditions and this is considered in the following assessment.

9.2 Proposed Structural Loadings and Serviceability Criteria

Details of imposed foundation loads (i.e. actions imposed by the building structure) and serviceability limit values are not currently available for the proposed structures. The geotechnical assessment presented in the report has considered generic values for the proposed development type, which is considered appropriate for the appraisal of engineering solutions and preliminary design, and these are listed below:

Preliminary Values, for appraisal purposes:

Maximum Imposed Load on Foundations: 190 kN/m run

Serviceability Limit Values (associated with above action)

Maximum Total Settlement: 25 mm

Maximum Deflection: 1/1000

9.3 Geotechnical Category of Proposed Structures

In view of the nature of the proposed structure, comprising a two to two-and-a-half-storey (and possibly locally three-storey), and with reference to the indicated ground conditions, as outlined in Section 5, it is considered that the development is compatible with Geotechnical Category 2, as defined in BS EN 1997-1:2004, and the necessary information relating to the Ground Investigation and Geotechnical Design Reports has been obtained and assessed on this basis.

9.4 Assessment of Foundation Solutions

With reference to the recorded ground conditions and corresponding Geological Model presented in Section 5, characteristic values relating to the geotechnical properties of the strata within influencing distance of the proposed structures are presented in Appendix V. Salient elements of the geotechnical model are outlined below.

Variable SPT “N” values have been recorded within the shallow soils beneath the site. However, this may be a result of the very silty nature of the soils and the presence of perched water, both of which could cause the test to underestimate soil density/strength. It is recommended that a supplementary ground investigation be

undertaken at the site, following purchase and clearance of structures. The investigation should use trial pits as these will permit a more detailed assessment to be made of the nature of the shallow soils and the groundwater regime. It may also be necessary to undertake static cone penetration testing (CPTs) as this technique can provide a better assessment of soil density/strength in silty soils. It is possible that such an investigation could demonstrate that a shallow strip/trench fill foundation solution could be appropriate for the proposed development.

If supplementary investigation indicates that a strip/trench fill foundation solution is not feasible, vibro-replacement ground treatment techniques are unlikely to be appropriate due to the high silt content of the shallow soils. Therefore, it may be prudent, at this stage, to make allowance for a piled foundation solution. CFA piles are likely to be most appropriate for the ground conditions at the site.

Natural clay soils beneath the site are of high volume change potential, as defined in NHBC Standards (2014). The foundation solution will, within influencing distance of trees, need to take into account NHBC requirements for building within influencing distance of trees.

There is anecdotal information to suggest that Japanese Knotweed has been present on the site and that the current owner has undertaken some eradication works. Japanese Knotweed is a persistent plant that can cause damage to foundations and hardstanding. Therefore, it would be prudent to obtain further details from the vendor regarding the location(s) of the Knotweed and the treatment undertaken. It would also be prudent to commission a survey by a specialist in invasive plant/weed species. If Japanese Knotweed (or other invasive species) are identified, the required eradication duration will need to be considered in relation to the proposed construction programme.

9.5 Floor Slab Recommendations

Due to the thickness of Made Ground at the site, it is recommended that an allowance be made for suspended ground floor slabs.

9.6 General Construction Advice

All formations should be cleaned, and subsequently inspected by a suitably qualified engineer prior to placing concrete. Should any soft, compressible or otherwise unsuitable materials be encountered they should be removed and replaced by blinding concrete.

Foundation concrete, or alternatively, a blinding layer of concrete, should be placed immediately after excavation and inspection in order to protect the formation against softening and disturbance.

Generally, all formations should be placed wholly within the same material type, unless specific geotechnical inspection and assessment have been undertaken.

Care should be taken to ensure that any field drains encountered are carefully and satisfactorily blocked to prevent water seeping through the drains and into any excavations.

10. TEMPORARY WORKS

Conventional plant is considered appropriate for shallow excavation works at this site. However, the use of hydraulic breakers may be required to break up any existing hard surfacing, foundations, floor slabs and any other buried obstructions at the site.

Where man-entry into shallow excavations is required then a suitable risk assessment should be undertaken, and the inclusion of support or a designed stable configuration may be required.

Groundwater was not encountered at shallow depths during the ground investigation although perched water was identified. It is considered that, should shallow perched groundwater be encountered during groundworks, the resultant seepages should be controlled by conventional sump pumping techniques. However, it is recommended that a Supplementary Ground Investigation be used to better assess water entry to excavations and potential dewatering solutions.

An appropriately designed piling platform will be required to be constructed prior to the piling contractor commencing work if a piled solution is considered to be the most appropriate foundation. The platform should be designed by a suitably qualified geotechnical specialist in accordance with the guidance given in BRE Document BR470 (2004). The platform can be designed to be placed on existing ground and then may be removed following completion of the piling work. Alternatively, ground levels can be reduced and the piling platform incorporated into the final development.

11. ASSESSMENT OF SOAKAWAY DRAINAGE

Based on the recorded ground conditions, comprising low permeability silt and clay strata, it is considered that soakaway drainage is unlikely to be feasible for the proposed development. Therefore, it is recommended that an alternative method of drainage be identified for the site.

12. ROAD PAVEMENTS

Based on an examination of the soils present at the site and the guidance of TRRL Report LR1132 and the Highways Agency Interim Advice Note 73/06 (Rev 1), it is considered that an equilibrium design CBR value of 3% is considered to be applicable for the shallow soils.

It is considered that the shallow materials may be frost-susceptible.

13. ASSESSMENT OF MATERIALS FOR WASTE DISPOSAL

There should be no environmental requirement to remove materials from site to permit development. Therefore, excavated materials should be retained and reused on site where possible.

The majority of the materials at the site should be classified as “inert” waste if taken off site, although some Made Ground deposits may be classified as “non-hazardous” if taken to landfill. Asbestos containing materials have been identified in the Made Ground below the site. Where visible fragments (cement bound asbestos, asbestos tiles etc.) are identified during groundworks, these should be hand-picked, bagged and placed in a lidded skip or bin that is only for asbestos waste. These materials should then be classified as “hazardous” waste. Where asbestos fibres have been identified, the concentration of fibres in soil is unlikely to be above “hazardous” waste thresholds. However, additional testing has been scheduled to confirm this assessment and will be forwarded in due course under separate cover. It is recommended that waste classification and, if applicable, waste acceptance criteria (WAC) testing be undertaken as part of a supplementary ground investigation once development layouts and levels have been finalised.

Landfill tax would be payable on any materials removed from site and taken to landfill. However, “inert” and “non-hazardous” waste may also be taken to a facility that is exempt under the Environmental Permitting regulations, subject to specific exemption requirements.

14. RECOMMENDATIONS FOR SUPPLEMENTARY GROUND INVESTIGATIONS

It is recommended that a supplementary ground investigation be undertaken at the site, following purchase and clearance of structures. The investigation should use trial pits as these will permit a more detailed assessment to be made of the nature of the shallow soils and the groundwater regime. It may also be necessary to undertake static cone penetration testing (CPTs) as this technique can provide a better assessment of soil density/strength in silty soils. It is possible that such an investigation could demonstrate that a shallow strip/trench fill foundation solution could be appropriate for the proposed development.

The supplementary investigation should also consider further required assessment of pollutant linkages and waste classification issues.

15. RECOMMENDED SUPERVISION AND MONITORING

In compliance with the requirements in BS EN 1997-1:2004 and BE EN 1997-2:2007, construction and workmanship of the engineering solutions recommended in this report shall be supervised. In particular, issues listed in Section 9.6 General Construction Advice shall be considered in the implementation of the works and design of any necessary temporary works set out in Section 10.

In relation to the foundation solution(s) and ground floor slab recommendations in Section 9, the following supervision and monitoring is recommended.

- Verification testing required following pile installation (if applicable)
- Inspections of formation strata in excavations for shallow strip/trench fill footings (if applicable)

16. SUMMARY

McCarthy & Stone Retirement Lifestyles Limited proposes to redevelop a site at 38-44 London Road, Waterloooville for residential purposes. Currently, the site is occupied by a builder’s merchant, a used car dealership and workshop garages. The proposed development comprises a two to two-and-a-half-storey (possibly locally three-storey) block of sheltered apartments together with car parking and amenity areas of managed soft landscaping. Occupants of the apartments will be of retirement age.

Ground conditions at the site comprise a thickness of Made Ground, overlying soft to firm consistency, sandy, silty clay of the Wittering Formation. Beneath this horizon, London Clay strata are recorded (clayey silt or silty clay). Perched water was encountered within Made Ground or sandy horizons within all the holes. Groundwater was not encountered during the investigation.

Possible pollutant linkages have been identified between impacted Made Ground materials and the future residents at the site. Allowance should be made for placement of clean cover capping materials within soft landscaping area which will provide an effective barrier to break the pollutant linkage. Due to limited access for investigation, there may be localised impaction by potentially volatile compounds beneath the footprints of the workshop buildings. Therefore, it may be prudent to make allowance for a limited area of the

proposed building to use a hydrocarbon-resistant membrane within the ground floor slab. It is also recommended that an allowance be made for multi-layer barrier pipe for potable water supply.

A shallow strip/trench fill foundation solution could be appropriate for the proposed development but would require additional investigation for confirmation. It would be prudent, at this stage, to make allowance for a piled foundation solution. CFA piles are likely to be most appropriate for the ground conditions at the site.

In view of the very low permeability silt and clay soils recorded at the site, soakway drainage is considered not to provide a viable solution.

In view of the recorded ground conditions, it is recommended that a supplementary ground investigation be undertaken at the site, following purchase and clearance of structures. The investigation should use trial pits as these will permit a more detailed assessment to be made of the nature of the shallow soils and the groundwater regime. It may also be necessary to undertake static cone penetration testing (CPTs) as this technique can provide a better assessment of soil density/strength in silty soils. The supplementary investigation should also consider further required assessment of pollutant linkages and waste classification issues.

REFERENCES

BRE (2005) *Special Digest 1 – Concrete in aggressive ground*, CRC Ltd

BRE (2007) *BR211 – Radon: Guidance on protective measures for new buildings* BRE Press

BSI (2010) *BS 5930:1999+A2:2010 Code of Practice for Site Investigations* British Standards Institution

BSI (2007) *BS 3882:2007 Specification for topsoil and requirements for use* British Standards Institution

BSI (2011) *BS 10175:2011 Code of Practice for Investigation of Potentially Contaminated Sites* British Standards Institution

BSI (2004) *BS EN1997-1:2004 Eurocode 7: Geotechnical Design – Part 1: General Rules* British Standards Institution

BSI (2007) *BS EN1997-2:2007 Eurocode 7: Geotechnical Design – Part 2: Ground Investigation and Testing* British Standards Institution

CIRIA (2001) *CIRIA C552 – Contaminated Land Risk Assessment: A Guide to Good Practice* Construction Industry Research Association

CIRIA (2000) *CIRIA C515 – Groundwater Control – design and practice* Construction Industry Research Association

CL:AIRE (2011) *The Definition of Waste: Development Industry Code of Practice Version 2* Contaminated Land: Applications in Real Environments

CL:AIRE (2010) *Soil Generic Assessment Criteria for Human Health Risk Assessment* Contaminated Land: Applications in Real Environments

DoE (1990) *The Environmental Protection Act* Department of The Environment HMSO

Department for Communities and Local Government (2012) *National Planning Policy Framework*

Environment Agency (2009) *Human Health Toxicological Assessment of Contaminants in Soil Science Report SC050021/SR2* EA

Environment Agency (2009) *Updated Technical Background to the CLEA Model Science Report SC050021/SR3* EA

Environment Agency (2009) *CLEA Software (Version 1.06) Handbook Science Report SC050021/SR4* EA

Environment Agency (2004) *Model Procedures for the Management of Land Contamination CLR11* EA

Environment Agency (2005) *Environment Agency Guidance on Requirements for Land Contamination Reports* EA

Highways Agency (2009) *Interim Advice Note 73/06 Revision 1 – Design Guidance for Road Pavements (Draft HD25)* HA

LQM/CIEH (2015) *The LQM/CIEH S4ULs for Human Health Risk Assessment* Land Quality Press, Nottingham

NHBC (2014) *Standards* National House Building Council

TRRL (1989) *LR1132 – The Design of Bituminous Road Pavements* Transport and Road Research Laboratory

UKWIR (2010) *Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites* Report Ref. No. 10/WM/03/21 UK Water Industry Research

GENERAL NOTES

1. This report is provided in the context of the stated development proposals and should not be used in a different context.
2. The accuracy of map extracts cannot be guaranteed and it should be recognised that different conditions on site may have existed between and subsequent to the various map surveys.
3. Any borehole data from the British Geological Survey sources are included on the following basis: "The British Geological Survey accept no responsibility for omissions or misinterpretation of the data from their Data Bank as this may be old or obtained from non-BGS sources and may not represent current interpretation.
4. Where any data supplied by the Client or by other external sources, including previous site investigation data, have been used it has been assumed that the information is correct unless otherwise stated. No responsibility can be accepted by Crossfield Consulting Limited for inaccuracies within the data supplied by others.
5. Exploratory hole locations provided in the report are generally established by tape measurement from existing features or boundaries. Hole locations are not accurately surveyed and ground levels at these locations are not obtained unless specifically requested.
6. Any assessments made in this report are based on the ground conditions indicated by the trial pits and/or boreholes, together with the results of any field or laboratory testing undertaken and, where appropriate, other relevant site data which may have been obtained for the site. Variations in ground conditions may occur between exploratory hole locations and there may be special conditions appertaining to the site which have not been revealed by the investigation and which have not been taken into account in the report. The assessment may be subject to amendment in the light of additional information becoming available.
7. The report is provided for the sole use by the Client or its assignees and is confidential to the Client's professional advisers. No responsibility whatsoever for the contents of this report will be accepted to any person other than the Client or its assignees.
8. New information, improved practices and legislation may necessitate an alteration to the report in whole, or in part, after its submission. Therefore with any change in circumstances or after the expiry of one year from the date of the report, the report should be referred to Crossfield Consulting Limited for re-assessment and, if necessary, re-appraisal.

TABLES

TABLE 1

CONCEPTUAL SITE MODEL

Potential Contaminant Source	Potential Pathway	Receptors and Assessed Pollutant Linkage
Solids <i>On Site:</i> <i>Toxic heavy metals:</i> Potential source associated with site usage. <i>Phytotoxic metals:</i> Potential source from site usage. <i>Petroleum hydrocarbons:</i> Potential source associated with site usage. <i>Polyaromatic Hydrocarbons:</i> Potential source associated with site usage. <i>Volatile Organic Compounds:</i> Potential source associated with site usage. <i>Asbestos:</i> Potential source from demolition of former buildings on site. <i>Sulphates:</i> Possible source associated with natural strata beneath the site. <i>Off site:</i> No valid source Liquids <i>Leached Source:</i> Potential for limited source to be released from soils <i>Liquid Source:</i> Limited volumes of liquid contaminants should adsorb to soil if released to the ground. Low possibility of residual free-phase <i>Off site:</i> No valid source Ground Gases <i>Landfill gases:</i> No valid source identified <i>Radon:</i> No evidence of significant source – not a radon affected area.	Movement of Solids Dermal and oral exposure pathways (including air-borne migration) are present during construction phase but will generally not be present following development due to building and hardstanding effective barriers. Limited landscaping areas after development represent possible dust exposure pathways. Chemical reactions can occur between sulphates and buried concrete Certain organic compounds can readily penetrate plastic construction materials Release into Liquid Phase Metal solubility generally low at typical soil temperature and pH. Low possibility of metal uptake by plants. The majority of organic compounds are of low solubility. Potential for certain petroleum hydrocarbons and VOCs to be mobilised Movement of Liquids Low permeability strata expected beneath the site would inhibit lateral and vertical migration effectively eliminating a valid migration pathway. Movement of Gases Not applicable (no source)	Human Health <i>End users:</i> Pollutant linkage possible <i>Construction workers:</i> Pollutant linkage possible during development <i>Neighbouring properties:</i> Pollutant linkage possible Buried Structures & Services <i>Plastic pipes for potable water:</i> Pollutant linkage possible <i>Buried concrete:</i> Pollutant linkage possible Landscape Areas Pollutant linkage possible Controlled Waters <i>Groundwater:</i> No pollutant linkage <i>Surface Water:</i> No pollutant linkage Human Health (Ground Gases) No pollutant linkage

NOTES

1. The above conceptual model is based on CIRIA C552 (2001) and BS 10175 (2011).
2. The Conceptual Site Model is prepared from available desk study information. Where a site walkover or ground investigation identifies information that was not known at the desk study stage, such information is used to modify the Model.
3. Where a pollutant linkage is identified, any subsequent ground investigation is designed to obtain relevant information to assess the pollutant linkage. See Table 3 for a summary of pollutant linkage assessments.

TABLE 2
(Page 1 of 2)

SUMMARY OF ANALYTICAL TEST DATA: SOILS
POTENTIAL RISKS TO HUMAN HEALTH

Determinand	Units	No of Tests	Concentration (mg/kg)		Generic Assessment Criteria (mg/kg) Residential Without Plant Uptake		Category 4 Screening Level (mg/kg) Residential Without Plant Uptake	
			Min	Max	Value	No>GAC	Value	No>C4SL
Arsenic	mg/kg	6	5.4	15	40 ¹	0	40 ⁴	0
Cadmium	mg/kg	6	<0.2	2.2	85 ¹	0	149 ⁴	0
Chromium (Total) ⁵	mg/kg	6	11	22	910 ¹	0	-	-
Chromium (VI)	mg/kg	6	<4.0	<4.0	6 ¹	0	21 ⁴	0
Lead	mg/kg	6	26	410	140 ²	3	310 ⁴	1
Inorganic Mercury	mg/kg	6	<0.3	0.5	56 ¹	0	-	-
Nickel	mg/kg	6	8.3	15	180 ¹	0	-	-
Selenium	mg/kg	6	<1.0	<1.0	430 ¹	0	-	-
Copper	mg/kg	6	13	130	7100 ¹	0	-	-
Zinc	mg/kg	6	36	300	40,000 ¹	0	-	-
Boron	mg/kg	6	0.4	14	11,000 ¹	0	-	-
Phenols	mg/kg	6	<1.0	<1.0	440 ¹	-	-	-
pH	-	10	7.5	11.0	-	-	-	-
Total Organic Carbon	%	6	<0.1	2.3	-	-	-	-
Petroleum Hydrocarbons								
Aliphatics C ₅ – C ₆	mg/kg	6	<0.1	<0.1	42 ¹	0	-	-
Aliphatics C ₆ – C ₈	mg/kg	6	<0.1	<0.1	100 ¹	0	-	-
Aliphatics C ₈ – C ₁₀	mg/kg	6	<0.1	<0.1	27 ¹	0	-	-
Aliphatics C ₁₀ – C ₁₂	mg/kg	6	<1.0	<1.0	130 ¹	0	-	-
Aliphatics C ₁₂ – C ₁₆	mg/kg	6	<2.0	4.5	1100 ¹	0	-	-
Aliphatics C ₁₆ – C ₃₅	mg/kg	6	<8.0	466	65,000 ¹	0	-	-
Aromatics C ₆ – C ₇	mg/kg	6	<0.1	<0.1	370 ¹	0	-	-
Aromatics C ₇ – C ₈	mg/kg	6	<0.1	<0.1	860 ¹	0	-	-
Aromatics C ₈ – C ₁₀	mg/kg	6	<0.1	<0.1	47 ¹	0	-	-
Aromatics C ₁₀ – C ₁₂	mg/kg	6	<1.0	2.4	250 ¹	0	-	-
Aromatics C ₁₂ – C ₁₆	mg/kg	6	<2.0	10	1800 ¹	0	-	-
Aromatics C ₁₆ – C ₂₁	mg/kg	6	<10	39	1900 ¹	0	-	-
Aromatics C ₂₁ – C ₃₅	mg/kg	6	<10	100	1900 ¹	0	-	-
VOCs								
Benzene	mg/kg	6	<0.001	<0.001	0.38 ¹	0	3.3 ⁴	0
Toluene	mg/kg	6	<0.001	<0.001	880 ¹	0	-	-
Ethylbenzene	mg/kg	6	<0.001	<0.001	83 ¹	0	-	-
Xylene	mg/kg	6	<0.001	<0.001	79 ¹	0	-	-
MTBE	mg/kg	6	<0.001	<0.001	73 ³	0	-	-

TABLE 2
(Page 2 of 2)

Determinand	Units	No of Tests ⁶	Concentration (mg/kg)		Generic Assessment Criteria (mg/kg) Residential Without Plant Uptake		Category 4 Screening Level (mg/kg) Residential Without Plant Uptake	
			Min	Max	Value	No>GAC	Value	No>C4SL
PAHs								
Naphthalene	mg/kg	6	<0.05	<0.05	2.3 ¹	0	-	-
Acenaphthylene	mg/kg	6	<0.10	<0.10	2900 ¹	0	-	-
Acenaphthene	mg/kg	6	<0.10	<0.10	3000 ¹	0	-	-
Fluorene	mg/kg	6	<0.10	0.23	2800 ¹	0	-	-
Phenanthrene	mg/kg	6	0.30	2.20	1300 ¹	0	-	-
Anthracene	mg/kg	6	<0.10	0.31	31,000 ¹	0	-	-
Fluoranthene	mg/kg	6	0.28	3.50	1500 ¹	0	-	-
Pyrene	mg/kg	6	0.25	2.70	3700 ¹	0	-	-
Benz(a)anthracene	mg/kg	6	<0.10	1.10	11 ¹	0	-	-
Chrysene	mg/kg	6	<0.05	1.40	30 ¹	0	-	-
Benzo(b)fluoranthene	mg/kg	6	<0.10	1.60	3.9 ¹	0	-	-
Benzo(k)fluoranthene	mg/kg	6	<0.10	0.71	110 ¹	0	-	-
Benzo(a)pyrene	mg/kg	6	<0.10	1.30	3.2 ¹	0	5.3 ⁴	0
Indeno(123cd)pyrene	mg/kg	6	<0.10	0.70	45 ¹	0	-	-
Dibenzo(ah)anthracene	mg/kg	6	<0.10	<0.10	0.31 ¹	0	-	-
Benzo(ghi)perylene	mg/kg	6	<0.05	0.84	360 ¹	0	-	-

NOTES

1. Suitable for Use Level (S4UL) published by LQM/CIEH, 2015 – Residential Without Plant Uptake landuse. S4UL assumptions comprise 1% soil organic matter, soil pH of 7 and sandy loam soil type. Where S4UL presented by LQM is greater than 100%, the S4UL for this assessment has been capped at 1,000,000 mg/kg. S4ULs are copyright © Land Quality Management Limited reproduced with permission; Publication Number S4UL3133.
2. Generic assessment criteria (GAC) for lead calculated using CLEA Software version 1.06 (Environment Agency, 2009) with a lead intake based on a target blood level of 3.5 µg/dL. Other model assumptions comprise 1% soil organic matter, soil pH of 7 and sandy loam soil type.
3. Soil GAC for Human Health Risk Assessment produced by CL:AIRE (2010) – Residential Without Plant Uptake. Assumption of 1% soil organic matter.
4. Category 4 Screening Level (C4SL), Department for Environment Food and Rural Affairs (March 2014)
5. In the absence of desk study or historical map evidence indicating a potential source of chromium (VI) usage at or in the near vicinity of the site (and confirmed by laboratory testing), total chromium concentrations have been compared to the GAC for chromium (III).
6. For determinands that exceed the GAC and C4SL, site specific assessment criteria are derived in Appendix IV

TABLE 3

ASSESSMENT OF POLLUTANT LINKAGES

NOTES:

- Pollutant linkage validity assessed following qualitative or semi-quantitative risk assessment.
- Pollutant linkage assessed following detailed quantitative risk assessment or assuming the recommended remediation or mitigation measures are in place

		Consequence (C)			
		Severe	Medium	Mild	Minor
Probability (P)	High likelihood (HL)	Very High Risk	High Risk	Moderate Risk	Moderate/ Low Risk
	Likely (L)	High Risk	Moderate Risk	Moderate/ Low Risk	Low Risk
	Low likelihood (LL)	Moderate Risk	Moderate/ Low Rsk	Low Risk	Very Low Risk
	Unlikey (UL)	Moderate/ Low Risk	Low Risk	Very Low Risk	Very Low Risk

All terminology in accordance with the definitions provided in CIRIA C552 (2001)

Pollutant Linkage			Assessment of Pollutant Linkage following Ground Investigation	Pollutant Linkage Valid? ¹	Risk Rating			Quantitative Risk Assessment	Recommended Remediation/Mitigation (See Section 7 for further details)	Recommended Work Verified?	Pollutant Linkage Valid? ²
Source	Pathway	Receptor			C	P	Risk				
Toxic metals Petroleum hydrocarbons PAHs Volatile Organic Compounds Asbestos	Dermal contact (dust), Ingestion (dust), Inhalation (dust)	End Users	Lead elevated above GAC. Petroleum hydrocarbons below GAC. PAH concentrations below GAC. Volatile Organic Compounds below GAC. Asbestos identified. Further assessment is needed due to access constraints. Pollutant linkages assumed to be valid at this stage.	Yes Yes Yes Yes Yes	Med Med Med Med Sev	LL LL LL LL LL	Mod/Low Mod/Low Mod/Low Mod/Low Mod	Yes, site specific assessment criteria prepared using CLEA Model v1.06. Lead concentrations are below the SSAC. Further risk assessment may be required if a supplementary ground investigation records contaminants above GAC.	Recommended topsoil capping layer in the managed soft landscaping areas, to act as barrier between potential contaminants and site end users. Recommended hydrocarbon-resistant membrane within ground floor slab for a limited area of the proposed building.	To be confirmed during construction phase. Validity of pollutant linkage to be confirmed following supplementary ground investigation.	No
Toxic metals Petroleum hydrocarbons PAHs Volatile Organic Compounds Asbestos	Dermal contact, Ingestion, Inhalation	Construction workers	All tests below concentrations considered to be a short-term (acute) risk. No further assessment required. Asbestos identified.	No No No No Yes	n/a n/a n/a n/a Sev	n/a n/a n/a n/a LL	n/a n/a n/a n/a Mod	Not applicable.	Standard personal protective equipment is recommended as good practice and conventional dust control methods are to be used.	To be confirmed during construction phase.	No
Toxic metals Petroleum hydrocarbons PAHs Volatile Organic Compounds Asbestos	Dermal contact (dust), Ingestion (dust), Inhalation (dust)	Neighbours/general public	Lead elevated above GAC. Petroleum hydrocarbons below GAC. PAH concentrations below GAC. Volatile Organic Compounds below GAC. Asbestos identified. Further assessment is needed due to access constraints. Pollutant linkages assumed to be valid at this stage.	Yes Yes Yes Yes Yes	Med Med Med Med Sev	UL UL UL UL UL	Low Low Low Low Mod/Low	Not undertaken as GAC considered appropriate for neighbouring properties.	During construction, conventional dust control methods are to be used.	To be confirmed during construction phase.	No
Petroleum hydrocarbons	Penetration of plastic materials	Water supply pipes	Low concentrations identified. Further assessment is needed due to access constraints. Pollutant linkages assumed to be valid at this stage.	Yes	Med	LL	Mod/Low	Not applicable.	It would be prudent to make allowance for multi-barrier pipes.	Validity of pollutant linkage to be confirmed following supplementary ground investigation.	No
Sulphates	Chemical reaction	Buried concrete	Low levels of elevated sulphates identified.	Yes	Mild	LL	Low	Not applicable.	ACEC site classification of AC-2 for standard buried concrete.	To be confirmed during construction phase.	No
Phytotoxic metals	Plant uptake	Landscape plantings	Concentrations of zinc identified locally at concentrations considered unacceptable to healthy plant growth based on BS 3882:2007	Yes	Minor	LL	Very Low	Not applicable.	Recommend allowance be made for placement of imported topsoil in proposed landscaping areas to provide a healthy growing medium for plantings.	To be confirmed during construction phase.	No

FIGURES

FIGURE 1

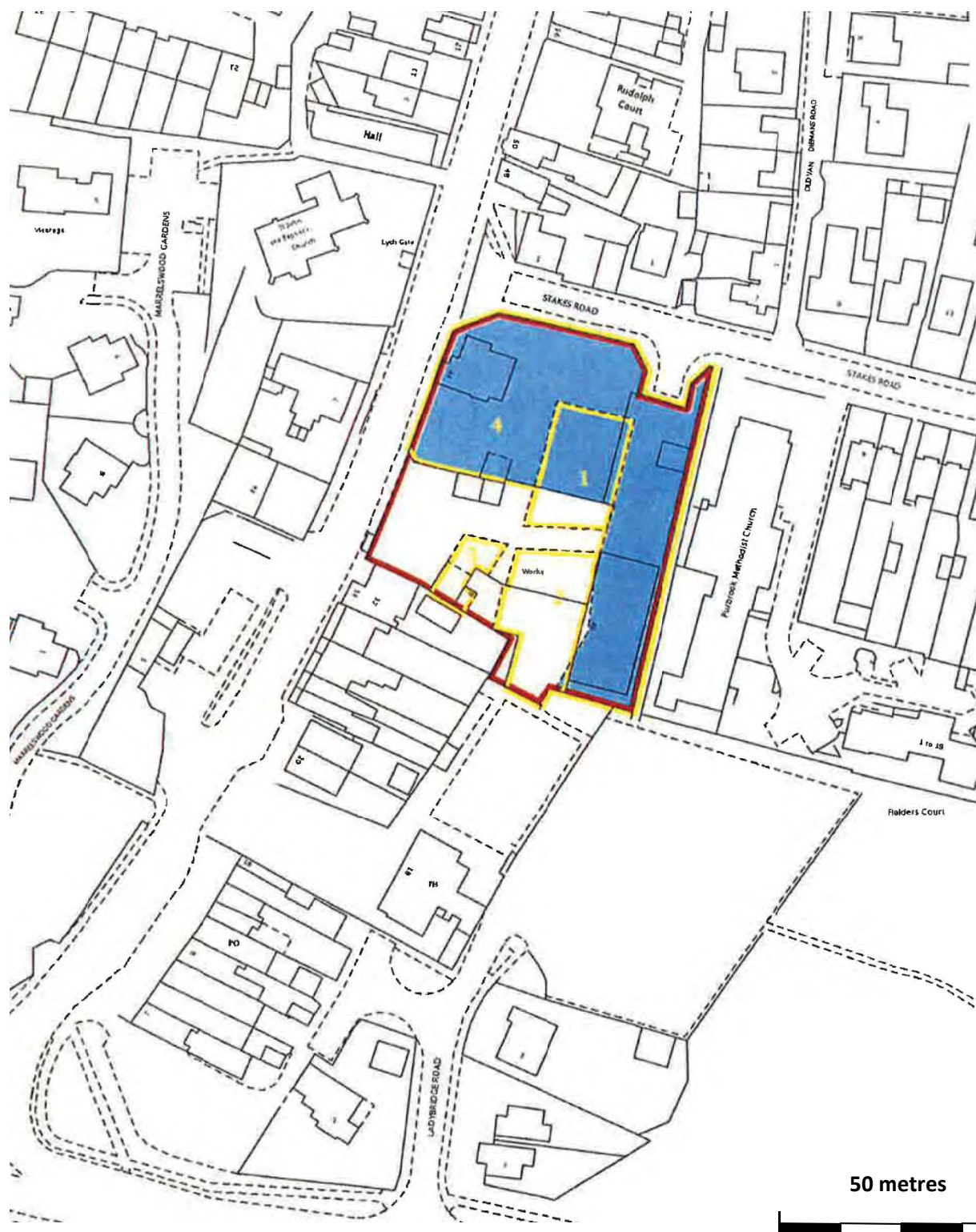


SITE LOCATION PLAN

Scale 1: 50,000

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FIGURE 2



SITE PLAN
Scale 1:1250

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APPENDIX I

Site Details:

Purbrook, Waterlooville, 38-44
London Road, Purbrook, PO75LJ

Client Ref: EMS_298303_403256
Report Ref: EMS-298303_403256
Grid Ref: 467351, 107962

Map Name: County Series

Map date: 1859-1860

Scale: 1:2,500

Printed at: 1:2,500



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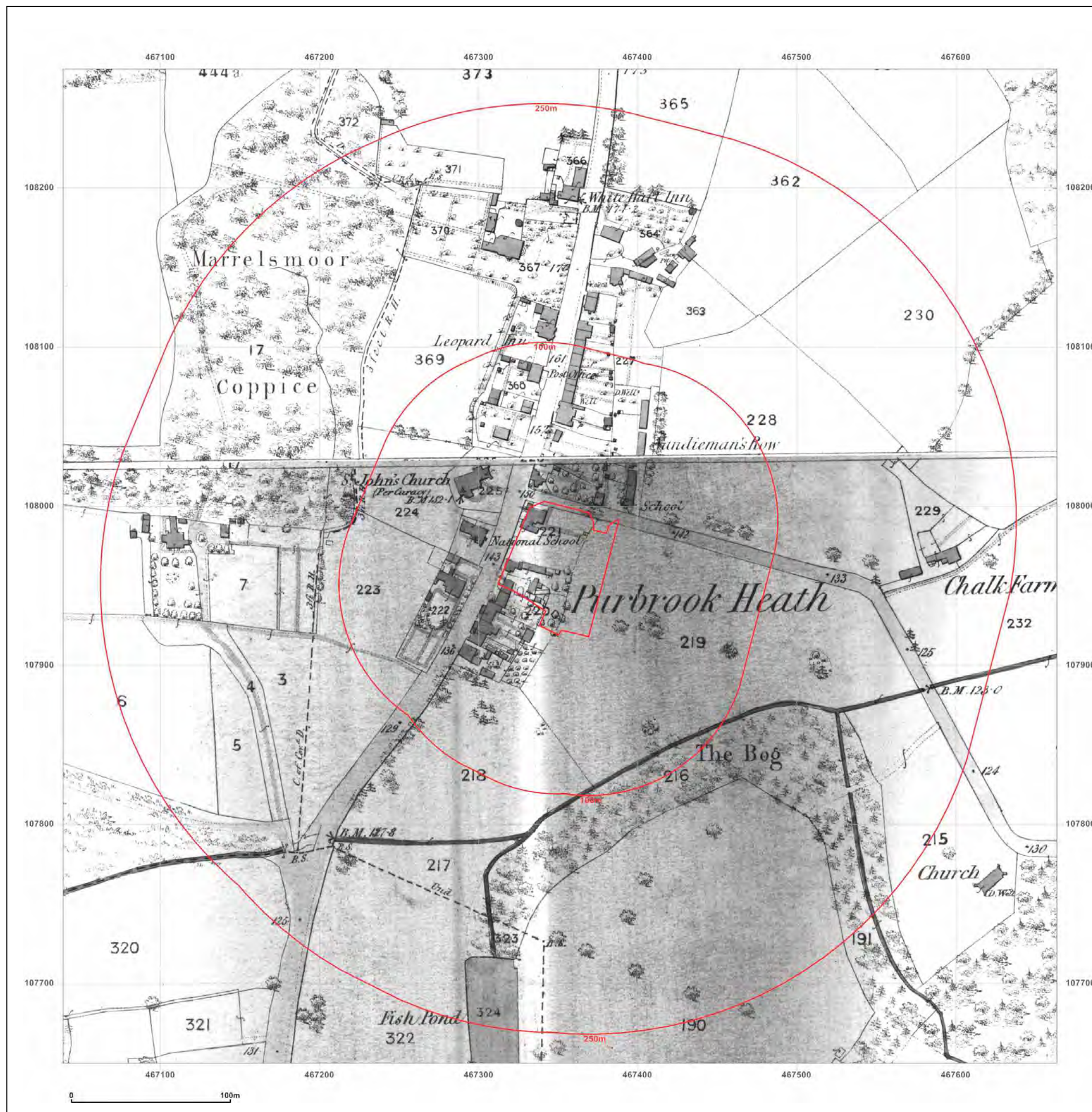


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Site Details:

Purbrook, Waterlooville, 38-44
London Road, Purbrook, PO75LJ

Client Ref: EMS_298303_403256
Report Ref: EMS-298303_403256
Grid Ref: 467351, 107962

Map Name: County Series

Map date: 1869

Scale: 1:2,500

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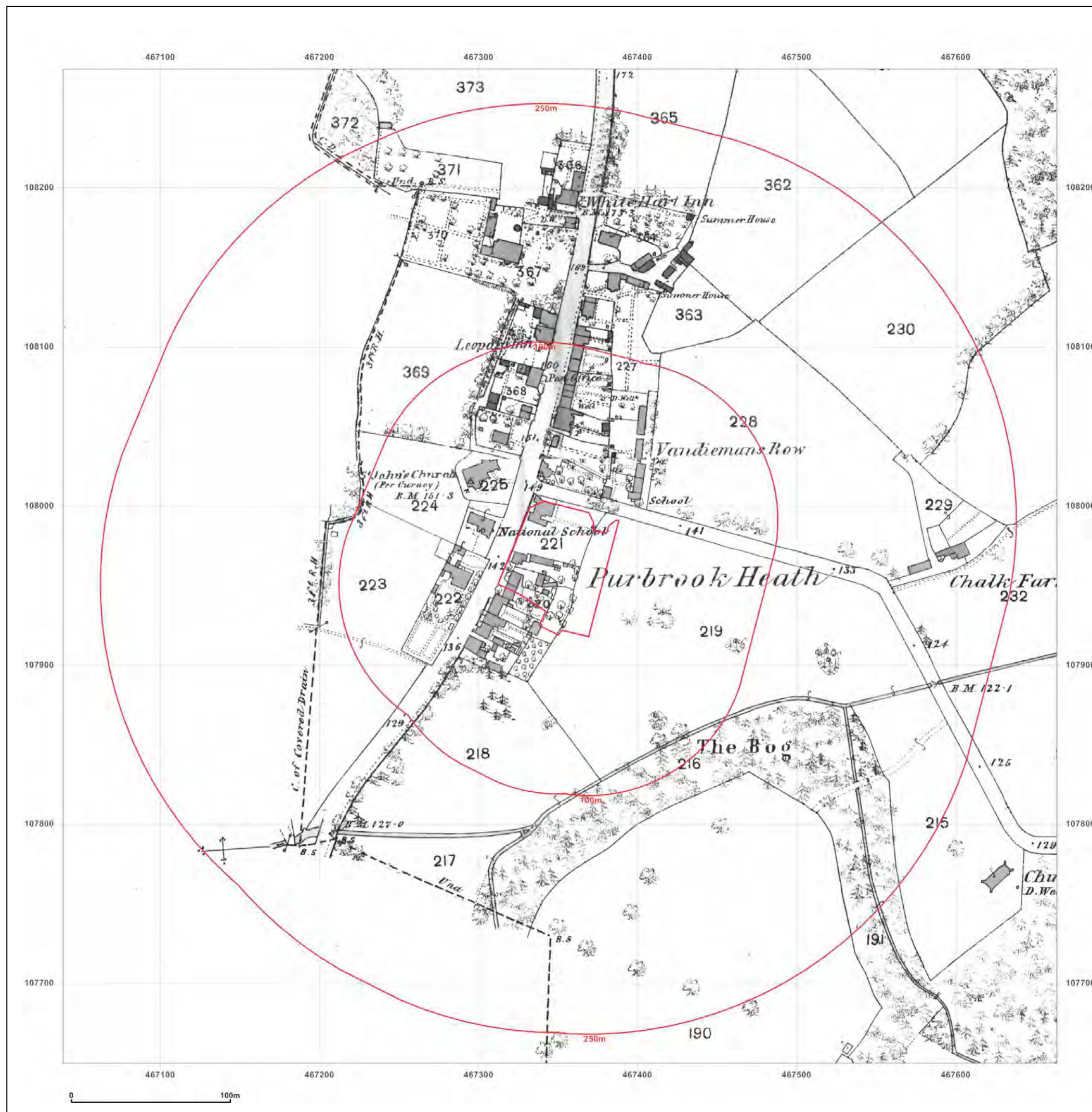


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Site Details:

Purbrook, Waterlooville, 38-44
London Road, Purbrook, PO75LJ

Client Ref: EMS_298303_403256
Report Ref: EMS-298303_403256
Grid Ref: 467351, 107962

Map Name: County Series

Map date: 1897

Scale: 1:2,500

Printed at: 1:2,500



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Edition N/A
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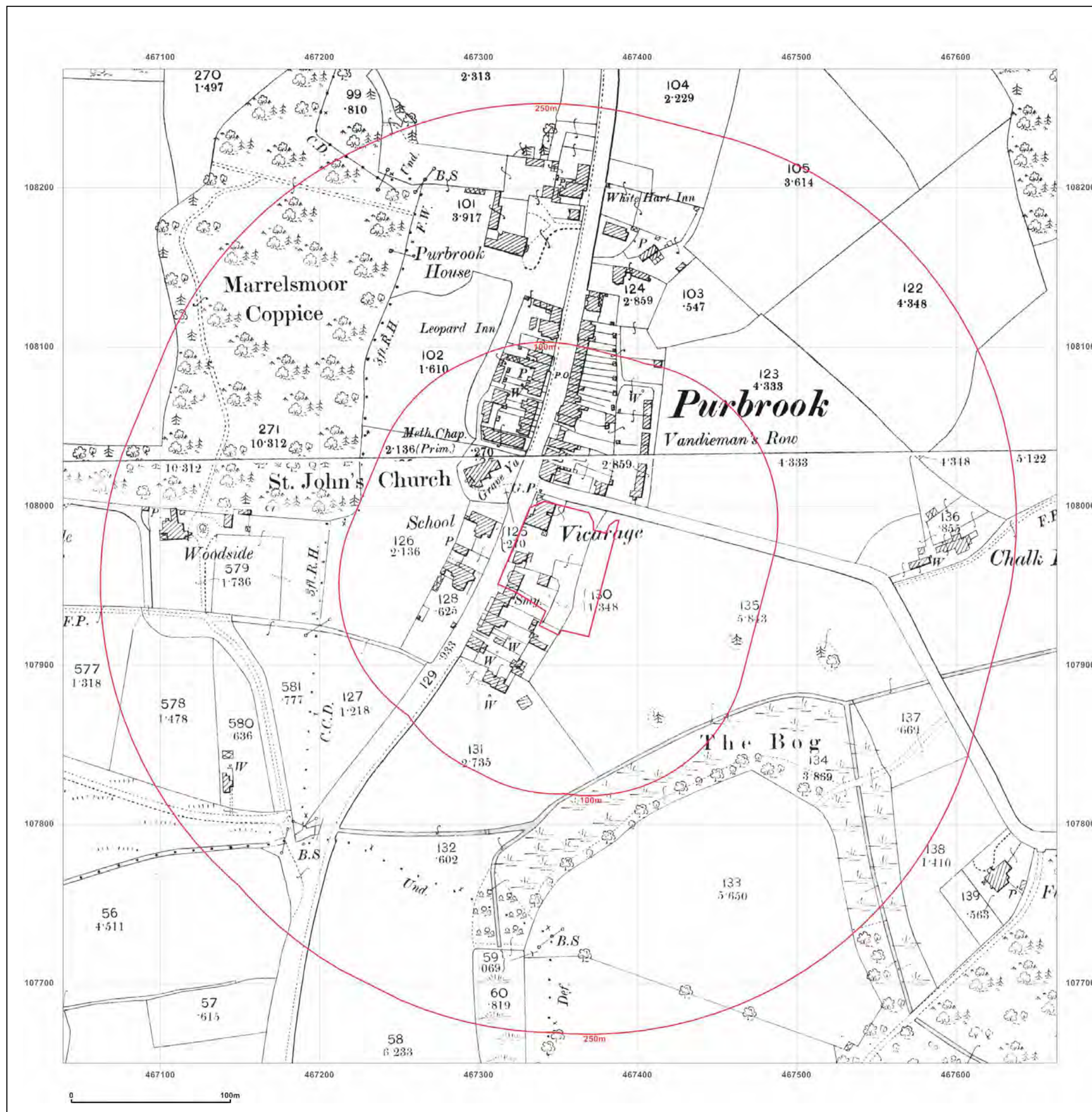


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Site Details:

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Client Ref: EMS_298303_403256
Report Ref: EMS-298303_403256
Grid Ref: 467351, 107962

Map Name: County Series

Map date: 1909

Scale: 1:2,500

Printed at: 1:2,500



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Edition N/A
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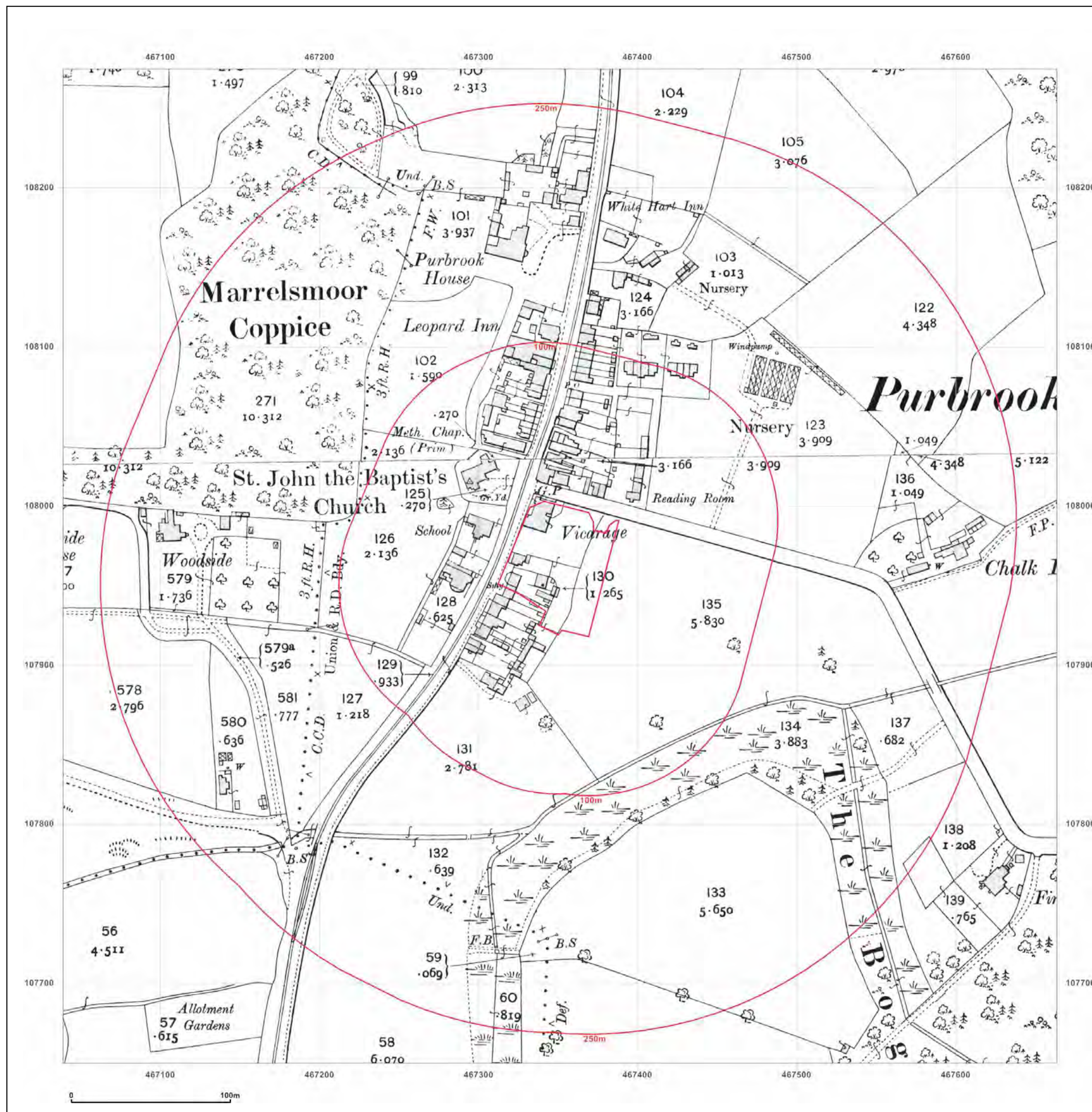


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Site Details:

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Client Ref: EMS_298303_403256
Report Ref: EMS-298303_403256
Grid Ref: 467351, 107962

Map Name: County Series

Map date: 1932

Scale: 1:2,500

Printed at: 1:2,500



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Revised 1932
Edition N/A
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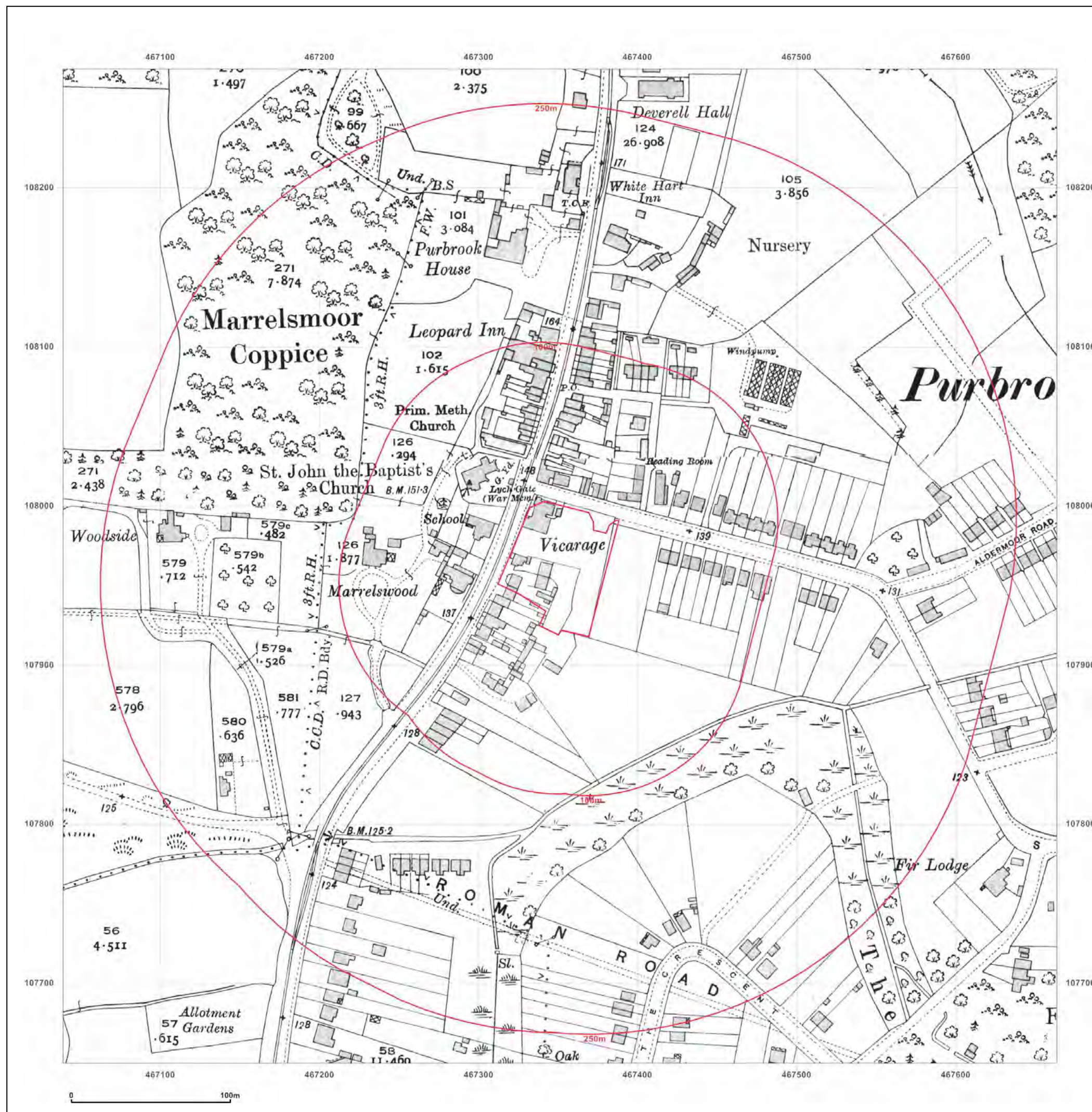


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Site Details:

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London Road, Purbrook, PO75LJ

Client Ref: EMS_298303_403256
Report Ref: EMS-298303_403256
Grid Ref: 467351, 107962

Map Name: County Series

Map date: 1937-1939

Scale: 1:2,500

Printed at: 1:2,500



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Revised 1937
Edition N/A
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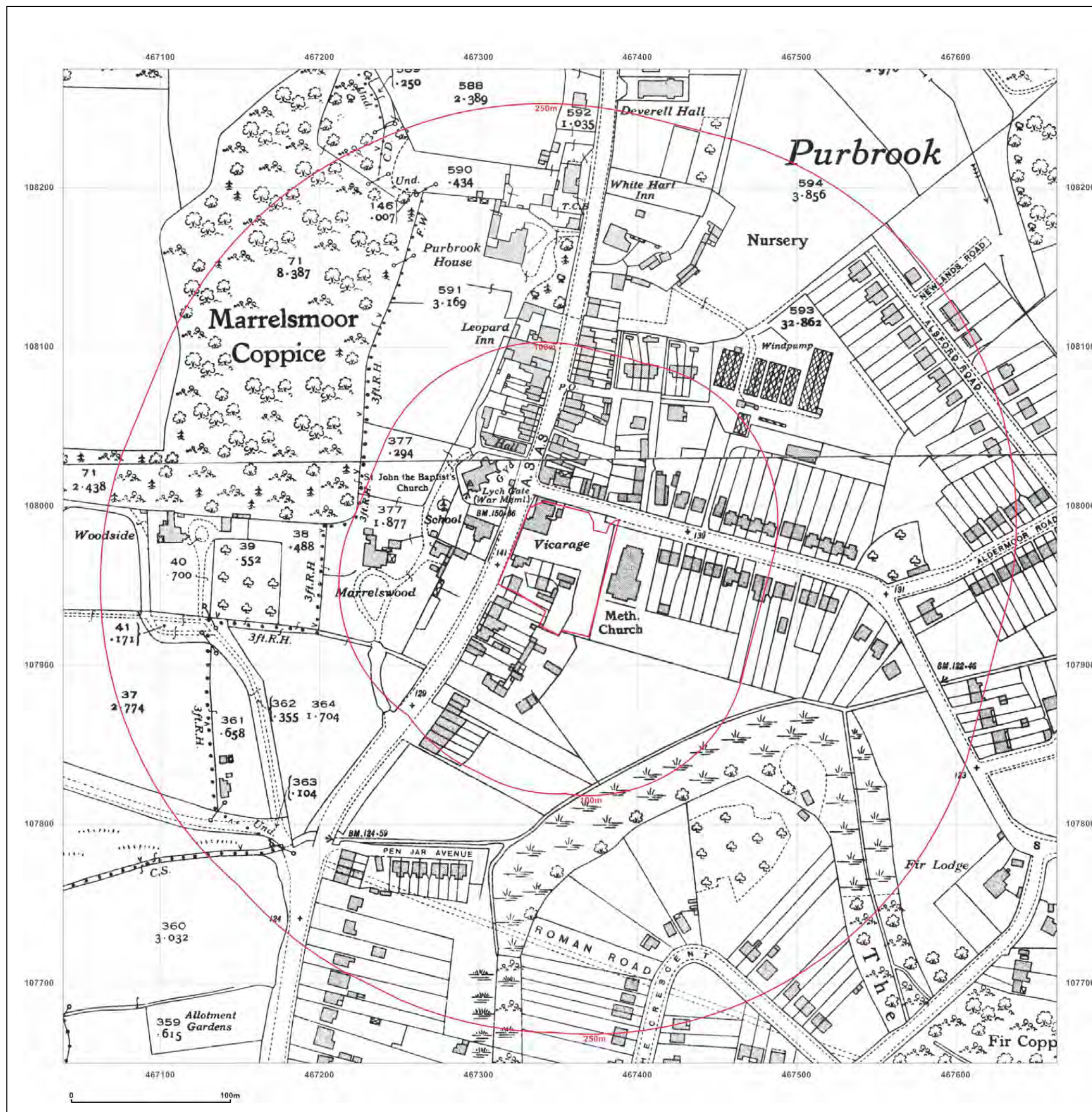


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Site Details:

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Client Ref: EMS_298303_403256
Report Ref: EMS-298303_403256
Grid Ref: 467351, 107962

Map Name: National Grid

Map date: 1952

Scale: 1:2,500

Printed at: 1:2,500



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Revised 1952
Edition N/A
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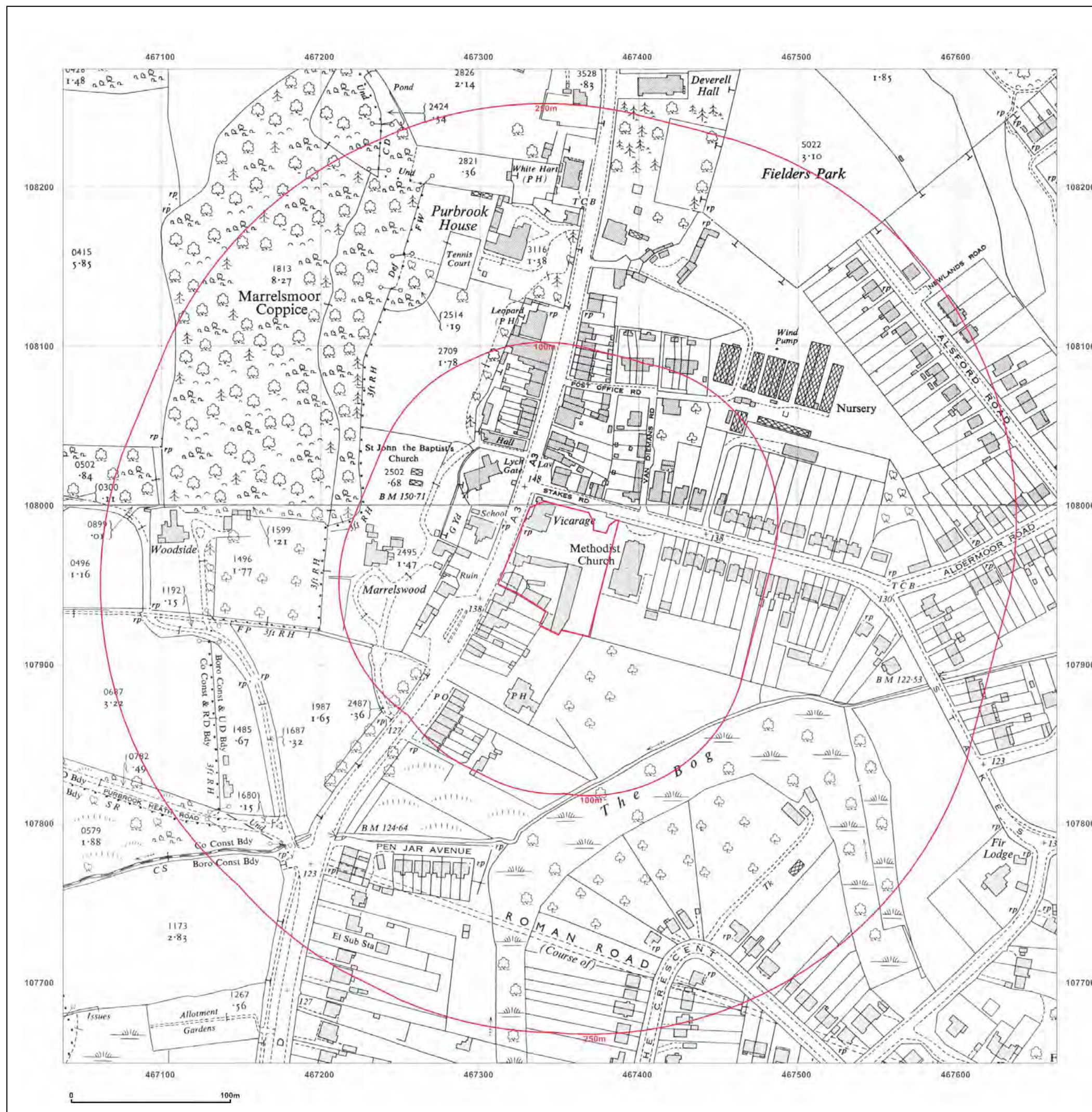


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Site Details:

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Client Ref: EMS_298303_403256
Report Ref: EMS-298303_403256
Grid Ref: 467351, 107962

Map Name: National Grid

Map date: 1959-1964

Scale: 1:2,500

Printed at: 1:2,500



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Revised 1959
Edition N/A
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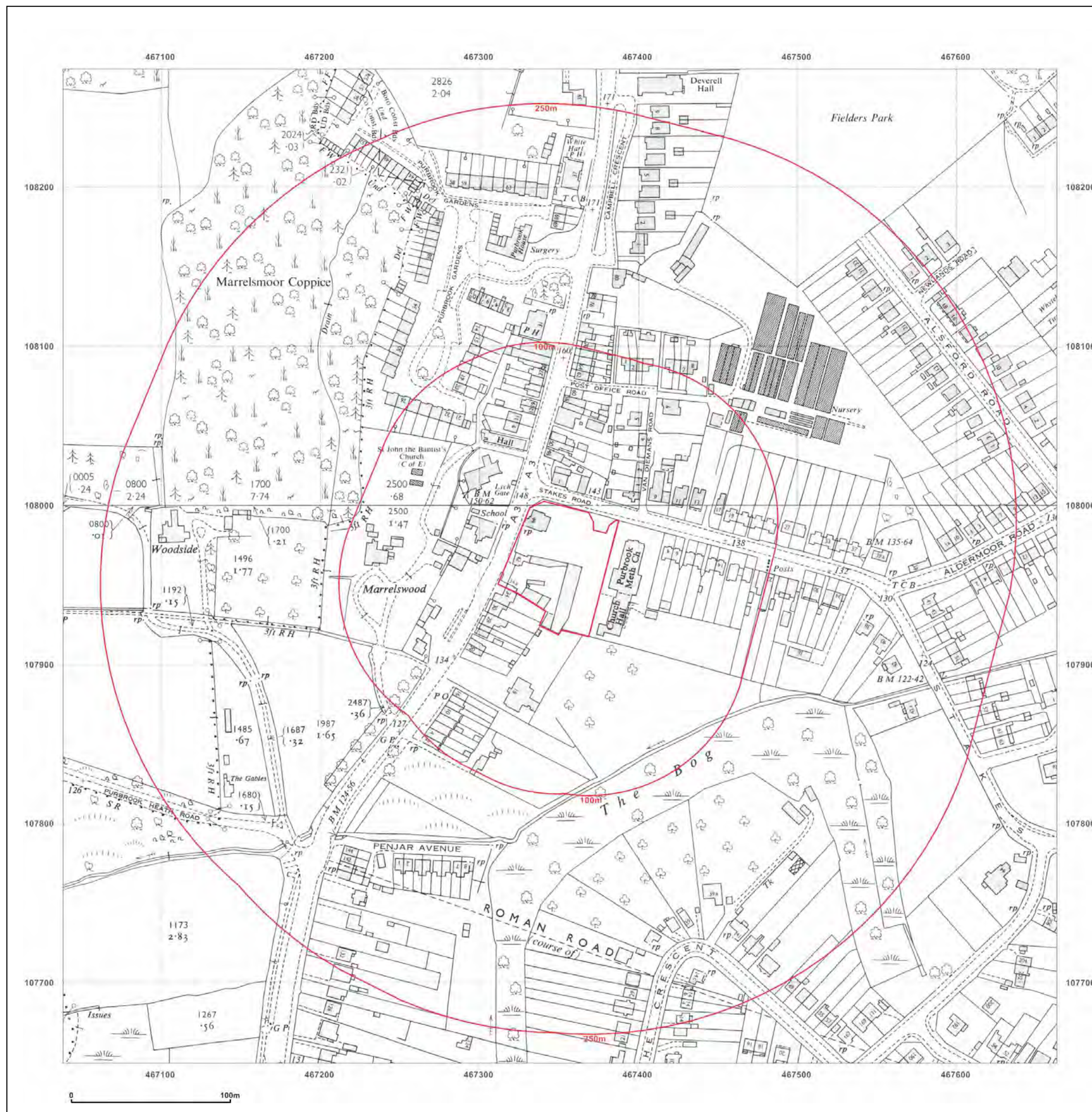


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Site Details:

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London Road, Purbrook, PO75LJ

Client Ref: EMS_298303_403256
Report Ref: EMS-298303_403256
Grid Ref: 467351, 107962

Map Name: National Grid

Map date: 1971-1974

Scale: 1:1,250

Printed at: 1:2,000



Surveyed 1972
Revised 1972
Edition N/A
Copyright 1974
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Surveyed 1972
Revised 1972
Edition N/A
Copyright 1974
Levelled 1957

Surveyed 1971
Revised 1971
Edition N/A
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Revised 1971
Edition N/A
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Site Details:

Purbrook, Waterlooville, 38-44
London Road, Purbrook, PO75LJ

Client Ref: EMS_298303_403256
Report Ref: EMS-298303_403256
Grid Ref: 467351, 107962

Map Name: National Grid

Map date: 1978-1981

Scale: 1:1,250

Printed at: 1:2,000



Surveyed N/A
Revised N/A
Edition N/A
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Surveyed N/A
Revised N/A
Edition N/A
Copyright 1978
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Site Details:

Purbrook, Waterlooville, 38-44
London Road, Purbrook, PO75LJ

Client Ref: EMS_298303_403256
Report Ref: EMS-298303_403256
Grid Ref: 467351, 107962

Map Name: National Grid

Map date: 1989-1993

Scale: 1:1,250

Printed at: 1:2,000



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Edition N/A
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Surveyed 1957
Revised 1989
Edition N/A
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Levelled 1957

Surveyed 1957
Revised 1989
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APPENDIX II

APPENDIX II – DESK STUDY INFORMATION

GroundSure Environmental Database

Enquiries were made to the GroundSure Environmental Database regarding the site and surrounding area. This database includes collated and continuously updated information from a variety of sources and includes entries that cover Environment Agency licences, waste sites, hazardous substances, geological data, industrial landuse, groundwater vulnerability, source protection zones and floodplains.

A report is included in this Appendix for a search radius of 1 km around the site and this report includes a summary table of the search results. Detailed information contained in the report has been included only if it is relevant to the geotechnical and environmental assessment. All other pages have been omitted. A full copy of the GroundSure Report can be provided on request.

Groundsure Enviroinsight

Address: Purbrook, Waterlooville, 38-44 London Road, Purbrook, PO75LJ,
Date: 14 Apr 2015
Reference: EMS-298303_403257
Client: EmapSite

NW

N

NE

W

E



SW

S

SE

Aerial Photograph Capture date: 20-Aug-2013
Grid Reference: 467351,107962
Site Size: 0.40ha

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: Environmental Permits, Incidents and Registers	On-site	0-50m	51-250	251-500
1.1 Industrial Sites Holding Environmental Permits and/or Authorisations				
1.1.1 Records of historic IPC Authorisations	0	0	0	0
1.1.2 Records of Part A(1) and IPPC Authorised Activities	0	0	0	0
1.1.3 Records of Water Industry Referrals (potentially harmful discharges to the public sewer)	0	0	0	0
1.1.4 Records of Red List Discharge Consents (potentially harmful discharges to controlled waters)	0	0	0	0
1.1.5 Records of List 1 Dangerous Substances Inventory sites	0	0	0	0
1.1.6 Records of List 2 Dangerous Substances Inventory sites	0	0	0	0
1.1.7 Records of Part A(2) and Part B Activities and Enforcements	0	0	1	0
1.1.8 Records of Category 3 or 4 Radioactive Substances Authorisations	0	0	0	0
1.1.9 Records of Licensed Discharge Consents	0	0	2	5
1.1.10 Records of Planning Hazardous Substance Consents and Enforcements	0	0	0	0
1.2 Records of COMAH and NIHHS sites	0	0	0	0
1.3 Environment Agency Recorded Pollution Incidents				
1.3.1 National Incidents Recording System, List 2	0	0	0	2
1.3.2 National Incidents Recording System, List 1	0	0	0	0
1.4 Sites Determined as Contaminated Land under Part 2A EPA 1990	0	0	0	0

Section 2: Landfill and Other Waste Sites	On-site	0-50m	51-250	251-500	501-1000	1000-5000
2.1 Landfill Sites						
2.1.1 Environment Agency Registered Landfill Sites	0	0	0	0	0	Not searched
2.1.2 Environment Agency Historic Landfill Sites	0	0	1	0	2	0
2.1.3 BGS/DoE Landfill Site Survey	0	0	0	0	0	0
2.1.4 Groundsure Local Authority Landfill Sites Data	0	0	0	0	0	0
2.2 Landfill and Other Waste Sites Findings						

Section 2: Landfill and Other Waste Sites	On-site	0-50m	51-250	251-500	501-1000	1000-5000
2.2.1 Operational and Non-Operational Waste Treatment, Transfer and Disposal Sites	0	0	0	0	Not searched	Not searched
2.2.2 Environment Agency Licensed Waste Sites	0	0	0	0	0	0

Section 3: Current Land Use	On-site	0-50m	51-250	251-500
3.1 Current Industrial Sites Data	6	2	7	Not searched
3.2 Records of Petrol and Fuel Sites	0	1	0	0
3.3 Underground High Pressure Oil and Gas Pipelines	0	0	0	0

Section 4: Geology	
4.1 Are there any records of Artificial Ground and Made Ground present beneath the study site?	No
4.2 Are there any records of Superficial Ground and Drift Geology present beneath the study site?	None
4.3 For records of Bedrock and Solid Geology beneath the study site see the detailed findings section.	

Section 5: Hydrogeology and Hydrology				0-500m		
5.1 Are there any records of Strata Classification in the Superficial Geology within 500m of the study site?				Yes		
5.2 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
5.3 Groundwater Abstraction Licences (within 2000m of the study site)	0	0	0	0	0	0
5.4 Surface Water Abstraction Licences (within 2000m of the study site)	0	0	0	0	0	0
5.5 Potable Water Abstraction Licences (within 2000m of the study site)	0	0	0	0	0	0
5.6 Source Protection Zones (within 500m of the study site)	0	0	0	0	Not searched	Not searched
5.7 Source Protection Zones within Confined Aquifer	1	0	0	0	Not searched	Not searched
5.8 Groundwater Vulnerability and Soil Leaching Potential (within 500m of the study site)	1	0	0	1	Not searched	Not searched
	On-site	0-50m	51-250	251-500	501-1000	1000-1500
5.9 Is there any Environment Agency information on river quality within 1500m of the study site?	No	No	No	No	No	No
5.10 Detailed River Network entries within 500m of the site	0	0	8	7	Not searched	Not searched
5.11 Surface water features within 250m of the study site	No	No	Yes	Not searched	Not searched	Not searched

Section 6: Flooding

6.1 Are there any Environment Agency Zone 2 floodplains within 250m of the study site?	Yes
6.2 Are there any Environment Agency Zone 3 floodplains within 250m of the study site?	Yes
6.3 Are there any Flood Defences within 250m of the study site?	No
6.4 Are there any areas benefiting from Flood Defences within 250m of the study site?	No
6.5 Are there any areas used for Flood Storage within 250m of the study site?	No
6.6 What is the maximum BGS Groundwater Flooding susceptibility within 50m of the study site?	Limited potential
6.7 What is the BGS confidence rating for the Groundwater Flooding susceptibility areas?	Low

Section 7: Designated Environmentally Sensitive Sites

	On-site	0-50m	51-250	251-500	501-1000	1000-2000
7.1 Records of Sites of Special Scientific Interest (SSSI)	0	0	0	0	0	1
7.2 Records of National Nature Reserves (NNR)	0	0	0	0	0	0
7.3 Records of Special Areas of Conservation (SAC)	0	0	0	0	0	0
7.4 Records of Special Protection Areas (SPA)	0	0	0	0	0	0
7.5 Records of Ramsar sites	0	0	0	0	0	0
7.6 Records of Ancient Woodlands	0	0	1	0	3	15
7.7 Records of Local Nature Reserves (LNR)	0	0	0	0	0	0
7.8 Records of World Heritage Sites	0	0	0	0	0	0
7.9 Records of Environmentally Sensitive Areas	0	0	0	0	0	0
7.10 Records of Areas of Outstanding Natural Beauty (AONB)	0	0	0	0	0	0
7.11 Records of National Parks	0	0	0	0	0	0
7.12 Records of Nitrate Sensitive Areas	0	0	0	0	0	0
7.13 Records of Nitrate Vulnerable Zones	1	0	0	0	0	2
7.14 Records of Green Belt Data	0	0	0	0	0	0

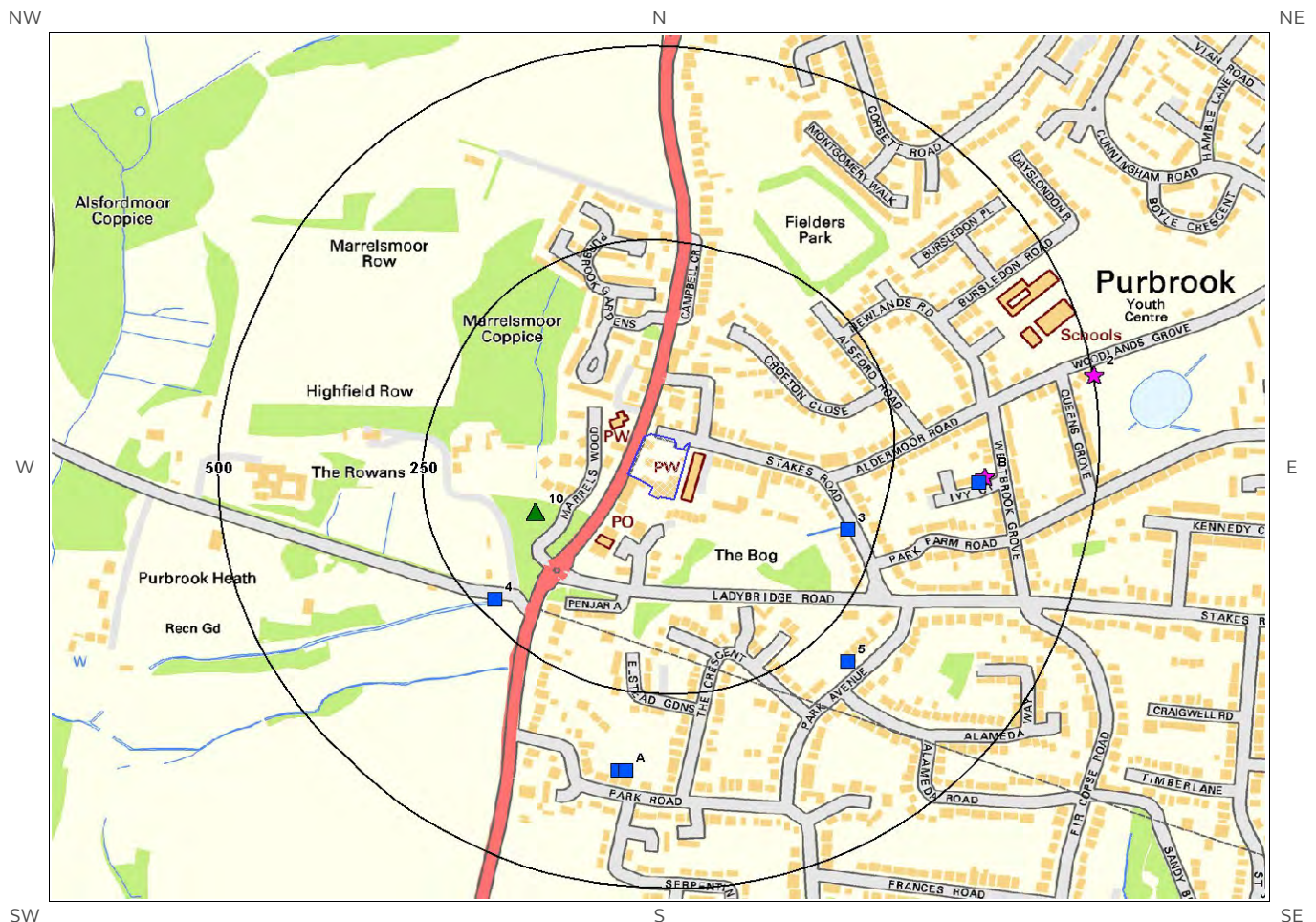
Section 8: Natural Hazards

8.1 What is the maximum risk of natural ground subsidence?	Moderate
8.1.1 What is the maximum Shrink-Swell hazard rating identified on the study site?	Moderate
8.1.2 What is the maximum Landslides hazard rating identified on the study site?	Very Low
8.1.3 What is the maximum Soluble Rocks hazard rating identified on the study site?	Negligible
8.1.4 What is the maximum Compressible Ground hazard rating identified on the study site?	Negligible
8.1.5 What is the maximum Collapsible Rocks hazard rating identified on the study site?	Very Low
8.1.6 What is the maximum Running Sand hazard rating identified on the study site?	Very Low

Section 9: Mining

9.1 Are there any coal mining areas within 75m of the study site?	No
9.2 What is the risk of subsidence relating to shallow mining within 150m of the study site?	Negligible
9.3 Are there any brine affected areas within 75m of the study site?	No

1. Environmental Permits, Incidents and Registers Map



Environmental Permits,
Incidents and Registers Legend

Mapping
sourced from
Ordnance Survey

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- | | | |
|--------------------|-------------------------------|--|
| Site Outline | Recorded Pollution Incident | RAS 3 & 4 Authorisations |
| Search Buffers (m) | Dangerous Substances (List 1) | Part A(1) Authorised Processes and Historic IPC Authorisations |
| | Dangerous Substances (List 2) | Part A(2) and Part B Authorised Processes |
| | Water Industry Referrals | COMAH / NIHHS Sites |
| | Licenced Discharge Consents | Sites Determined as Contaminated Land |
| | Red List Discharge Consents | Hazardous Substance Consents and Enforcements |

1.1.6 Records of List 2 Dangerous Substance Inventory Sites within 500m of the study site:

0

Database searched and no data found.

1.1.7 Records of Part A(2) and Part B Activities and Enforcements within 500m of the study site:

1

The following Part A(2) and Part B Activities are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance	Direction	NGR	Details
10	123.0	SW	467200 107900	Address: Bp Manor Fill Stn London Rd, Po7 5Lq Process: Petrol Vapour Recovery Process Status: Unknown Permit Type: Part B Enforcement: Data requested, not received. Date of Enforcement: Data requested, not received. Comment: Data requested, not received.

1.1.8 Records of Category 3 or 4 Radioactive Substances Authorisations:

0

Database searched and no data found.

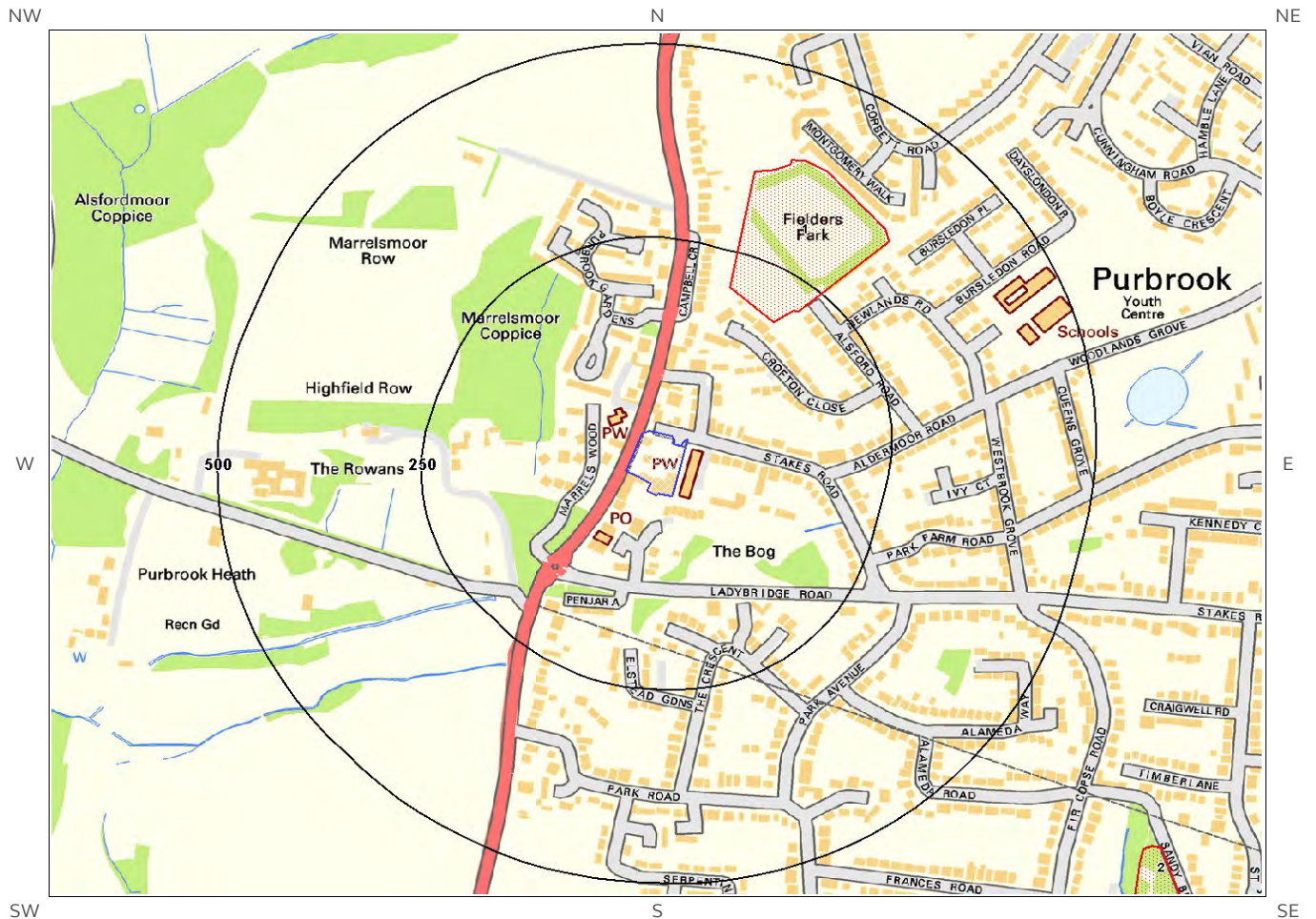
1.1.9 Records of Licensed Discharge Consents within 500m of the study site:

7

The following Licensed Discharge Consents records are represented as points on the Environmental Permits, Incidents and Registers Map:

ID	Distance	Direction	NGR	Details
3	214.0	E	467580 107880	Address: Westbrook Grove Purbrook Cso, Westbrook Grove Purbrook Cso, Westbrook Grove, Purbrook, Waterloooville, Hampshire, PO7 5HX Effluent Type: Sewage Discharges - Sewer Storm Overflow - Water Company Permit Number: A01278 Permit Version: 1 Receiving Water: Wallington River Via Drain Status: New Consent (wra 91, S88 & Sched 10 As Amended By Env Act 1995) Issue date: 20/9/2006 Effective Date: 20/9/2006 Revocation Date: -
4	228.0	SW	467150 107790	Address: Lone Valley/serpentine Road Cso, Lone Valley/serpentine Road Cso, Lone Valley, Waterloooville, Hampshire, PO7 5EB Effluent Type: Sewage Discharges - Sewer Storm Overflow - Water Company Permit Number: A01017 Permit Version: 1 Receiving Water: Tributary Of River Wallington Status: Pre Nra Legislation Where Issue Date < 01-sep-89 (historic Only) Issue date: 30/8/2001 Effective Date: 30/8/2001 Revocation Date: -

2. Landfill and Other Waste Sites Map



Landfill and Other Waste Sites
Legend

Mapping
sourced from



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- | | | |
|--------------------|--------------------------|----------------------------------|
| Site Outline | E.A. Active Landfill | Historic and Planned Waste Sites |
| Search Buffers (m) | E.A. Historic Landfill | E.A. Licensed Waste Site |
| | Local Authority Landfill | BGS / DoE Survey Landfill |

2. Landfill and Other Waste Sites

2.1 Landfill Sites

2.1.1 Records from Environment Agency landfill data within 1000m of the study site:

0

Database searched and no data found.

2.1.2 Records of Environment Agency historic landfill sites within 1500m of the study site:

3

The following landfill records are represented as either points or polygons on the Landfill and Other Waste Sites map:

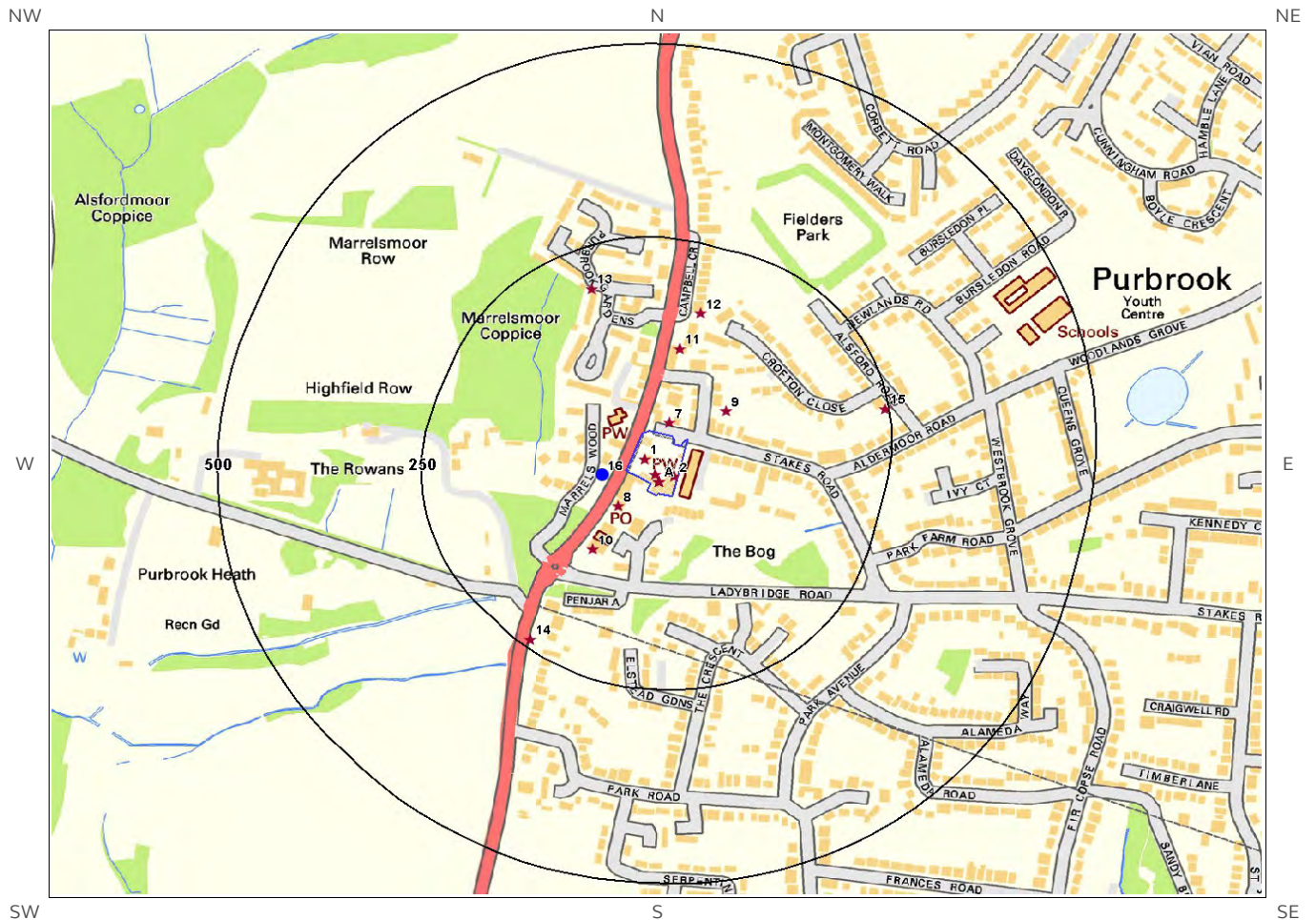
ID	Distance (m)	Direction	NGR	Details
1	185.0	NE	467500 108200	Site Address: Fielders Park, Purbrook Waste Licence: - Site Reference: FHA13 Waste Type: Household Environmental Permitting Regulations (Waste) Reference: - Licence Issue: Licence Surrendered: Licence Hold Address: - Operator: -
2	735.0	SE	467900 107400	Site Address: Disused Sand Pit A, Sandy Brow, Waterlooville, Hampshire Waste Licence: - Site Reference: FHA7, HAV 2 Waste Type: Waste unknown Environmental Permitting Regulations (Waste) Reference: - Licence Issue: Licence Surrendered: Licence Hold Address: - Operator: -
Not shown	839.0	SE	467900 107200	Site Address: Disused Sand Pit B, Sandy Brow, Waterlooville, Hampshire Waste Licence: - Site Reference: FHA8, HAV 2 Waste Type: Waste unknown Environmental Permitting Regulations (Waste) Reference: - Licence Issue: Licence Surrendered: Licence Hold Address: - Operator: -

2.1.3 Records of BGS/DoE non-operational landfill sites within 1500m of the study site:

0

Database searched and no data found.

3. Current Land Use Map



Current Land Use Legend



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Site Outline



Search Buffers (m)



Current Industrial Sites



Petrol & Fuel Sites



Underground High Pressure Oil & Fuel Pipelines

3. Current Land Uses

3.1 Current Industrial Data

Records of potentially contaminative industrial sites within 250m of the study site:

15

The following records are represented as points on the Current Land Uses map.

ID	Distance (m)	Direction	Company	NGR	Address	Activity	Category
1	0.0	On Site	Trevor Howell Cars	467334 107965	42, London Road, Purbrook, Waterlooville, PO7 5LJ	Secondhand Vehicles	Motoring
2	0.0	On Site	D Baker Joinery	467370 107943	40, London Road, Purbrook, Waterlooville, PO7 5LJ	General Construction Supplies	Industrial Products
3A	0.0	On Site	Asphaltic Roofing Supplies		38-44 London Road, Purbrook, Waterlooville, PO7 5LJ	General Construction Supplies	Industrial Products
4A	0.0	On Site	Works		PO7	Unspecified Works Or Factories	Industrial Features
5A	0.0	On Site	Purbrook Tyres	467352 107936	38a, London Road, Purbrook, Waterlooville, PO7 5LJ	Vehicle Parts and Accessories	Motoring
6A	0.0	On Site	Purbrook Garage Services	467352 107936	38, London Road, Purbrook, Waterlooville, PO7 5LJ	Vehicle Repair, Testing and Servicing	Repair and Servicing
7	16.0	N	J C B Motorcycle Services		1, Palmers Road Industrial Estate, Emsworth, PO10 7DH	Vehicle Repair, Testing and Servicing	Repair and Servicing
8	40.0	SW	Refresh	467303 107905	20, London Road, Purbrook, Waterlooville, PO7 5LJ	Electronic Equipment	Industrial Products
9	60.0	NE	Electricity Sub Station		PO7	Electrical Features	Infrastructure and Facilities
10	100.0	SW	Hulbert Cars	467271 107849	2a, London Road, Purbrook, Waterlooville, PO7 5LJ	Secondhand Vehicles	Motoring
11	111.0	N	Roadracer	467378 108108	74, London Road, Purbrook, Waterlooville, PO7 5LW	New Vehicles	Motoring
12	162.0	N	Electricity Sub Station		PO7	Electrical Features	Infrastructure and Facilities
13	196.0	N	Electricity Sub Station		PO7	Electrical Features	Infrastructure and Facilities
14	239.0	SW	Electricity Sub Station		PO7	Electrical Features	Infrastructure and Facilities
15	244.0	E	Electricity Sub Station		PO7	Electrical Features	Infrastructure and Facilities

3.2 Petrol and Fuel Sites

Records of petrol or fuel sites within 500m of the study site:

1

The following petrol or fuel site records provided by Catalist are represented as points on the Current Land Use map:

ID	Distance (m)	Direction	NGR	Company	Address	LPG	Status
16	29.0	W	467283 107946	Obsolete	Manor Filling Station, 3, London Road, London Road, Purbrook, Portsmouth, Hampshire, PO2 0BQ	Not Applicable	Obsolete

3.3 Underground High Pressure Oil and Gas Pipelines

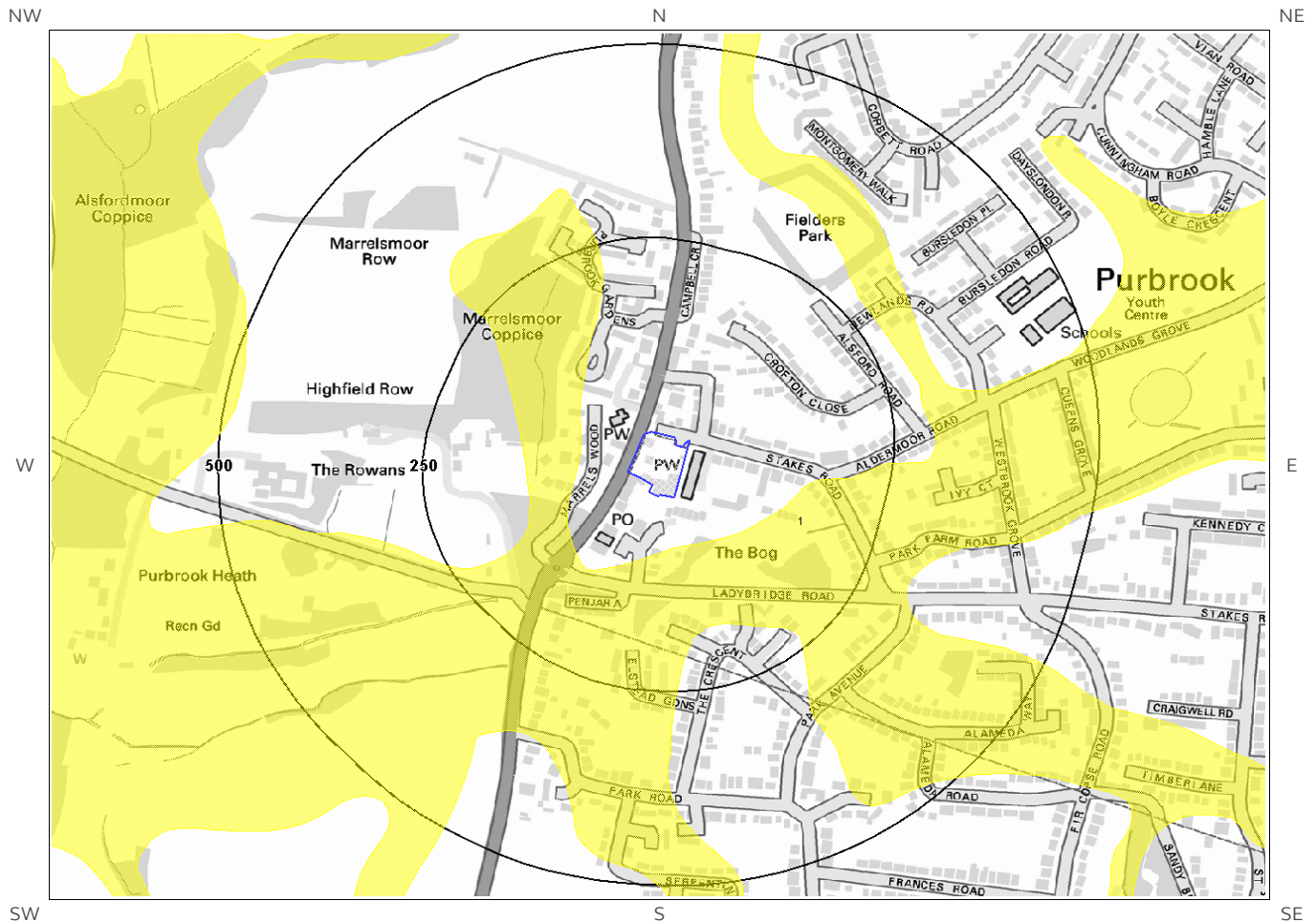
Records of high pressure underground pipelines within 500m of the study site:

0

Database searched and no data found.

5. Hydrogeology and Hydrology

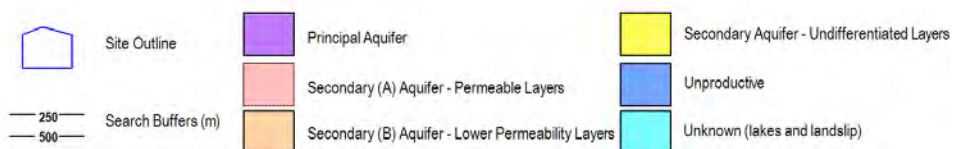
5a. Aquifer Within Superficial Geology



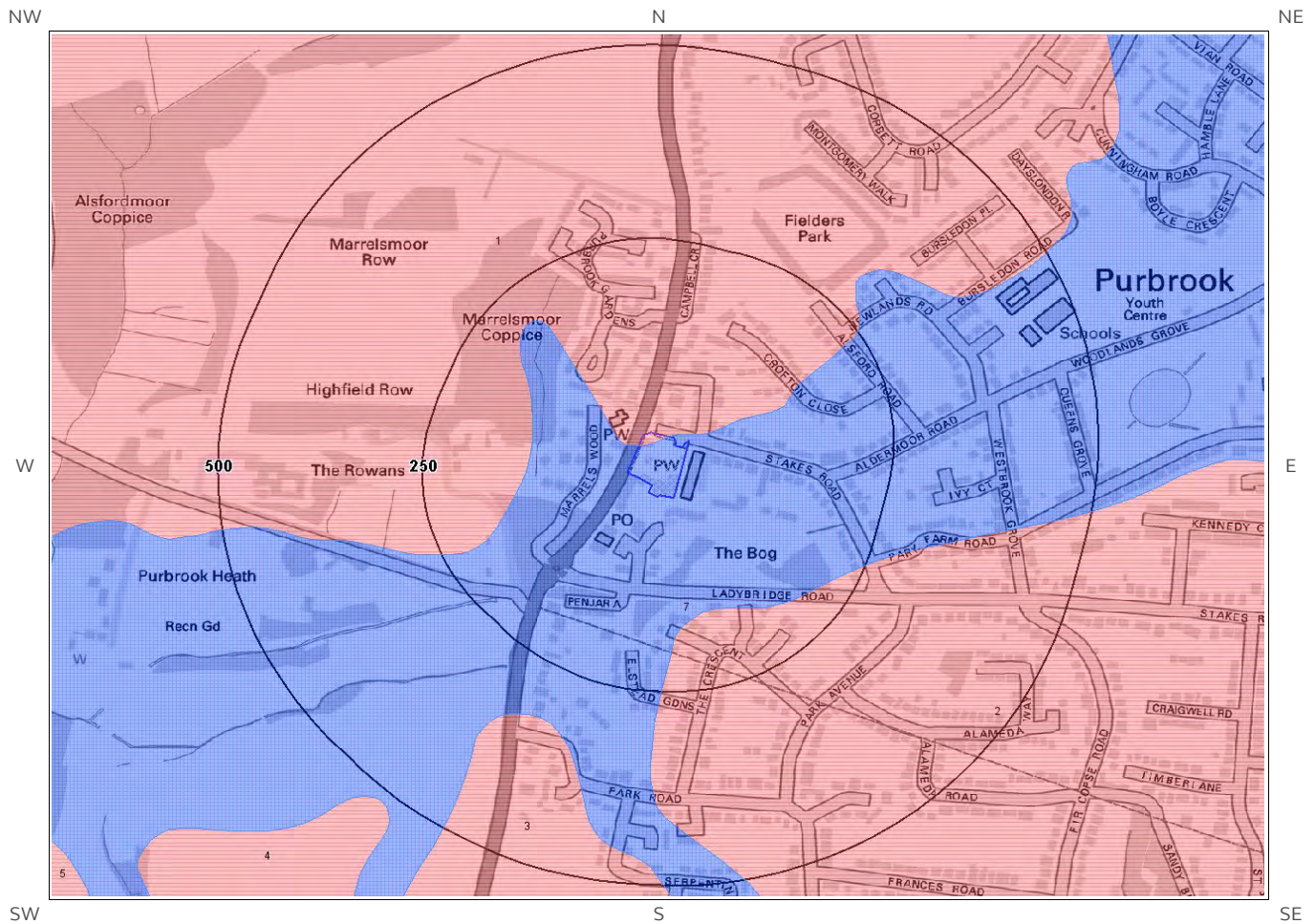
Aquifer Within Superficial Geology



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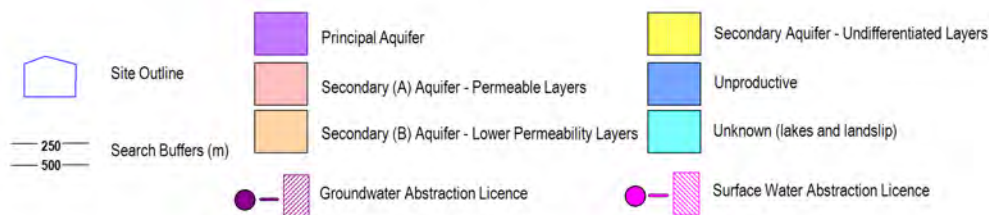
5b. Aquifer Within Bedrock Geology and Abstraction Licenses



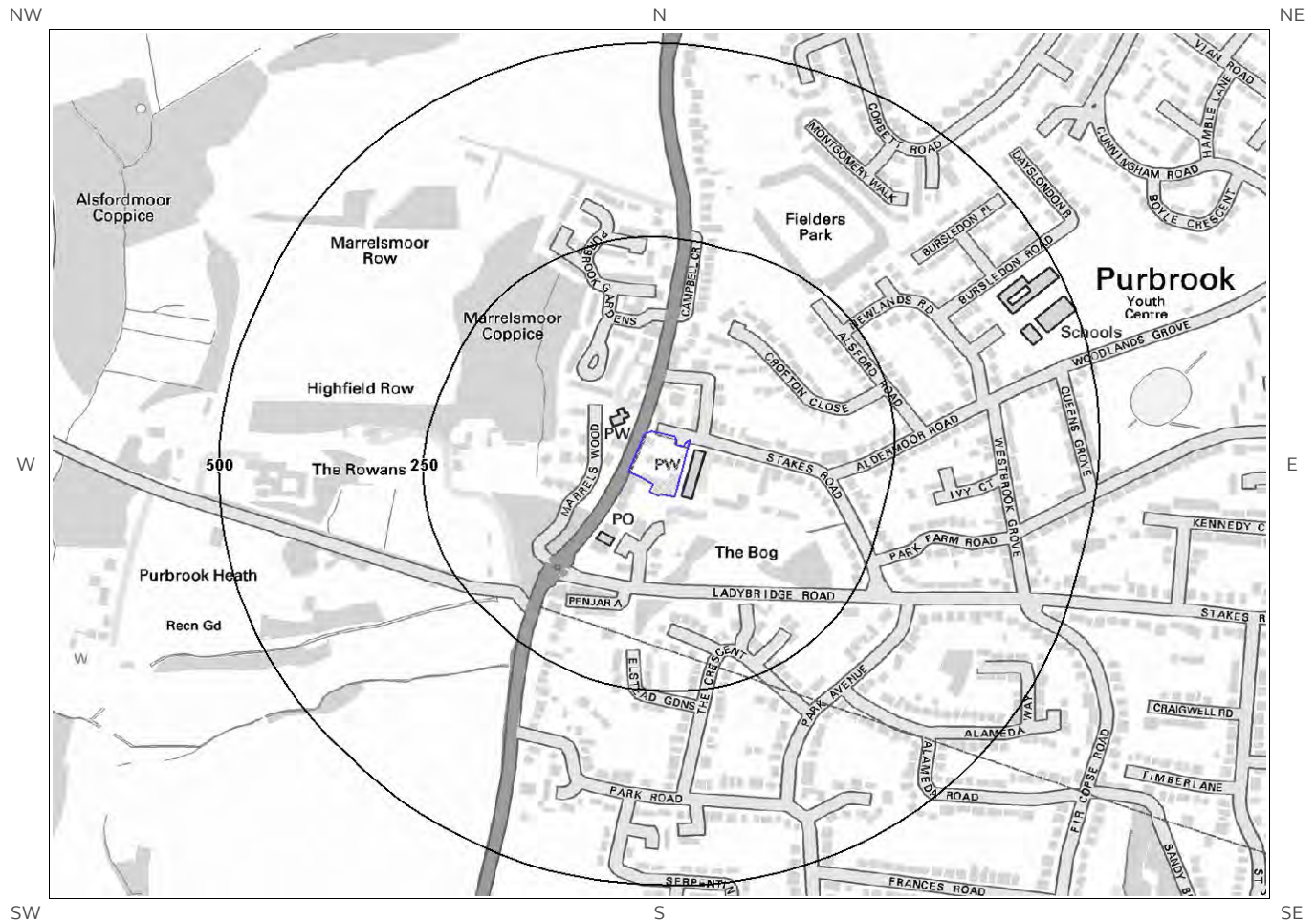
Aquifer Within Bedrock Geology and Abstraction Licenses



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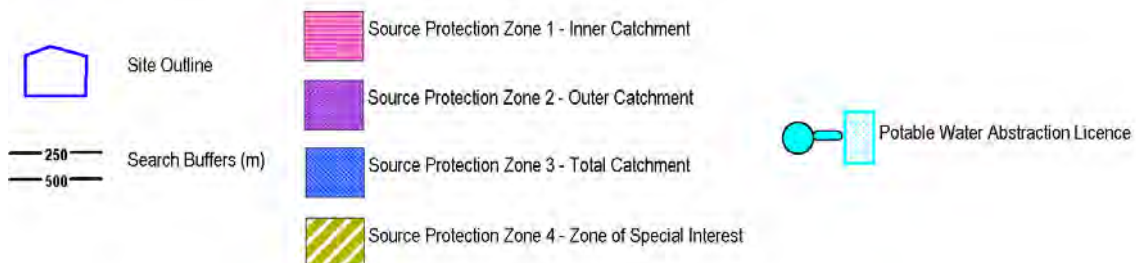
5c. Hydrogeology – Source Protection Zones and Potable Water Abstraction Licenses



Map Legend Source Protection Zones and Potable Water Abstraction Licenses



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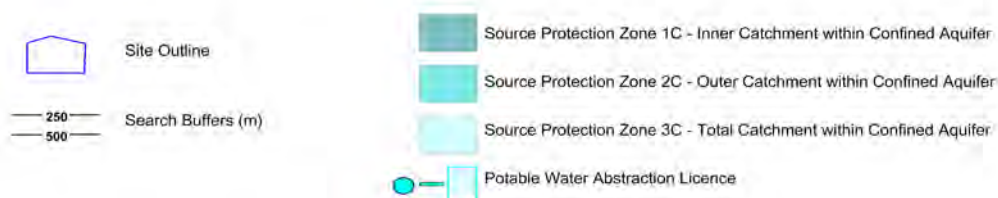
5d. Hydrology Source Protection Zones within confined aquifer



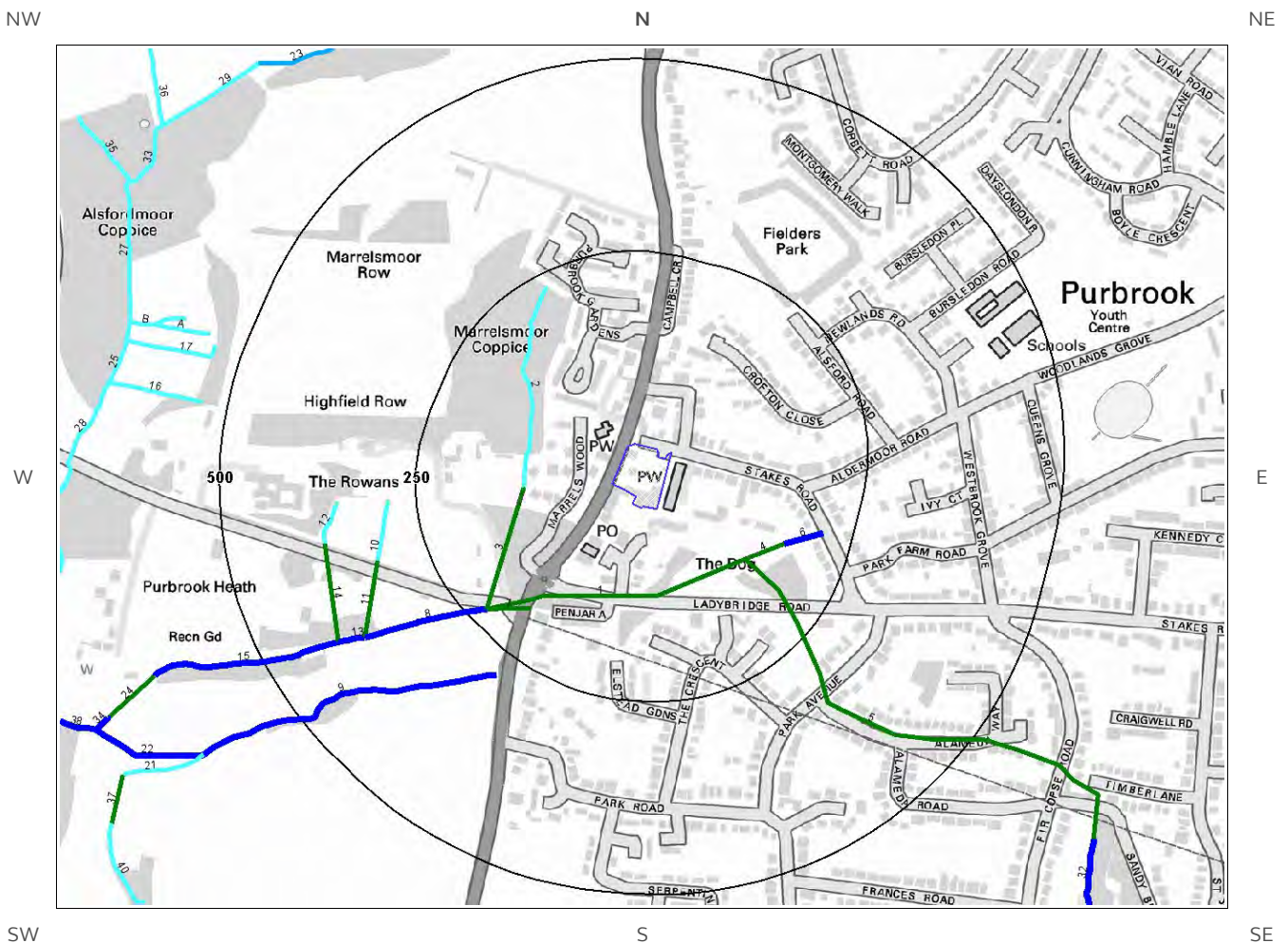
Hydrology Source Protection Zones



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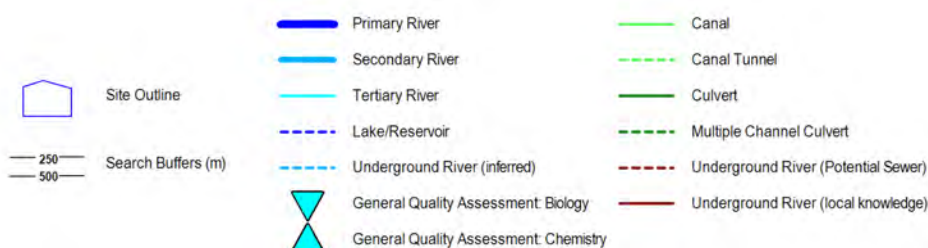
5 e. Hydrology – Detailed River Network and River Quality



Hydrology – Detailed River Network and River Quality



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5. Hydrogeology and Hydrology

5.1 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 (5a):

ID	Distance (m)	Direction	Designation	Description
1	61.0	W	Secondary (undifferentiated)	Assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type

5.2 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 (5b):

ID	Distance (m)	Direction	Designation	Description
1	0.0	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
7	0.0	On Site	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow
2	151.0	S	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	318.0	SW	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

5.7 Source Protection Zones within Confined Aquifer

Are there any Source Protection Zones within the Confined Aquifer within 500m of the study site?

Yes

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.

The following Source Protection Zones records are represented on the SPZ within Confined Aquifer and Potable Water Abstraction Map(5e):

ID	Distance	Direction	Type	Description
1	0	On Site	1c	Inner catchment within confined aquifer

5.8 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	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.
270	NW	Minor Aquifer/Intermediate Leaching Potential	I1	Soils which can possibly transmit a wide range of pollutants.

5.9 River Quality

Is there any Environment Agency information on river quality within 1500m of the study site?

No

5.9.1 Biological Quality:

Database searched and no data found.

5.10 Detailed River Network

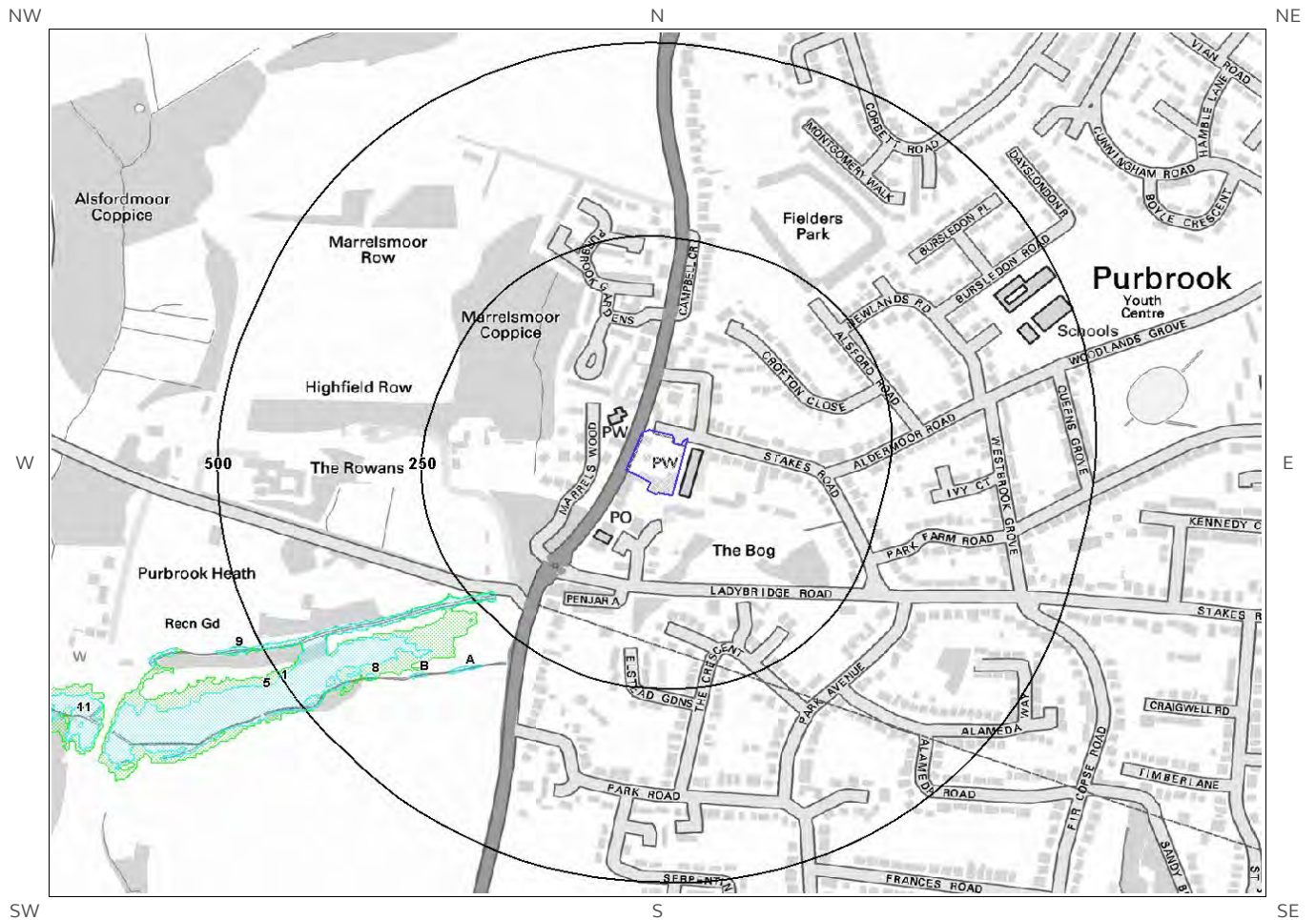
Are there any Detailed River Network entries within 500m of the study site?

Yes

The following Detailed River Network records are represented on the Hydrology Map (5e):

ID	Distance (m)	Direction	Details
1	104.0	SE	River Name: - Welsh River Name: - Alternative Name: - River Type: Culvert Main River Status: Currently Undefined
2	112.0	W	River Name: - Welsh River Name: - Alternative Name: - River Type: Tertiary River Main River Status: Currently Undefined
3	112.0	W	River Name: - Welsh River Name: - Alternative Name: - River Type: Culvert Main River Status: Currently Undefined
4	129.0	SE	River Name: - Welsh River Name: - Alternative Name: - River Type: Culvert Main River Status: Currently Undefined
5	129.0	SE	River Name: - Welsh River Name: - Alternative Name: - River Type: Culvert Main River Status: Currently Undefined
6	169.0	E	River Name: - Welsh River Name: - Alternative Name: - River Type: Primary River Main River Status: Currently Undefined
7	187.0	SW	River Name: - Welsh River Name: - Alternative Name: - River Type: Culvert Main River Status: Currently Undefined
8	228.0	SW	River Name: - Welsh River Name: - Alternative Name: - River Type: Primary River Main River Status: Currently Undefined
9	282.0	SW	River Name: - Welsh River Name: - Alternative Name: - River Type: Primary River Main River Status: Currently Undefined
10	286.0	W	River Name: Drain Welsh River Name: - Alternative Name: - River Type: Tertiary River Main River Status: Currently Undefined
11	315.0	W	River Name: - Welsh River Name: - Alternative Name: - River Type: Culvert Main River Status: Currently Undefined
12	351.0	W	River Name: Drain Welsh River Name: - Alternative Name: - River Type: Tertiary River Main River Status: Currently Undefined
13	372.0	SW	River Name: - Welsh River Name: - Alternative Name: - River Type: Primary River Main River Status: Currently Undefined
14	374.0	W	River Name: - Welsh River Name: - Alternative Name: - River Type: Culvert Main River Status: Currently Undefined
15	405.0	SW	River Name: - Welsh River Name: - Alternative Name: - River Type: Primary River Main River Status: Currently Undefined

6. Environment Agency Flood Map for planning (from rivers and the sea)

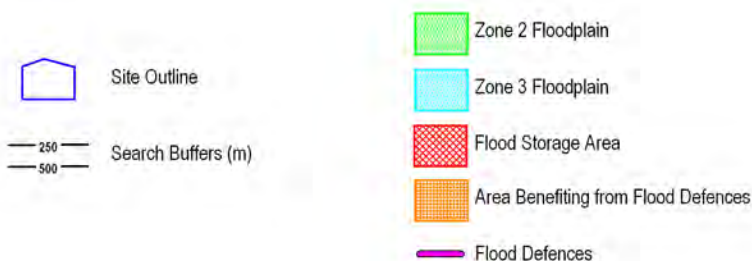


Environment Agency Flood Map for planning (from rivers and the sea)

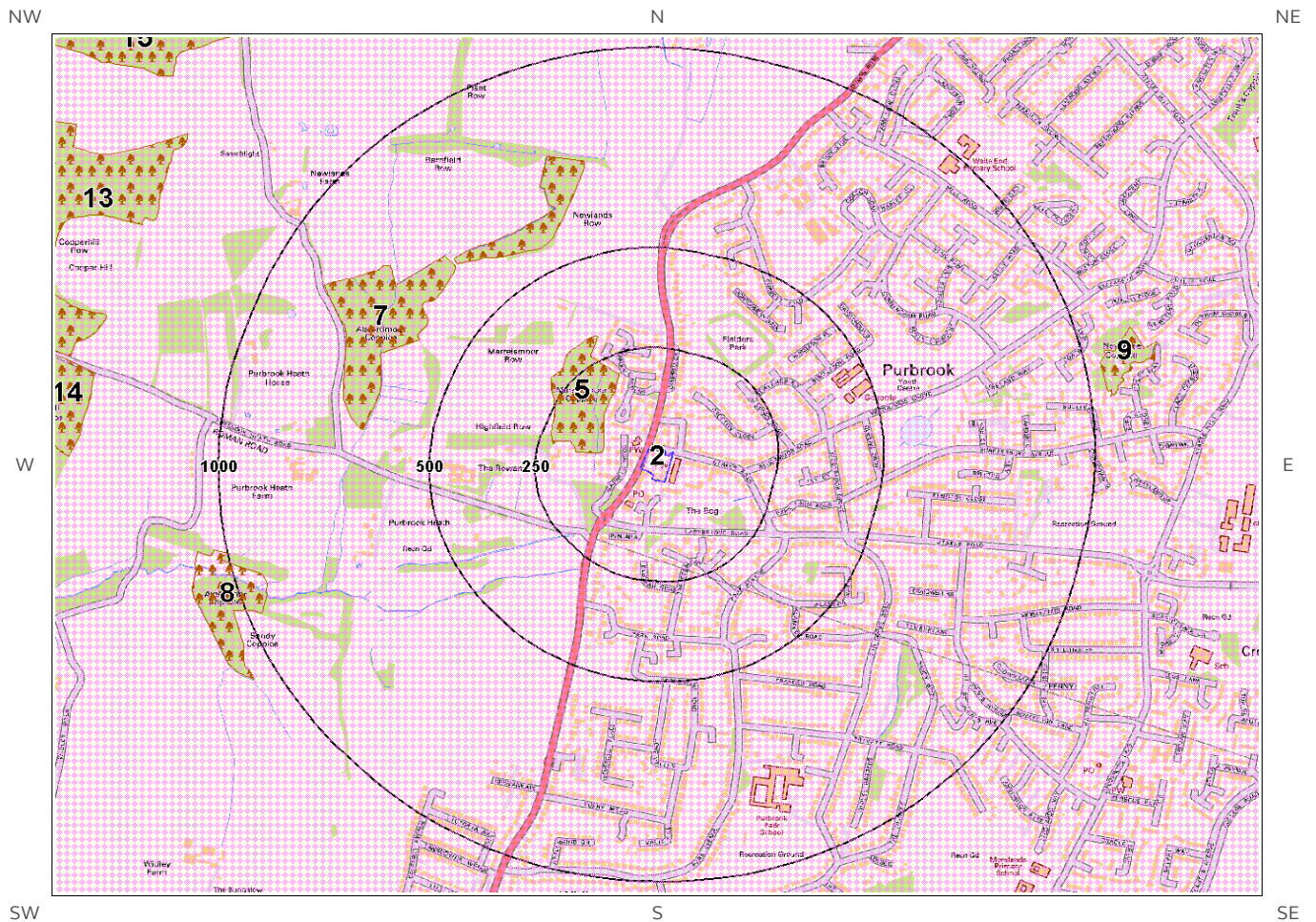
Mapping sourced from



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7. Designated Environmentally Sensitive Sites Map



Designated Environmentally Sensitive Sites Map

Mapping sourced from



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7.9 Records of Environmentally Sensitive Areas within 2000m of the study site:

0

Database searched and no data found.

7.10 Records of Areas of Outstanding Natural Beauty (AONB) within 2000m of the study site:

0

Database searched and no data found.

7.11 Records of National Parks (NP) within 2000m of the study site:

0

Database searched and no data found.

7.12 Records of Nitrate Sensitive Areas within 2000m of the study site:

0

Database searched and no data found.

7.13 Records of Nitrate Vulnerable Zones within 2000m of the study site:

3

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
2	0.0	On Site	Existing	DEFRA
Not shown	1409.0	SW	Existing	DEFRA
Not shown	1997.0	N	Existing	DEFRA

7.14 Records of Green Belt land within 2000m of the study site:

0

Database searched and no data found.

APPENDIX III

APPENDIX III – GROUND INVESTIGATION

Introduction

This Appendix, together with Sections 2 to 5 of the report, forms the Ground Investigation Report for the development described in the report, in compliance with the requirements of BS 5930:1999+A2:2010, BS EN1997-1:2004(2007) and BS EN1997-2:2007(2007).

The site operations were carried out on 6th May 2015 under the supervision of a geotechnical engineer from Crossfield Consulting Limited. The scope and rationale for the design of the investigation is presented in Table III-1.

The ground investigation was designed and supervised by qualified and experienced geo-environmental specialists from Crossfield Consulting Limited. Where appropriate, and as outlined below, specialist drilling/sampling equipment was procured together with trained and experienced operators. Unless otherwise indicated, sampling and logging remained the responsibility of trained staff from Crossfield Consulting Limited and field records were prepared on site, during or immediately following drilling/sampling or in situ measurements/tests. The results of in situ tests are presented on the relevant record sheets in this Appendix.

An exploratory hole location plan is presented as Figure III-1.

Windowless Sampling

Six windowless sampling boreholes, denoted as WS1 to WS6, were sunk by Dynamic Sampling UK Limited, on 6th May to between 4 m and 5 m depth. Dynamic/driven open-tube soil sampling/boring was undertaken using a Premier Compact rig. Using a 1.0 m long thick-walled open-tube sampler (with plastic liner), Category A and B samples were recovered (sample disturbance being influenced by the specific soils encountered). Where appropriate, small disturbed sub-samples were recovered from the materials recovered in the open-tube sampler.

In situ hand vane tests were carried out on fine-grained soils, where appropriate, to provide undrained shear strength data representative of the tested horizon. The tests were carried out using Pilcon hand vane test equipment (with extension rods, where necessary).

Standard Penetration Tests (SPT) were carried out at regular intervals to provide data on the in situ density of coarse-grained strata and an indication of strength within fine-grained strata. The SPTs were carried out in accordance with BS EN ISO 22476-3:2005(2007).

The records from the investigation are presented in this Appendix. These records include the descriptions and depths of the strata encountered, together with sample depths, in situ test results (uncorrected values), groundwater observations, details of installations/backfill within exploratory holes and other pertinent comments.

Soil Samples

All samples for analytical testing were collected in appropriate containers, stored in cool boxes (where appropriate) and sent to the testing laboratory overnight. The sample containers, storage and handling procedures were all compatible with the relevant recommendations of the UKAS accredited testing laboratory for the specific testing proposed.

Samples designated for geotechnical testing were collected, stored and transported in accordance with the published requirements for the specific tests scheduled, such that moisture content and soil structure integrity was maintained, as necessary for the test requirements.

Analytical Laboratory Testing

The rationale for the analytical testing is set out in Table III-2.

Selected samples of the soils encountered were submitted for screening analysis of the following determinands:

- Arsenic (Total)
- Chromium (Total)
- Lead (Total)
- Nickel (Total)
- Selenium (Total)
- Cyanide (Total)
- Sulphate (Water soluble)
- pH
- Asbestos (Fibres & ACM Screen)
- Cadmium (Total)
- Copper (Total)
- Mercury (Total)
- Zinc (Total)
- Boron (Water soluble)
- Sulphide (Total)
- Phenols (Total-monohydric)
- Total Organic Carbon

Note: Total determinands are based on an aqua-regia extract.

Selected samples of the soils encountered were submitted for analysis of the following determinands:

- Total Petroleum Hydrocarbons – aromatic/aliphatic split and carbon number banding, using GC-FID techniques
- Volatile Organic Compounds – using GC-MS techniques
- Polyaromatic Hydrocarbons – using GC-MS techniques

The analyses were carried out by i2 Analytical Limited, a UKAS accredited laboratory, and the results are presented in this Appendix. Soil testing was undertaken in accordance with the Environment Agency's Monitoring Certification Scheme (MCERTS).

Geotechnical Laboratory Testing

The rationale for the geotechnical laboratory testing is set out in the Table III-3.

Selected samples of the soils encountered were submitted for analysis for the following tests:

- Moisture content
- Atterberg Limits
- pH value
- Water soluble sulphate

The analyses were carried out by Geo Site & Testing Services Limited, a UKAS accredited laboratory, and the results are presented in this Appendix.

TABLE III-1

RATIONALE FOR THE DESIGN OF THE GROUND INVESTIGATION

The scope of the ground investigation was designed with reference to the published geology and ground conditions indicated in the desk study information. It is noted that the investigation works were constrained by access restrictions, in particular by operating workshops remaining on site where potential contaminants are most likely to be identified.

In compliance with the guidance published in BS EN 1997-2:2007, the ground investigation was designed to verify the preliminary ground model, established from the desk study information and to characterise the ground conditions within influencing distance of the proposed structures. In this regard, the exploratory holes were targeted within relevant areas of the site to provide information on the strata profile down to competent materials.

In compliance with the guidance published in BS 10175:2011 and BS 5930:1999+A2:2010, the layout of the exploratory holes and sampling regime also considers the Conceptual Site Model and potential pollutant linkages, such that the spatial arrangement of the investigation provides the necessary information to support a risk assessment of the identified potential pollutant linkages.

Exploratory Hole and Technique	Rationale for Hole Location	Depth (m)	Sampling/In Situ Testing and Monitoring
WS1 to WS6	All exploratory holes were located to provide information on soil density/strength within, or in close proximity to, the proposed building footprint.	5 m	Soil samples were recovered at regular intervals for geotechnical testing. Standard Penetration Tests (SPTs) carried out at 1.0 m intervals.
WS2 WS3 WS5 WS6	Exploratory holes were located within close proximity to potential contaminant sources in order to investigate potential pollutant linkages.	4 m to 5 m	Soil samples were recovered for analytical testing.

Key

WS X Windowless Sample Borehole

TABLE III-2

RATIONALE FOR THE ANALYTICAL TESTING SUITE

Exploratory Hole and Samples	Selection Criteria	Analytical Tests
WS1: 0.3 m WS2: 0.4 m WS3: 0.3 m WS4: 0.4 m WS5: 0.5 m WS6: 0.3 m	A selection of soil samples were recovered from within areas of potential contaminant sources based on the Conceptual Site Model.	Screening tests for metals and metalloids, cyanide, boron Phenols Petroleum Hydrocarbons Volatile Organic Compounds Polyaromatic Hydrocarbons Asbestos Screen & Identification

TABLE III-3

RATIONALE FOR THE GEOTECHNICAL TESTING SUITE

Exploratory Hole and Sample	Selection Criteria	Geotechnical Tests
WS2: 2.5 m WS3: 1.0 m WS5: 1.5 m WS6: 1.7 m	Samples of potential founding strata recovered for design of foundations within influencing distance of trees and for design of floor slabs.	Moisture content Atterberg Limits
WS2: 2.5 m WS3: 1.0 m WS5: 1.5 m WS6: 1.7 m	Samples of potential founding strata recovered for foundation concrete design purposes.	pH Water soluble sulphate

WINDOWLESS SAMPLE RECORDS

KEY

Sampling

J	Disturbed Jar Sample
G	Jar Sample in Glass Container
g	Soil Sample in Glass Vial
W	Water Sample
IC	Nett sample recovery ratio (ratio of length of recovered sample to length of sample run)

In Situ Measurements

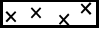
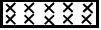
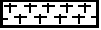
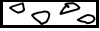
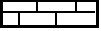
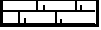
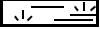
FVT	C_{fv}	Undrained Shear Strength (from hand vane shear vane test)
	C_{rv}	Undrained Remoulded Shear Strength (from hand vane shear vane test)
	C_{fv}^*	Hand Vane Shear Strength Test (on Category A: OS-TK/W soil sample recovered in window sampler)
	S	Standard Penetration Test (SPT: split spoon sampler)
	SPT(C)	SPT carried out with a 60° cone
	'N'	'N' Value from SPT test
	N_{10}	Dynamic Probe Test: Number of blows to drive 100 mm
DPH	N_{H10}	Dynamic Probe Test: Heavy (30 kg mass & 500 mm fall)
DPSH-A	N_{SHA10}	Dynamic Probe Test: Super-Heavy A (63.5 kg mass & 500 mm fall)
DPSH-B	N_{SHB10}	Dynamic Probe Test: Super-Heavy B (63.5 kg mass & 750 mm fall)
	$\frac{x}{y}$	x Blows per y Driving Distance (for non-standard SPT or DP driving distance)
	y mm	
	T	Torque (max) required to turn rods (unit: Nm, unless otherwise shown)

Notes:

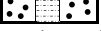
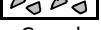
1. All measurement values on record sheets are uncorrected, unless otherwise indicated.
2. For corrected test values, refer to report.
3. Identification and classification of strata is based on the guidance published in the current edition of BS5930 together with BS EN ISO 14688-1:2002, BS EN ISO 14688-2:2004 and BS EN ISO 14689-1:2003
4. Consistency (soft, firm, stiff etc) relates to a manual test/inspection on site (in compliance with BS EN ISO 14688-1:2002 Section 5.14).
5. Undrained shear strength (low, medium, high etc) relates to in situ or laboratory test data and the associated assessed strength of a stratum (in compliance with BS EN ISO 14688-2:2004 Section 5.3 and Table 5).
6. The density of coarse-grained soils is based on SPT N values (or equivalent Dynamic Probe test or CPT data) as outlined in BS5930 and BS EN ISO 14688-2:2004.
7. Rock strength (weak, strong etc) is based on field identification (and/or strength test data), as outlined in BS EN ISO 14689-1:2003 Table 5.

BOREHOLE & DRILLHOLE RECORDS - LEGENDS KEY SHEET

Legend - Strata Encountered in Exploratory Hole

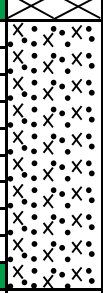
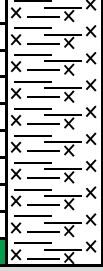
Soil	Rock		
	Sedimentary	Igneous	Metamorphic
 Made Ground	 Mudstone	 Fine-grained	 Fine-grained
 Clay	 Shale	 Medium-grained	 Medium-grained
 Silt	 Siltstone	 Coarse-grained	 Coarse-grained
 Sand	 Sandstone		
 Gravel	 Limestone		
 Peat/Topsoil	 Chalk		
 Organic Sand	 Coal		
 Organic Clay	 Conglomerate		

Legend - Backfill to Borehole and Standpipe Installations

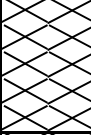
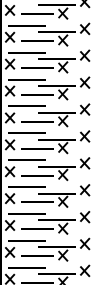
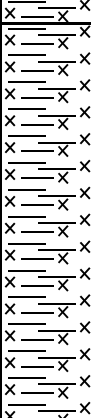
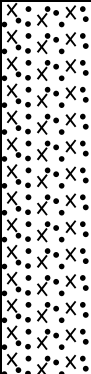
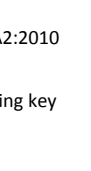
Backfill	Installations
 Soil arisings	 Concrete Cover Over Standpipe
 Bentonite	 Plain Standpipe - Bentonite Surround
 Cement-based Grout	 Perforated Standpipe - Geotextile and Granular Filter Surround
 Gravel	 Perforated Standpipe End Geotextile and Granular Filter Surround

Notes:

1. A combination of the strata symbols are indicative of mixed soil types.
2. The above symbols are based on the guidance published in BS 5930:1999+A2:2010
3. The response zone of a standpipe refers to the section of perforated pipe within a granular surround, where substances may freely enter the standpipe from the surrounding strata.

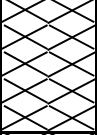
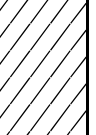
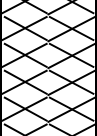
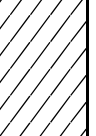
					Windowless Sample Record Sheet			Hole Ref. WS1	
Project: 38-44 London Road, Waterlooville Date: 06/05/2015					Sheet 1 of 1 Job No. CCL02684				
Contractor Dynamic Sampling Ltd Equipment Premier Compact 110 Method 0.0 m to 5.0 m windowless sampling Boring Diameter 100 mm					Ground Level. 43.90 m OD Co-ordinates Logged by: SC Logged on site during drilling operations Checked by: 				
Sample Depth	Sample or Test	Casing Depth	Water Depth	Test Value	Description	Depth	Legend	Backfill	Level O.D.
0.30	Gg				Concrete surfacing (150 mm) over dark brown fine to coarse sand and fine to coarse and angular to subangular gravel with concrete and brick fragments and rare ashy materials (MADE GROUND)				
1.00-1.45	S	1.00		N=4	Green with pockets of orange silty fine to medium SAND (WITTERING FORMATION)	1.00			42.90
2.00-2.45	S	1.00		N=4	No recovery	2.00			41.90
3.00-3.45	S	1.00		N=0					
4.00-4.45	S	1.00		N=0		4.00			39.90
5.00-5.45	S	1.00		N=7	Firm to stiff consistency dark grey clayey SILT (LONDON CLAY)				
					End of Hole	5.45			38.45
Core Recovery					Groundwater			Additional Tests	
Depth	Recovery	Hole Depth	Strike Depth	Water Depth	Observations	Test type	Test Depth	Test Value	
0.00-1.00	70%	1.00	1.00	-	Water entry				
1.00-2.00	70%								
2.00-3.00	0%								
3.00-4.00	0%								
4.00-5.00	20%								
Remarks Ground level based on a topographical survey drawing by Proscaplans Limited, Dwg No. PP/3066/M&S/Purbrook/F1					Notes 1. All logging and sampling in accordance with BS 5930:1999+A2:2010 2. The depths to strata change are approximate only 3. Symbols and abbreviations are explained on the accompanying key 4. All linear dimensions are in metres unless otherwise stated 5. Undrained shear strength test value given in kN/m ²				

					Windowless Sample Record Sheet			Hole Ref. WS2	
					Project: 38-44 London Road, Waterlooville Date: 06/05/2015			Sheet 1 of 1 Job No. CCL02684	
Contractor Dynamic Sampling Ltd		Equipment Premier Compact 110		Ground Level. 43.30 m OD Co-ordinates Logged by: SC Logged on site during drilling operations Checked by: 					
Method 0.0 m to 5.0 m windowless sampling		Boring Diameter 100 mm							
Sample Depth	Sample or Test	Casing Depth	Water Depth	Test Value	Description	Depth	Legend	Backfill	Level O.D.
0.40	Gg				Concrete surfacing (200 mm) over light grey sandy fine to coarse angular to subangular gravel (MADE GROUND)				
1.00-1.45	S	1.00		N=2	Dark brown slightly gravelly sandy silt with rare ashy materials (MADE GROUND)	1.00			42.30
2.00-2.45	S	1.00		N=7		2.00			41.30
2.50	J				Soft consistency grey mottled orange silty sandy CLAY (WITTERING FORMATION)				
3.00-3.45	S	1.00		N=10					
4.00-4.45	S	1.00		N=13	Firm to stiff consistency dark grey sandy SILT (LONDON CLAY)	3.90			39.40
5.00-5.45	S	1.00		N=12	End of Hole	5.45			37.85
Core Recovery				Groundwater			Additional Tests		
Depth	Recovery	Hole Depth	Strike Depth	Water Depth	Observations	Test type	Test Depth	Test Value	
0.00-1.00	40%	1.00	1.00	-	Water entry				
1.00-2.00	10%	5.00	-	1.30	Water depth on completion				
2.00-3.00	90%								
3.00-4.00	90%								
4.00-5.00	70%								
Remarks					Notes				
Ground level based on a topographical survey drawing by Prospaplans Limited, Dwg No. PP/3066/M&S/Purbrook/F1					1. All logging and sampling in accordance with BS 5930:1999+A2:2010 2. The depths to strata change are approximate only 3. Symbols and abbreviations are explained on the accompanying key 4. All linear dimensions are in metres unless otherwise stated 5. Undrained shear strength test value given in kN/m ²				

					Windowless Sample Record Sheet			Hole Ref. WS3	
					Project: 38-44 London Road, Waterloooville Date: 06/05/2015			Sheet 1 of 1 Job No. CCL02684	
Contractor Dynamic Sampling Ltd Method 0.0 m to 5.0 m windowless sampling Boring Diameter 100 mm			Equipment Premier Compact 110			Ground Level. 42.70 m OD Co-ordinates Logged by: SC Logged on site during drilling operations Checked by: 			
Sample Depth	Sample or Test	Casing Depth	Water Depth	Test Value	Description	Depth	Legend	Backfill	Level O.D.
0.30	Gg				Tarmac over concrete (200 mm) over dark brown fine to coarse sand and subrounded to angular gravel with concrete and brick fragments (MADE GROUND)	0.50			42.20
					Dark brown slightly gravelly silt with rare brick fragments and ashy materials MADE GROUND	0.80			41.90
1.00-1.45 1.00	S, G, g C _{iv} *	1.00		N=4 60	Firm consistency greenish grey mottled orange silty CLAY (WITTERING FORMATION)				
2.00-2.45	S	1.00		N=4	Firm consistency orangish brown silty CLAY (WITTERING FORMATION)	2.00			40.70
3.00-3.45	S	1.00		N=9		3.50			39.20
4.00-4.45	S	1.00		N=7	Firm to stiff consistency dark grey clayey sandy SILT				
5.00-5.45	S	1.00		N=12	End of Hole	5.45			37.25
Core Recovery					Groundwater			Additional Tests	
Depth	Recovery	Hole Depth	Strike Depth	Water Depth	Observations	Test type	Test Depth	Test Value	
0.00-1.00	90%	1.00	1.00	-	Water entry				
1.00-2.00	100%								
2.00-3.00	50%								
3.00-4.00	100%								
4.00-5.00	80%								
Remarks					Notes				
Ground level based on a topographical survey drawing by Proscaplans Limited, Dwg No. PP/3066/M&S/Purbrook/F1					1. All logging and sampling in accordance with BS 5930:1999+A2:2010 2. The depths to strata change are approximate only 3. Symbols and abbreviations are explained on the accompanying key 4. All linear dimensions are in metres unless otherwise stated 5. Undrained shear strength test value given in kN/m ²				

					Windowless Sample Record Sheet			Hole Ref. WS4	
					Project: 38-44 London Road, Waterlooville Date: 06/05/2015			Sheet 1 of 1 Job No. CCL02684	
Contractor Dynamic Sampling Ltd		Equipment Premier Compact 110			Ground Level. 43.50 m OD				
Method 0.0 m to 5.0 m windowless sampling					Co-ordinates				
Boring Diameter 100 mm					Logged by: SC Logged on site during drilling operations Checked by: 				
Sample Depth	Sample or Test	Casing Depth	Water Depth	Test Value	Description	Depth	Legend	Backfill	Level O.D.
0.40	Gg				Concrete (200 mm) over brown fine to coarse sand and fine to coarse subrounded to angular gravel with brick and concrete fragments (MADE GROUND)				
1.00-1.45	S	1.00		N=4		1.60			41.90
2.00-2.45	S	1.00		N=4	Firm consistency green sandy SILT (WITTERING FORMATION)				
3.00-3.45	S	1.00		N=4		3.00			40.50
4.00-4.45	S	1.00		N=7	Firm to stiff consistency dark grey sandy SILT (LONDON CLAY)				
5.00-5.45	S	1.00		N=8	End of Hole	5.45			38.05
Core Recovery					Groundwater			Additional Tests	
Depth	Recovery	Hole Depth	Strike Depth	Water Depth	Observations	Test type	Test Depth	Test Value	
0.00-1.00	60%	1.00	1.00	-	Water entry				
1.00-2.00	60%								
2.00-3.00	0%								
3.00-4.00	0%								
4.00-5.00	0%								
Remarks					Notes				
Ground level based on a topographical survey drawing by Prospaplans Limited, Dwg No. PP/3066/M&S/Purbrook/F1					1. All logging and sampling in accordance with BS 5930:1999+A2:2010				
No core recovery below 2.0 m, description based on SPT sample recovery					2. The depths to strata change are approximate only				
					3. Symbols and abbreviations are explained on the accompanying key				
					4. All linear dimensions are in metres unless otherwise stated				
					5. Undrained shear strength test value given in kN/m ²				

					Windowless Sample Record Sheet			Hole Ref. WS5		
					Project: 38-44 London Road, Waterlooville			Sheet 1 of 1		
					Date: 06/05/2015			Job No. CCL02684		
Contractor Dynamic Sampling Ltd		Equipment Premier Compact 110		Ground Level. 42.90 m OD						
Method 0.0 m to 5.0 m windowless sampling				Co-ordinates						
Boring Diameter 100 mm				Logged by: SC Logged on site during drilling operations Checked by: 						
Sample Depth	Sample or Test	Casing Depth	Water Depth	Test Value	Description	Depth	Legend	Backfill	Level O.D.	
0.50	Gg				Gravel over concrete (200 mm) over fine to coarse sand and fine to coarse subrounded to angular gravel with brick and concrete fragments (MADE GROUND)					
1.00-1.45	S	1.00		N=4	Soft to firm consistency brown slightly gravelly silty clay. Gravel is fine to medium and subangular to angular (MADE GROUND)	1.00			41.90	
1.50	J				Firm consistency green mottled orange silty CLAY (WITTERING FORMATION)	1.40			41.50	
2.00-2.45	S	1.00		N=7						
3.00-3.45	S	1.00		N=8		3.00			39.90	
4.00-4.45	S	1.00		N=9	Firm to stiff dark grey clayey SILT (LONDON CLAY)					
5.00-5.45	S	1.00		N=12	End of Hole	5.45			37.45	
Core Recovery				Groundwater			Additional Tests			
Depth		Recovery		Hole Depth	Strike Depth	Water Depth	Observations	Test type	Test Depth	Test Value
0.00-1.00		50%		1.00	1.00	-	Water entry			
1.00-2.00		100%		5.00	-	1.90	Water depth on completion			
2.00-3.00		90%								
3.00-4.00		20%								
4.00-5.00		100%								
Remarks					Notes					
Ground level based on a topographical survey drawing by Proscaplans Limited, Dwg No. PP/3066/M&S/Purbrook/F1					1. All logging and sampling in accordance with BS 5930:1999+A2:2010 2. The depths to strata change are approximate only 3. Symbols and abbreviations are explained on the accompanying key 4. All linear dimensions are in metres unless otherwise stated 5. Undrained shear strength test value given in kN/m ²					

					Windowless Sample Record Sheet					Hole Ref. WS6	
					Project: 38-44 London Road, Waterlooville					Sheet 1 of 1	
					Date: 06/05/2015					Job No. CCL02684	
Contractor Dynamic Sampling Ltd			Equipment Premier Compact 110			Ground Level. 42.60 m OD					
Method 0.0 m to 4.0 m windowless sampling								Co-ordinates			
Boring Diameter 100 mm								Logged by: SC Logged on site during drilling operations Checked by: 			
Sample Depth	Sample or Test	Casing Depth	Water Depth	Test Value	Description	Depth	Legend	Backfill	Level O.D.		
0.30	Gg				Concrete (200 mm) over brown fine to coarse sand and fine to coarse gravel with brick fragments (MADE GROUND)	0.50			42.10		
1.00-1.45	S	1.00		N=	Dark brown gravelly silt with brick, concrete, glass and ashy materials (MADE GROUND)	1.50			41.10		
1.70	J				Firm consistency green mottled orange silty CLAY (WITTERING FORMATION)						
2.00-2.45	S	1.00		N=							
3.00-3.45	S	1.00		N=	...becoming orange below 2.8 m						
4.00-4.45	S	1.00		N=	Firm to stiff dark grey silty CLAY (LONDON CLAY)	4.00			38.60		
						4.45			38.15		
5.00-5.45	S	1.00		N=	Base of Hole						
Core Recovery					Groundwater			Additional Tests			
Depth	Recovery	Hole Depth	Strike Depth	Water Depth	Observations	Test type	Test Depth	Test Value			
0.00-1.00	50%	1.00	1.00	-	Water entry						
1.00-2.00	70%	5.00	-	1.50	Water depth on completion						
2.00-3.00	30%										
3.00-4.00	20%										
Remarks					Notes						
Ground level based on a topographical survey drawing by Proscaplans Limited, Dwg No. PP/3066/M&S/Purbrook/F1					1. All logging and sampling in accordance with BS 5930:1999+A2:2010 2. The depths to strata change are approximate only 3. Symbols and abbreviations are explained on the accompanying key 4. All linear dimensions are in metres unless otherwise stated 5. Undrained shear strength test value given in kN/m ²						



Hammer Energy Test Report

in accordance with BSEN ISO 22476-3:2005

Dynamic sampling UK Ltd
Unit 8
Victory park way
Victory road
Derby
DE24 8ZF

Hammer Ref: 110.45MB
Test Date: 25/06/2014
Report Date:
File Name: 110.45MB.spt
Test Operator: TP

Instrumented Rod Data

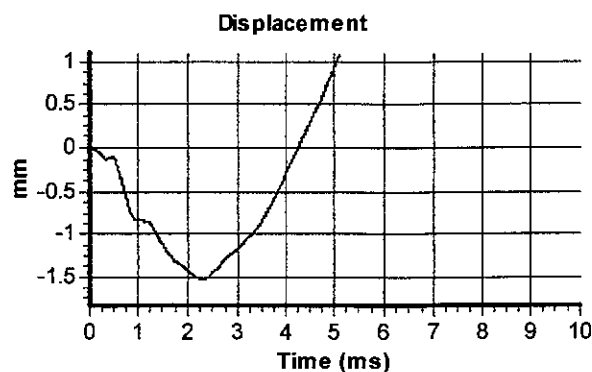
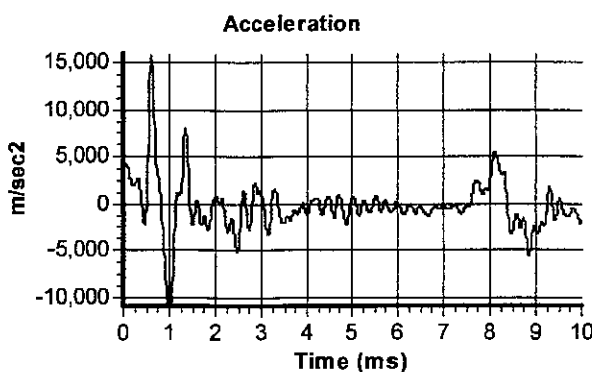
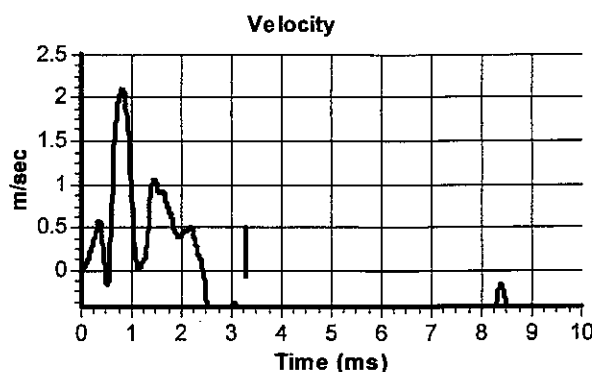
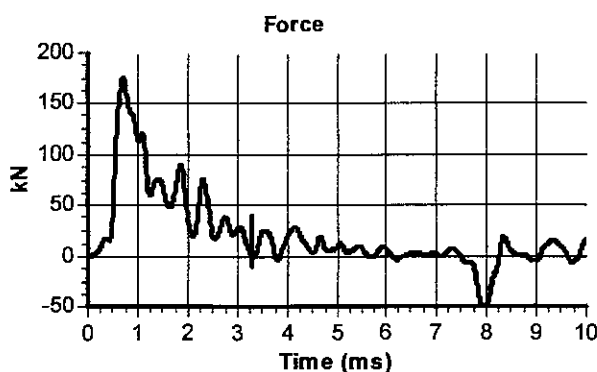
Diameter d_r (mm): 54
Wall Thickness t_r (mm): 6.9
Assumed Modulus E_a (GPa): 208
Accelerometer No.1: 6455
Accelerometer No.2: 6457

Hammer Information

Hammer Mass m (kg): 63.5
Falling Height h (mm): 760
String Length L (m): 14.0

Comments / Location

Hammer tested at Dynamic samplings yard.



Calculations

Area of Rod A (mm^2): 1021
Theoretical Energy E_{theor} (J): 473
Measured Energy E_{meas} (J): 385

Energy Ratio E_r (%): **81**

Signed: T.parker
Title: Manager

The recommended calibration interval is 12 months



Samantha Copper
Crossfield Consulting Ltd
The Granary
White Hall Farm
Leamington Road
Long Itchington
Warwickshire
CV47 9PU

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

e: mail@crossfield-consulting.co.uk

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

Analytical Report Number : 15-71313

Project / Site name: 28-44 London Road , Purbrook ,
Waterlooville

Samples received on: 07/05/2015

Your job number: CCL02684

Samples instructed on: 07/05/2015

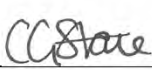
Your order number: PO8915

Analysis completed by: 18/05/2015

Report Issue Number: 1

Report issued on: 18/05/2015

Samples Analysed: 10 soil samples

Signed: 

Dr Claire Stone
Quality Manager
For & on behalf of i2 Analytical Ltd.

Signed: 

Rexona Rahman
Reporting Manager
For & on behalf of i2 Analytical Ltd.

Other office located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland

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

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

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

Analytical Report Number: 15-71313

Project / Site name: 28-44 London Road , Purbrook , Waterlooville

Your Order No: PO8915

Lab Sample Number	442401	442402	442403	442404	442405
Sample Reference	WS1	WS2	WS2	WS3	WS3
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.30	0.40	2.50	0.30	1.00
Date Sampled	06/05/2015	06/05/2015	06/05/2015	06/05/2015	06/05/2015
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		
Stone Content	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	12	11
Total mass of sample received	kg	0.001	NONE	2.0	2.0

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	Chrysotile - Hard/cement type material	Chrysotile - Loose fibres	-	Chrysotile - Loose fibres	-
Asbestos in Soil	Type	N/A	ISO 17025	Detected	Detected	-	Detected	-

General Inorganics

pH	pH Units	N/A	MCERTS	8.2	8.5	7.7	8.6	7.5
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	-	< 1	-
Total Sulphate as SO ₄	mg/kg	50	ISO 17025	1300	1800	-	3300	-
Water Soluble Sulphate (Soil Equivalent)	g/l	0.0025	MCERTS	0.54	0.63	0.050	0.64	0.086
Water Soluble Sulphate as SO ₄ (2:1)	mg/kg	2.5	MCERTS	540	630	50	640	86
Water Soluble SO ₄ (BRE SD 2:1 Leach Equivalent)	g/l	0.00125	MCERTS	0.27	0.31	0.025	0.32	0.043
Sulphide	mg/kg	1	MCERTS	21	4.3	-	2.8	-
Total Sulphur	mg/kg	50	NONE	860	740	-	1200	-
Total Organic Carbon (TOC)	%	0.1	MCERTS	0.2	0.7	-	0.4	-

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	< 0.05	-
Acenaphthylene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	-	< 0.10	-
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	-	< 0.10	-
Fluorene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	-	0.23	-
Phenanthrene	mg/kg	0.1	MCERTS	0.50	0.30	-	2.2	-
Anthracene	mg/kg	0.1	MCERTS	0.11	< 0.10	-	0.31	-
Fluoranthene	mg/kg	0.1	MCERTS	0.71	0.28	-	3.5	-
Pyrene	mg/kg	0.1	MCERTS	0.62	0.25	-	2.7	-
Benzo(a)anthracene	mg/kg	0.1	MCERTS	0.29	< 0.10	-	1.1	-
Chrysene	mg/kg	0.05	MCERTS	0.40	< 0.05	-	1.4	-
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	0.40	< 0.10	-	1.6	-
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	0.27	< 0.10	-	0.71	-
Benzo(a)pyrene	mg/kg	0.1	MCERTS	0.34	< 0.10	-	1.3	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	0.23	< 0.10	-	0.70	-
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	-	< 0.10	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.33	< 0.05	-	0.84	-

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	4.20	< 1.60	-	16.4	-
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	8.0	12	-	5.4	-
Boron (water soluble)	mg/kg	0.2	MCERTS	1.6	1.1	-	1.1	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	2.2	-	< 0.2	-
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	-	< 4.0	-
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	15	22	-	11	-
Copper (aqua regia extractable)	mg/kg	1	MCERTS	21	130	-	16	-
Lead (aqua regia extractable)	mg/kg	1	MCERTS	68	410	-	26	-
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	-	< 0.3	-
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	13	15	-	8.3	-
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	85	300	-	36	-

Analytical Report Number: 15-71313

Project / Site name: 28-44 London Road , Purbrook , Waterlooville

Your Order No: PO8915

Lab Sample Number				442401	442402	442403	442404	442405
Sample Reference				WS1	WS2	WS2	WS3	WS3
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30	0.40	2.50	0.30	1.00
Date Sampled				06/05/2015	06/05/2015	06/05/2015	06/05/2015	06/05/2015
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					

Monoaromatics

Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.1	MCERTS	< 0.1	< 0.1	-	< 0.1	-
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.1	MCERTS	< 0.1	< 0.1	-	< 0.1	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.1	MCERTS	< 0.1	< 0.1	-	< 0.1	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	4.3	-	4.5	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	26	-	28	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	18	440	-	190	-
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	18	470	-	220	-

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.1	MCERTS	< 0.1	< 0.1	-	< 0.1	-
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.1	MCERTS	< 0.1	< 0.1	-	< 0.1	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.1	MCERTS	< 0.1	< 0.1	-	< 0.1	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	-	2.4	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	-	10	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10	11	-	39	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	< 10	90	-	100	-
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	100	-	150	-



Analytical Report Number: 15-71313

Project / Site name: 28-44 London Road , Purbrook , Waterlooville

Your Order No: PO8915

Lab Sample Number				442401	442402	442403	442404	442405
Sample Reference				WS1	WS2	WS2	WS3	WS3
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30	0.40	2.50	0.30	1.00
Date Sampled				06/05/2015	06/05/2015	06/05/2015	06/05/2015	06/05/2015
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					

VOCs

Chloromethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	-
Chloroethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	-
Bromomethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	-
Vinyl Chloride	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	-
Trichlorofluoromethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	-
1,1-Dichloroethene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
1,1-Dichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
2,2-Dichloropropane	µg/kg	1	NONE	< 1.0	< 1.0	-	< 1.0	-
Trichloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
1,1,1-Trichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
1,2-Dichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
1,1-Dichloropropene	µg/kg	1	NONE	< 1.0	< 1.0	-	< 1.0	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	< 1.0	< 1.0	-	< 1.0	-
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
Tetrachloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
1,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
Trichloroethene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
Dibromomethane	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
Bromodichloromethane	µg/kg	1	NONE	< 1.0	< 1.0	-	< 1.0	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	-
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	-
Dibromochloromethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	-
Tetrachloroethene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	-
Chlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
1,1,1,2-Tetrachloroethane	µg/kg	1	NONE	< 1.0	< 1.0	-	< 1.0	-
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
p & m-Xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
Styrene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
Tribromomethane	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
o-Xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
Isopropylbenzene	µg/kg	1	NONE	< 1.0	< 1.0	-	< 1.0	-
Bromobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
n-Propylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	-
2-Chlorotoluene	µg/kg	1	NONE	< 1.0	< 1.0	-	< 1.0	-
4-Chlorotoluene	µg/kg	1	NONE	< 1.0	< 1.0	-	< 1.0	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	-
tert-Butylbenzene	µg/kg	1	NONE	< 1.0	< 1.0	-	< 1.0	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	-
sec-Butylbenzene	µg/kg	1	NONE	< 1.0	< 1.0	-	< 1.0	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	-
1,2-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
Butylbenzene	µg/kg	1	NONE	< 1.0	< 1.0	-	< 1.0	-
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
Hexachlorobutadiene	µg/kg	1	NONE	< 1.0	< 1.0	-	< 1.0	-
1,2,3-Trichlorobenzene	µg/kg	1	NONE	< 1.0	< 1.0	-	< 1.0	-

Analytical Report Number: 15-71313

Project / Site name: 28-44 London Road , Purbrook , Waterlooville

Your Order No: PO8915

Lab Sample Number	442406	442407	442408	442409	442410
Sample Reference	WS4	WS5	WS5	WS6	WS6
Sample Number	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)	0.40	0.50	1.50	0.30	1.70
Date Sampled	06/05/2015	06/05/2015	06/05/2015	06/05/2015	06/05/2015
Time Taken	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status		
Stone Content	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	8.4	5.7
Total mass of sample received	kg	0.001	NONE	2.0	2.0

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	Chrysotile - Loose fibres	-	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Detected	Not-detected	-	Not-detected	-

General Inorganics

pH	pH Units	N/A	MCERTS	8.8	11.0	7.7	7.5	7.5
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	-	< 1	-
Total Sulphate as SO ₄	mg/kg	50	ISO 17025	3800	2600	-	680	-
Water Soluble Sulphate (Soil Equivalent)	g/l	0.0025	MCERTS	1.5	0.12	0.022	0.36	0.032
Water Soluble Sulphate as SO ₄ (2:1)	mg/kg	2.5	MCERTS	1500	120	22	360	32
Water Soluble SO ₄ (BRE SD 2:1 Leach Equivalent)	g/l	0.00125	MCERTS	0.73	0.062	0.011	0.18	0.016
Sulphide	mg/kg	1	MCERTS	43	4.8	-	38	-
Total Sulphur	mg/kg	50	NONE	1500	880	-	880	-
Total Organic Carbon (TOC)	%	0.1	MCERTS	0.1	< 0.1	-	2.3	-

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	-	< 0.05	-
Acenaphthylene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	-	< 0.10	-
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	-	< 0.10	-
Fluorene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	-	< 0.10	-
Phenanthrene	mg/kg	0.1	MCERTS	0.80	0.48	-	0.51	-
Anthracene	mg/kg	0.1	MCERTS	0.16	0.16	-	0.10	-
Fluoranthene	mg/kg	0.1	MCERTS	0.86	0.31	-	1.1	-
Pyrene	mg/kg	0.1	MCERTS	1.0	0.27	-	0.96	-
Benzo(a)anthracene	mg/kg	0.1	MCERTS	0.31	0.12	-	0.46	-
Chrysene	mg/kg	0.05	MCERTS	0.54	0.19	-	0.65	-
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	0.43	< 0.10	-	0.65	-
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	0.31	< 0.10	-	0.45	-
Benzo(a)pyrene	mg/kg	0.1	MCERTS	0.41	< 0.10	-	0.64	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	0.25	< 0.10	-	0.36	-
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	-	< 0.10	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.30	< 0.05	-	0.44	-

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	5.39	< 1.60	-	6.34	-
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Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	13	7.0	-	15	-
Boron (water soluble)	mg/kg	0.2	MCERTS	3.3	0.4	-	14	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.8	< 0.2	-	< 0.2	-
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	-	< 4.0	-
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	14	13	-	15	-
Copper (aqua regia extractable)	mg/kg	1	MCERTS	42	13	-	43	-
Lead (aqua regia extractable)	mg/kg	1	MCERTS	250	70	-	260	-
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	-	0.5	-
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	9.4	12	-	15	-
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	300	45	-	180	-

Analytical Report Number: 15-71313

Project / Site name: 28-44 London Road , Purbrook , Waterlooville

Your Order No: PO8915

Lab Sample Number				442406	442407	442408	442409	442410
Sample Reference				WS4	WS5	WS5	WS6	WS6
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	0.50	1.50	0.30	1.70
Date Sampled				06/05/2015	06/05/2015	06/05/2015	06/05/2015	06/05/2015
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Monoaromatics								
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.1	MCERTS	< 0.1	< 0.1	-	< 0.1	-
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.1	MCERTS	< 0.1	< 0.1	-	< 0.1	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.1	MCERTS	< 0.1	< 0.1	-	< 0.1	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	2.4	< 2.0	-	2.4	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	19	10	-	< 8.0	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	150	45	-	38	-
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	170	55	-	41	-
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.1	MCERTS	< 0.1	< 0.1	-	< 0.1	-
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.1	MCERTS	< 0.1	< 0.1	-	< 0.1	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.1	MCERTS	< 0.1	< 0.1	-	< 0.1	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	3.7	< 2.0	-	< 2.0	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	18	< 10	-	< 10	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	60	18	-	19	-
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	82	18	-	19	-



Analytical Report Number: 15-71313

Project / Site name: 28-44 London Road , Purbrook , Waterlooville

Your Order No: PO8915

Lab Sample Number				442406	442407	442408	442409	442410
Sample Reference				WS4	WS5	WS5	WS6	WS6
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.40	0.50	1.50	0.30	1.70
Date Sampled				06/05/2015	06/05/2015	06/05/2015	06/05/2015	06/05/2015
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
VOCs								
Chloromethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	-
Chloroethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	-
Bromomethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	-
Vinyl Chloride	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	-
Trichlorofluoromethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	-
1,1-Dichloroethene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
1,1,2-Trichloro 1,2,2-Trifluoroethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	-
Cis-1,2-dichloroethene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
1,1-Dichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
2,2-Dichloropropane	µg/kg	1	NONE	< 1.0	< 1.0	-	< 1.0	-
Trichloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
1,1,1-Trichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
1,2-Dichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
1,1-Dichloropropene	µg/kg	1	NONE	< 1.0	< 1.0	-	< 1.0	-
Trans-1,2-dichloroethene	µg/kg	1	NONE	< 1.0	< 1.0	-	< 1.0	-
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
Tetrachloromethane	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
1,2-Dichloropropane	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
Trichloroethene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
Dibromomethane	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
Bromodichloromethane	µg/kg	1	NONE	< 1.0	< 1.0	-	< 1.0	-
Cis-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	-
Trans-1,3-dichloropropene	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	-
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
1,1,2-Trichloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
1,3-Dichloropropane	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	-
Dibromochloromethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	-
Tetrachloroethene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
1,2-Dibromoethane	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	-
Chlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
1,1,1,2-Tetrachloroethane	µg/kg	1	NONE	< 1.0	< 1.0	-	< 1.0	-
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
p & m-Xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
Styrene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
Tribromomethane	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
o-Xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
1,1,2,2-Tetrachloroethane	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
Isopropylbenzene	µg/kg	1	NONE	< 1.0	< 1.0	-	< 1.0	-
Bromobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
n-Propylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	-
2-Chlorotoluene	µg/kg	1	NONE	< 1.0	< 1.0	-	< 1.0	-
4-Chlorotoluene	µg/kg	1	NONE	< 1.0	< 1.0	-	< 1.0	-
1,3,5-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	-
tert-Butylbenzene	µg/kg	1	NONE	< 1.0	< 1.0	-	< 1.0	-
1,2,4-Trimethylbenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	-
sec-Butylbenzene	µg/kg	1	NONE	< 1.0	< 1.0	-	< 1.0	-
1,3-Dichlorobenzene	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	-
p-Isopropyltoluene	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	-
1,2-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
1,4-Dichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
Butylbenzene	µg/kg	1	NONE	< 1.0	< 1.0	-	< 1.0	-
1,2-Dibromo-3-chloropropane	µg/kg	1	ISO 17025	< 1.0	< 1.0	-	< 1.0	-
1,2,4-Trichlorobenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0	-
Hexachlorobutadiene	µg/kg	1	NONE	< 1.0	< 1.0	-	< 1.0	-
1,2,3-Trichlorobenzene	µg/kg	1	NONE	< 1.0	< 1.0	-	< 1.0	-



Analytical Report Number : 15-71313

Project / Site name: 28-44 London Road , Purbrook , Waterlooville

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

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

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
442401	WS1	None Supplied	0.30	Light grey clay and sand with gravel and brick.
442402	WS2	None Supplied	0.40	Light grey topsoil and clay with gravel.
442403	WS2	None Supplied	2.50	Light brown clay and sand.
442404	WS3	None Supplied	0.30	Beige clay and sand with gravel and brick.
442405	WS3	None Supplied	1.00	Light brown clay and sand.
442406	WS4	None Supplied	0.40	Beige clay and sand with gravel and brick.
442407	WS5	None Supplied	0.50	Beige topsoil and clay with gravel.
442408	WS5	None Supplied	1.50	Light grey clay and sand.
442409	WS6	None Supplied	0.30	Black topsoil and sand.
442410	WS6	None Supplied	1.70	Light grey clay and sand.

Analytical Report Number : 15-71313

Project / Site name: 28-44 London Road , Purbrook , Waterloooville

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
BTEX and MTBE in soil	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L0735-PL	W	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 dphenylcarbazine followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Total organic carbon in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L023-PL	D	MCERTS
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L038-PL	D	ISO 17025
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, and MEWAM 2006 Methods for the Determination of Metals in Soil	L038-PL	D	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method	L076-PL	W	MCERTS

Iss No 15-71313-1



Analytical Report Number : 15-71313

Project / Site name: 28-44 London Road , Purbrook , Waterloooville

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS.	In-house method based on USEPA8260	L073S-PL	W	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.



Laboratory Report



GEO Site & Testing Services Ltd

Contract Number: 26883

Client's Reference: **CCL02684 PO8916**

Report Date:

Client **Crossfield Consulting**
The Granary
White Hall Farm
Long Itchington
Warwickshire
CV47 9PU

Contract Title: **38-44 London Road, Purbrook, Waterlooville, Hampshire P075LI**
For the attention of: **Samantha Cooper**

Date Received: **11-05-2015**

Date Commenced: **11-05-2015**

Date Completed:

Test Description	Qty
Moisture Content 1377 : 1990 Part 2 : 3.2 - * UKAS	4
4 Point Liquid & Plastic Limit (LL/PL) 1377 : 1990 Part 2 : 4.3 & 5.3 - * UKAS	4
Disposal of Samples on Project	1

Notes: **Observations and Interpretations are outside the UKAS Accreditation**

* - denotes test included in laboratory scope of accreditation

- denotes test carried out by approved contractor

@ - denotes non accredited tests

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced in full, without the prior written approval of the laboratory.

Approved Signatories:

Alex Wynn (Associate Director) - Benjamin Sharp (Contracts Manager) - D V Edwards (Managing Director)

Emma Williams (Office Manager) - Paul Evans (Quality/Technical Manager)

GEO Site & Testing Services Ltd

Unit 4, Heol Aur, Dafen Ind Estate, Dafen, Llanelli, Carmarthenshire SA14 8QN

Tel: 01554 784040 Fax: 01554 784041 info@geo.uk.com geo.uk.com

**Test Report: Method of the Determination of the plastic limit and plasticity index
BS 1377 : Part 2 : 1990 Method 5**

Client ref: CCL02684

Location: 38-44 London Road, Purbrook, Waterlooville, Hampshire P0

Contract Number: 26883-260515

Hole / Sample Number	Sample Type	Depth m	Moisture Content % Cl. 3.2	Liquid Limit % Cl. 4.3 / 4.4	Plastic Limit % Cl. 5.	Plasticity Index % Cl. 6.	% Passing .425mm	Remarks
WS2		2.50	36	71	28	43	100	CV Very High Plasticity
WS3		1.00	30	65	25	40	100	CH High Plasticity
WS5		1.50	26	55	15	40	100	CH High Plasticity
WS6		1.70	19	54	21	33	100	CH High Plasticity

Symbols: NP : Non Plastic # : Liquid Limit and Plastic Limit Wet Sieved

PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.

BS 5930:1999+A2:2010

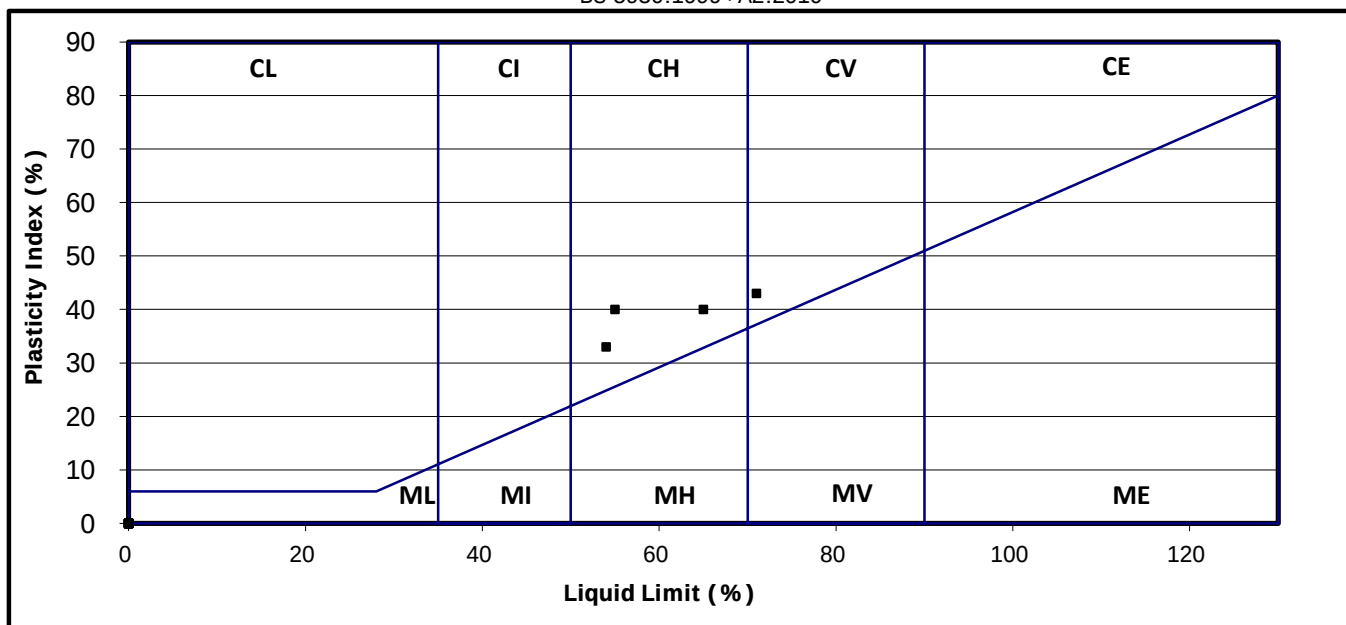
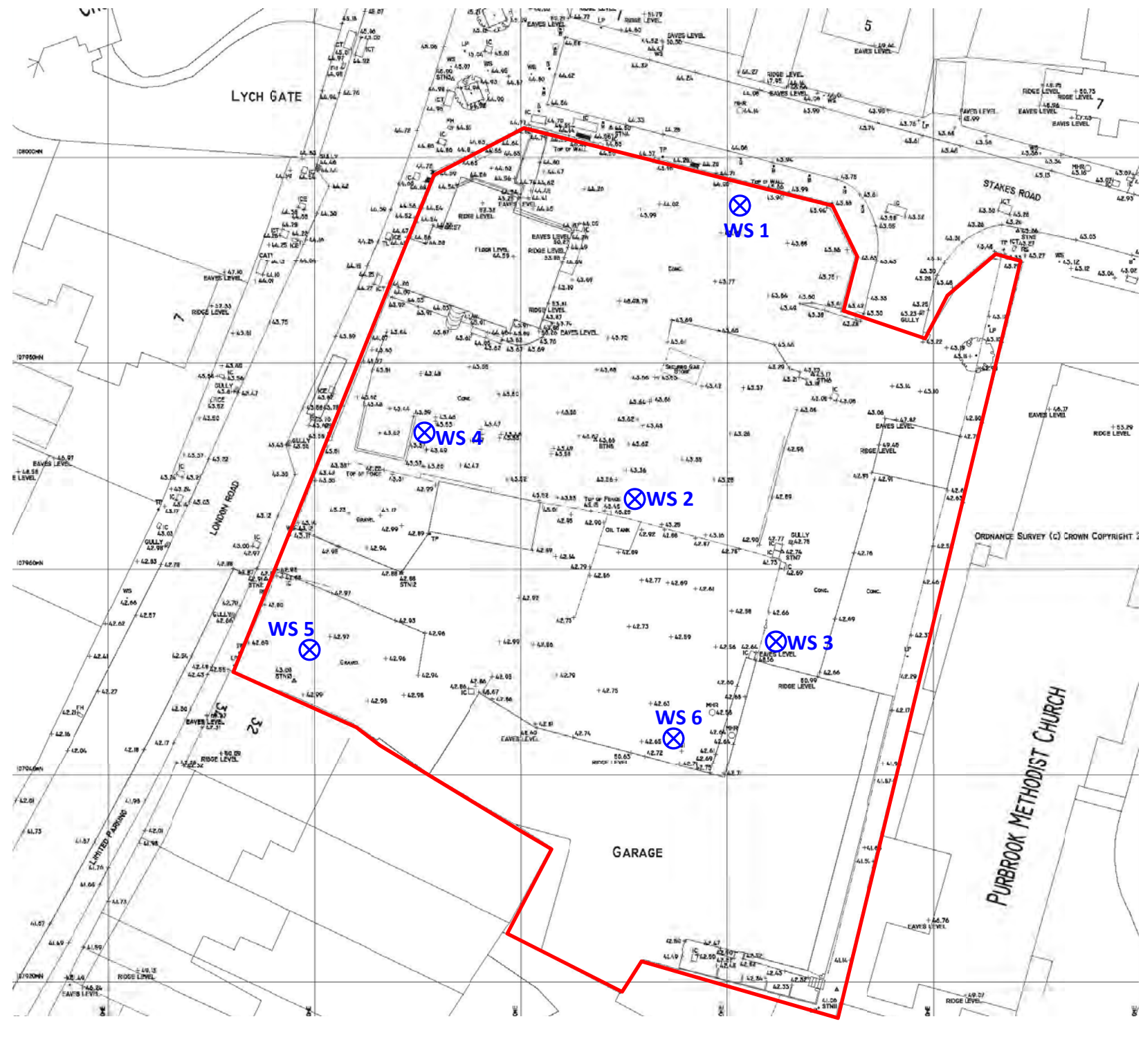


FIGURE III-1



EXPLORATORY HOLE LOCATION PLAN
Scale 1:500

Reproduced from the April 2015 1:200 @ A1Topographical Survey produced by Prospaplans Limited, Drawing Number: PP/3066/M&S/PURBROOK/F1

APPENDIX IV

APPENDIX IV – QUANTITATIVE RISK ASSESSMENT: HUMAN HEALTH

Contaminated Land Exposure Assessment Model v1.06

A site-specific risk assessment, with respect to human health considerations, has been undertaken due to the concentrations of certain inorganic compounds recorded at levels above the generic assessment criteria (GAC).

The model has been set up on the basis that the proposed development comprises apartments, for residents of retirement age. The development will have managed landscaping such that there will be no private gardens and residents will not be permitted to cultivate the ground. The pollutant linkages considered are compatible with the published criteria for a residential development without plant uptake. It is noted that the risk assessment model presumes that the soil associated with the substance will be exposed at the surface following completion of the development. However, as the soft landscaped areas will comprise entirely grassed and mulched ornamental planting areas, which will be tended by landscaping contractors as part of a maintenance agreement, it is considered that there will be no exposure route relating to home grown produce or long-term direct dermal soil contact. The CLEA model has been set up for an age class of 18, which is appropriate for end users of retirement age as the critical risk receptor. The soil organic matter and pH parameters have been determined from average site data.

The model parameters, exposure route analysis and the summary of results for the relevant compounds are presented in this Appendix. The output data are summarised as follows:

Substance	Maximum Concentration (mg/kg)	Concentration Range (mg/kg)	Site Specific Assessment Criteria (SSAC) (mg/kg)	Maximum Concentration Exceeds SSAC? ¹	No. of Samples that Exceed SSAC
Lead	410	26 to 410	760	No	0

Notes

1. Where the maximum concentration does not exceed the SSAC, risks to end users are considered to be negligible and, therefore, no further assessment is required. For compounds with a maximum concentration above the SSAC, further consideration of risks or remediation may be required. See Section 7.

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Page 1 of 5

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Report title 38-44 London Road, Waterloooville

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**BASIC SETTINGS**

Land Use Residential without homegrown produce

Building Apartment - Large

Receptor Female (res)

Start age class 18

End age class 18

Exposure Duration 10 years

Soil Sandy clay loam

Exposure Pathways

Direct soil and dust ingestion	☒	Dermal contact with indoor dust	☒	Inhalation of indoor dust	☒
Consumption of homegrown produce	☐	Dermal contact with soil	☐	Inhalation of soil dust	☒
Soil attached to homegrown produce	☐			Inhalation of indoor vapour	☒
				Inhalation of outdoor vapour	☒

Land Use Residential without homegrown produce

Age Class	Exposure Frequencies (days yr ⁻¹)					
	Direct soil ingestion	Consumption of homegrown produce	Dermal contact with indoor dust	Dermal contact with soil	Inhalation of dust and vapour, indoor	Inhalation of dust and vapour, outdoor
1	180	0	180	180	365	365
2	365	0	365	365	365	365
3	365	0	365	365	365	365
4	365	0	365	365	365	365
5	365	0	365	365	365	365
6	365	0	365	365	365	365
7	0	0	0	0	0	0
8	0	0	0	0	0	0
9	0	0	0	0	0	0
10	0	0	0	0	0	0
11	0	0	0	0	0	0
12	0	0	0	0	0	0
13	0	0	0	0	0	0
14	0	0	0	0	0	0
15	0	0	0	0	0	0
16	0	0	0	0	0	0
17	0	0	0	0	0	0
18	365	365	365	170	365	365

Occupation Periods (hr day ⁻¹)		Soil to skin adherence factors (mg cm ²)		Direct soil ingestion rate (g day ⁻¹)
Indoors	Outdoors	Indoor	Outdoor	
23.0	1.0	0.06	1.00	0.10
23.0	1.0	0.06	1.00	0.10
23.0	1.0	0.06	1.00	0.10
23.0	1.0	0.06	1.00	0.10
19.0	1.0	0.06	1.00	0.10
19.0	1.0	0.06	1.00	0.10
0.0	0.0	0.00	0.00	0.00
0.0	0.0	0.00	0.00	0.00
0.0	0.0	0.00	0.00	0.00
0.0	0.0	0.00	0.00	0.00
0.0	0.0	0.00	0.00	0.00
0.0	0.0	0.00	0.00	0.00
0.0	0.0	0.00	0.00	0.00
0.0	0.0	0.00	0.00	0.00
0.0	0.0	0.00	0.00	0.00
0.0	0.0	0.00	0.00	0.00
0.0	0.0	0.00	0.00	0.00
0.0	0.0	0.00	0.00	0.00
0.0	0.0	0.00	0.00	0.00
16.0	1.0	0.06	0.30	0.05



Receptor Female (res)

Age Class	Body weight (kg)	Body height (m)	Inhalation rate (m ³ day ⁻¹)	Max exposed skin factor			Consumption rates (g FW kg ⁻¹ BW day ⁻¹)					
				Indoor (m ² m ⁻²)	Outdoor (m ² m ⁻²)	Total skin area (m ²)	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
1	5.60	0.7	8.5	0.32	0.26	3.43E-01	7.12	10.69	16.03	1.83	2.23	3.82
2	9.80	0.8	13.3	0.33	0.26	4.84E-01	6.85	3.30	5.46	3.96	0.54	11.96
3	12.70	0.9	12.7	0.32	0.25	5.82E-01	6.85	3.30	5.46	3.96	0.54	11.96
4	15.10	0.9	12.2	0.35	0.28	6.36E-01	6.85	3.30	5.46	3.96	0.54	11.96
5	16.90	1.0	12.2	0.35	0.28	7.04E-01	3.74	1.77	3.38	1.85	0.16	4.26
6	19.70	1.1	12.2	0.33	0.26	7.94E-01	3.74	1.77	3.38	1.85	0.16	4.26
7	22.10	1.2	12.4	0.22	0.15	8.73E-01	3.74	1.77	3.38	1.85	0.16	4.26
8	25.30	1.2	12.4	0.22	0.15	9.36E-01	3.74	1.77	3.38	1.85	0.16	4.26
9	27.50	1.3	12.4	0.22	0.15	1.01E+00	3.74	1.77	3.38	1.85	0.16	4.26
10	31.40	1.3	12.4	0.22	0.15	1.08E+00	3.74	1.77	3.38	1.85	0.16	4.26
11	35.70	1.4	12.4	0.22	0.14	1.19E+00	3.74	1.77	3.38	1.85	0.16	4.26
12	41.30	1.4	13.4	0.22	0.14	1.29E+00	3.74	1.77	3.38	1.85	0.16	4.26
13	47.20	1.5	13.4	0.22	0.14	1.42E+00	3.74	1.77	3.38	1.85	0.16	4.26
14	51.20	1.6	13.4	0.22	0.14	1.52E+00	3.74	1.77	3.38	1.85	0.16	4.26
15	56.70	1.6	13.4	0.21	0.14	1.60E+00	3.74	1.77	3.38	1.85	0.16	4.26
16	59.00	1.6	13.4	0.21	0.14	1.63E+00	3.74	1.77	3.38	1.85	0.16	4.26
17	70.00	1.6	14.8	0.33	0.27	1.78E+00	2.94	1.40	1.79	1.61	0.22	2.97
18	70.90	1.6	17.4	0.33	0.27	1.80E+00	2.94	1.40	1.79	1.61	0.22	2.97

Building Apartment - Large

Building footprint (m ²)	8.00E+01
Living space air exchange rate (hr ⁻¹)	5.00E-01
Living space height (above ground, m)	2.50E+00
Living space height (below ground, m)	0.00E+00
Pressure difference (soil to enclosed space, Pa)	3.10E+00
Foundation thickness (m)	1.50E-01
Floor crack area (cm ²)	2.56E+03
Dust loading factor (µg m ⁻³)	5.00E+01

Soil Sandy clay loam

Porosity, Total (cm ³ cm ⁻³)	5.30E-01
Porosity, Air-Filled (cm ³ cm ⁻³)	1.60E-01
Porosity, Water-Filled (cm ³ cm ⁻³)	3.70E-01
Residual soil water content (cm ³ cm ⁻³)	1.50E-01
Saturated hydraulic conductivity (cm s ⁻¹)	2.37E-03
van Genuchten shape parameter <i>m</i> (dimensionless)	3.10E-01
Bulk density (g cm ⁻³)	1.20E+00
Threshold value of wind speed at 10m (m s ⁻¹)	7.20E+00
Empirical function (F _x) for dust model (dimensionless)	1.22E+00
Ambient soil temperature (K)	2.83E+02
Soil pH	8.00E+00
Soil Organic Matter content (%)	1.00E+00
Fraction of organic carbon (g g ⁻¹)	5.80E-03
Effective total fluid saturation (unitless)	5.79E-01
Intrinsic soil permeability (cm ²)	3.16E-08
Relative soil air permeability (unitless)	5.78E-01
Effective air permeability (cm ²)	1.83E-08

**Soil - Vapour Model**

Depth to top of source (no building) (cm)	0
Depth to top of source (beneath building) (cm)	65
Default soil gas ingress rate?	Yes
Soil gas ingress rate ($\text{cm}^3 \text{s}^{-1}$)	2.50E+01
Building ventilation rate ($\text{cm}^3 \text{s}^{-1}$)	2.78E+04
Averaging time surface emissions (yr)	10
Finite vapour source model?	No
Thickness of contaminated layer (cm)	200

Air Dispersion Model

Mean annual windspeed at 10m (m s^{-1})	5.00
Air dispersion factor at height of 0.8m *	2400.00
Air dispersion factor at height of 1.6m *	0.00
Fraction of site cover ($\text{m}^2 \text{m}^{-2}$)	0.75

* Air dispersion factor in $\text{g m}^{-2} \text{s}^{-1}$ per kg m^{-3} **Soil - Plant Model**

	Dry weight conversion factor	Homegrown fraction		Soil loading factor	Preparation correction factor
	g DW g^{-1} FW	Average	High		
		dimensionless		g g^{-1} DW	dimensionless
Green vegetables	0.096	0.05	0.33	1.00E-03	2.00E-01
Root vegetables	0.103	0.06	0.40	1.00E-03	1.00E+00
Tuber vegetables	0.210	0.02	0.13	1.00E-03	1.00E+00
Herbaceous fruit	0.058	0.06	0.40	1.00E-03	6.00E-01
Shrub fruit	0.166	0.09	0.60	1.00E-03	6.00E-01
Tree fruit	0.157	0.04	0.27	1.00E-03	6.00E-01

Gardener type None

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Page 1 of 11

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RESULTS

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APPENDIX V

APPENDIX V – BASIS OF GEOTECHNICAL ASSESSMENT FOR FOUNDATIONS

Geotechnical Design Category of Structure: 2

Design Working Life: Standard building structure (50 years)

Design Approach: 1

1. Geotechnical Model

On the basis of the ground investigation data, the following model of the ground conditions is considered appropriate for foundation design purposes:

Depth (m)	General Description of Strata (and classification)	Parameter	Characteristic Value & Units	Remarks
0.00 to 1.50	Made Ground	γ	17 kN/m ³	
1.50 to 3.50	Medium strength sandy silty clay (Wittering Formation)	N γ c_u Modified PI	4 20 kN/m ³ 60 kN/m ² 40 %	Based on field data Based on field descriptions In-situ hand vane tests High volume-change potential NHBC (2014)
3.50 >5.00	Clayey silt or silty clay (London Clay Formation)	N γ c_u ϕ_u	8 21 kN/m ³ 75 kN/m ² 0°	Based on field data Based on field descriptions Based on field data

Characteristic Depth to Groundwater (or groundwater level): >5 m (perched water at 1 m)

Reference should be made to Sections 8 – 9 of the report for an assessment of overall ground stability, seismic risk, combined failure of the structure/ground, excessive settlements and potential soil-volume changes (including heave).