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Former Brickworks, Star Lane, Great Wakering

Ground Conditions and Contamination Assessment

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1. Introduction

1.1 This report considers the likely significant effects of the Proposed Development on ground conditions and contamination at the Application Site.

1.2 This report describes the assessment methodology; the baseline conditions currently existing at the Application Site and surroundings; the likely significant environmental effects; the measures required to prevent, reduce or offset any significant adverse effects or enhance any beneficial effects.

2. Assessment Methodology

2.1 The following documents were used as the basis for this assessment of ground conditions:

- DTS Raeburn Ltd report titled – GEO-ENVIRONMENTAL DESK STUDY REPORT FOR A SITE AT STAR LANE, GREAT WAKERING, ESSEX ref E11997/1 Dec.
- DTS Raeburn Ltd Envirocheck Report – Nov 2006
- DTS Raeburn Report on Ground Investigation Carried out at Star Lane, Great Wakering, Essex – ref 11997/2 Dec 2006
- Ken Rush Associates Geotechnical Report for Star Lane Great Wakering ref 11-4593 June 2011
- Ground Sure – EnviroInsight Report on a site at Star Lane, Great Wakering Oct 2011

2.2 The boreholes were taken to a depth of between 4m and 5.5m, with the trial holes excavated to between 2.2m and 3.7m below existing ground level.

2.4 A total of seven samples from trial pits and boreholes were tested using CLEA guidelines for the full suite of what was formerly known as the ICRCL contaminants. Further testing for asbestos, total petroleum hydrocarbons, a full suite of polyaromatic hydrocarbons , and a range of contaminants in ground water formerly known as the ICRCL contaminants. In addition 10 soil samples were tested using a PetroFLAG hydrocarbon detector.

3. Baseline Conditions

3.1 Topography

3.1.1 The Application Site covers an area of approximately 180m x 120m. It is sensibly level at a general height of 11m AOD. The south eastern corner of the site is lower, probably due to old excavation during the construction of the previous brick factory. .

3.1.2 The site is surrounded on three sides by open ground, with an industrial estate present to the northern site boundary. Star Lane runs along the western side between the site and the open countryside. The land to the eastern side of the site consists of the lakes formed by excavations of brickearth for the old brickworks, with open fallow land to the north of these lakes upto the rear gardens of the properties on the High Street. A dirt track runs along the southern edge of the site between the site and the farmland.

3.1.3 The only surface water features in the immediate vicinity of the site are the lakes which have been formed to the east of and immediately adjacent to the site. Ground water was encountered in the boreholes at a depth of approximately 3.8m below existing ground level. It is anticipated that any subsurface drainage will be flowing toward the sea. No surface water features are present on the site.

3.2 Existing Coverage

3.2.1 The Application Site was used as a brickworks. The brickworks have been demolished but the foundations and ground slabs are still in place, currently has a number of properties located around the perimeter on the Pleasant Road and the Marine Parade elevations.

3.2.2 Areas outside of the building perimeters have a covering comprising concrete hardstanding and hardcore/demolition rubble..

3.3 Existing Soil Profiles

3.3.1 The Application Site generally has a variable covering of made ground. This varies in thickness from a maximum of 1.3m in Ken Rush Associates borehole 2, to approximately 0.1m in DTS Raeburns Trial Pit 1.

3.3.2 The made ground is generally underlain by silty, sandy clay which extends to a depth of between 1m and 4m below existing ground level.

3.3.3 This stratum is in turn underlain by a layer of Silty Sand with some Gravel, which extends to the maximum borehole depth of 5.5m in Ken Rush Associates Borehole 1.

3.3.4 The solid geology of the London Clay is anticipated from the geological maps to lie below the Sand deposit.

3.3.5 The Ken Rush Associtates investigation reported water seepages at between 2.8m and 3.7m below ground level with all boreholes having a wet base – depth 4.0m - upon completion.

3.4 Site History

3.4.1 The 1873 Essex Series OS map shows that the Application Site was at that stage undeveloped, probably agricultural land. Star Lane is inexistence and runs along the western boundary of the site in its current position. A small bridal path is present to the southern boundary of the site..

3.4.2 The 1880 OS map shows that much of the surrounding area was also undeveloped at that time. The village of Great Wakering is shown on this map, approximately 600m to the north east of the site.

3.4.3 Maps from 1897 and 1898 show the site and its environs to be largely unchanged at this time.

3.4.4 The 1923 OS map shows that the area of the site is itself largely unchanged. The surrounding area has changed with the village of Great Wakering having expanded slightly and several farm houses and outbuildings constructed. Several brick pits and brickworks are present in the surrounding areas, some of which have been abandoned at the time the map was drawn up.

3.4.5 The 1938 OS map indicates a path giving access to the site and the construction of six small square buildings in the area to the north of the site, currently the industrial estate.

3.4.6 The 1939 map shows the site as a brickworks. Several small buildings have appeared on the site at this time. A brick field is indicated to the eastern site boundary. A small number of houses have been constructed approximately 200m to the north of the site.

3.4.7 The 1961 map shows two rectangular buildings, one long one short, toward the centre of the site and a small square building to the south eastern corner. Great Wakering has expanded westwards and to the south east.

3.4.8 The 1965 map shows the brickworks more or less fully developed with four chimneys for the kilns present. The clay pits to the east of the site are now called up as ponds. Development has extended from Great Wakering as far as the junction with Star Lane and sloping features are recorded to the north of the site indicating that clay extraction may have proceeded to this area.

3.4.9 The 1971 and 1976 maps show the site as largely unaltered. A 'works' is called up in the area to the southern end of Alexandra road in Great Wakering. The 1976 indicates development on the industrial estate to the north of the site.

3.4.10 The 1978 and 1982 show the site as largely unchanged. The area to the north is now called up as the Star lane Industrial Estate.

3.4.11 The maps from 1989, 1993 and 2005 show the brcikworks buildings as having extended on the southern end of the site, but with the site remaining very much the same throughout this period. The works to the southern end of Alexandra Road has been replaced by a housing estate on the 2005 map.

3.5 Existing Site Contaminants

3.5.1 Two intrusive site investigations were undertaken on the site, the first by DTS Raeburn in December 2006 which looked at contamination only. The second by Ken Rush Associates was undertaken in June 2011 looked at geotechnical aspects only.

3.5.2 There was no visual or olfactory evidence of contamination encountered during the field works.

3.5.3 The DTS Raeburn investigation encountered elevated levels of Extractable Petroleum Hydracarbons in one of their trial pits referenced TP2 at a depth of 3.7m.

3.5.4 The further encountered elevated levels of arsenic, lead and nickle in a sample of made ground taken from their trial pit referenced TP6.

3.5.5 On the basis of their investigation, they recommended that a further more extensive investigation be carried out.

3.5.7 Drawing number 13005/S/01, indicates the location of the investigation points for the DTS Raeburn investigation and the Ken Rush Associates investigation. These show the Contaminants found by the DTS investigation together with the soil profile found by both investigations.

3.6 Possible Offsite Contamination Sources

3.6.1 Possible sources of contamination that were identified in the environs of the site include the industrial estate immediately to the north of the site, which includes Vehicle testing facilities, Distribution and Haulage, Plastics manufacture, electrical works, refrigeration works and steelwork fabrication. There is also the possibility of imported contamination in fill to surrounding brick pits.

3.6.2 No evidence was found in the site investigation to suggest that contamination from any of these sources was affecting the site.

4. Likely Significant Effects

4.1 Demolition & Construction

4.1.1 All of the existing brickwork buildings on the site have previously been demolished..

4.1.2 There was no evidence of asbestos present in any of the soils tested.

4.1.3 There are no indications that any special precautions will be required for workers on this site. The requirements of the Health and Safety Executive(The Blue Book) HS(G)66 should be adhered to.

4.1.4 Where existing footings are to be removed as part of the demolition work, then any arisings should be taken to a properly licensed tip who should be made aware of the contents of any existing and future intrusive investigations and testing. No significant effects as a result of demolition are anticipated.

4.1.5 The current foundation proposals envisage the use of strip footings founded in the low to medium shrinkability Brickearth at approximately 1m below existing ground level. Footings will be deepened as required for the presence of trees.

4.1.6 Heave testing is currently being undertaken on the soils in the vicinity of the old kilns to determine if this clay has been excessively dried out.

4.1.7 Where required, floor slabs will be suspended, but over most of the site they can be ground bearing.

4.1.8 WAC testing will be undertaken as part of the more detailed intrusive investigation and likely requirements for waste removal will be confirmed when testing is complete. Is it not anticipated that any special requirements will be needed.

4.1.9 It is currently envisaged that a low area to the south eastern corner of the site will have its level raised to the general site level. Excavation arisings will be cheked on site and if suitable, these will be reused on site as the fill material.

4.1.10 Ongoing examination for potential isolated concentrations of contaminants will continue throughout the ground works and should anything be encountered a geo-environmental engineer will attend site to advise on the most appropriate method of local remediation.

4.1.11 There are no indications that any special precautions will be required for workers on this site. The requirements of the \health and Safety Executive(The Blue Book) HS(G)66 should be adhered to.

4.2 Operation

4.2.1 Generally, the proposed site usage, being residential, will not produce contaminants that could affect the sub- soil.

4.2.2 Adopted highways will use catch pit manholes and sumped road gullies to prevent any potential contamination of sub surface water.

4.2.3 Non- adopted highways will be similarly protected where non- SUDs systems are used.

4.2.4 Where a porous paving is provided these will have a sand regulating course to trap any hydrocarbons and protect the underlying ground water.

4.2.5 Given the levels of contamination encountered in the initial investigations it is not anticipated that there will be any affects on end users of the site from soil contamination.

5. Mitigation and Enhancement

5.1 The detailed intrusive site investigation will determine the extent of remediation required to the site. A remediation strategy will be drawn up following the compilation of the intrusive investigation report and will be submitted to the Local Authority Environmental Health Officer and the Environment Agency for their approval.

5.2 The remediation strategy will be developed to account for any hidden hotspots that may be encountered during the works.

5.3 All garden and soft landscaped will require the provision of a layer of topsoil. This will be imported to the site.

6. Cumulative Effects

6.1 The exact extent of contamination on the site will be determined by the planned extensive intrusive investigation.

6.2 There was no sign of any impact on the Application site from any surrounding sites.

6.3 The proposed development will in itself have a negligable impact on the quality of the underlying soil and ground water.

7. Summary

7.1 The Application Site was developed as a brickworks having previously been agricultural land. The brickworks buildings have all been demolished down to foundation, ground slab and hard standing.

7.2 The ground conditions generally comprise a thin covering of made ground overlying sandy, silty clay overlying sand overlying the solid geometry of the London Clay.

7.3 Foundations for the proposed buildings will comprise strip footings in the brickearth (sandy, silty clay) at a depth of generally 1m below existing ground level.

7.4 Contamination in the form of benzo-a-pyrene, lead, arsenic, nickle and extractable pertoleum hydrocarbons were encountered in 2 out of a total of 17 investigation points. Further intrusive investigations will be required to determine the exact extent and the remediation measures required.

7.5 Proposed end usages for the Application Site are unlikely to cause future contamination to the subsoil.

7.6 It is unlikely that off site sources of contamination will affect the Proposed Development. No evidence of any impact from off site usages were encountered during the investigation and monitoring of water quality in the three boreholes is ongoing with no evidence of contamination encountered to date.

Appendix A - DTS Raeburn Reports

CONTRACT NO. E11997/1

GEO-ENVIRONMENTAL DESK STUDY REPORT FOR A SITE AT STAR LANE, GREAT WAKERING, ESSEX

Prepared by
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GEO-ENVIRONMENTAL DESK STUDY REPORT FOR A SITE AT STAR LANE, GREAT WAKERING, ESSEX

Executive Summary

DTS RAEBURN Limited were commissioned by Stirling Maynard and Partners on behalf of JG Great Wakering LLP and Anglo Irish Asset Finance Plc, to carry out a geo-environmental desk study at a site at Star Lane, Great Wakering, Essex. It is understood that the proposed development will comprise residential properties. The desk study is required to determine the past usage of the site and likely ground conditions, and also to highlight any associated ground contamination and geotechnical risks. The desk study has also been designed to fulfil the objectives of a 'preliminary investigation' as defined by British Standard BS10175:2001, the current standard for contaminated land investigation. The following principal findings have been established:

□ The site is occupied by Hanson brickworks. Production at the site ceased in April 2005 and at the time of the site visit the remaining stockpiles of bricks were in the process of being removed. The site comprises a number of brick buildings, some of which have roofs constructed from corrugated asbestos cement sheeting. Five above ground waste oil and diesel storage tanks are also located within the site. Adjacent the site to the south is an area previously used to stockpile clay soils, but this has recently been restored to agricultural land. A detailed description is contained in Section 2.0 and a site plan is included as Figure 3.

□ Published geological information (Section 3.0 and Figure 5) indicates the site to be underlain by River Brickearth, which has been worked over a fairly large area to the south and east of the site as well as a smaller area to the north. The Brickearth may be underlain by deposits of fluvial sand and gravel. The underlying solid geology is London Clay, which typically consists of stiff to hard bluish grey clay which weathers at outcrop to brown. Characteristics of the London Clay include selenite crystals (calcium sulphate).

□ Site sensitivity data is presented in Enclosure A and discussed in Section 4.0. On the basis of this information the site should be considered potentially sensitive to controlled waters because of the proximity of surface water bodies. However, both the Brickearth and London Clay are classified as non-aquifers, suggesting that the site is of low sensitivity to groundwater. The data suggests that the site is not vulnerable to flooding.

□ The environmental database indicates a moderate risk of compressible ground, which is probably associate with mineral extraction adjacent the site. However, further enquiries have revealed that the extraction closest to the site was restored to agricultural land on completion and has not been used for landfill. This suggests a low risk of subsidence occurring at the site as a result of mineral extraction (Section 5.0).

□ Historical map information (Section 6.0 and Figures 6 to 19) along with additional information (Section 6.2) suggests that the brickworks was developed at the site from Greenfield in 1932. The site remained in use as a brickworks until its closure in 2005, but a number of structural alterations have taken place during this period. A map of 1939 suggests that clay extraction encroached onto the south eastern corner of the site at this time. Planning records and other enquiries have revealed that a narrow gauge railway was used to transport clay from nearby quarries to the brickworks, but this ceased to operate in 1991 and was later dismantled.

□ Environmental database information supplied by Landmark Information Group Limited is presented in Enclosure B and reviewed in Section 7.0. The database information states that the site is located on an area of landfill which extends approximately 1.1km to the east and 300m to the south of the site. However, enquiries submitted to Essex County Council have revealed that this represents an

area for which a licence has been granted for clay extraction. The areas of extraction to the south and east of the site were restored to agricultural use on completion and have not been used for landfill. The database information also lists a number of manufacturing units and other industrial sites within Star Lane Industrial Estate, located adjacent the site to the north. These include three garage servicing firms, two engineering firms, two printing firms, a sheet metal works and a injection moulding plastics company.

□ An initial conceptual model for the site is introduced in Section 8.0. This has identified a relatively small number of potential contaminant sources at the site, including the existing oil and diesel storage tanks, an electricity substation and the former narrow gauge railway. A ground contamination risk prioritisation is presented in Section 9.2 and indicates that a moderate risk of significant harm may be presented to human receptors, the development end use and controlled water receptors (nearby surface water bodies) from soil contamination at the site. The risk of soil contamination from off-site sources (most significantly the adjacent industrial estate) is also considered moderate. An intrusive investigation is recommended to confirm the extent of ground contamination and to confirm the potential 'pollutant linkages' identified.

□ A preliminary geotechnical assessment is included in Section 9.1. Shallow pad or strip foundations may suffice for lightly loaded structures such as 2-3 storey dwellings, but piled foundations are likely to be the most appropriate solution for heavier structures such as multi-storey apartments. A physical investigation is recommended to provide quantitative information for foundation design. The presence of selenite crystals within the London Clay may generate increased concentrations of soluble sulphate, which could necessitate additional protective measures for buried concrete particularly if piled foundations are used.

□ The desk study information suggests a low risk of soil gas migration to the site, but it would be prudent to quantify this by means of a gas monitoring regime as part of any future site investigation works (Section 9.3).

□ Section 9.4 shows that the site has been designated as Employment Land under the current Local Plan, and hence business or industrial developments would normally be permitted. Six key sites have been allocated for residential development, but these are located some distance from the site under consideration. It is recommended that consultations with the relevant authorities be initiated at an early stage if these have not already been undertaken.

□A summary of identified ground risks is tabulated in Section 9.5. This is not exhaustive and should be read in conjunction with the main text of the report.

□Attention is drawn to the limitations and use of this report in Section 10.0.

GEO-ENVIRONMENTAL DESK STUDY REPORT FOR A SITE AT STAR LANE, GREAT WAKERING, ESSEX

1.0 INTRODUCTION

DTS RAEBURN Limited were commissioned by Stirling Maynard and Partners on behalf of JG Great Wakering LLP and Anglo Irish Asset Finance Plc, to carry out a geo-environmental desk study for a site at Star Lane, Great Wakering, Essex. It is understood that the site is to be redeveloped into residential houses. The desk study is required to provide information regarding the past usage of the site and likely ground conditions, and also to highlight any associated ground contamination and geotechnical risks.

The environmental aspects of the desk study have been prepared utilising a risk based approach and incorporating the accepted 'pollutant linkage' approach to contaminated land hazard identification (i.e. source – pathway – receptor linkage). This approach is consistent with methodologies contained in Part IIA of the Environmental Protection Act 1990 and introduced by Section 57 of the Environment Act 1995 which came into force in England and Wales in April 2000. The desk study has also been designed to fulfil the objectives of a 'preliminary investigation' as defined by British Standard BS10175:2001, 'Investigation of Potentially Contaminated Sites – Code of Practice'.

The following information has been used to formulate the geo-environmental desk study report:

- Site walk over survey carried out on 4th December 2006.
- Ordnance Survey maps obtained from Landmark Information Group Limited.
- Review of additional information held at Great Wakering Library and Southend Central Library
- Geological Survey of England and Wales Sheet 258/259 of Southend (1:50,000 Solid and Drift Edition).
- Environmental database information prepared by Landmark Information Group Limited.
- Correspondence with Local Authorities and other statutory agencies.
- SLR Consulting Limited Report Ref 4C-027-058-21 'Star Lane Brickworks, Great Wakering, Near Southend-on-Sea, Essex. Site Report for A(2) PPC Application', dated September 1998, supplied by Stirling Maynard and Partners, (hereinafter referred to as the 'SLR Report'). This report was commissioned by Hanson Brick Limited and prepared in support of an application for permit to operate under the Pollution Prevention and Control (PPC) Regulations 2000. The report includes a review of the site history and an Envirocheck database search.

2.0 THE SITE AND SURROUNDING AREA

2.1 Site Location

The site consists of an irregular parcel of land covering approximately 3.3 hectares located approximately 700m to the southwest of Great Wakering as shown in Figures 1 and 2. The site is centred on National Grid Reference 593470, 187230. A plan showing the site and the immediate surrounding area is included as Figure 3 and a satellite image of the site as Figure 4. Hereafter in this report 'the site' refers to the area within the boundary indicated in Figures 3 and 4.

2.2 Site Description

The site is occupied by Hanson brickworks. Production at the site ceased in April 2005 and at the time of the site visit the remaining stockpiles of bricks were in the process of being removed. Vehicular access to the site is gained via Star Lane which bounds the site to the west.

A number of small single storey buildings are located adjacent the western site boundary near the main site entrance. These include a gas house, offices, a canteen and storage sheds. An above ground brick 40,000 litre diesel storage tank, surrounded by a brick bund, is also located adjacent the western site boundary. Site operatives stated that only a small amount of fuel remained in the tank and was used to fuel the fork lift trucks.

The former processing building occupies the central and southern parts of the site, and has been amalgamated from a number of smaller buildings and extensions. Discussions with the site operatives indicated that the building was used for brickmaking and drying processes. Parts of the building have roofs constructed from corrugated asbestos cement sheeting. The central part of the building also contains a number of drums containing engine and hydraulic oils, and three above ground heavy oil storage tanks which were formerly used to fire the nearby kilns. The site operatives stated that the tanks have been redundant for a number of years because the kilns are currently gas-fuelled. At the time of the site visit sections of the roof of the building had been removed to allow the removal of the oil drums from the building.

A small above ground waste oil tank, surrounded by a brick bund, is located adjacent the main building to the north and an electricity substation is situated adjacent the building to the south.

Eight brick-built kilns with four chimneys and two control houses are located in the central part of the site to the east and west of the main processing building. An above ground brick bunded 6,000 litre diesel tank is also located between two of the kilns to the east of the main building. In the northern section of the site is a large two-storey barn used for brick storage. The barn is of brick and steel construction with a corrugated asbestos cement sheet roof. A chimney is located adjacent the barn to the west and two small single storey buildings, most recently used as a cutting shed and a shrink wrap shed are located adjacent the barn to the west and north respectively.

A former transport building and a concrete loading bay occupy the south-eastern corner of the site. The building is two-storey and of brick construction with a corrugated asbestos cement sheet roof. The level of the building and loading bay is approximately 1m below the remainder of the site. Adjacent the building to the south are the concrete and tile floors of two previous buildings, and the partial remains of one of the brick walls.

The external areas within the site are almost entirely covered by concrete or tarmac hardstanding. No infestations of Japanese Knotweed or other notifiable weeds were observed within the site at the time of the visit, but it would be prudent to verify their absence by conducting a second inspection during the spring or summer months when the plants would be flowering.

2.3 Surrounding Area

The site is bounded to the north by Star Lane Industrial Estate which includes a telephone exchange, a waste transfer facility, several garages and a number of engineering firms. Opposite the site to the west is farmland and adjacent the site to the east are a number of fishing ponds. Discussions with the site occupiers revealed that these formerly formed part of an open cast quarry. A partially culverted ditch is located adjacent the site to the south, and has an outlet into a fish pond approximately 60m to the south east of the site. To the south of the ditch is an area that was previously used by the brickworks to stockpile clay but has recently been restored to farmland.

3.0 GENERAL GEOLOGY

Figure 5 shows extracts from the British Geological Survey Sheets 258/259 of Southend (1:50,000 Solid and Drift Edition). This shows the site to be underlain by the following strata:

Loam (River Brickearth) (of *Pleistocene* and *Recent* age). The map indicates that these deposits have been extracted over a fairly large area adjacent the site to the south and east, as well as a smaller area to the north. Deposits of fluvial sand and gravel are also shown in the vicinity, and these may underlie the Brickearth.

London Clay (of *Eocene* age). These deposits consist of stiff dark or bluish grey clay which weathers at outcrop to brown. Characteristics of the clay can include selenite crystals (calcium sulphate).

There are no faults indicated within 1km.

4.0 HYDROLOGY, HYDROGEOLOGY AND SITE SENSITIVITY

Enclosure A contains three maps indicating flood risk, groundwater vulnerability and environment quality in the vicinity of the site.

The Flood Map (Page 1 of Enclosure A) shows that the site is not at risk from fluvial or marine flooding. A number of water bodies are recorded within 1km of the site, the closest of

which is a lagoon located approximately 40m to the east of the site. These are likely to represent flooded clay pits associated with the former brickworks.

The Groundwater Vulnerability Map (Page 2 of Enclosure A) shows that the underlying geology is classified as a non-aquifer which is negligibly permeable. This classification would be applicable to both the Brickearth and the London Clay. However, the area adjacent the site to the north, south and east is identified as a minor aquifer. Correlation of this map to the Geological map suggests that the minor aquifer classification has been applied to the areas where Brickearth has been extracted.

Reference to environmental database information, presented in Enclosure B, has shown that there are four licensed abstractions of groundwater within 500m of the site. The information states that the strata from which groundwater is abstracted include fluvial sand and gravel and chalk. The latter exists at depth beneath the London Clay. The purpose of the abstractions is for agricultural use (spray irrigation). Further information from the Environment Agency has revealed that the site does not lie within a Groundwater Source Protection Zone associated with these abstractions.

The Land Sensitivity Map (Page 3 of Enclosure A) indicates that two areas located approximately 1.5km to the north east of the site and a section of coastline approximately 2km to the south east of the site are designated Ramsar Sites (wetlands of international importance), Sites of Special Scientific Interest (SSSI) and Special Protection Areas (SPA). These designations constitute major ecological receptors. In addition, The Royal Society for the Protection of Birds (RSPB) have identified the former clay pit adjacent the site as an ideal habitat for bird watching. The map also shows that the surrounding area to the west, east and south of the site has been adopted as a Green Belt, but this does not constitute an ecological receptor.

In view of the above information the site is likely to be of low sensitivity with respect to groundwater due to the non-aquifer status of the underlying Brickearth. However, the site should still be considered potentially sensitive to controlled waters, given the proximity of surface watercourses. At this stage the site should also be considered potentially sensitive to major ecological receptors. The data suggests that the site is not vulnerable to flooding.

5.0 MINERAL EXTRACTION

The geological map (Figure 5 and Section 3.0), historical information (Section 6.0 and Figures 6-22) and the environmental database information (Section 7.0 and Enclosure B) indicate that Brickearth has been extracted from the areas adjacent the site to the east and north for the purposes of brick manufacture on the site. The maps suggest that the extraction may have encroached onto the south eastern corner of the site. The environmental databases report a moderate risk of subsidence due to compressible ground, which probably reflects the clay extraction in the area. However, enquiries submitted to both Rochford District Council and Essex County Council have revealed that the excavations were either flooded or restored to agricultural land, and were not used for landfill. This information suggests a low risk of subsidence occurring at the site as a result of mineral extraction.

6.0 SITE HISTORY

The site history has been deduced primarily from historical Ordnance Survey maps and plans obtained from Landmark Information Group Limited. Copies of the relevant map extracts are included as Figures 6 to 22. Information on planning applications has also been obtained from Rochford District Council and is discussed in Section 6.2.

6.1 Historical Maps and Plans

In order to determine the historical development of the site the following maps and plans were studied.

Figure 6 Essex Sheet LXXIX .05 Published 1873 1:2,500	The map shows the site to have been undeveloped except for a small footpath or bridleway running east-just inside the southern boundary of the site. The surrounding area was also largely undeveloped, but Star Lane had been established along its present day route adjacent the western boundary of the site. Patron's Pit, possibly a very small clay pit, is shown at approximately 200m to the north of the site.
Figure 7 Essex Sheet LXXIX .00 Published 1880 1:10,000	The map shows the site and much of the surrounding area to have been undeveloped and occupied by agricultural land. The village of Great Wakering is identified at approximately 600m to the northeast of the site.
Figure 8 Essex Sheet LXXIX .05 Published 1897 1:2,500	Townfield Villas are shown approximately 200m to the north of the site, but there are no other significant changes to the site or surrounding area.
Figure 9 Essex Sheets LXXIX .NW & LXXIX .SW Published 1898 1:10,000	No changes are shown within the site. Two clay pits are shown to have been established approximately 1.1km and 1.6km to the southeast of the site. A brickworks had also been constructed approximately 1.4km to the northeast of the site.
Figure 10 Essex Sheets LXXXIII .16 & XCI .04 Published 1923 1:10,000	No changes are shown within the site. A pumping station had been constructed approximately 250m to the west of the site. To the east of the site, Great Wakering had expanded slightly and various farms, cottages and large houses are shown to have been constructed in the surrounding area. The map suggests that the clay pit about 1.1km to the southeast of the site was no longer operational but that it had vastly expanded in size and had included a brickworks prior to its closure. The clay pit 1.6km to the southeast and another clay pit approximately 850m to the north of the site are also indicated to have closed. In addition to this, the brickworks about 1.4km to the northeast of the site is no

	longer indicated, but a large pit is shown suggesting that substantial clay extraction had taken place at this location.
Figure 11 Essex Sheet XCI .NE Published 1923 1:2,500	No changes to the site are apparent.
Figure 12 Essex Sheets XCI .NE Published 1938 1:10,000	A track is shown in the southern part of the site, extending from the western boundary about half way into the site. Six small square shaped buildings are shown at about 80m to the north of the site.
Figure 13 Essex Sheet XCI .04 Published 1939 1:2,500	This map shows that the site had been designated as a brick works, although the buildings within the site were limited to a small rectangular structure adjacent the western boundary of the site and five small structures just inside the southern boundary. The latter appear to have been served by the track identified in the previous map. A brick field is identified adjacent the site to the south east, and this appears to have encroached onto the south eastern corner of the site. Outside the site boundary, a small number of residential houses are shown at about 200m to the north of the site.
Figure 14 Ordnance Survey Sheet TQ98NW Published 1961 1:10,000	This map shows the establishment of two rectangular buildings in the central part of the site and a further five smaller structures adjacent the western boundary. A further small building (not the transport building currently present) is shown in the south easern corner of the site. This map suggests that clay extraction within and adjacent the south eastern corner of the site had ceased, and the closest remaining pit was now approximately 100m to the east of the site. Outside the site boundary, the pumping station located at about 250m to the west is shown to have been demolished. Two further medium sized clay pits are also shown at distances of about 650m to the south and 900m to the north of the site; the former was served by a tramway. Great Wakering appears to have expanded westwards to within about 200m to the north east of the site.
Figure 15 Ordnance Survey Sheet TQ9387 Published 1966 1:2,500	This map indicates further development of the brickworks, including the establishment of the existing kilns and chimneys. Ponds are identified at approximately 80m of the site, and are likely to represent flooding of former clay pits. Further residential housing and a garage had developed approximately 200m to the north of the site. The map identifies the presence of sloping features between the site and the housing, and thus suggests that clay extraction had extended into this area.

Figure 16 Ordnance Survey Sheet TQ98NW Published 1971 1:10,000	No changes to the site are apparent at this scale. The clay pits shown in the vicinity of the site in previous maps are no longer identified.
Figure 17 Ordnance Survey Sheet TQ98NW Published 1976 1:10,000	This map shows that industrial units had been constructed adjacent the site to the north.
Figure 18 Ordnance Survey Sheet TQ9387 Published 1978 1:2,500	Two small buildings and a further chimney had been constructed in the north-eastern section of the site, and two small rectangular shaped buildings had been developed in the south-eastern corner of the site. The industrial units adjacent the site to the north formed part of Star Lane Industrial Estate, which is shown to have comprised seventeen small units, two plastics factories and a telephone exchange.
Figure 19 Ordnance Survey Sheet TQ9387 Published 1982 1:2,500	No significant changes are indicated within the site or surrounding area.
Figure 20 Ordnance Survey Sheet TQ98NW Published 1989 1:10,000	The map shows that the building located within the centre of the site had been significantly extended to the east. However, later map editions indicate this to be a separate building rather than an extension.
Figure 21 Ordnance Survey Sheet TQ9387 Published 1993 1:2,500	This map indicates the demolition of two small buildings located in the south-western section of the site.
Figure 22 Ordnance Survey Sheet TQ98NW Published 2005 1:10,000	No significant changes are indicated within the site boundary. The industrial estate to the north of the site had expanded. A path is shown to have been constructed running east-west adjacent the southern boundary of the site. A substantial amount of residential development had occurred in the vicinity of North Shoebury and extended to within about 400m to the south of the site.

6.2 Planning History

Records of planning applications submitted within the site boundary have been obtained from the Planning Department of Rochford District Council. The most significant of these are listed in Table 6.1 below. It should be noted that the approval of a planning application should not be taken as definitive proof that construction work actually took place.

Table 6.1 Records of Planning applications submitted at the site

Application Number	Date	Subject of Application	Decision
EEC/ROC/134 /48	07.12.48	Erection of open dryer shed (central part of site)	Approved
EEC/ROC/10/ 49	01.02.49	Erection of sand dryer and sand store (adjacent tunnel dryer)	Approved
EEC/ROC/315 /56	07.12.56	Erection of permanent office building to replace temporary office building (offices)	Approved
EEC/ROC/433 /57	20.12.57	Extension of machine shop (southern part of site adjacent tunnel dryer)	Approved
EEC/ROC/325 /58	08.09.58	Erection of works extension for processing clay (Main clay prep building)	Conditional Approval
EEC/ROC/209 /58	28.10.58	Extraction of Brickearth from 4.5 acres of land at Star Lane	Conditional Approval
EEC/ROC/210 /58	28.10.58	Use of 1.33 acres of land at Star Lane for the extraction of Brickearth	Conditional Approval
EEC/ROC/271 /58	08.05.59	Extraction of Brickearth from 32acres of land between Alexandra Road and Poynters Lane (south of brickworks)	Conditional Approval
EEC/ROC/457 /59	21.12.59	Additions and modifications to drying unit	Conditional Approval
EEC/ROC/42/ 63	26.02.63	Extension to offices	Approved
EEC/ROC/224 /63	14.10.63	Modernisation of brickworks including the erection of 8 kilns, 4 chimneys and 2 control rooms	Conditional Approval
T/ROC/312/65	06.07.65	Erection of 8 additional kilns, 2 control rooms and 4 chimneys (to north of existing kilns). Erection of fuel store and compressor house, extension to machine shop and mixing & milling shop, and re-siting of dutch barn.	Approved
T/ROC/235/66	27.09.66	Layout and construct roads and sewers	Conditional Approval
T/ROC/233/67	13.06.67	Erection of toilet block (adjacent stores) and construction of new drainage	Conditional Approval
ROC/413/71	21.10.71	Demolish existing canteen and erect new canteen next to existing toilet block	Conditional Approval

Table 6.1 ***continued***

ROC/625/76	01.12.76	Extend and enclose existing dutch barn and erect Drayton solid hearth gas fired kiln and chimney	Conditional Approval
ROC/772/78	27.09.78	Construction of additional Drayton solid hearth gas fired kiln and chimney in dutch barn	Conditional Approval
ROC/927/78	08.11.78	Permission to site porta-cabin as temporary office accommodation while an application is submitted to extend existing offices	Conditional Approval
ROC/11/79	07.03.79	Erect a maintenance workshop and convert existing workshop into offices and stores (both in south-east corner of site)	Conditional Approval
109/87	10.06.87	Erection of building for brick machine and dryer (southern part of site)	Conditional Approval
936/88	05.10.88	Erection of new gas fired, computer controlled kiln with blue pvc cladding and chimney (eastern part of site)	Conditional Approval
256/89	09.08.89	Extension to existing canteen and kitchen	Conditional Approval
1015/88	13.03.89	Restoration of former stockpile area, narrow gauge railway to Crouchman's Farm to be removed, landscaping, tree planting and temporary use of land for unloading and parking of earth moving machinery (land adjacent brickworks to south) – plans also indicate a fuel tank in this area	Conditional Approval
CM/0009/91/ROC	17.12.90	Winning, working and stockpiling of brickearth and ancillary matters including construction of conveyor, provision of access and restoration to agriculture of land on western side of Star Lane	No Decision
CM/00208/98	28.08.98	Relocation of brickearth stockpile area and Haul Road	Conditional Approval
CM/509/98	28.10.98	Lean-to extension to the clay preparation building	Conditional Approval
CM/00002/02	09.01.02	Continuation of brick imports from Cherry Orchard until 31.12.06 and modifications to CM/00208/98	No decision

6.3 Additional Information

A review of information held at Great Wakering Library and Southend Central Library has revealed that the brickworks opened in 1932 and production quickly rose to 13 million bricks per year. Information from the University of Essex has indicated that brick manufacture at Star Lane Brickworks was suspended in 1991, but that the works re-opened in 1994. The brickworks finally closed in April 2005. Information from the Industrial Narrow Gauge Railways Society's website has confirmed that Brickearth was previously transported to the

works from a nearby quarry by means of a narrow gauge railway. The railway ceased to operate in 1991 and was later dismantled.

6.4 Summary

The available historical information suggests that the site remained undeveloped until 1932 when a brickworks was constructed and a clay pit opened adjacent the site to the east. A map of 1939 indicates that the clay pit encroached onto the south eastern corner of the site at this time. By 1966 the brickworks had expanded to include the establishment of the existing kilns and chimneys. Planning records and other enquiries have revealed that a narrow guage railway was used to transport clay from nearby quarries to the brickworks, but that this was dismantled after 1991. The area adjacent the site to the south has remained undeveloped but was until recently used for the stockpiling of clay. Production at the brickworks ceased in 1991 but the site was re-opened in 1994 before finally closing again in 2005. The possibility of ground contamination having occurred as a result of the previous uses of the site and surrounding area is discussed further in Section 8.0 of this report.

7.0 ENVIRONMENTAL DATABASE INFORMATION

Enclosure B contains information derived from Environmental Databases for a radius of up to 2 kilometres from the site. The information contained therein covers data sets held by the following organisations:

British Geological Survey
Catalist Limited (Fuel Station Data)
Centre for Ecology and Hydrology
Health and Safety Executive
Health Protection Agency
English Nature
Environment Agency
Essex County Council
Ordanance Survey
Ove Arup and Partners
Peter Brett Associates
The Coal Authority
Thompson Directories

The results are presented in both summary and detailed form in Enclosure B. The main points of note within the database information are reviewed briefly below. The information has been categorised into the following data types:

Agency and Hydrological
Waste
Hazardous Substances
Geological
Industrial Land Use
Sensitive Land Uses

7.1 Agency and Hydrological

Discharge Consents: The databases show that the brickworks held a Discharge Consent for the release of surface water to a tributary of the River Thames approximately 150m to the northeast of the site. A further three consents are recorded within 1km of the site, the closest of which relate to the discharge of sewerage effluent into a soakaway approximately 500m to the southeast of the site. At about 850m to the west of the site, agricultural and surface effluents are discharged onto land, and at approximately 1km to the north of the site, surface water is discharged into Little Wakering Creek. None of these consents are likely to have affected the site.

Pollution Incidents to Controlled Waters: All of the four pollution incidents to controlled waters listed within 1km of the site have been categorised as Category 3 ('minor') incidents. The most proximal of these to the site occurred at a distance of approximately 266m to the north and involved the accidental spillage/leakage of waste oil. This is unlikely to have affected the site.

Licensed Water Abstractions: The databases record that a licensed groundwater abstraction was operated by Hanson Brick Limited at a location approximately 230m to the east of the site. The database states that the licence remains in perpetuity, but in practice it is unlikely that this has been used since closure of the brickworks in 2005. A further six abstractions, two of which are recorded to have been revoked, are listed within 1km of the site and are used for spray irrigation. The site does not lie within a Groundwater Source Protection Zone associated with any of these abstractions.

7.2 Waste

Registered Waste Transfer Sites: According to the database, a waste transfer site is located approximately 135m to the north-east of the site. The transfer site is licensed to accept household, commercial and industrial waste but as the activities undertaken comprise waste transfer rather than disposal this is unlikely to have affected the site.

Local Authority Recorded Landfill Sites: The databases suggest that the site is located on an area of landfill which extends approximately 1.1km to the east and 300m to the south of the site. In addition to this, landfill sites are also listed opposite the site to the west, approximately 490m to the south, approximately 740m to the northeast and approximately 770m to the north of the site.

Further enquires submitted to Rochford District Council have revealed that the landfill site recorded in the databases at 770m to the north of the site is in fact located at approximately 2km to the north-east. The landfill site was operational between 1970 and 1993 and was licensed to accept household, commercial and non-hazardous industrial waste.

Discussions with the Planning Department of Essex County Council have revealed that the remaining four landfill sites listed above, including the one shown to extend beneath the brickworks, represent areas where licences have been granted for mineral extraction. However, no mineral extraction has been undertaken to the south or west of the site. A small amount of excavation took place approximately 740m to the northeast of the site, but on completion the excavation was flooded to create a pond/lake. Brickearth has also been excavated to the east of the site, but the Council have stated that no landfill occurred in this

area, and that the land was restored to agricultural use on completion of the clay extraction. Essex County Council have also confirmed that the brickworks was developed from Greenfield.

7.3 Hazardous Substances

The databases list no companies within 1km of the site that are licensed to produce, handle or store hazardous substances.

7.4 Geological

BGS Recorded Mineral Sites: Five opencast mining operations are listed within 1km of the site, all of which have now ceased to be operational. Sand and gravel was extracted at a distance of about 200m to the east of the site and clay and shale were extracted from locations approximately 150m to the east, 800m to the north, 900m to the southeast and 1km to the northeast.

Ground Stability Hazards: The database indicates a moderate risk of subsidence due to collapsible ground and shrinking or swelling clay. However, this classification is likely to reflect the presence of clay beneath the site and clay extraction in the vicinity, and does not necessarily indicate that subsidence has occurred in the area. No risks of ground instability as a result of shallow mining, compressible ground, running sand or ground dissolution are reported.

Radon Gas: According to the database less than 1% of homes in the area are above the radon action level and consequently no radon protective measures are necessary in the construction of new dwellings.

7.5 Industrial Land Use

Trade Directories: The database lists 14 active commercial and industrial properties within 250m of the site, all of which are located within the adjacent Star Lane Industrial Estate. These include three garage services, two engineering firms, a sheet metal works, a screen printing firm, a car breakdown and recovery service, an injection moulding plastics company, two car body repair workshops, a printing works, a road haulage operator and an air conditioning firm 199m to the north. Between 251 and 1,000m from the site there are a further three commercial and industrial properties listed. These are a car dealership 301m to the north and garage services 790m and 916m to the northeast of the site.

Fuel Station Entries: One closed petrol filling station (PFS) is recorded in the database at a distance of 301m to the north of the site.

7.6 Sensitive Land Uses

The database shows that the site is surrounded by, but not included in, areas of Green Belt. No major ecological receptors or other sensitive land uses are recorded within 1km of the site.

8.0 INITIAL CONCEPTUAL MODEL

A qualitative risk assessment of the site was undertaken utilising the information obtained in the preceding desk study section of this report in order to facilitate the development of an initial conceptual site model (CSM).

The risk of contamination is assessed through the accepted Source-Pathway-Receptor linkage approach ('pollutant linkage'), where the **source** is defined as a function of the nature of the contaminants that may be present, and the harm that they may present. The **pathway** is the route in the environment by which the contaminants may be transferred, and the **receptor** is the point at which damage may occur if the contaminant is present at a level sufficient to cause harm. A pathway linking an identified contamination source and a receptor must first be established for a contaminated land hazard to exist and before any other secondary considerations to the effects and the need/requirement for remediation.

In the preparation of this assessment, four broad types of **receptors** are considered with respect to the development sites, an approach that is consistent with current industry best practice. These are

- Human Health (Site Workers, Occupiers and Off-Site Residents)
- Development End Use (Buildings, Hardstandings, Domestic Garden Areas etc)
- Controlled Waters (Groundwater and Surface Water Resources)
- Ecological Receptors (Nature Reserves, Environmentally Sensitive Areas, SSSIs, etc)

At this stage, the **sources** of ground contamination can only be considered as potential sources until proven and hence the assessment is qualitative. For the purpose of this assessment the potential sources have been split between **on-site** and **off-site**.

The desk study research has revealed that the site was developed from Greenfield into a brickworks in 1932. Alterations to the site layout have occurred during its operation until the closure of the site in 2005. In general, the use of the site for brick manufacture is likely to present a low risk of ground contamination. However, the presence of oil drums, fuel and oil storage tanks and associated pipework within the site could constitute a potential **on-site source** of hydrocarbons (diesel, engine oil and hydraulic oil) and heavy metals. Similar contaminants could have been generated by the narrow gauge railway previously used to transport clay soil onto the site. The electricity substation in the southern section of the site could also constitute a potential **on-site source** of polychlorinated biphenyls (PCBs) and other dielectric oils.

The SLR Report indicates that calcium chloride solution, used as an additive during the brick making process, has also been stored at the site. However, this is of low toxicity and is non-persistent, and is therefore considered to present a low risk of ground contamination. Discussions with Essex County Council and Rochford District Council have revealed that the site and surrounding area have not been used for landfill. The release of inorganic sulphur and nitrogen salts to the air is typically associated with brick kilns, but it is unlikely that significant quantities of these substances would have been deposited and accumulated in the soils beneath the site.

Star Lane Industrial Estate adjacent the site to the north contains a number of manufacturing units and other industrial works, which constitute of potential **off-site sources** of ground

contamination. Potential contaminants that could occur as a result of these activities could include heavy metals, hydrocarbons, sulphates, acids/alkalis (low/high soil pH) solvents and other volatile organic compounds (VOCs).

The geological map records the site to be underlain by Brickearth, which is classified as a non-aquifer and is typically of low permeability. However, the transfer of contaminants could still occur through pores or fissures within the subsoil to adjacent watercourses (controlled water **receptors**). Direct run-off into surface water drains could also take place. In addition, the development end use and human **receptors** have the potential to come into direct contact with contaminated materials.

The CSM thus suggests that the accepted contaminated land hazard identification convention (Source-Pathway-Receptor linkage) may be completed for this site with respect to human health, development end use and controlled water receptors and major ecological receptors. A ground contamination risk prioritisation is presented in Section 9.3.

As discussed in Section 4.0, the site is surrounded to the west, east and south by areas of Green Belt, but this does not constitute a major ecological receptor. The closest ecological receptors to the site are located some 1.5km to the northeast and 2km to the southeast of the site. In view of this distance together with the generally low risk of contamination from the site and the likely low permeability of the underlying Brickearth, in practice it is unlikely that contamination from the site could affect the ecological receptors identified. The accepted 'pollutant linkage' is therefore unlikely to be completed with respect to major ecological receptors.

9.0 PRLIMINARY RISK ASSESMENT

9.1 Geotechnical Assessment

At the present time there is little information available regarding the Engineering properties of the underlying Brickearth, largely due to the lack of previous development in the area. However, previous experience of similar soils suggests that the use of conventional pad or strip foundations may be feasible for lightly loaded structures such as 2-3 storey domestic dwellings. For larger or heavier structures such as multi-storey apartments, it is likely that piled foundations would be the most appropriate solution. A physical investigation is recommended to provide quantitative information for foundation and pavement design.

The presence of selenite crystals (calcium sulphate) within the London Clay could generate increased concentrations of soluble sulphate. This may necessitate the requirement for additional protective measures to buried concrete, particularly if piled foundations are required. This risk should be quantified by means of appropriate laboratory testing of soil and groundwater samples.

9.2 Ground Contamination Risk Prioritisation

Tables 9.1 and 9.2 illustrate a risk prioritisation of pollutant linkages that may be present as a result of **on-site sources** and **off-site sources** respectively. Details of the **pathway** and **receptor** considerations in the risk prioritisation are presented below.

Potential **receptors**: Humans (Site workers and end users, offsite residents)
Development end use (Buildings, hardstandings, services/utilities and limited landscaped areas)
Controlled Waters (Proximal surface water courses)

Potential **pathways**: Humans: Ingestion, skin contact, inhalation of indoor and outdoor air
Development End Use: Contact
Controlled Waters: Surface run-off and lateral migration within underlying soils

The significance of 'pollutant linkages' has been assessed as low, moderate or high based upon the following definitions:

- Low: No significant linkage exists and / or the potential for future impact is considered to be minimal.
- Moderate: The linkage exists however there is insufficient field or laboratory data to confirm the link.
- High: The linkage exists and the availability of data indicates remedial action may be required to address potential liability issues.

The assessment relates the relevance of these features to the site under consideration and assumes the redevelopment of the site into residential properties.

Table 9.1 Ground Contamination Assessment with respect to on-site sources

On-site sources	Potential contamination	Pathway	Receptor	Risk
Above ground oil and diesel storage tanks and associated pipework, and oil drums	Hydrocarbons Heavy metals	Contact Ingestion Inhalation	Humans (construction workers)	Moderate
			Humans (site end users, off-site residents)	Moderate
		Contact	Development End Use	Moderate
Former narrow gauge railway	Residual hydrocarbons Heavy metals	None (underlying soils are classified as a non-aquifer)	Controlled Waters: Groundwater	Low
Electricity substation	PCBs			
		Surface run-off and lateral migration through soils	Surface waters	Moderate
Demolition of former buildings and materials in exisiting buildings	Asbestos	Contact Ingestion Inhalation	Humans (construction workers)	High
			Humans (site end users) and development end use	Low

The above assessment indicates that the risk of significant harm to human receptors and the development end use should be considered moderate, although the risk to site end users would decrease if the finished development did not include domestic gardens. The risk to surface water bodies is considered moderate because of their proximity to the site.

Asbestos containing materials were observed within a number of the existing buildings at the site, hence the 'high' risk classification adopted in the above table with regard to construction/demolition workers. It is recommended that a detailed 'Type 3' asbestos survey be undertaken prior to demolition of the existing structures. However, risks to the health of construction workers should be minimised by the use of appropriate working practices and personal protective equipment. There should be no significant risk to site end users, the proposed development end use or controlled water receptors from asbestos provided that safe working practices are adopted during the construction phase.

Table 9.2 Ground Contamination Assessment with respect to off-site sources

Off-site sources	Potential contamination	Pathway	Receptor	Risk
Garage services, printers, engineering firms, plastics factory and other industry adjacent the site to the north	Hydrocarbons Heavy metals Sulphates Acids/alkalis VOCs (including chlorinated solvents)	Contact Ingestion Inhalation	Humans (construction workers)	Moderate
			Humans (site end users, off-site residents)	Moderate
		Contact	Development End Use	Moderate
		None	Controlled Waters: Groundwater	Low
		Surface run-off and lateral migration through made ground	Surface waters	Moderate

The assessment indicates the possibility of contamination at the site from the potential off-site sources identified above. The risk of significant harm to humans, the development end use and surface waters is considered to be moderate due to the proximity of the potential sources to the site. However, the responsibility for contamination from off-site sources would lie with the respective site owners/occupiers.

9.3 Soil Gas Hazard

Discussions with Essex County Council have revealed that no landfill has taken place beneath the site or in the immediate vicinity. Further discussions with Rochford District Council have revealed that the closest recorded landfill site is approximately 2km to the northeast of the site. In practice it is unlikely that the migration of landfill gases would occur over this distance. Therefore, on the basis of current information it is unlikely that soil gas protection measures would be required for new development on the site, but it would be prudent to confirm this by means of a gas monitoring regime as part of any future site investigation works.

9.4 Planning Considerations

Information from the Planning Department of Rochford District Council has revealed that the site has been designated as Employment Land under the Rochford District Replacement Local Plan, adopted in February 2006. Development end uses normally permitted on such sites are Class B1 (Business), Class B2 (General industrial) and Class B8 (Storage). Provision made for new housing developments until 2011 have identified six key development sites which are located some distance from the site under consideration. It is therefore recommended that consultations with the relevant authorities be initiated at an early stage if these have not already been undertaken to avoid delays during the Planning process.

9.5 Summary of Identified Ground Risks

Table 9.3 summarises the main risks to the proposed development by the desk study as perceived by DTS Raeburn. A risk classification has not been included, as this would need to include a likely cost-benefit analysis, which is outside the scope of this report. The list of hazard/risks tabulated is not exhaustive and should be read in conjunction with the main text of the report.

Table 9.3 Main risks to proposed development as identified by desk study

HAZARD/RISK	CAUSE	POSSIBLE IMPACT/ CONSEQUENCE	RECOMMENDATIONS
Need for piled foundations or ground improvement	Site shown to be underlain by Brickearth, but no Engineering data currently available. Previous experience suggests piled foundations are likely to be required for heavy structures, but shallow foundations may suffice for 2-3 storey dwellings	Higher costs and possible programming issues	Site investigation required
Naturally occurring soluble sulphates	Presence of selenite crystals (calcium sulphate) within London Clay	May necessitate additional protective measures for buried concrete, particularly for piled foundations	Appropriate laboratory tests to be included as part of site investigation works
Potential soil and groundwater contamination	Potential 'pollutant linkages' as identified in preceding sections	Need for consideration of all remedial options or soil removal. May affect cost of soil disposal, and buried concrete classification	Site investigation required

10.0 LIMITATIONS AND USE OF THIS REPORT

IMPORTANT: This section should be read before reliance is placed on any of the opinions, advice, recommendations and conclusions contained in this report.

a) This report has been prepared at the request of Stirling Maynard and Partners to provide advice to JG Great Wakering LLP and Anglo Irish Finance Plc ('the Client') pursuant to their appointment of DTS Raeburn Limited in connection with the desk study;

b) Except for JG Great Wakering LLP and Anglo Irish Finance Plc no duty is undertaken or warranty or representation made to any party in respect of the opinions, advice, recommendations or conclusions contained in this report;

c) All work carried out in preparing this report has used, and is based upon DTS Raeburn's professional knowledge and understanding of the current (November 2006) relevant English, Scottish and European Community standards and codes, technology and legislation. Changes in the above may cause the opinion, advice, recommendations or conclusions set out in this report to become inappropriate or incorrect. Following delivery of this report, DTS Raeburn will have no obligation to advise the Clients of any such changes or of their effects. It may therefore be necessary to review the opinions, advice, recommendations and conclusions of this report following future changes to legislation;

d) Some of the information referenced and included in the desk study has been provided by third parties and whilst DTS Raeburn has no reason to doubt the accuracy, these items have not been verified. DTS Raeburn accepts no responsibility for errors within third party materials referenced and presented in this report;

e) The content of this report represents the professional opinion of experienced geotechnical and environmental specialists. DTS Raeburn does not provide associated legal advice and the advice of lawyers will be required in this regard;

f) The lack of evidence of the presence of hazardous materials, voids or obstructive features at the subject property does not guarantee the absence of such materials/features rather it indicates only that none was found as a result of the services provided.

For DTS RAEBURN Ltd

.....	.....
J. Brown BSc	**A. B. C. Obinwa BEng MSc CEng MICE**
Geo-environmental Engineer	**Managing Director**

E11997/1 – December 2006

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FIGURE 1

Site Location Plan
Scale 1:250,000

E11997/1: Star Lane, Great Wakering
Client: JG Great Wakering LLP

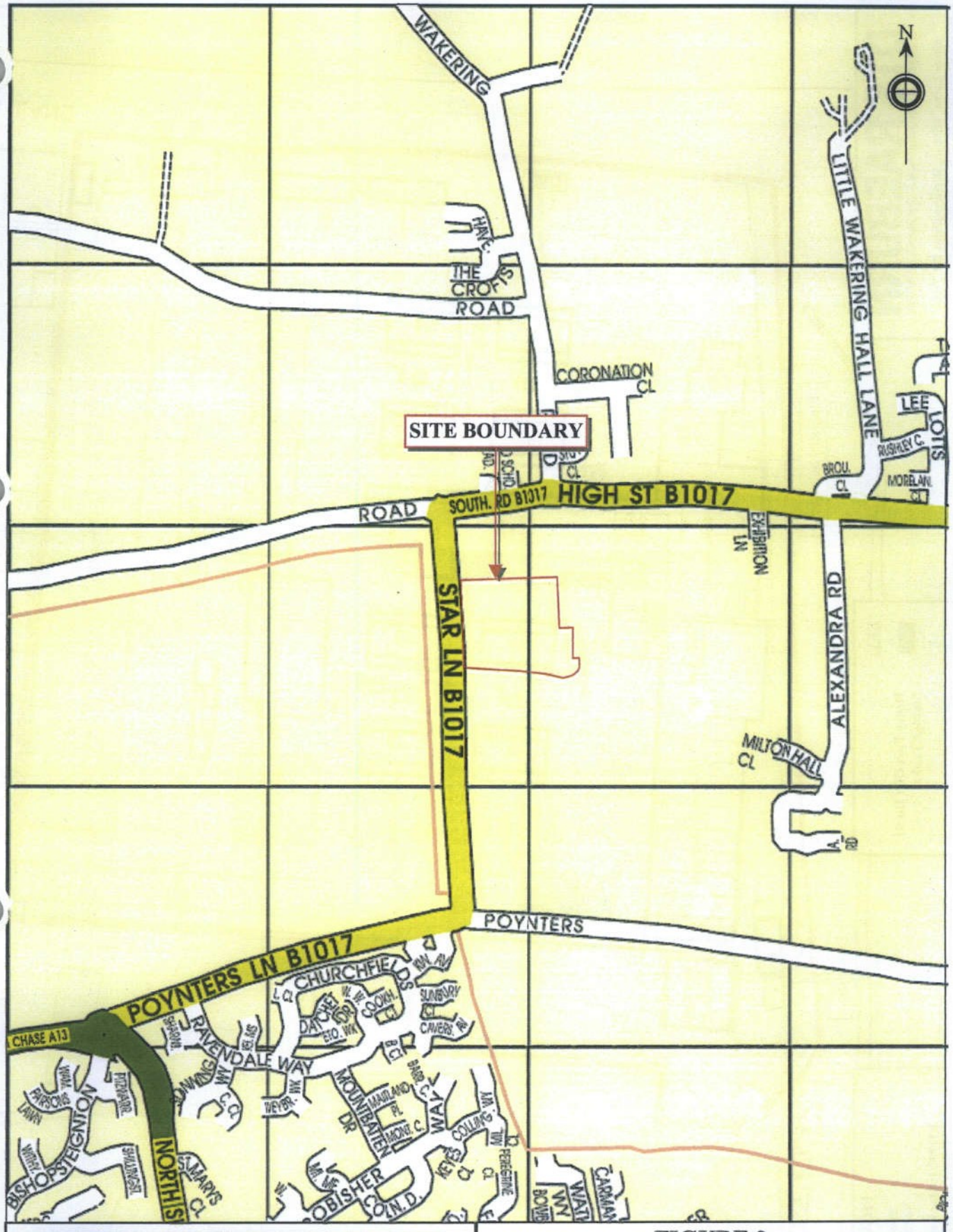

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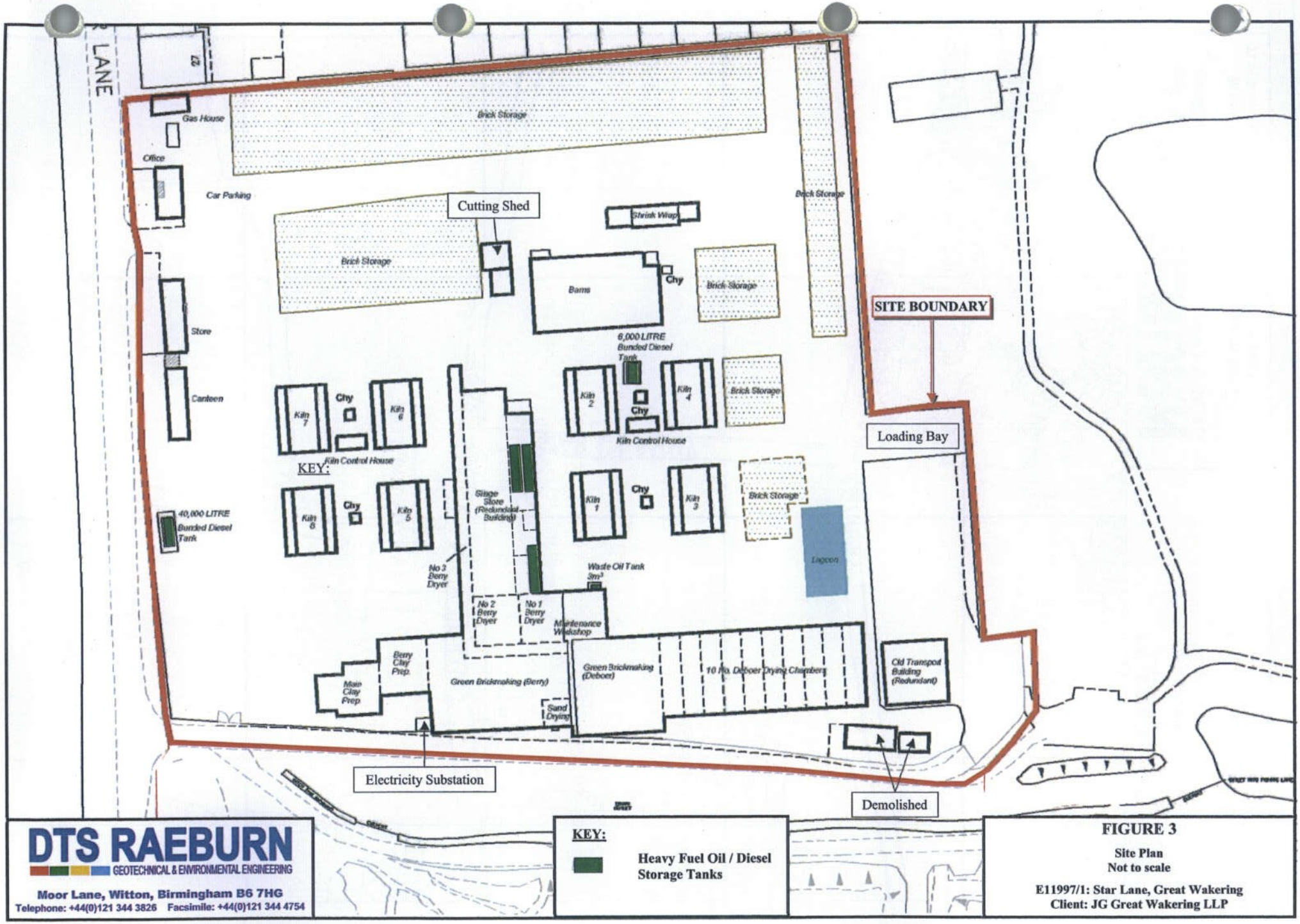
FIGURE 2

Street Map
Not to Scale

E11997/1: Star Lane, Great Wakering
Client: JG Great Wakering LLP



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KEY:

Heavy Fuel Oil / Diesel Storage Tanks

FIGURE 3

Site Plan
Not to scale

E11997/1: Star Lane, Great Wakering
Client: JG Great Wakering LLP

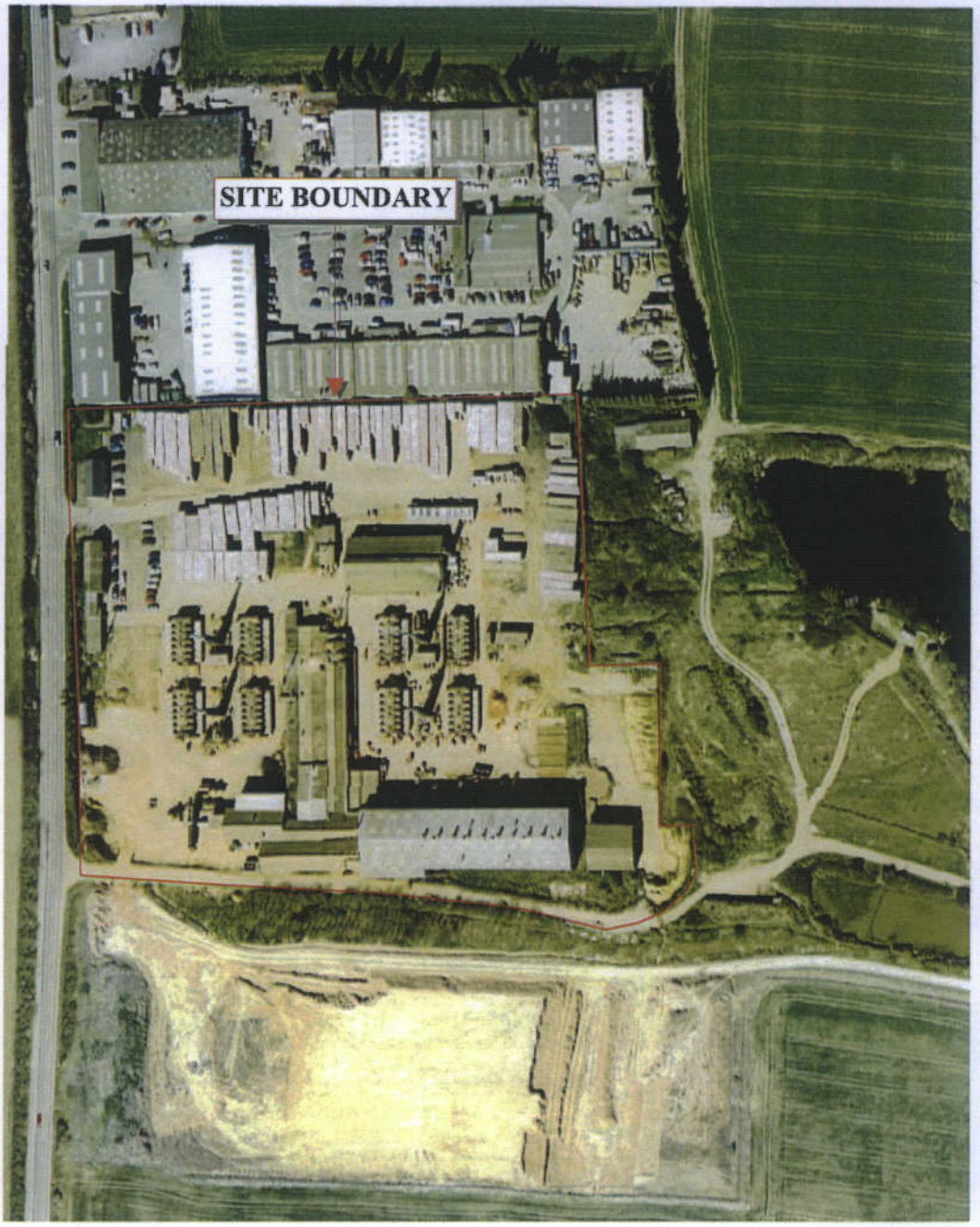

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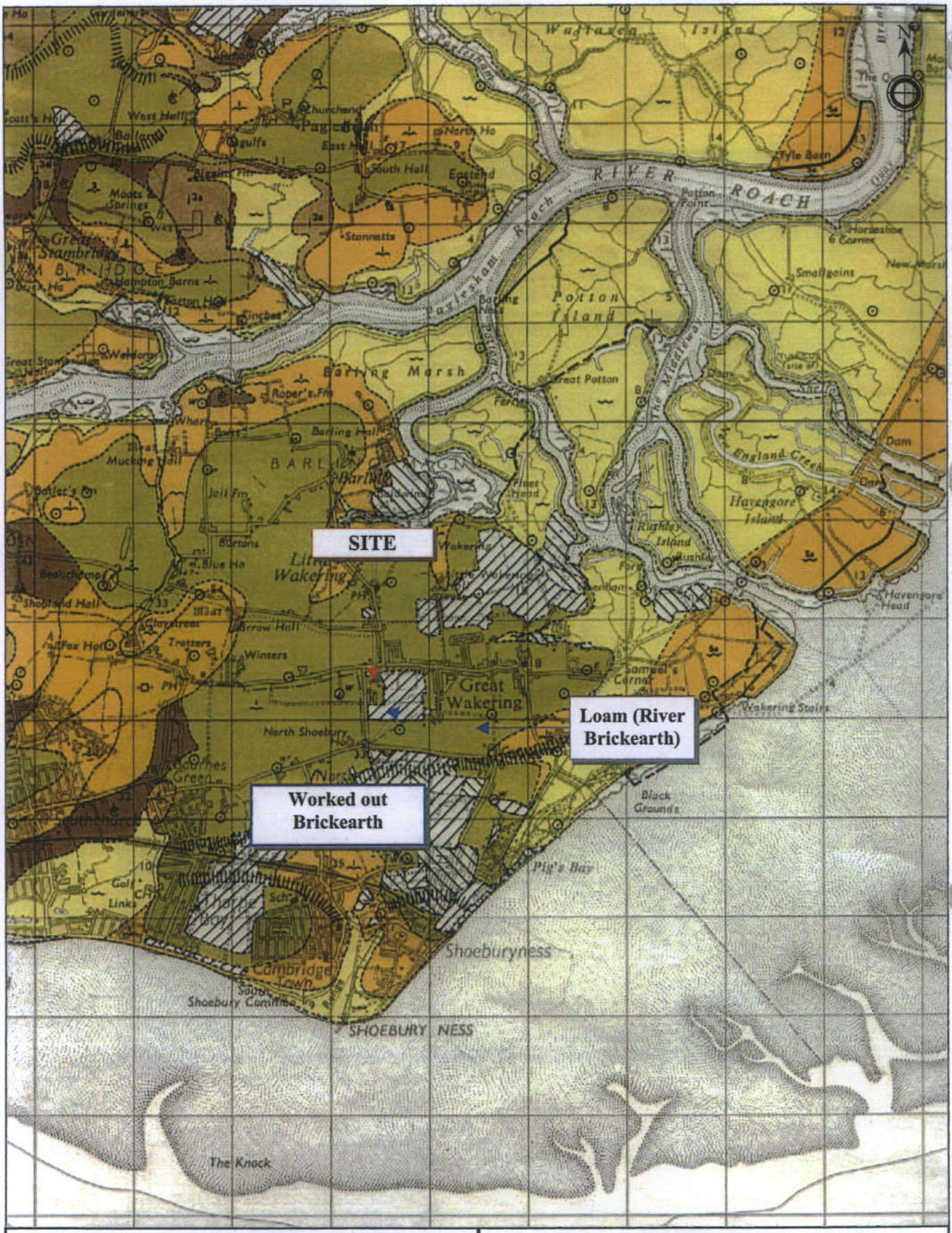
FIGURE 4

Satellite Image
Not to Scale

E11997/1: Star Lane, Great Wakering
Client: JG Great Wakering LLP



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GEOTECHNICAL & ENVIRONMENTAL ENGINEERING

Moor Lane, Witton, Birmingham B6 7HG

Telephone: +44(0)121 344 3826 Facsimile: +44(0)121 344 4754

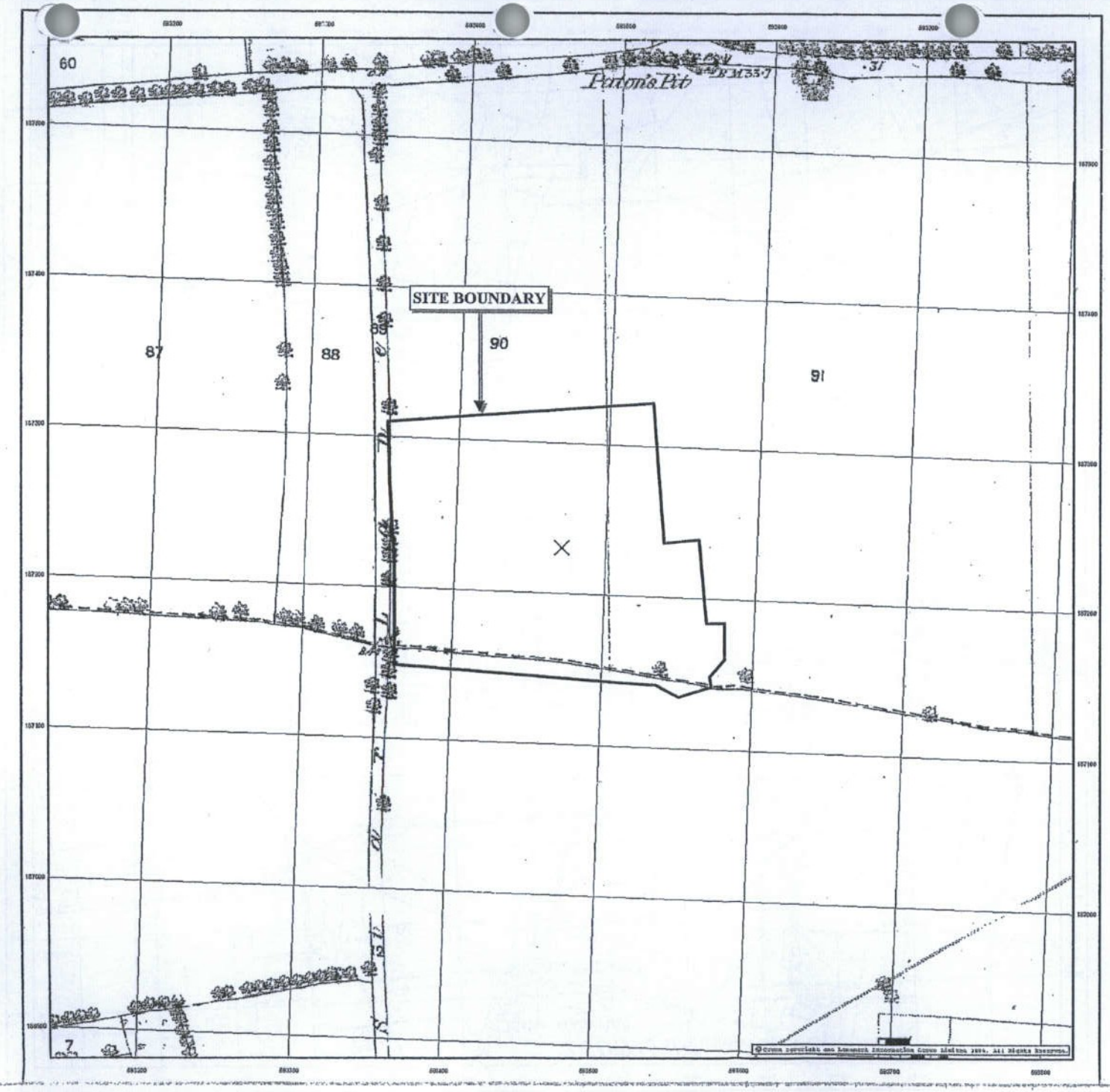
FIGURE 5

Extract from BGS Sheets 258/259 (Solid and Drift Edition)

Scale 1:50,000

E11997/1: Star Lane, Great Wakering

Client: JG Great Wakering LLP



DTS RAEBURN

GEOTECHNICAL & ENVIRONMENTAL ENGINEERING

CLIENT DETAILS Envirocheck Order No. EC20603860_1_1

Customer Ref: MR S Johnson,01 1997/1
Dts Raeburn Ltd
Moor Lane Wilton
Birmingham
B6 7HG

SITE DETAILS Grid Reference 593470 187230

Raeburn Brick
Star Lane Works
Star Lane
Great Wakering
Essex SS30PP

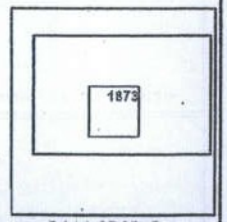
Historical Map Legend

Quarry
Sand Pit
Marsh
Reeds
Gravel Pit
Clay Pit
Rough Pasture
Furze
Refuse Heap
Shingle
Osiers
Ford
Railway crossing River or Canal
Railway crossing Road
Level Crossing
Embankment
Cutting
Road crossing Railway
Road over single Stream
Road over River or Canal
Arrow denotes flow of Water

Ordnance Survey County Series 1

The historical maps shown were reproduced from maps produced mostly held at the scale adopted for England, Wales and Scotland in the 1840's, in 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1880 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given on the right is often some years later than the surveyed date. Before 1935, all OS maps were based on the Cassini Projection, with independent surveys of a village or county or group of counties, giving rise to significant inaccuracies in outlying areas.

ESSEX
Published 1873
Source map scale - 1:2,500



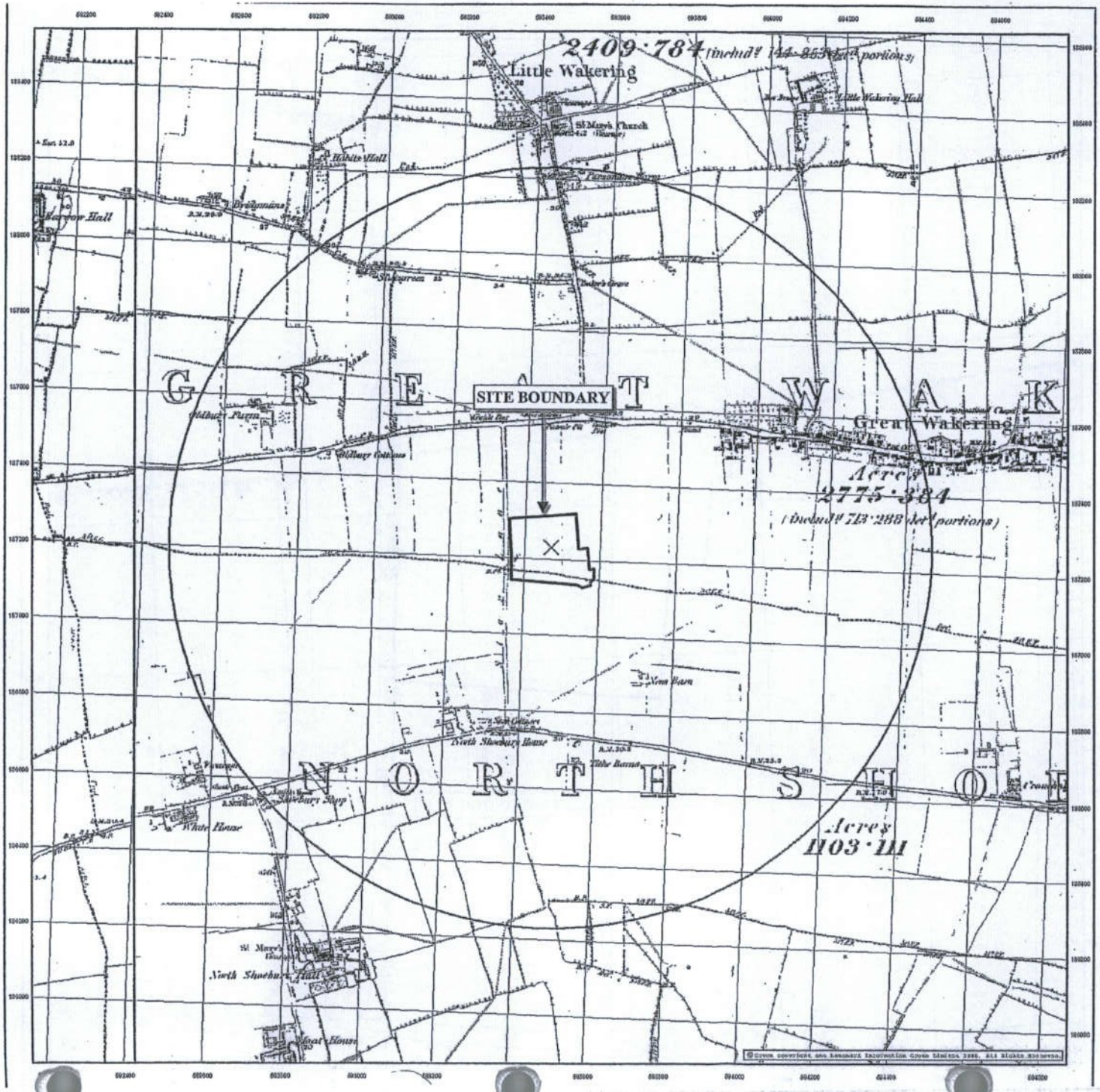
Date(s) of Publication

FIGURE 6

Ordnance Survey Licensed Partner

LANDMARK Information Group

Produced by Landmark Information Group Limited. Tel: 0870 850 6570 Fax: 0870 850 6571



DTS RAEBURN

GEOTECHNICAL & ENVIRONMENTAL ENGINEERING

CLIENT DETAILS Envirocheck Order No. EC20603860_1_1

Customer Ref: MR'S Johnson,E119971
Dts Raeburn Ltd
Moor Lane Witton
Birmingham
B6 7HG

SITE DETAILS Grid Reference 593470 187230

Hanson Brick
Star Lane Works
Star Lane
Great Wakering
Essex SS30PP

Historical Map Legend

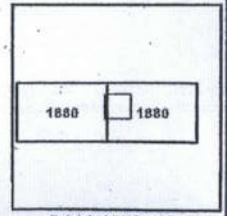
- Quarry
- Shingle
- Railway over Road
- Road over Railway
- Gravel Pit
- Sand Pit
- Level Crossing
- Railway over River
- Other Pits
- Road over Stream
- Road over Stream
- Rough Pasture
- Furze
- Road over River or Canal
- Marsh
- Reeds
- Sunken Road
- Raised Road
- Osiers
- Instrumental Contour
- Arrow denotes flow of Water
- Sketched Contour

Ordinance Survey County Series 1

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given on the right hand side is often some years later than the surveyed date. Before 1855 all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies at edging areas.

In the late 1840's, a revised Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unlabelled - with all military camps and other strategic sites removed. These maps were initially overlaid with the National Grid. In 1890, the first 1:20,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

ESSEX
Published 1880
Source map scale - 1:10,560



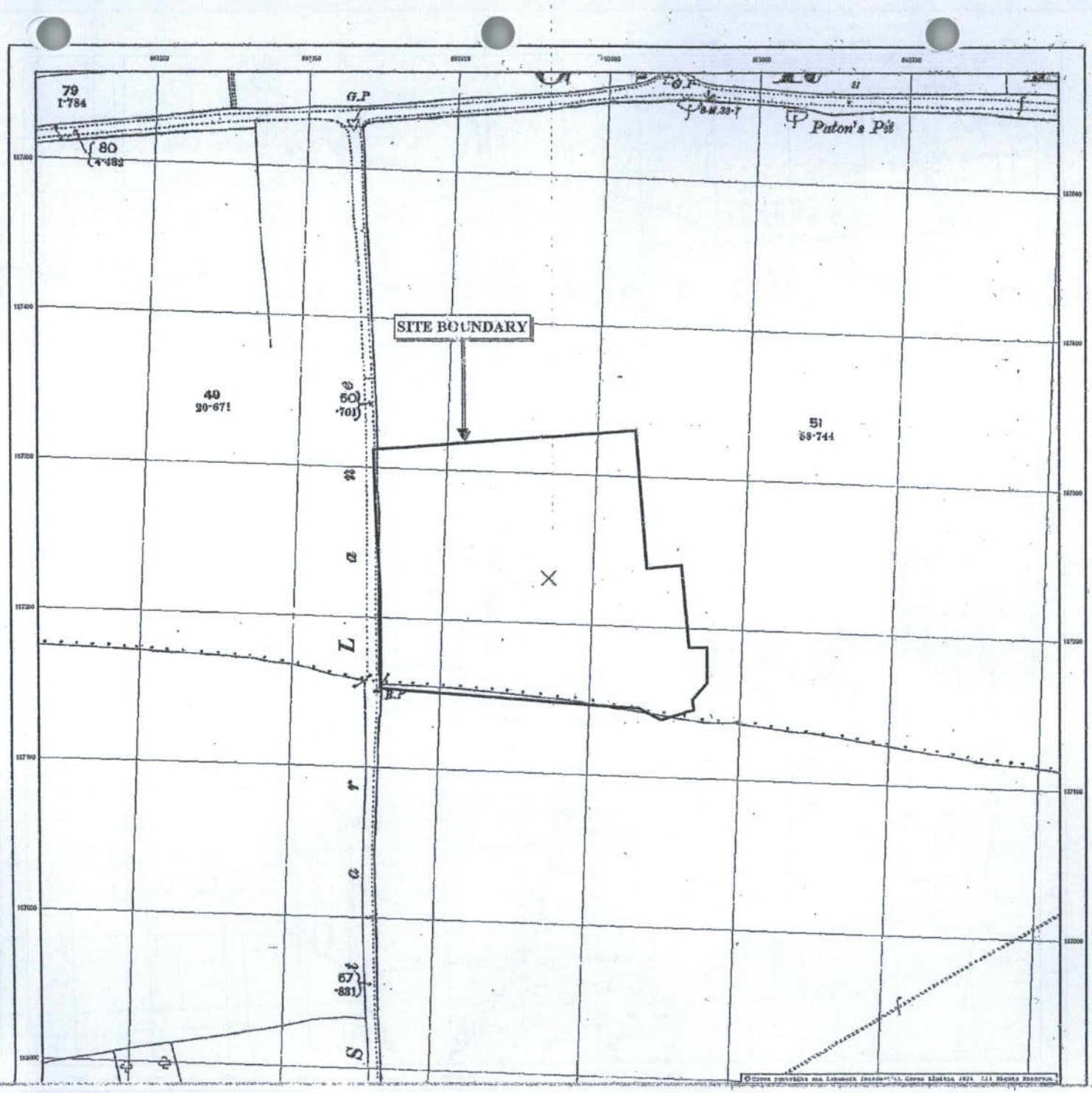
Date(s) of Publication

FIGURE 7

Ordnance Survey Licensed Partner

LANDMARK Information Group

Produced by Landmark Information Group Limited Tel: 0870 850 6570



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GEOTECHNICAL & ENVIRONMENTAL ENGINEERING

CLIENT DETAILS Envirocheck Order No. EC20603860_1_1

Customer Ref: MR S Johnson,21190771
Dts Raeburn Ltd
Moor Lane Wilton
Birmingham
B8 7HG

SITE DETAILS Grid Reference 593479 187230

Hanson Brick
Star Lane Works
Star Lane
Great Wakering
Essex SS30PP

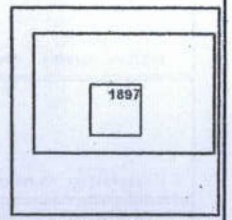
Historical Map Legend

Quarry
Sand Pit
Marsh
Reeds
Gravel Pit
Clay Pit
Rough Pasture
Furze
Refuse Heap
Shingle
Osiers
Ford
Railway crossing River or Canal
Railway crossing Road
Level Crossing
Embankment
Cutting
Road crossing Railway
Road over Single Stream
Road over River or Canal
Arrow denotes flow of Water

Ordnance Survey County Series 2

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's: in 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1888 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given to the right is often some years later than the surveyed date. Before 1952, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

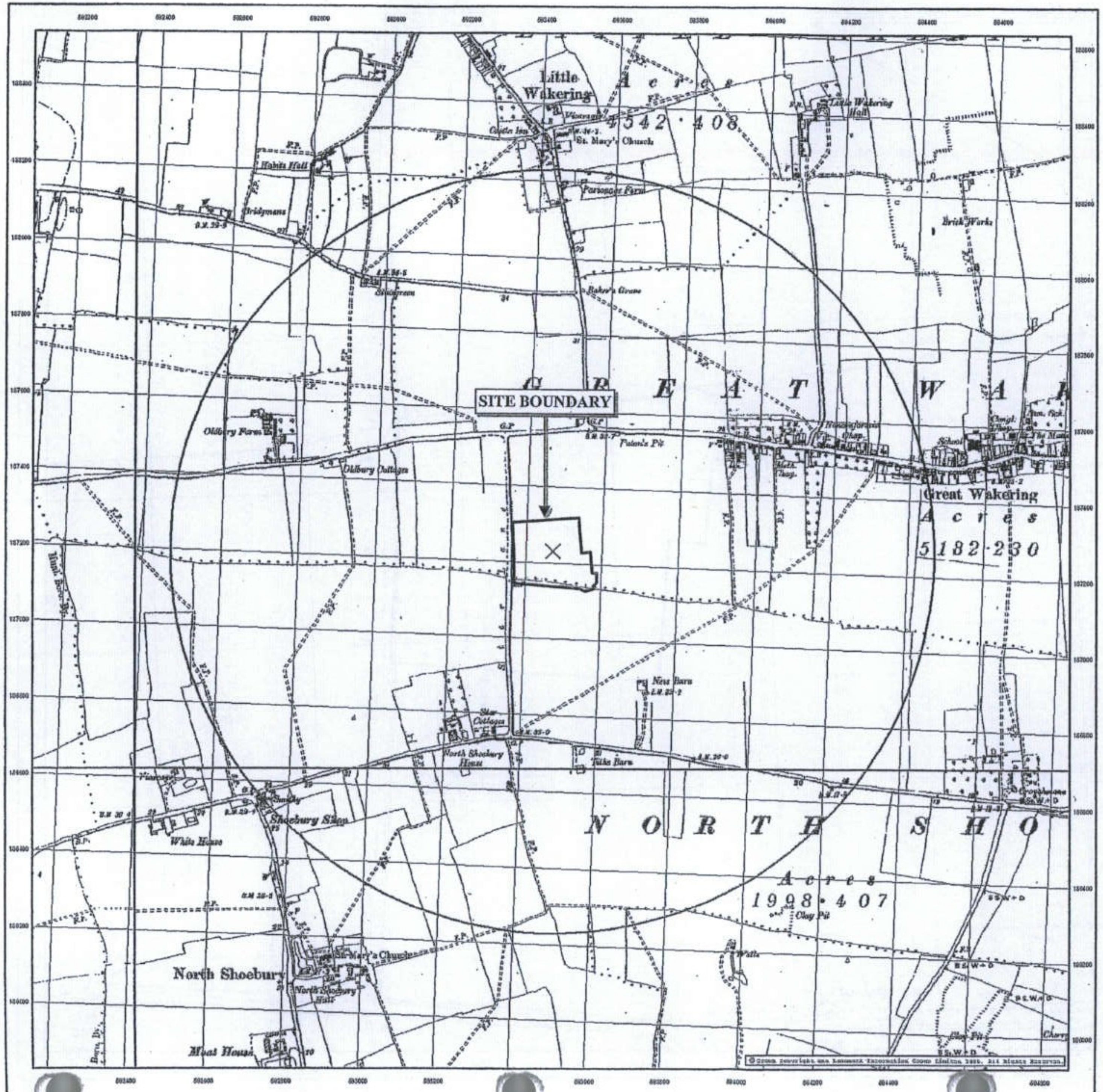
ESSEX
Published 1897
Source map scale - 1:2,500



Date(s) of Publication

FIGURE 8

Ordnance Survey
LANDMARK®



DTS RAEBURN

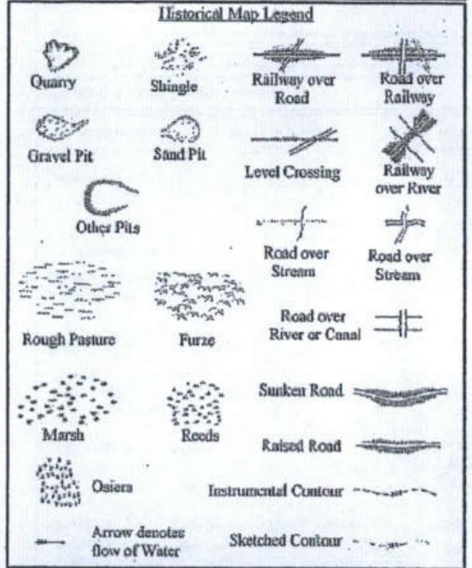
GEOTECHNICAL & ENVIRONMENTAL ENGINEERING

CLIENT DETAILS Envirocheck Order No. EC20603860_1_1

Customer Ref: MR S Johnson,E1190771
Dts Raeburn Ltd
Moor Lane Witton
Birmingham
B6 7HG

SITE DETAILS Grid Reference 593470 187230

Hanson Brick
Star Lane Works
Star Lane
Great Wakering
Essex SS30PF



Ordnance Survey County Series 2

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given on the right therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

ESSEX
Published 1898
Source map scale - 1:10,560

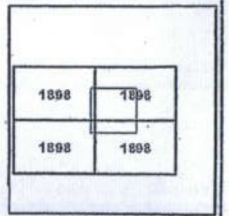


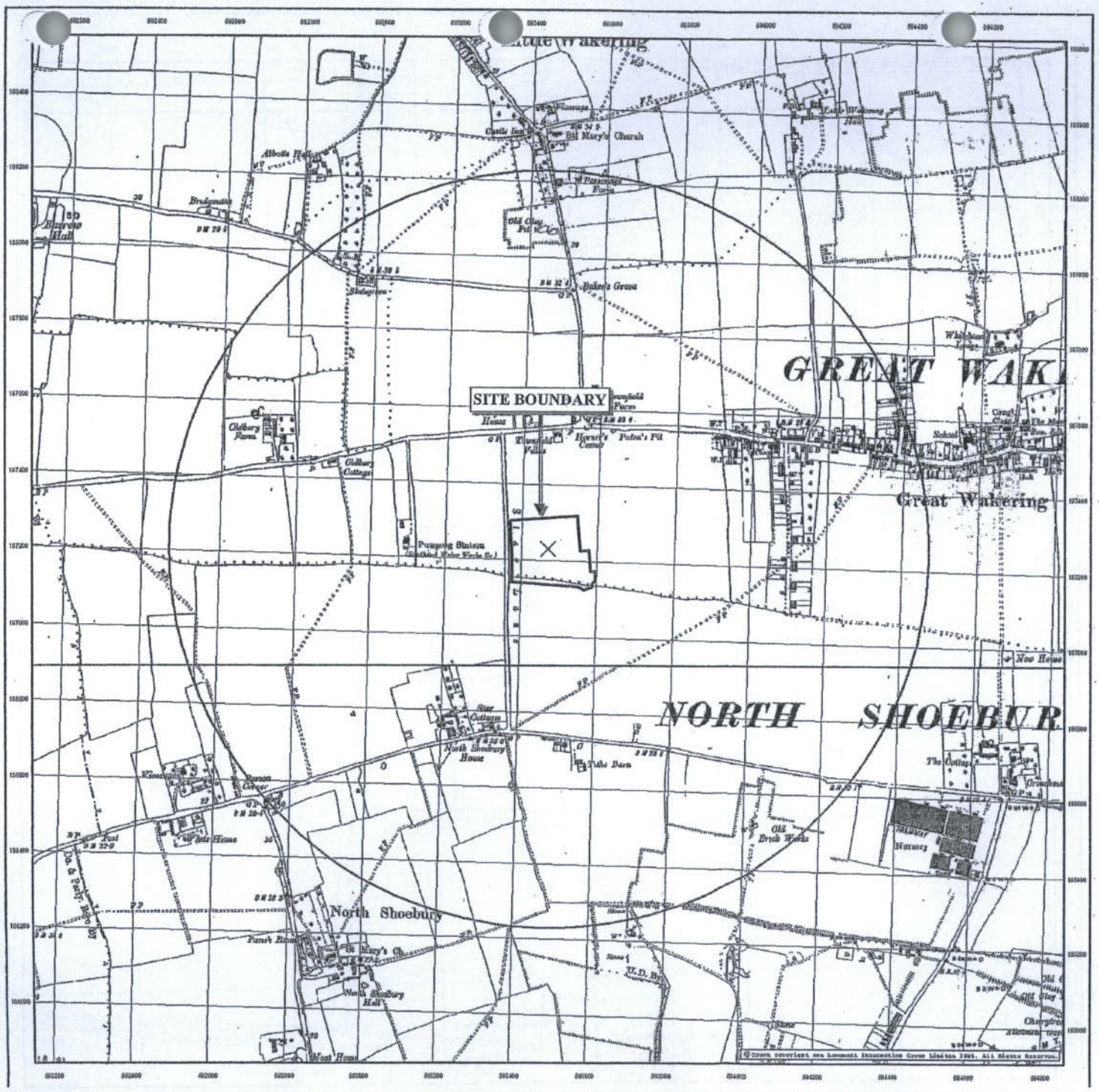
FIGURE 9

Date(s) of Publication

Ordnance Survey Licensed Partner

LANDMARK Information Group

Produced by Landmark Information Group Limited. Tel: 0870 850 6670



DTS RAEBURN

GEOTECHNICAL & ENVIRONMENTAL ENGINEERING

CLIENT DETAILS Envirocheck Order No. EC20603860_1_1

Customer Ref: Mr S Johnson,B110071
Dts Raeburn Ltd
Moor Lane Witton
Birmingham
B6 7HG

SITE DETAILS Grid Reference 593470 187230

Hanson Brick
Star Lane Works
Star Lane
Great Wakering
Essex SS30PP

Historical Map Legend

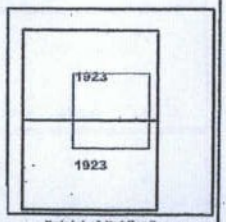
Quarry
Shingle
Railway over Road
Road over Railway
Gravel Pit
Sand Pit
Level Crossing
Railway over River
Other Pits
Road over Stream
Road over Stream
Rough Pasture
Furze
Road over River or Canal
Marsh
Reeds
Sunken Road
Raised Road
Osiers
Instrumental Contour
Arrow denotes flow of Water
Sketched Contour

Ordnance Survey County Series 3

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given on the right therefore is often some years later than the surveyed date. Before 1855, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in overlying areas.

In the late 1840's a Provisional Edition was produced, which updated the 1:10,560 map plan from a variety of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

ESSEX
Published 1923
Source map scale - 1:10,560



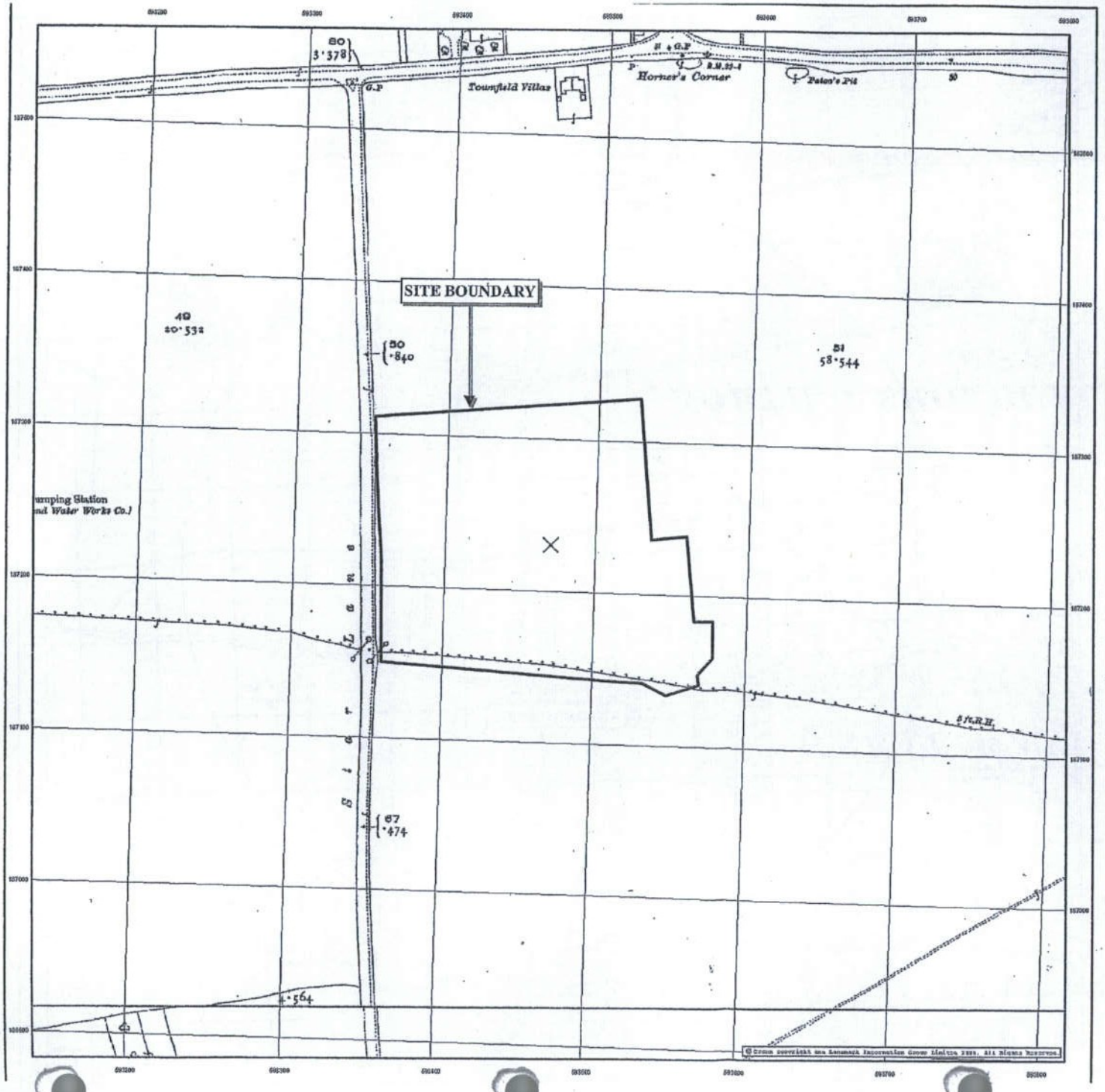
Date(s) of Publication

FIGURE 10

Ordnance Survey Licensed Partner

LANDMARK Information Group

Produced by Landmark Information Group Limited. Tel: 0870 850 6870 Fax: 0870 850 6871



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GEOTECHNICAL & ENVIRONMENTAL ENGINEERING

CLIENT DETAILS Envirocheck Order No. EC20803860_1_1

Customer Ref: MR S Johnson,01192721
Dts Raeburn Ltd
Moor Lane Witton
Birmingham
B6 7HG

SITE DETAILS Grid Reference 593470 187230

Hanson Brick
Star Lane Works
Star Lane
Great Wakering
Essex SS30PP

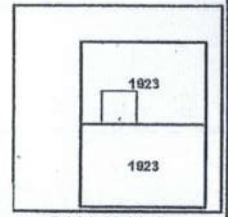
Historical Map Legend

Quarry
Sand Pit
Marsh
Reeds
Gravel Pit
Clay Pit
Rough Pasture
Furze
Refuse Heap
Shingle
Osiers
Ford
Railway crossing River or Canal
Railway crossing Road
Level Crossing
Embankment
Cutting
Road crossing Railway
Road over single Stream
Road over River or Canal
Arrow denotes flow of Water

Ordnance Survey County Series 3

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1890 it covered the whole of what were considered to be the cultivated parts of Great Britain. The publication date given on the right is often some years later than the surveyed date. Before 1855, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

ESSEX
Published 1923
Source map scale - 1:2,500

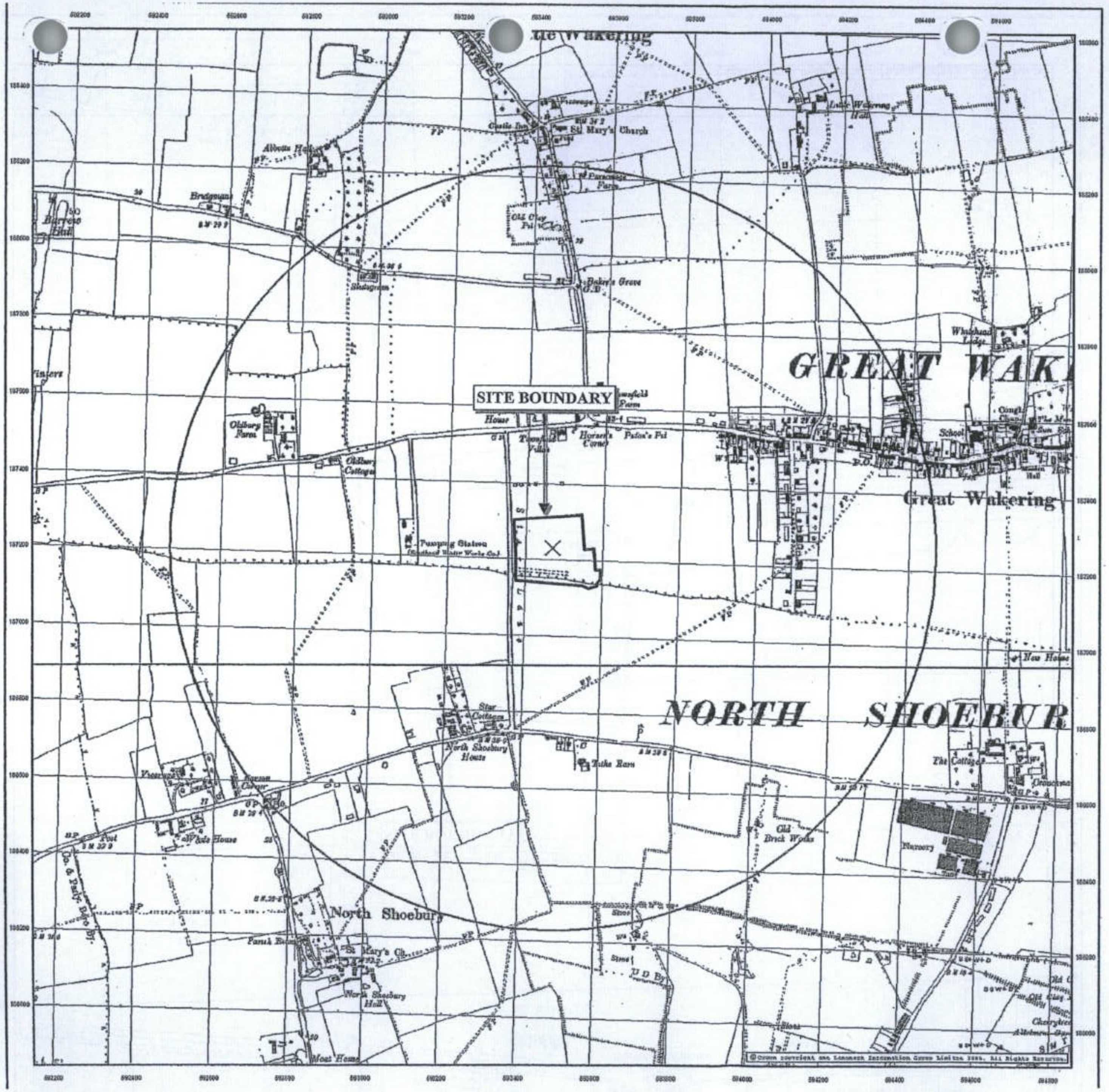


Date(s) of Publication

FIGURE 11

Ordnance Survey Licensed Partner

LANDMARK Information Group



DTS RAEBURN
GEOTECHNICAL & ENVIRONMENTAL ENGINEERING

CLIENT DETAILS Envirocheck Order No. EC20603860_1_1

Customer Ref: MR S Johnson,E11007/1
Dts Raeburn Ltd
Moor Lane Witton
Birmingham
B6 7HG

SITE DETAILS Grid Reference 593470 167230

Haseon Brick
Star Lane Works,
Star Lane
Great Wakering
Essex SS30PP

Historical Map Legend

Quarry
Shingle
Railway over Road
Road over Railway
Gravel Pit
Sand Pit
Level Crossing
Railway over River
Other Pits
Road over Stream
Road over Stream
Rough Pasture
Furze
Road over River or Canal
Marsh
Reeds
Sunken Road
Raised Road
Osiers
Instrumental Contour
Arrow denotes flow of Water
Skotched Contour

Ordnance Survey County Series 4

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given on the right therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

ESSEX
Published 1938
Source map scale - 1:10,560

1938
1938

FIGURE 12

Date(s) of Publication

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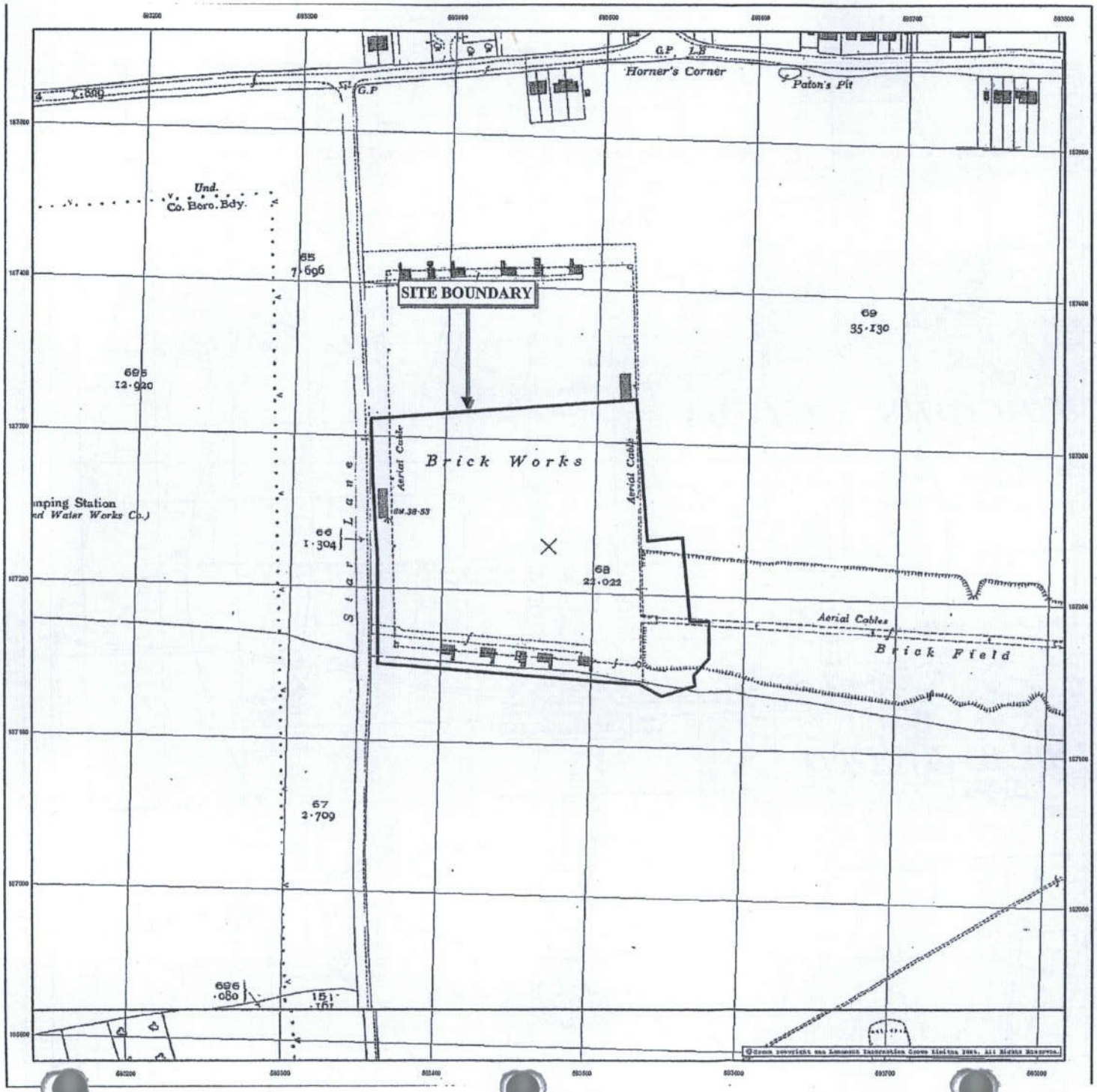
LANDMARK® Information Group



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GEOTECHNICAL & ENVIRONMENTAL ENGINEERING

CLIENT DETAILS Envirocheck Order No. EC20603860_1_1

Customer Ref: MR S Johnson,01109271
Dts Raeburn Ltd
Moor Lane Witton
Gtrimingham
SS 7HG

SITE DETAILS Grid Reference 593470 187230

Hanson Brick
Star Lane Works
Star Lane
Great Wakering
Essex SS3 0PP

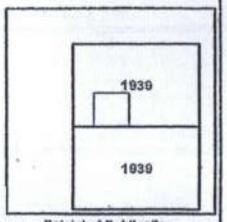
Historical Map Legend

Quarry
Sand Pit
Marsh
Reeds
Gravel Pit
Clay Pit
Rough Pasture
Furze
Refuse Heap
Shingle
Osiers
Ford
Railway crossing River or Canal
Railway crossing Road
Level Crossing
Embankment
Cutting
Road crossing Railway
Road over single Stream
Road over River or Canal
Arrow denotes flow of Water

Ordnance Survey County Series 4

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1890 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given on the right is often some years later than the surveyed date. Before 1855, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

ESSEX
Published 1939
Source map scale - 1:2,500



Date(s) of Publication

FIGURE 13

Ordnance Survey Licensed Partner

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GEOTECHNICAL & ENVIRONMENTAL ENGINEERING

CLIENT DETAILS Envirocheck Order No. EC20603860_1_1

Customer Ref: Mr S Johnson/E1109771
Dts Raeburn Ltd
Moor Lane Mills
Birmingham
B6 7HQ

SITE DETAILS Grid Reference 593470 187230

Hanson Brick
Star Lane Works
Star Lane
Great Wakering
Essex SS3 0PP

Historical Map Legend

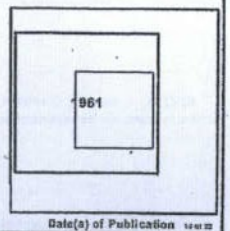
- Chalk Pit, Clay Pit, or Quarry
- Gravel Pit
- Sand Pit
- Disused Pit or Quarry
- Refuse or Slag Heap
- Direction of Flow of Water
- Cutting
- Road Under
- Road Over
- Level Crossing
- Foot Bridge
- Non-coniferous Trees
- Coniferous Trees
- Scrub
- Lake, Loch or Pond
- Pylon
- Electricity Transmission Line
- Pole
- Shingle
- Sand
- Embankment
- Standard Gauge Multiple Track
- Standard Gauge Single Track
- Siding, Tramway or Mineral Line
- Narrow Gauge
- Bracken
- Heath
- Rough Grassland
- Reeds
- Saltings
- Marsh

Ordnance Survey Plan 1

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given on the right therefore is often some years later than the surveyed date. Before 1855, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in adjoining areas.

In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the final 1:10,000 maps were produced using the Transverse Mercator Projection. The six-inch process continued until recently, with new editions appearing every 30 years or so for urban areas.

ORDNANCE SURVEY PLAN
Published 1961
Source map scale - 1:10,560



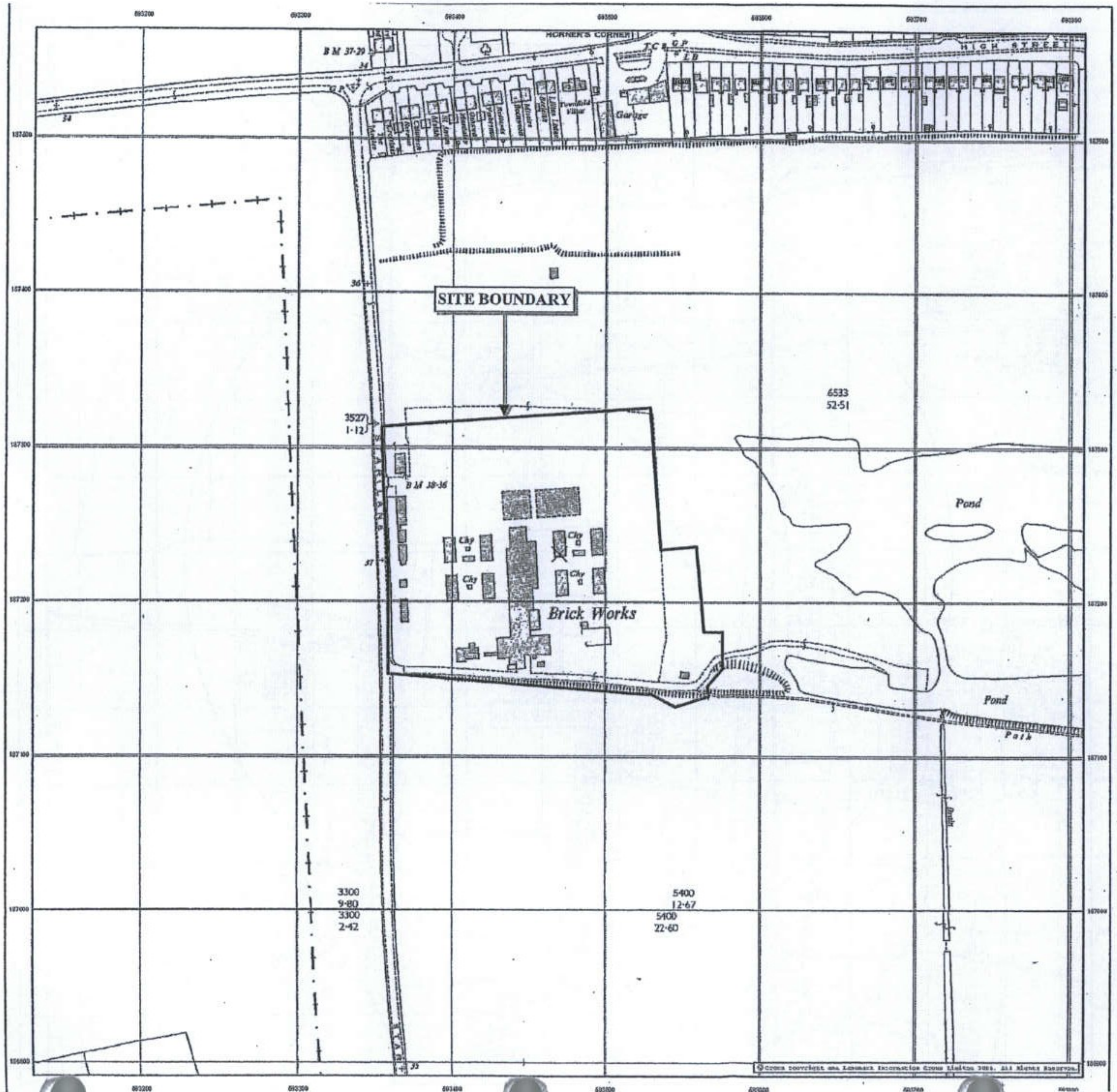
Date(s) of Publication

FIGURE 14

Ordnance Survey Licensed Partner

LANDMARK Information Group

Produced by Landmark Information Group Limited Tel: 0870 850 6272 Fax: 0870 850 6274



DTS RAEBURN
GEOTECHNICAL & ENVIRONMENTAL ENGINEERING

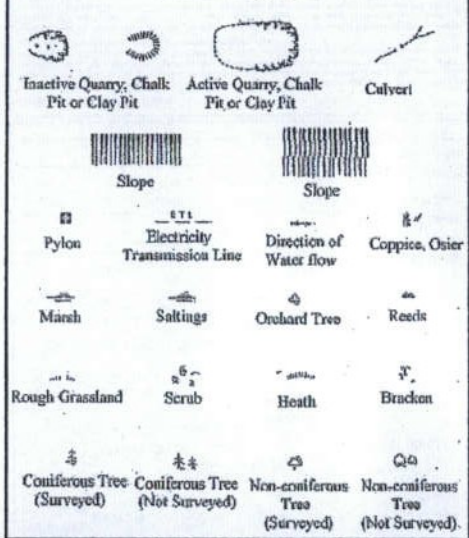
CLIENT DETAILS Envirocheck Order No. EC20603860_1_1

Customer Ref: MR S Johnson,E11997/1
Dts Raeburn Ltd
Moor Lane Witton
Birmingham
B6 7HG

SITE DETAILS Grid Reference 593470 187230

Hanson Brick
Star Lane Works
Star Lane
Great Wakering
Essex SS30FF

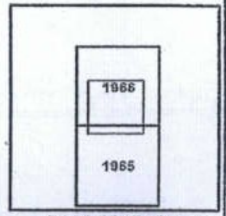
Historical Map Legend



Ordnance Survey Plan 1

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas and by 1896 it covered the whole of what were considered to be the cultivated parts of Great Britain. The published date given on the right is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

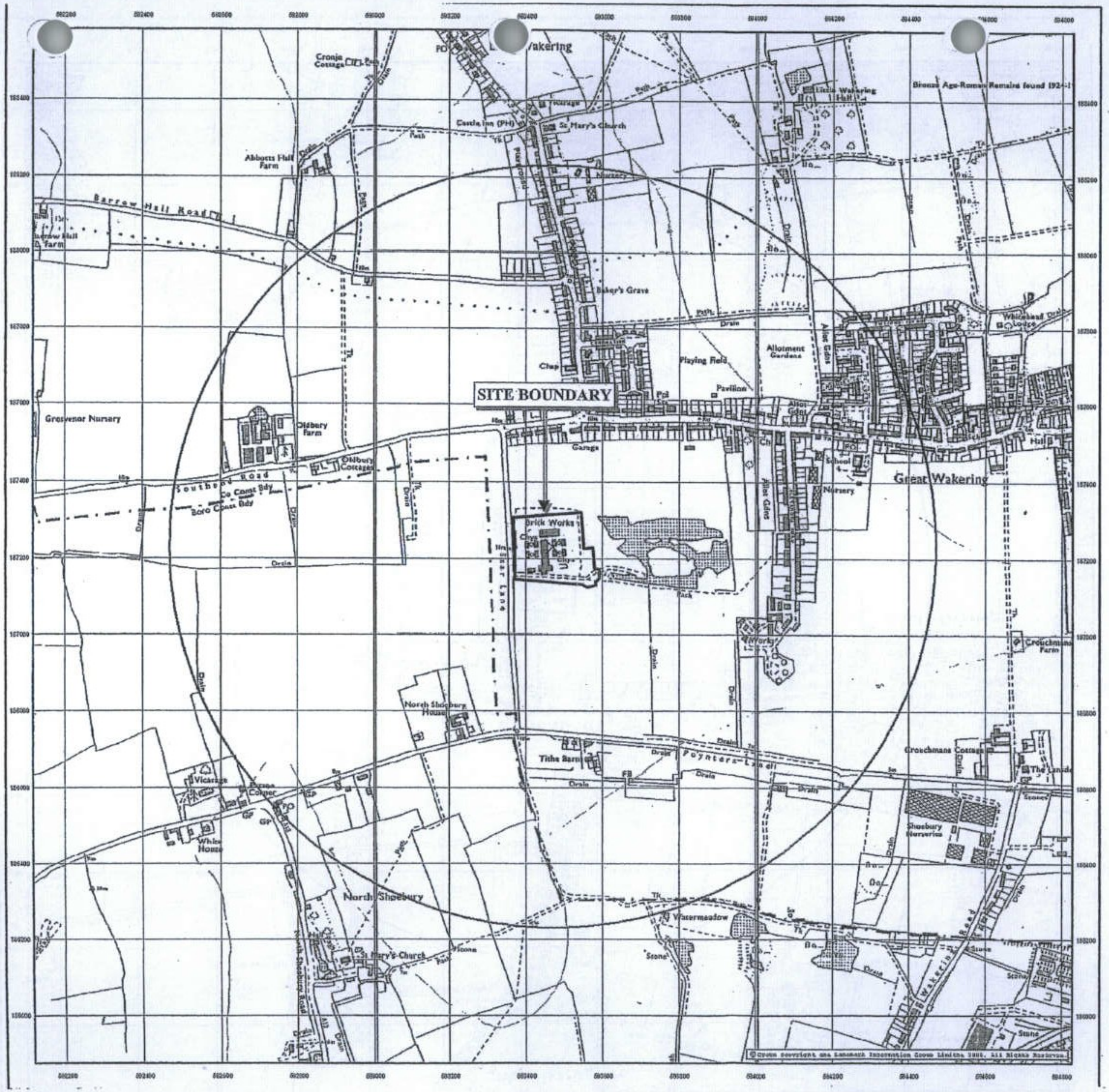
ORDNANCE SURVEY PLAN
Published 1965 to 1966
Source map scale - 1:2,500



Date(s) of Publication

FIGURE 15

Ordnance Survey Licensed Partner
LANDMARK Information Group



DTS RAEBURN

GEOTECHNICAL & ENVIRONMENTAL ENGINEERING

CLIENT DETAILS Envirocheck Order No. EC20603860_1_1

Customer Ref: MR S Johnson,E11987/1
Dts Raeburn Ltd
Moor Lane Witton
Birmingham
B6 7HG

SITE DETAILS Grid Reference 593470 187230

Hanson Brick
Star Lane Works
Star Lane
Great Wakering
Essex SS30PP

Historical Map Legend

- Chalk Pit, Clay Pit, or Quarry
- Non-coniferous Trees
- Bracken
- Gravel Pit
- Coniferous Trees
- Heath
- Sand Pit
- Scrub
- Rough Grassland
- Lake, Loch or Pond
- Disused Pit or Quarry
- Pylon
- Electricity Transmission Line
- Pole
- Reeds
- Refuse or Slag Heap
- Saltings
- Direction of Flow of Water
- Shingle
- Sand
- Marsh
- Cutting
- Embankment
- Standard Gauge Multiple Track
- Standard Gauge Single Track
- Road Under
- Road Over
- Level Crossing
- Foot Bridge
- Siding, Tramway or Mineral Line
- Narrow Gauge

Ordnance Survey Plan 1

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given on the right therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas.

In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

ORDNANCE SURVEY PLAN
Published 1971
Source map scale - 1:10,000

1971

FIGURE 16

Date(s) of Publication

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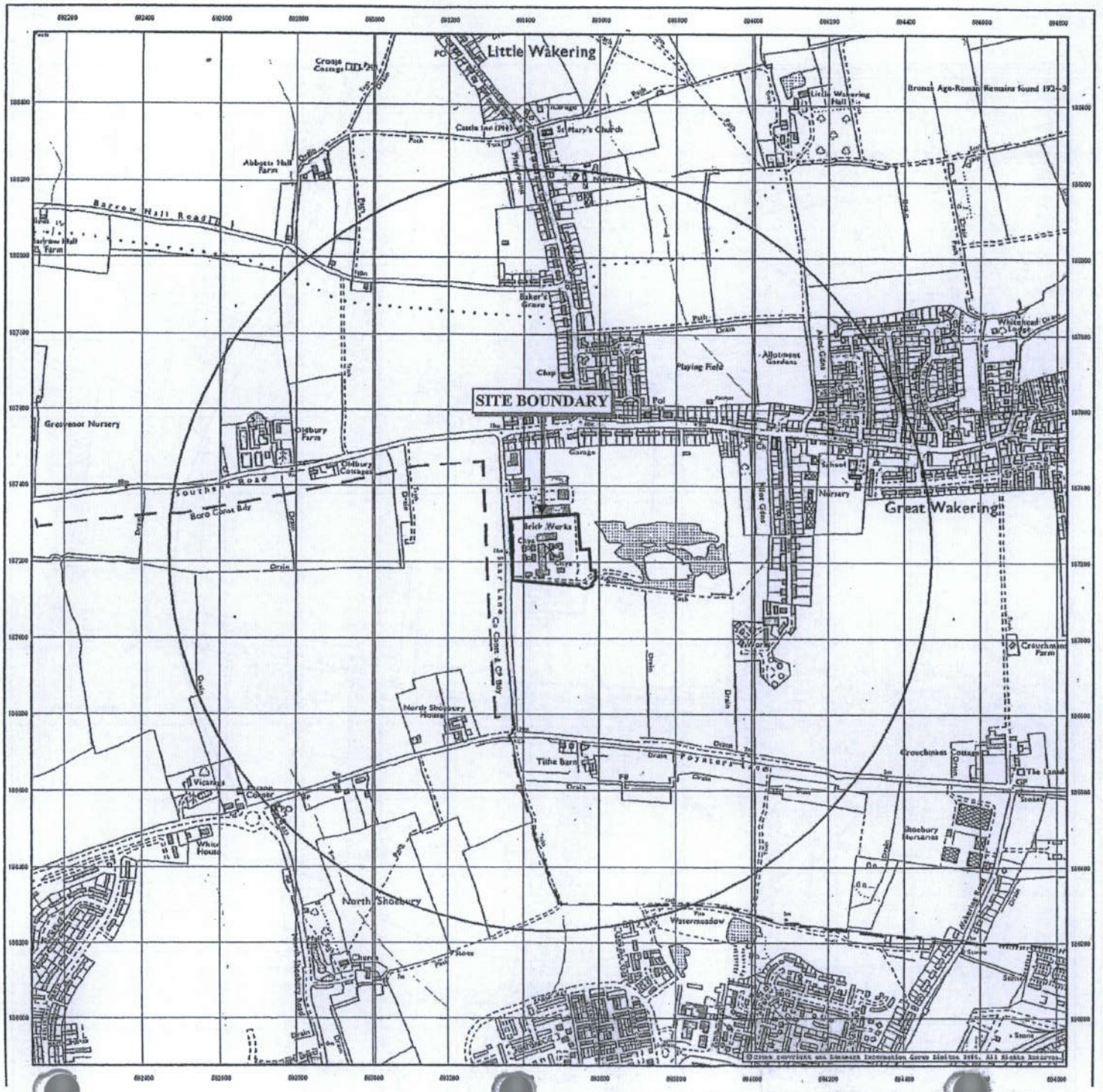


DTS RAEBURN

GEOTECHNICAL & ENVIRONMENTAL ENGINEERING

CLIENT DETAILS Envirocheck Order No. EC20603860_1_1

Customer Ref: MR B Johnson.E11007/1
Dts RaeBurn Ltd
Moor Lane Witton
Birmingham
B6 7BG

SITE DETAILS Grid Reference 593470 187230

Hanson Brick
Star Lane Works
Star Lane
Great Wakering
Essex SS30PP

Historical Map Legend

- Chalk Pit, Clay Pit, or Quarry
- Non-coniferous Trees
- Bracken
- Gravel Pit
- Coniferous Trees
- Heath
- Sand Pit
- Scrub
- Rough Grassland
- Lake, Loch or Pond
- Disused Pit or Quarry
- Pylon
- Reeds
- Electricity Transmission Line
- Refuse or Slag Heap
- Pole
- Saltings
- Direction of Flow of Water
- Marsh
- Shingle
- Sand
- Cutting
- Embankment
- Standard Gauge Multiple Track
- Road "T" Under
- Road Over
- Level Crossing
- Foot Bridge
- Standard Gauge Single Track
- Siding, Tramway or Mineral Line
- Narrow Gauge

Ordnance Survey Plan. 2

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1/2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,000 maps. The published date given on the right therefore is often some years later than the surveyed date. Before 1939, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in overlying areas.

In the late 1940's, a Provisional Edition was produced, which updated the 1:10,000 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were latterly overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

ORDNANCE SURVEY PLAN
Published 1975
Source map scale - 1:10,000

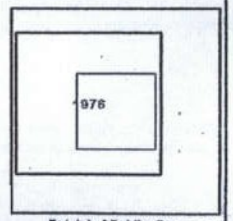
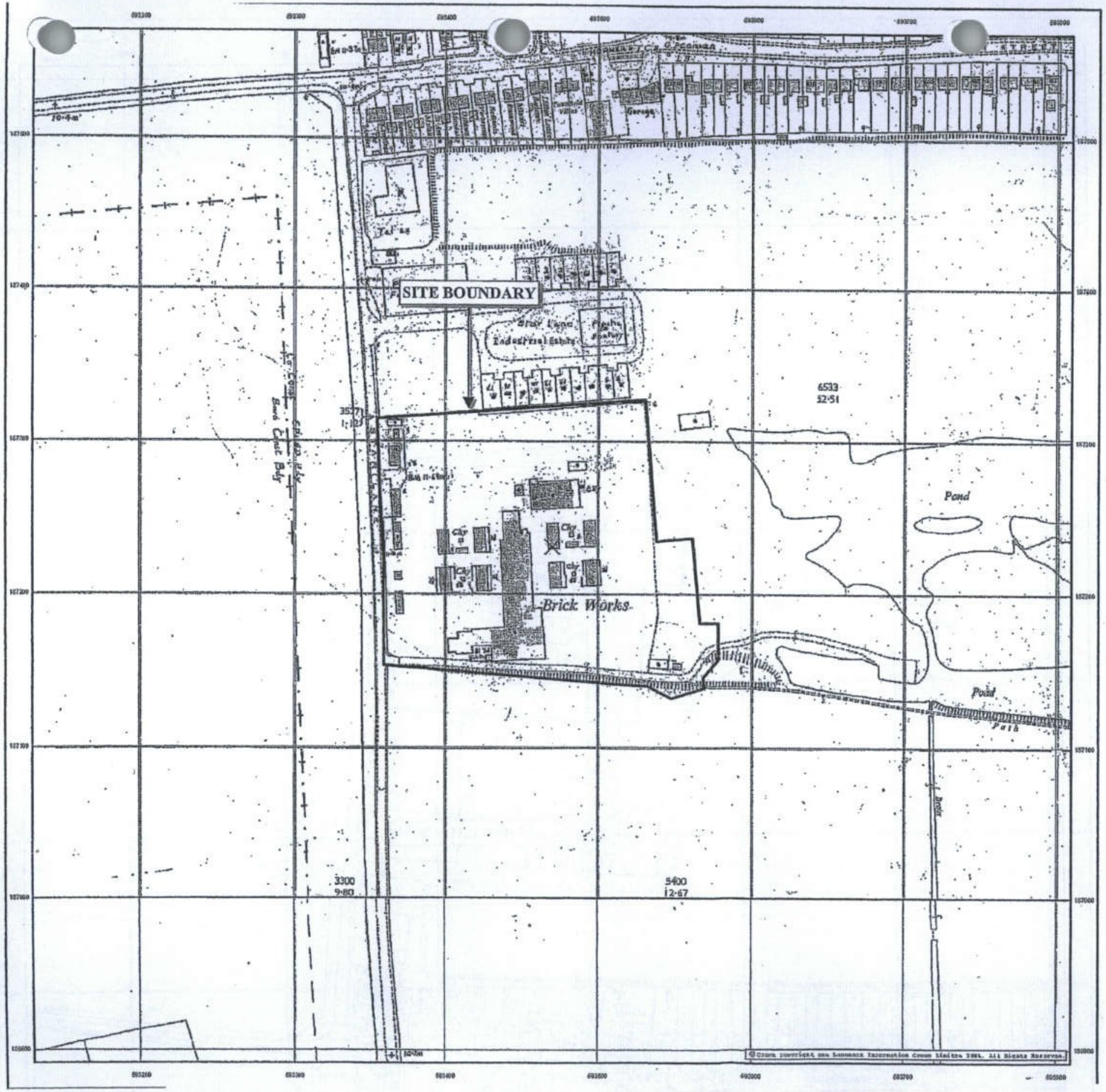


FIGURE 17

Date(s) of Publication 20 of 22

Ordnance Survey® Licensed Partner

LANDMARK® Information Group



DTS RAEBURN

GEOTECHNICAL & ENVIRONMENTAL ENGINEERING

CLIENT DETAILS Envirocheck Order No. EC20603860_1_1

Customer Ref: MR S Johnson;E11907/1
Dts Raeburn Ltd
Moor Lane Witton
Birmingham
B6 7HG

SITE DETAILS Grid Reference 593470 187230

Hanson Brick
Star Lane Works
Star Lane
Great Wakering
Essex SS3 0PP

Historical Map Legend

Inactive Quarry, Chalk Pit or Clay Pit
Active Quarry, Chalk Pit or Clay Pit
Culvert
Slope
Slope
Pylon
Electricity Transmission Line
Direction of Water flow
Coppice, Osier
Marsh
Saltings
Orchard Tree
Reeds
Rough Grassland
Scrub
Heath
Bracken
Coniferous Tree (Surveyed)
Coniferous Tree (Not Surveyed)
Non-coniferous Tree (Surveyed)
Non-coniferous Tree (Not Surveyed)

Additional SIMs 1

The SIM cards (Ordnance Survey's 'Survey of Information on Microfilm') are further, minor editions of mapping which were produced and published in between the main editions as an area was updated. They date from 1947 to 1991, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

ORDNANCE SURVEY PLAN
Published 1978 to 1987
Source map scale - 1:2,500

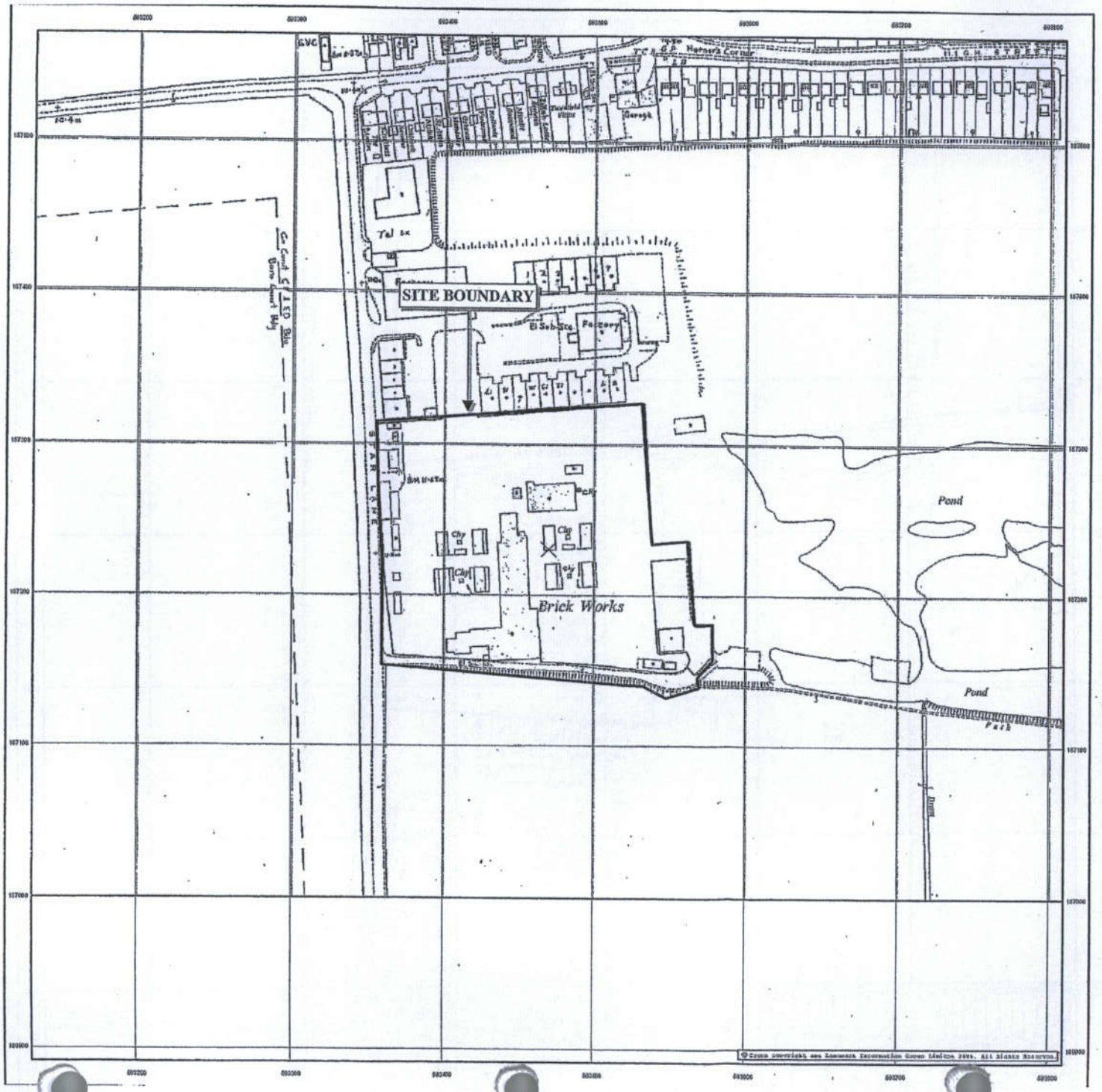
1978
1987

Date(s) of Publication

FIGURE 18

Ordnance Survey
Licensed Partner

LANDMARK
Information Group



DTS RAEBURN

GEOTECHNICAL & ENVIRONMENTAL ENGINEERING

CLIENT DETAILS Envirocheck Order No. EC20603860_1_1

Customer Ref: MR S Johnson,B1199271
Dts Raeburn Ltd
Moor Lane Wilton
Birmingham
B6 7BG

SITE DETAILS Grid Reference 593470 187230

Hanson Brick
Star Lane Works
Star Lane
Great Wakering
Essex SS30PP

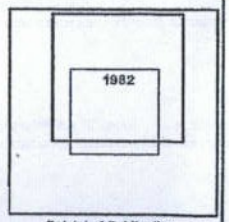
Historical Map Legend

Inactive Quarry, Chalk Pit or Clay Pit
Active Quarry, Chalk Pit or Clay Pit
Culvert
Slope
Slope
Pylon
Electricity Transmission Line
Direction of Water flow
Coppice, Osier
Marsh
Saltings
Orchard Tree
Reeds
Rough Grassland
Scrub
Heath
Bracken
Coniferous Tree (Surveyed)
Coniferous Tree (Not Surveyed)
Non-coniferous Tree (Surveyed)
Non-coniferous Tree (Not Surveyed)

Additional SIMs 2

The SIM cards (Ordnance Survey's "Survey of Information on Microfilm") are further, minor edition of mapping which were produced and published to between the main editions on an ad-hoc non updated. They date from 1947 to 1987, and contain detailed information on buildings, roads and land-use. These maps were produced at both 1:2,500 and 1:1,250 scales.

ORDNANCE SURVEY PLAN
Published 1982
Source map scale - 1:2,500



Date(s) of Publication

FIGURE 19

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DTS RAEBURN

GEOTECHNICAL & ENVIRONMENTAL ENGINEERING

CLIENT DETAILS 'Envirocheck Order No.. EC20603869_1_1

Customer Ref: MR S Johnson,E1100771
Dts Raeburn Ltd
Moor Lane Wilton
Birmingham
B6 7HG

SITE DETAILS Grid Reference 593470 187230

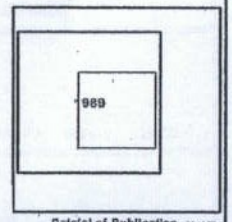
Hanson Brick
Star Lane Works
Star Lane
Great Wakering
Essex SS30PP

Ordnance Survey Plan 3

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland for 1840's, ie. 1:1056 (i.e. 1:2,500 scale was adopted for mapping urban areas) these maps were used to update the 1:10,000 maps. The published date given on the right hand side is often some years later than the surveyed date. Before 1935, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in overlying areas.

In the late 1940's a Provisional Edition was produced, which updated the 1:10,000 mapping from a number of sources. The maps appear unlabelled - with all the hilly camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

ORDNANCE SURVEY PLAN
Published 1969
Source map scale - 1:10,000



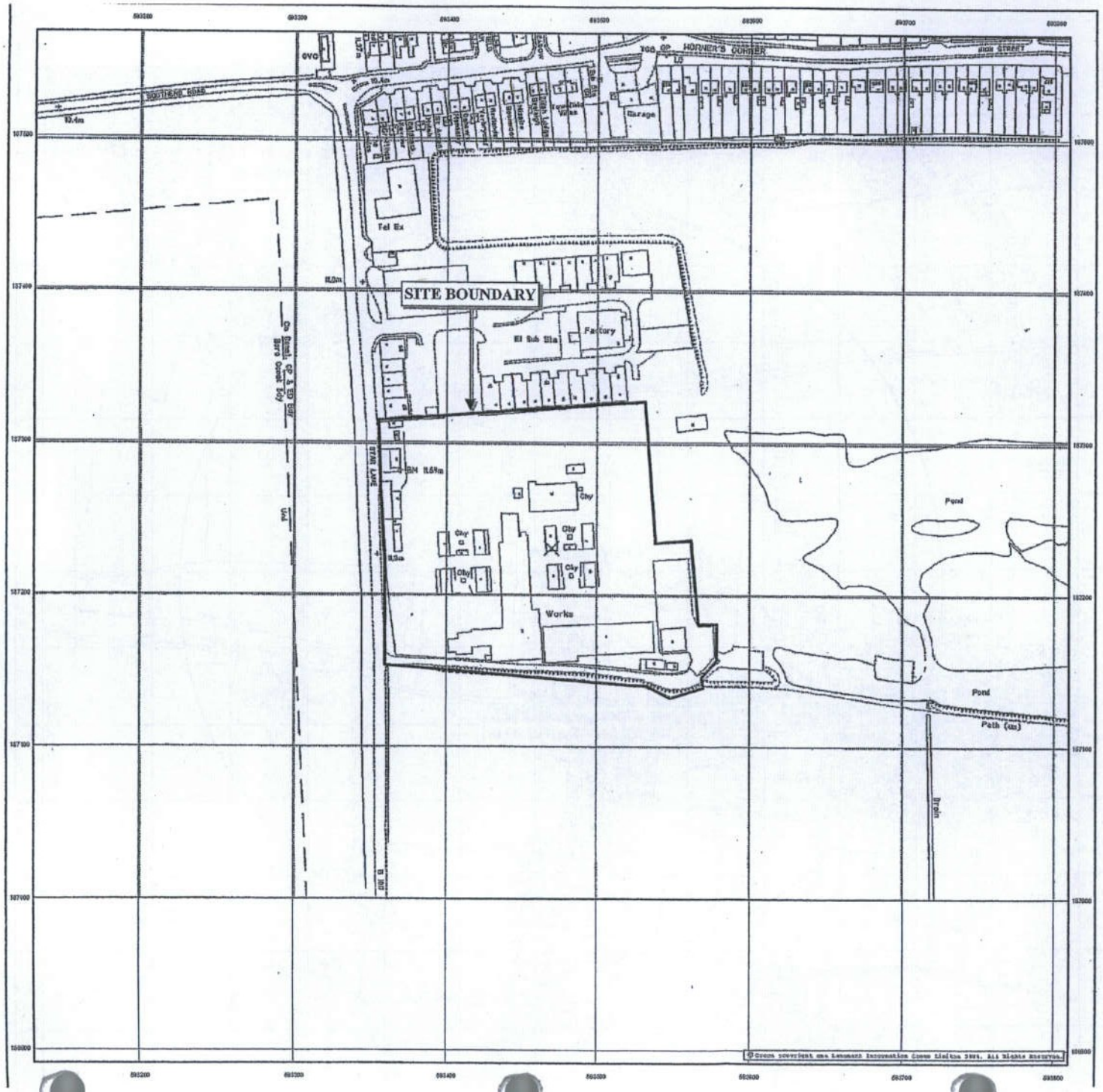
Date(s) of Publication 21 of 22

FIGURE 20

Ordnance Survey Licensed Partner

LANDMARK Information Group

Produced by Landmark Information Group Limited Tel: 0870 850 6870 Fax: 0870 850 6874



DTS RAEBURN

GEOTECHNICAL & ENVIRONMENTAL ENGINEERING

CLIENT DETAILS Envirocheck Order No. EG206038B8_1_1

Customer Ref: Mr S Johnson,E1196771
Dts Raeburn Ltd
Moor Lane Witton
Birmingham
B6 7HG

SITE DETAILS Grid Reference 593470 187230

Hanson Brick
Star Lane Works
Star Lane
Great Wakering
Essex SS30PP

Historical Map Legend

Slope
Slope
Bench Mark
Wells
Buildings with Building Seed
Direction of Water flow
Pylon
Electricity Transmission Line

Administrative Boundaries

- Civil parish/community boundary
- District boundary
- County boundary
- Boundary post/stone
- Boundary meeting symbol (note: these always appear in opposed pairs or groups of three)

Large-Scale National Grid Data 1

"Large Scale National Grid Data" as provided GIS cards (Ordnance Survey's "Survey of Information on Microfiche") in 1992, and continued to be produced until 1995. These maps were the first-ever use of digital mapping and so provide detailed information on houses and roads, but tend to show less topographic features such as vegetation. These maps were produced at both 1:2,500 and 1:1250 scales.

ORDNANCE SURVEY PLAN
Published 1993
Source map scale - 1:2,500

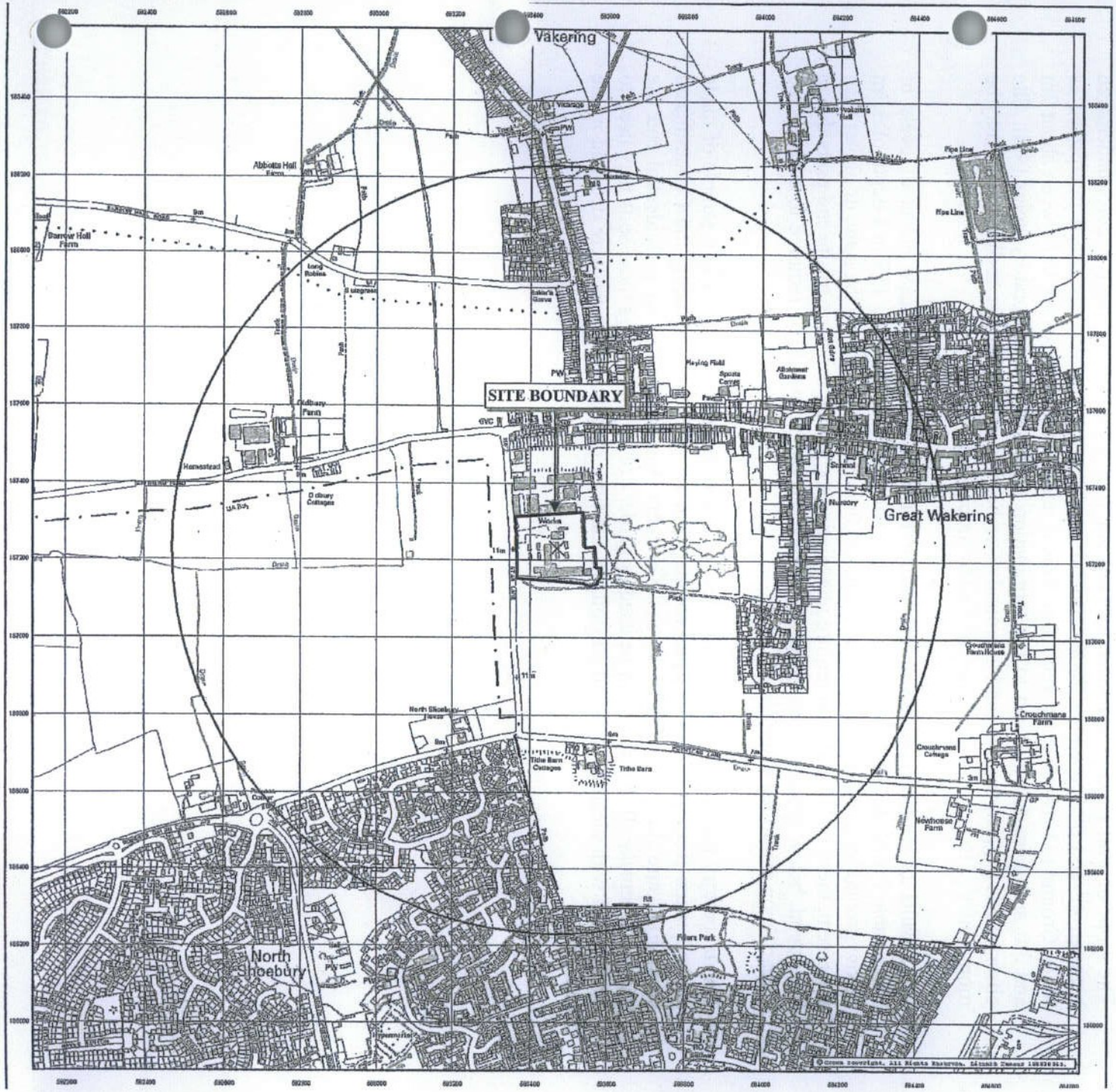
1993

Date(s) of Publication

FIGURE 21

Ordnance Survey® Licensed Partner

LANDMARK® Information Group



DTS RAEBURN

GEOTECHNICAL & ENVIRONMENTAL ENGINEERING

CLIENT DETAILS Envirocheck Order No. EC20603860_1_1

Customer Ref: MR S Johnson,61100271
Dts Raeburn Ltd
Moor Lane Witton
Birmingham
B6 7HG

SITE DETAILS Grid Reference 593479 187230

Ramsey Brick
Star Lane Works
Star Lane
Great Wakering
Essex SS36PP

Historical Map Legend

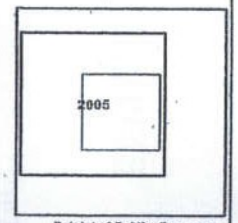
- Non-coniferous Trees
- Coniferous Trees
- Orchard
- Rough Grassland
- Heath
- Scrub
- Marsh, Salt Marsh or Reeds
- County Boundary (England only)
- Civil Parish or Community Boundary
- Constituency Boundary
- Pylon
- Telephone Line (where shown)
- Electricity Transmission Line (with poles)
- Gravel Pit
- Shingle
- Refuse Tip or Slag Heap
- Sand
- Sand Pit
- Slopes
- District, Unitary, Metropolitan, London Borough Boundary

10K Raster Mapping 1

The historical map images were produced from the Ordnance Survey's 1:10,000 colour raster mapping. These maps are derived from Landplan® which replaced the old 1:10,000 maps originally published in 1970.

The data is highly detailed showing buildings, fences and field boundaries as well as all roads, tracks and paths. Road names are also included together with the relevant road number and classification. Boundary information depicted includes county, unitary authority, district, civil parish and council ward.

ORDNANCE SURVEY PLAN
Published 2005
Source map scale - 1:10,000



Date(s) of Publication 22-01-22

FIGURE 22

Ordnance Survey Licensed Partner

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DTS RAEBURN
GEOTECHNICAL & ENVIRONMENTAL ENGINEERING

REPORT ON A GROUND INVESTIGATION CARRIED OUT AT STAR LANE, GREAT WAKERING, ESSEX

Executive Summary

- This report presents a summary of the information and conclusions derived from a limited ground investigation of a site at Star Lane, Great Wakering, Essex. It is not intended to provide detailed design information but rather to guide the client in making an informed judgement about ground conditions and potential abnormal development costs prior to acquisition/re-development to residential end use.

- The scope of works comprised seven trial pits and four window sampling boreholes undertaken between 4th and 5th December 2006. Ground conditions at the site have been interpreted as Made Ground to between 0.1m and 1.0m. This is underlain by sandy clay to between about 2m and 3m and thereafter by sand to the termination depths of the exploratory holes (4m). Site observations suggest that the sand is groundwater-bearing, and thus indicate that the site may be more sensitive to groundwater than previously anticipated.

- The results of on-site and laboratory testing for hydrocarbons indicate elevated levels of Extractable Petroleum Hydrocarbons (EPH) in a soil sample taken from TP2 at a depth of 3.7m below ground level. Assuming that the proposed finished site levels are the same or higher than at present, these soils would not require remediation to prevent exposure to site end users due to their depth below ground level. However, further assessment would be required to evaluate the impact upon controlled waters.

- The laboratory test results indicate high levels of arsenic, lead and nickel in a sample of made ground taken from TP6 (0.3m) when compared to set guidelines including the Contaminated Land Exposure Assessment (CLEA) Soil Guideline Values (SGVs) for a residential end use with plant uptake. If this area is to be used as gardens or in landscaping these soils may need to be covered with clean topsoil and subsoil. In addition, no asbestos fibres were detected in the test soils.

Introduction

DTS Raeburn Limited were commissioned by Stirling Maynard and Partners on behalf of JG Management LLP and Anglo Irish Asset Finance Plc, to carry out an initial ground investigation of a former brickworks at Star Lane, Great Wakering, Essex. It is understood that the site is to be redeveloped for residential use. The aim of the investigation was to assess the ground conditions at three main risk areas of contamination as identified in a previous geo-environmental desk study report (E11997-1) of the site undertaken by DTS Raeburn. These areas comprise three redundant heavy oil storage tanks within an existing building, three above ground oil and diesel storage tanks in external areas, and the area around a former transport building.

The scope of the investigation comprised trial pits and window sampling boreholes to obtain soil samples for contamination laboratory testing.

This report presents the factual information obtained from the investigation together with preliminary recommendations and comments on the levels of ground contamination encountered with respect to the development proposals for the site.

Site Location and Description

The site consists of an irregular parcel of land covering an area of approximately 3.3 hectares, located on the eastern side of Star Lane, at National Grid Reference 593470, 187230 (Figures 1 and 2).

The site is occupied by Hanson brickworks. Production at the site ceased in April 2005 and at the time of the site visit the remaining stockpiles of bricks were in the process of being removed. A detailed description of the site is included in Section 2.0 of Report E11997/1. The areas investigated in this report comprised the following:

- An above ground 40,000 litre diesel storage tank, surrounded by a brick bund located adjacent the western site boundary. At the time of the site investigation site operatives stated that only a small amount of fuel remained in the tank and was used to fuel the fork lift trucks.

- Three above ground heavy oil storage tanks located in the central part of the former processing building which were formerly used to fire the nearby kilns. A small above ground waste oil tank, surrounded by a brick bund, located adjacent the main processing building to the north and an above ground brick bunded 6,000 litre diesel tank located between two of the brick kilns to the east of the main building.

- A former transport building located in the south-eastern corner of the site. This comprises a two-storey brick building roofed with corrugated asbestos cement sheeting

General Geology

British Geological Survey Sheet 258/259 (Figure 4) of Southend (1:50,000 Solid and Drift Edition) indicates the site to be underlain by Loam (River Brickearth) over London Clay comprising stiff dark or bluish grey clay which weathers at outcrop to brown.

Hydrogeology and Site Sensitivity

'Envirocheck' database information included in the desk study report, indicates that the site does not lie within any fluvial or tidal floodplains. The underlying Brickearth deposits and London Clay are classified as non-aquifers. The nearest surface water features are a number of ponds located

approximately 40m to the east of the site where former clay pits were located. There are no major ecological receptors within 1km of the site, however, The Royal Society for the Protection of Birds (RSPB) have identified the former clay pit adjacent the site as an ideal habitat for bird watching.

At this stage, the site should be considered sensitive with respect to controlled waters (surface water). The Envirocheck data suggests that the site is not sensitive with respect to groundwater or major ecological receptors.

Fieldwork

Seven trial pits (TP1-TP7) and four window sampling boreholes (WS1 & WS4-WS6) were undertaken between the 4th and 5th December 2006. The exploratory holes were targeted at a number of above ground oil and diesel storage tanks and the area around a former transport building. The positions of the exploratory holes are presented in Figure 3. The underlying soils have been interpreted as Made Ground to between 0.1m and 1.0m. This is underlain by sandy clay to between 2m and 3m but thereafter the exploratory holes showed the site to be underlain by sand to the termination depths of the boreholes (4m) rather than the anticipated Brickearth.

Groundwater seepages were encountered at approximately 2.8m in TP6 and 3.0m in WS6. These exploratory holes were located adjacent the old transport building in the south-eastern corner of the site where the ground level is approximately 1m lower than the remainder of the site. These observations suggest that a continuous Groundwater Table exists beneath the site within the underlying sand, and thus that the site may be more sensitive to groundwater than anticipated from the Envirocheck database information.

Records of the exploratory holes are presented in Appendix 1.

Contamination Laboratory Testing

The results of testing of ten soil samples on site using a 'PetroFLAG' hydrocarbon detector (Table A) suggested that these were generally not elevated. However, elevated concentrations were detected in the soils from TP2, positioned adjacent the diesel storage tank in near the western site boundary, at a depth of 3.7m below ground level.

Laboratory tests for Total Petroleum Hydrocarbons (TPH) speciated into aliphatic and aromatic fractions in the ranges C_5-C_6, C_6-C_8, C_8-C_{10}, C_{10}-C_{12}, C_{12}-C_{16}, C_{16}-C_{21}, C_{21}-C_{35} and C_{35}-C_{39}, was undertaken on seven soil samples including those from TP2. These tests confirmed that the soils from TP2 at 3.7m below ground level contained levels of TPH of 5,420mg/kg. This predominantly comprised aliphatic compounds in the carbon range C_{12}-C_{21}. Assuming that the proposed finished site levels are the same or higher than at present, these soils would not require remediation to prevent exposure to site end users due to their depth below ground level. However, further assessment would be required to evaluate the impact upon controlled waters, particularly as the underlying soils were found to consist of sand that may be groundwater-bearing, rather than the anticipated clay soils.

The results of testing of seven soil samples for additional contaminants including metals, phenols, cyanides, total sulphate, sulphide and polycyclic aromatic hydrocarbons (PAH) indicate high levels of arsenic, lead and nickel in a sample of made ground taken from TP6 (0.3m) when compared to set guidelines including the Contaminated Land Exposure Assessment (CLEA) Soil Guideline Values (SGVs) for a residential end use with plant uptake. If this area is to be used as gardens or in landscaping these soils may need to be covered with clean topsoil and subsoil.

The results of asbestos testing show that no fibres were detected in the test soils.

The results of the contamination laboratory testing are presented in Appendix 2.

It is recommended that a more detailed environmental appraisal is undertaken to satisfy planning regulations prior to development and to confirm the initial findings of this report.

DTS RAEBURN LIMITED

Results of field testing for TPH using PetroFLAG test kit

Star Lane, Great Wakering, Essex
E11997-2

TABLE A

Soil Sample	TPH (mg/kg)
TP1 sa1 0.3m	0
TP2 sa1 0.3m	12
TP2 sa6 3.7m	2542
TP5 sa1 0.4m	7
TP5 sa2 0.7m	0
TP6 sa1 0.3m	105
TP6 sa2 1.0m	0
TP6 sa3 2.1m	0
WS4 sa1 0.3-0.45m	0
WS5 sa1 0.12-0.4m	3

DTS RAEBURN

GEOTECHNICAL & ENVIRONMENTAL ENGINEERING

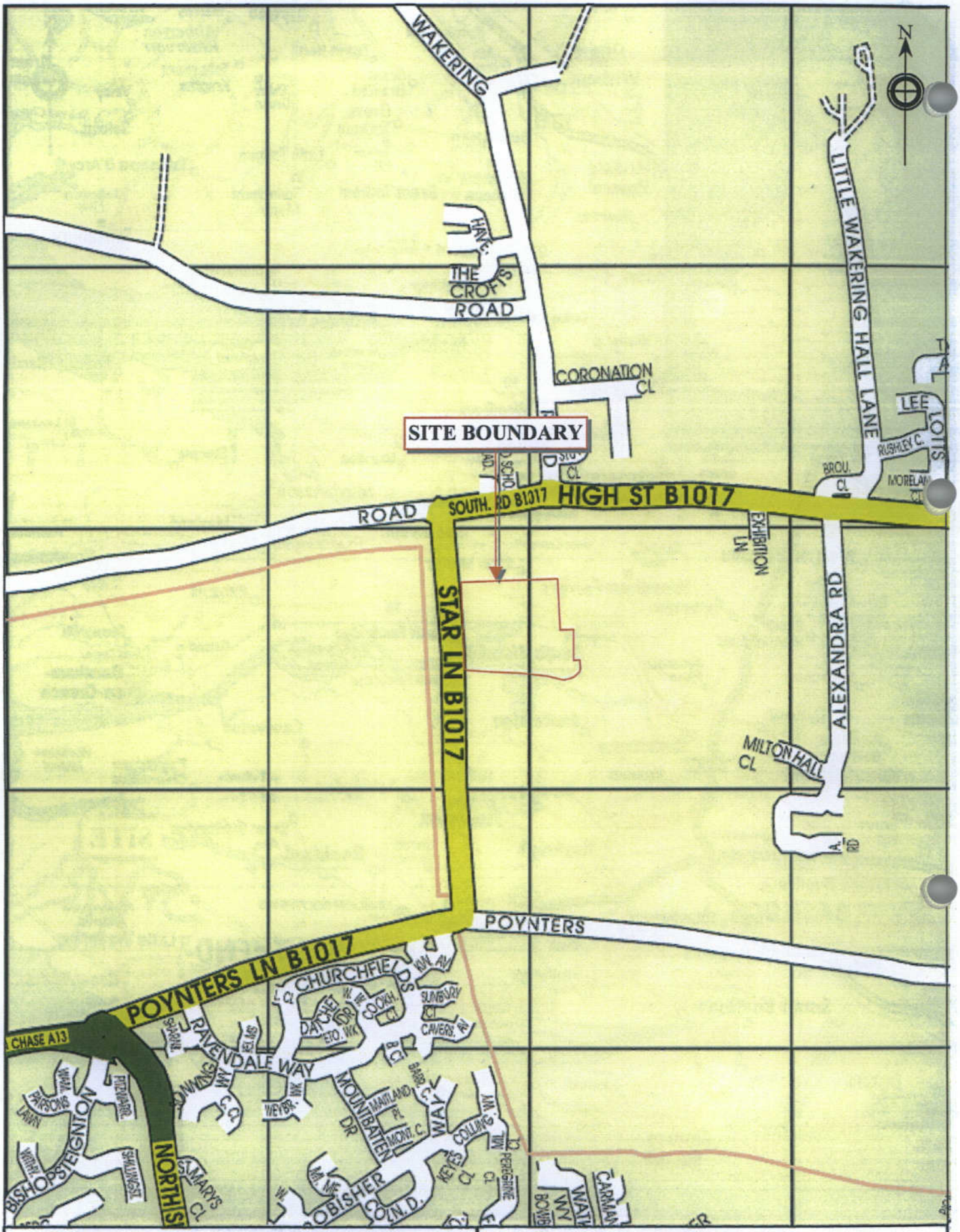
Moor Lane, Witton, Birmingham B6 7HG

Telephone: +44(0)121 344 3826 Facsimile: +44(0)121 344 4754

FIGURE 1

Site Location Plan
Scale 1:200,000

E11997/2: Star Lane, Great Wakering, Essex
Client: JG Management LLP



DTS RAEBURN

GEOTECHNICAL & ENVIRONMENTAL ENGINEERING

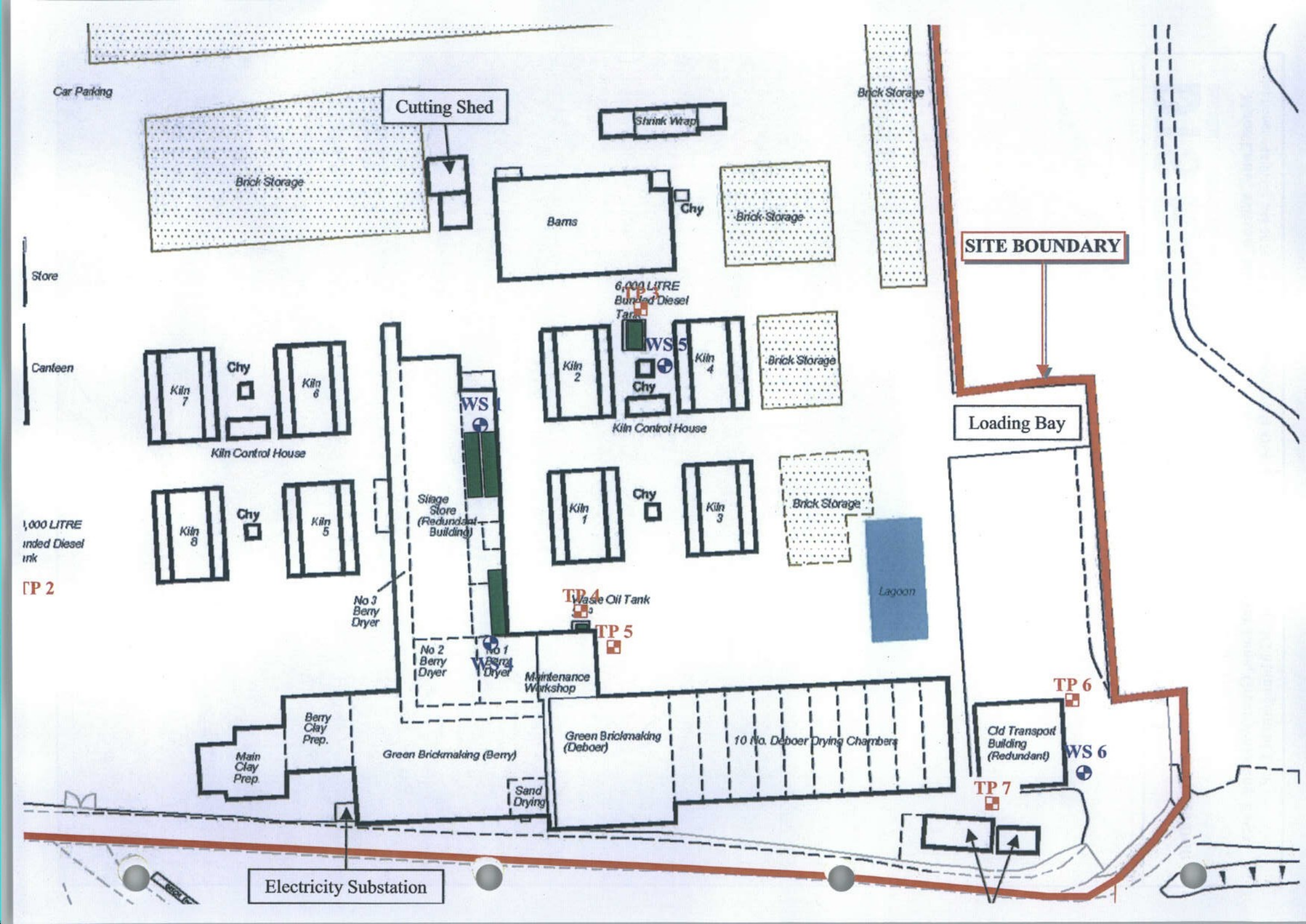
Moor Lane, Witton, Birmingham B6 7HG

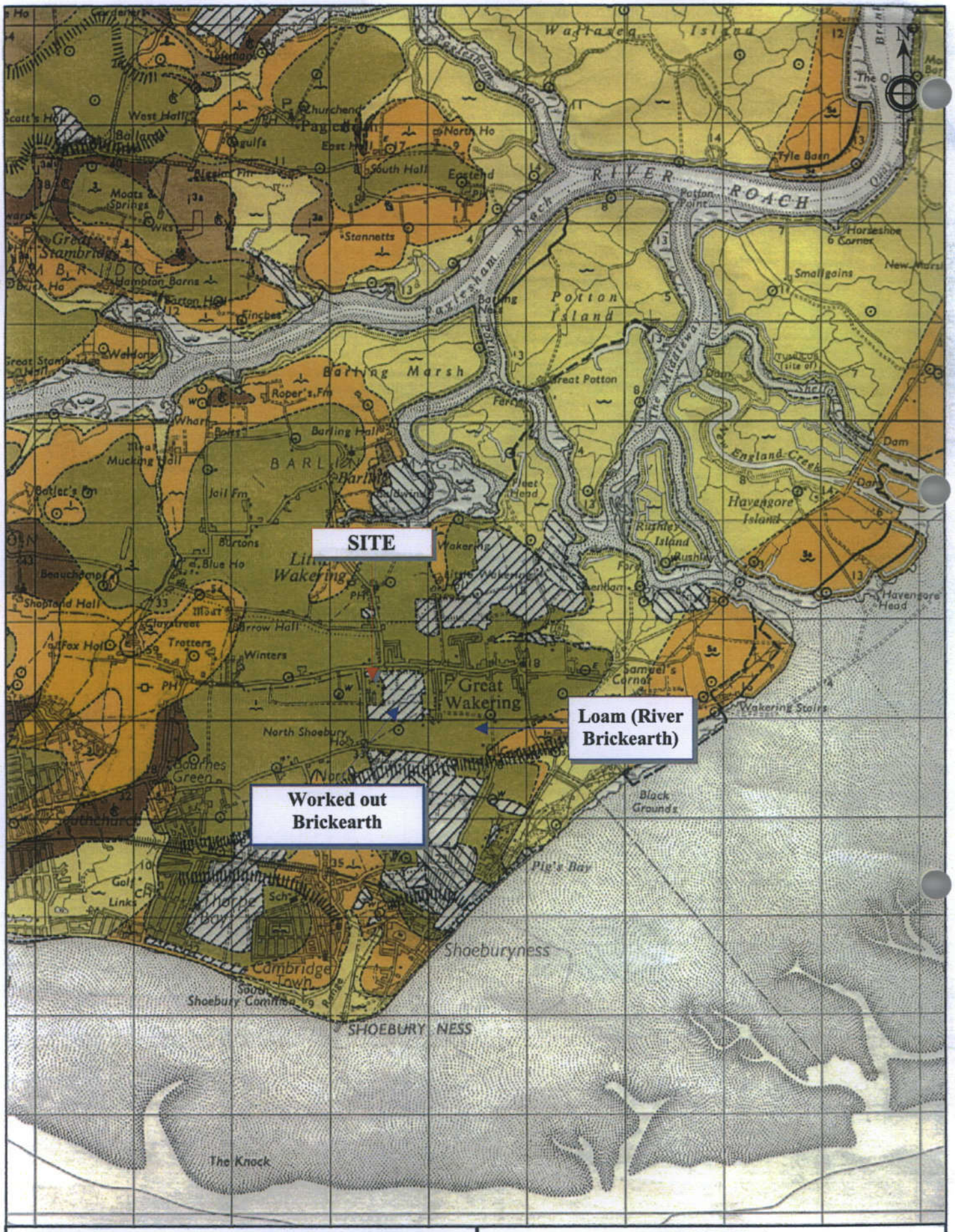
Telephone: +44(0)121 344 3826 Facsimile: +44(0)121 344 4754

FIGURE 2

Street Map
Not to Scale

E11997/2: Star Lane, Great Wakering, Essex
Client: JG Management LLP


Car Parking
Cutting Shed
Brick Storage
Shrink Wrap
Bams
Chy
Brick Storage
Brick Storage
SITE BOUNDARY
Store
Canteen
6,000 LITRE Bunded Diesel Tank
TP 3
WS 5
Kiln 7
Chy
Kiln 6
Kiln Control House
Kiln 2
Chy
Kiln 4
Brick Storage
Kiln Control House
Loading Bay
WS 1
Kiln 8
Chy
Kiln 5
Silage Store (Redundant Building)
Kiln 1
Chy
Kiln 3
Brick Storage
Lagoon
,000 LITRE
nded Diesel
nk
TP 2
No 3 Berry Dryer
TP 4
Waste Oil Tank
TP 5
No 2 Berry Dryer
No 1 Berry Dryer
WS 2
Maintenance Workshop
TP 6
Berry Clay Prep.
Green Brickmaking (Deboer)
10 No. Deboer Drying Chambers
Old Transport Building (Redundant)
WS 6
Main Clay Prep.
Green Brickmaking (Berry)
Sand Drying
TP 7
Electricity Substation



DTS RAEBURN

GEOTECHNICAL & ENVIRONMENTAL ENGINEERING

Moor Lane, Witton, Birmingham B6 7HG

Telephone: +44(0)121 344 3826 Facsimile: +44(0)121 344 4754

FIGURE 4

Extract from BGS Sheets 258/259 (Solid and Drift Edition)

Scale 1:50,000

E11997/2: Star Lane, Great Wakering, Essex

Client: JG Management LLP

APPENDIX 1

Exploratory Hole Records

DTS RAEBURN

GEOTECHNICAL & ENVIRONMENTAL ENGINEERING

Moor Lane, Witton, Birmingham
B6 7HG
Tel: +44 (0)121 344 3826
Fax: +44 (0)121 344 4754
email: enquiries@dts-raeburn.co.uk

Trialpit No
TP1
Sheet 1 of 1

Project Name: Former Hanson Brickworks	Project No. E11997/2	Co-ords: - Level: -	Date 05/12/2006
Location: Star Lane, Great Wakering		Dimensions: 1.20m, Depth 3.20m, 0.70m	Scale 1:25
Client: J G Management LLP			Logged By LH

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	CBR Test Results				
			0.10			MADE GROUND: Red-brown, very sandy, clay with occasional angular to subangular, fine to coarse gravels of brick.
0.30	D					Light brown, very sandy, CLAY.
1.50	D					
			2.30			Yellow-brown, fine to coarse SAND.
2.50	D					
3.20	D		3.20			Trialpit Complete at 3.20 m

Remarks:

Groundwater:

AGS

HoleBASE BI (BH 302) Standard Trialpit Log v2 dated 27th Nov 03

DTS RAEBURN
GEOTECHNICAL & ENVIRONMENTAL ENGINEERING

Moor Lane, Witton, Birmingham
B6 7HG
Tel: +44 (0)121 344 3826
Fax: +44 (0)121 344 4754
email: enquiries@dts-raeburn.co.uk

Trialpit No **TP2**
Sheet 1 of 1

Project Name: er Hanson Brickworks	Project No. E11997/2	Co-ords: - Level: -	Date 05/12/2006
Location: Star Lane, Great Wakering		Dimensions: 1.20m, Depth 3.70m, 0.70m	Scale 1:25
Client: J G Management LLP			Logged By LH

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	CBR Test Results				
						Reinforced CONCRETE.
0.30	D		0.30			
			0.40			Grey-brown mottled black, sandy, CLAY with hydrocarbon odour.
0.50	D					Light brown, sandy, CLAY.
1.80	D					
			2.40			
2.50	D					Yellow-brown, fine to coarse SAND.
			3.00			
3.10	D					Grey becoming black, sandy, SILT with strong hydrocarbon odour.
3.70	D		3.70			
						Trialpit Complete at 3.70 m

Remarks:

Groundwater:

AGS

DTS RAEBURN

GEOTECHNICAL & ENVIRONMENTAL ENGINEERING

Moor Lane, Witton, Birmingham
B6 7HG
Tel: +44 (0)121 344 3826
Fax: +44 (0)121 344 4754
email: enquiries@dts-raeburn.co.uk

Trialpit No
TP3
Sheet 1 of 1

Project Name: Former Hanson Brickworks	Project No. E11997/2	Co-ords: - Level: -	Date 05/12/2006
Location: Star Lane, Great Wakering		Dimensions: 1.20m, Depth 2.80m, 0.70m	Scale 1:25
Client: J G Management LLP			Logged By LH

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	CBR Test Results				
						Reinforced CONCRETE.
0.30	D		0.25			MADE GROUND: Red-brown, very gravelly, fine to coarse sand. Gravels are angular to subangular, fine to coarse of brick, sandstone and concrete.
			0.50			Light brown, very sandy, CLAY becoming silty below 1.5m.
1.00	D					
2.00	D					
			2.60			Yellow-brown, slightly gravelly, fine to coarse SAND. Gravels are angular to subangular, fine to coarse of flint.
2.70	D		2.80			Trialpit Complete at 2.80 m

Remarks: Metal pipe encountered on eastern side.

Groundwater:

AGS

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Trialpit No **TP4**
Sheet 1 of 1

Project Name: ...er Hanson Brickworks	Project No. E11997/2	Co-ords: - Level: -	Date 05/12/2006
Location: Star Lane, Great Wakering		Dimensions: 1.20m, Depth 3.00m, 0.70m	Scale 1:25
Client: J G Management LLP			Logged By LH

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	CBR Test Results				
						Reinforced CONCRETE.
			0.20			
0.40	D					MADE GROUND: Red0brown, very gravelly, fine to coarse sand. Gravels are angular to subangular, fine to coarse with some cobble-sized fragments of brick, sandstone and flint.
			0.70			
0.80	D					Light brown, sandy, CLAY bacoming very sandy below 1.5m.
2.50	D					
			2.80			Yellow-brown, clayey, fine to coarse SAND.
3.00	D		3.00			Trialpit Complete at 3.00 m

Remarks:

Groundwater:

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Trialpit No **TP5**
Sheet 1 of 1

Project Name: Former Hanson Brickworks	Project No. E11997/2	Co-ords: - Level: -	Date 05/12/2006
Location: Star Lane, Great Wakering		Dimensions: 1.20m, Depth 3.10m, 0.70m	Scale 1:25
Client: J G Management LLP			Logged By LH

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	CBR Test Results				
						Reinforced CONCRETE.
			0.25			
			0.30			MADE GROUND: Brown, very gravelly, fine to coarse sand. Gravels are angular to subangular, fine to coarse of flint and sandstone.
0.40	D					
			0.50			MADE GROUND: Grey-brown mottled black, sandy, clay with slight hydrocarbon odour.
0.70	D					Light brown, very sandy, CLAY becoming silty below 1.8m.
						1
						2
2.00	D					
			2.70			Yellow-brown, fine to coarse SAND.
						3
3.00	D					
			3.10			Trialpit Complete at 3.10 m
						4
						5

Remarks:

Groundwater:

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Trialpit No TP6
Sheet 1 of 1

Project Name: er Hanson Brickworks	Project No. E11997/2	Co-ords: - Level: -	Date 05/12/2006
Location: Star Lane, Great Wakering		Dimensions: 1.20m, Depth 2.80m, 0.70m	Scale 1:25
Client: J G Management LLP			Logged By LH

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	CBR Test Results				
						Reinforced CONCRETE.
			0.20			
0.30	D					MADE GROUND: Grey mottled black, sandy, gravelly, clay with fragments of glass and slight hydrocarbon odour. Gravels are angular to subangular, fine to coarse of brick, sandstone and flint.
			0.60			
						Brown, sandy, gravelly, CLAY with slight hydrocarbon odour. Gravels are angular to subangular, fine to coarse of flint.
1.00	D					
			2.00			
2.10	D					Yellow-brown, slightly gravelly, fine to coarse SAND.
2.80	D		2.80			Trialpit Complete at 2.80 m

Remarks: Two cables encountered along eastern side beneath concrete.

Groundwater: Groundwater seepag at 2.8m.

AGS

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Trialpit No **TP7**
Sheet 1 of 1

Project Name: Former Hanson Brickworks	Project No. E11997/2	Co-ords: - Level: -	Date 05/12/2006
Location: Star Lane, Great Wakering		Dimensions: 1.20m, Depth 3.40m, 0.70m	Scale 1:25
Client: J G Management LLP			Logged By LH

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
Depth (m)	Type	CBR Test Results				
0.20	B					Brown, very sandy, CLAY.
			0.70			Light brown, very sandy, CLAY.
1.00	B					
			2.70			Yellow-brown, fine to coarse SAND.
2.80	B					
			3.40			Trialpit Complete at 3.40 m

Remarks:

Groundwater:

AGS

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Borehole No **WS1**
Sheet 1 of 1

Project Name: er Hanson Brickworks	Project No. E11997/2	Co-ords: -	Hole Type WS
Location: Star Lane, Great Wakering		Level: -	Scale 1:50
Client: J G Management LLP		Dates: 04/12/2006	Logged By LH

Well	Water Strikes	Samples & In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
					0.25			CONCRETE.
		0.25-0.40	D		0.40			MADE GROUND: Light brown, sandy, gravelly, clay. Gravels are angular to subangular, fine to coarse of concrete and conglomerate.
					0.65			
		0.80-1.00	D		1.00			MADE GROUND: Light brown, clayey, very gravelly, fine to coarse sand. Gravels are angular to subangular, fine to coarse of concrete and conglomerate.
					1.20			
		1.50-1.70	D					MADE GROUND: Light brown, sandy, clay with occasional angular to subangular, fine to coarse gravels of conglomerate.
								Light brown, very sandy, angular to subrounded, fine to coarse GRAVEL of flint.
		2.40-2.60	D					Light brown, sandy, CLAY with occasional rounded fine to coarse gravel of flint.
		3.80-4.00	D		4.00			End of Borehole at 4.00 m
			Type	Results				

1 2 3 4 5 6 7 8 9 10

Remarks:

AGS

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Borehole No **WS4**
Sheet 1 of 1

Project Name: Former Hanson Brickworks	Project No. E11997/2	Co-ords: -	Hole Type WS
Location: Star Lane, Great Wakering		Level: -	Scale 1:50
Client: J G Management LLP		Dates: 04/12/2006	Logged By LH

Well	Water Strikes	Samples & In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
								CONCRETE.
		0.30-0.45	D		0.30			MADE GROUND: Light brown, very clayey, fine to coarse sand with occasional angular to subangular. fine to coarse gravel of mudstone, concrete and conglomerate.
		0.60-0.80	D		0.45			Light brown, sandy, CLAY.
		1.40-1.60	D					
		2.40-2.60	D		2.70			Light brown, fine to medium SAND.
		3.30-3.60	D					
					3.80			Light brown, slightly, clayey, fine to medium SAND.
					4.00			End of Borehole at 4.00 m

Type	Results

Remarks:

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Project Name: [illegible]er Hanson Brickworks	Project No. E11997/2	Co-ords: -	Borehole No **WS5** Sheet 1 of 1
Location: Star Lane, Great Wakering		Level: -	Hole Type WS Scale 1:50
Client: J G Management LLP		Dates: 04/12/2006	Logged By LH

Samples Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Stratum Description
			0.12		CONCRETE.
0.12-0.40	D		0.40		MADE GROUND: Brown mottled dark brown, sandy, slightly gravelly, clay with fragments of glass. Gravels are angular to subangular, fine to coarse of flint, brick and chalk.
0.60-0.80	D				Brown, sandy, CLAY.
1.50-1.70	D		2.60		
3.20-3.60	D		4.00		Yellow-brown, fine to coarse SAND.
					End of Borehole at 4.00 m

Remarks:

AGS

HoleBASE III (Bld 382) Standard Borehole Log v2 dated 27th Nov 03

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Borehole No **WS6** Sheet 1 of 1

Project Name: Former Hanson Brickworks	Project No. E11997/2	Co-ords: -	Hole Type WS
Location: Star Lane, Great Wakering		Level: -	Scale 1:50
Client: J G Management LLP		Dates: 04/12/2006	Logged By LH

Well	Water Strikes	Samples & In Situ Testing Depth (m)	Type	Results	Depth (m)	Level (m AOD)	Legend	Stratum Description
					0.20			Reinforced CONCRETE.
		0.20-0.30	D		0.30			MADE GROUND: Brown, sandy, gravelly, clay. Gravels are angular to subangular, fine to coarse of brick, concrete and sandstone.
		0.30-0.45	D		0.45			
					0.50			MADE GROUND: Grey-brown, fine to coarse sand.
		0.70-1.00	D		1.00			MADE GROUND: Brown, very gravelly, clay. Gravels are angular to subangular, fine to coarse of sandstone, brick, flint and clinker.
		1.20-1.40	D					
					1.80			MADE GROUND: Dark brown mottled black, sandy, gravelly, clay with slight hydrocarbon odour. Gravels are angular to subangular, fine to coarse of brick, flint and sandstone.
		2.00-2.40	D					Light brown, sandy, CLAY.
	▽							Yellow-brown, fine to coarse SAND.
		3.50-3.70	D					
					4.00			End of Borehole at 4.00 m
			Type	Results				

Remarks:

AGS

APPENDIX 2

Contamination Laboratory Test Results

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES	Site STAR LANE BRICKWORKS, GREAT WAKERING	Contract No E11997
	Client DTS Raeburn Limited	
	Engineer	

Test Description	Quantity	Figure No	UKAS Accredited
Contamination Suite - Soil	7	1	See Table
Polyaromatic Hydrocarbons - Soil	7	2	See Table
TPHCWG (Aliphatic/Aromatic Split) - Soil	7	3	See Table
Asbestos Screen	4	4	No

Originator	Checked & Approved	TABLE OF CONTENTS Analytical Chemistry	Figure 0
DD			Sheet 1 of 1

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site: **STAR LANE BRICKWORKS, GREAT WAKERING**

Contract No **E11997**

Client: DTS Raeburn Limited

Engineer:

Sample Identification																							
Exploratory Hole	Depth m	Sample Ref	Sample Type	Lab Sample ID	Arsenic mg/kg	Cadmium mg/kg	Chromium Hexavalent mg/kg	Chromium mg/kg	Lead mg/kg	Mercury mg/kg	Selenium mg/kg	Copper mg/kg	Nickel mg/kg	Zinc mg/kg	Boron (water soluble) mg/kg	Phenols mg/kg	Free Cyanide mg/kg	Complex Cyanides mg/kg	Thiocyanates mg/kg	Sulphate (acid soluble) as SO4 %	Sulphides (acid soluble) mg/kg	Total Sulphur %	pH units
TP01	1.50		D	BS31146	6.4	<1	<1.0	25	10	<0.5	<1.0	18	24	44	<1.0	<1.0	<1.0	<1.0	<1	<0.10	<20	0.04	8.0
TP02	3.70		J	BS31147	4.2	<1	<1.0	10	3	<0.5	<1.0	10	15	22	<1.0	<1.0	<1.0	<1.0	<1	<0.10	<20	0.02	7.2
WS01	0.80-1.00		J	BS31148	10.3	<1	<1.0	41	17	<0.5	<1.0	24	35	71	<1.0	<1.0	<1.0	<1.0	<1	<0.10	<20	0.02	7.6
WS05	0.12-0.40		J	BS31150	16.0	<1	<1.0	30	204	0.8	<1.0	103	28	179	1.4	<1.0	<1.0	<1.0	<1	<0.10	<20	0.02	7.8
TP04	0.80		J	BS31151	12.9	<1	<1.0	43	27	<0.5	<1.0	26	35	83	1.2	<1.0	<1.0	<1.0	<1	<0.10	<20	0.01	7.4
TP06	0.30		J	BS31153	24.0	<1	<1.0	33	620	1.3	<1.0	792	58	911	6	1.40	<1.0	<1.0	1	0.13	<20	0.46	8.2
WS06	1.20-1.40		J	BS31155	9.5	<1	<1.0	31	16	<0.5	<1.0	27	27	56	1.2	<1.0	<1.0	<1.0	<1	<0.10	<20	0.01	8.2
Limits of Detection					0.25	0.7	0.2	0.3	1.4	0.07	0.79	0.2	1.9	0.6	0.48	0.25	0.1	0.1	0.5	0.01	17	0.01	~
Terra Tek Analysis Method TP					038	037	040	037	037	039	038	037	037	037	032	046	047	049	050	029	051	S/C	019
UKAS Accredited Test Y/N					Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Originator	Checked & Approved
TH	

RESULTS OF CHEMICAL CONTAMINATION TESTS - SOILS

Figure 1

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Rev 1 March 2004

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site: **STAR LANE BRICKWORKS, GREAT WAKERING**

Client: DTS Raeburn Limited

Engineer:

Contract No **E11997**

Sample Identification																						
Exploratory Hole	Depth m	Sample Ref	Sample Type	Lab Sample ID	Naphthalene mg/kg	Acenaphthylene mg/kg	Acenaphthene mg/kg	Fluorene mg/kg	Phenanthrene mg/kg	Anthracene mg/kg	Fluoranthene mg/kg	Pyrene mg/kg	Benz(a)anthracene mg/kg	Chrysene mg/kg	Benzo(b)fluoranthene mg/kg	Benzo(k)fluoranthene mg/kg	Benzo(a)pyrene mg/kg	Indeno(123cd)pyrene mg/kg	Dibenzo(ah)anthracene mg/kg	Benzo(ghi)perylene mg/kg	Sum 16 Priority Pollutants mg/kg			
TP01	1.50		D	BS31146	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	<0.5	<1.0	<4.0			
TP02	3.70		J	BS31147	<0.5	<0.5	<0.5	0.62	1.22	1.10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	<0.5	<1.0	<4.0			
WS05	0.12-0.40		J	BS31150	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	<0.5	<1.0	<4.0			
TP04	0.80		J	BS31151	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	<0.5	<1.0	<4.0			
TP06	0.30		J	BS31153	<0.5	<0.5	<0.5	<0.5	0.77	0.73	1.68	1.42	0.71	0.78	<0.5	0.68	0.69	<1.0	<0.5	<1.0	7.5			
WS06	1.20-1.40		J	BS31155	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	<0.5	<1.0	<4.0			
WS01	0.80-1.00		J	BS31148	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1.0	<0.5	<1.0	<4.0			
Limits of Detection					0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	1.00	0.50	1.00	4.0			
Terra Tek Analysis Method TP					045	045	045	045	045	045	045	045	045	045	045	045	045	045	045	045	045			
UKAS Accredited Test Y/N					Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y			

Originator	Checked & Approved
TH	

POLYAROMATIC HYDROCARBONS - SOIL

Figure 2

Sheet 1 of 1

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site: **STAR LANE BRICKWORKS, GREAT WAKERING**

Client: DTS Raeburn Limited

Engineer:

Contract No **E11997**

Sample Identification					ALIPHATICS								AROMATICS											
Exploratory Hole	Depth m	Sample Ref	Sample Type	Lab Sample ID	C5-C6 (GC/MS H/S) µg/kg	C6-C8 (GC/MS H/S) µg/kg	C8-C10 (GC/MS H/S) µg/kg	>C10-C12 (GC/FID) mg/kg	>C12-C16 (GC/FID) mg/kg	>C16-C21 (GC/FID) mg/kg	>C21-C35 (GC/FID) mg/kg	>C35-C39 (GC/FID) mg/kg	C5-C6 (GC/MS H/S) µg/kg	C6-C8 (GC/MS H/S) µg/kg	C8-C10 (GC/MS H/S) µg/kg	>C10-C12 (GC/FID) mg/kg	>C12-C16 (GC/FID) mg/kg	>C16-C21 (GC/FID) mg/kg	>C21-C35 (GC/FID) mg/kg	>C35-C39 (GC/FID) mg/kg				
TP02	3.70		J	BS31147	<10	<10	<10	106	1801	2754	583	53	<10	<10	<10	1	16	24	26	56				
WS01	0.80-1.00		J	BS31148	<10	<10	<10	<1	7	9	17	38	<10	<10	<10	<1	<1	<1	<1	5				
TP03	1.00		J	BS31149	<10	<10	<10	<1	1	1	16	23	<10	<10	<10	<1	<1	<1	<1	3				
TP04	0.80		J	BS31151	<10	<10	<10	<1	2	2	31	36	<10	<10	<10	<1	<1	<1	<1	2				
TP05	0.40		J	BS31152	<10	<10	<10	<1	<1	<1	<1	<1	<10	<10	<10	<1	<1	2	4	16				
TP06	0.30		J	BS31153	<10	<10	<10	<1	<1	6	18	21	<10	11	14	<1	<1	5	8	24				
WS06	0.70		J	BS31154	<10	<10	<10	<1	<1	<1	<1	1	<10	<10	<10	<1	<1	<1	<1	2				
Limits of Detection					10	10	10	1	1	1	1	1	10	10	10	1	1	1	1	1				
Terra Tek Analysis Method TP					S/C	S/C	S/C	126	126	126	126	126	S/C	S/C	S/C	126	126	126	126	126				
UKAS Accredited Test Y/N					N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N				

Originator	Approved
TH	

RESULTS OF CHEMICAL CONTAMINATION TESTS - SOILS

Figure 3

Sheet 1 of 1

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Rev 1 March 2004

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site: **STAR LANE BRICKWORKS, GREAT WAKERING**

Client: DTS Raeburn Limited

Engineer:

Contract No **E11997**

Sample Identification				Lab Sample ID	Element	Asbestos Type	Asbestos Level	Comments
Exploratory Hole	Depth m	Sample Ref	Sample Type					
WS01	0.25-0.40	1	T	BS31245	~	~	None Detected	
WS06	0.20-0.30	1	D	BS31246	~	~	None Detected	
TP04	0.40	1	D	BS31247	~	~	None Detected	
TP03	0.30	1	D	BS31248	~	~	None Detected	
Limits of Detection					~	~	~	~
Terra Tek Analysis Method TP					S/C	S/C	S/C	S/C
UKAS Accredited Test Y/N					N	N	N	N

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TH	20/12/2006

ASBESTOS IDENTIFICATION - PLM

Figure 4

Sheet 1 of 1

Lab Project No B11727 : 20/12/2006 12:25:09

Moor Lane, Witton, Birmingham, B6 7HG

Appendix B – Ken Rush Associates Report

KEN RUSH ASSOCIATES

STRUCTURAL & CIVIL ENGINEERS

Geotechnical Report

For

Star Lane
Great Wakering

11-4593 June 2011

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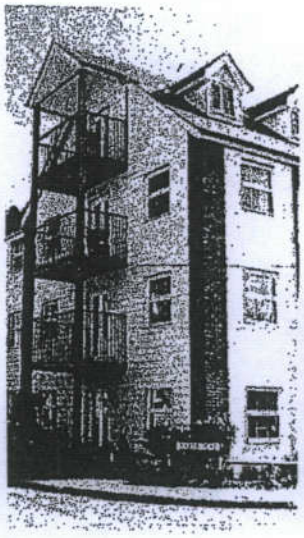
engineer@krusha.co.uk
info@krusha.co.uk
www.kenrush.co.uk



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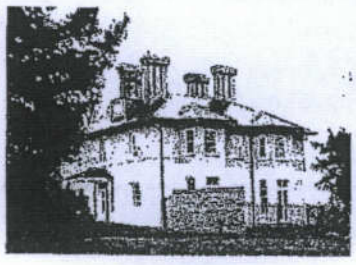
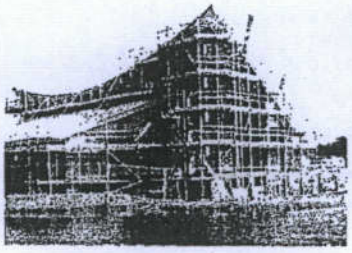
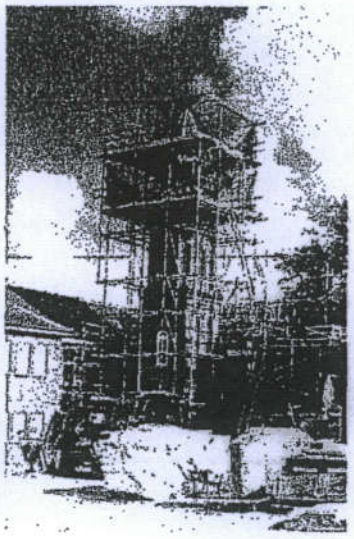






INDEX

1.0 INTRODUCTION

The site under investigation is an area of land adjacent Star Lane Industrial Estate. The site was previously a brickworks, all buildings had been demolished by the time of the investigation, some ground floor slabs remain. The depth of existing foundations are unknown.

Access to the site is gained by a gate from Star Lane at the Southern end of the site, this leads to a track which runs along the South of the site to fishing lakes which are located in the open land to the East boundary.

The Industrial Estate is to the North of the site and Star Lane is on the West boundary. There is a second access gate to the Western boundary however large concrete blocks have been placed in front of the gates to prevent access.

The site is reasonably level with the exception of the South East corner which is lower than the rest of the site.

There is vegetation to the East, South and West boundaries.

At the request of Taylor Wimpey East London Ltd Ken Rush Associates were appointed to carry out a geotechnical investigation in order to advise on foundation requirements for a proposed development of 141 houses and apartments.

We now report our findings.

It may be possible that exceptional conditions exist elsewhere on the site not revealed by this exploratory investigation.

2.0 FIELDWORK

A borehole investigation was carried out on Wednesday 25th May 2011 using an augered rig to construct two boreholes to 4.0m and one deeper borehole, which was terminated at 5.5m due to the depth of sand encountered.

Percolation testing was carried out in one of the boreholes to determine if soakaways will be suitable for the development.

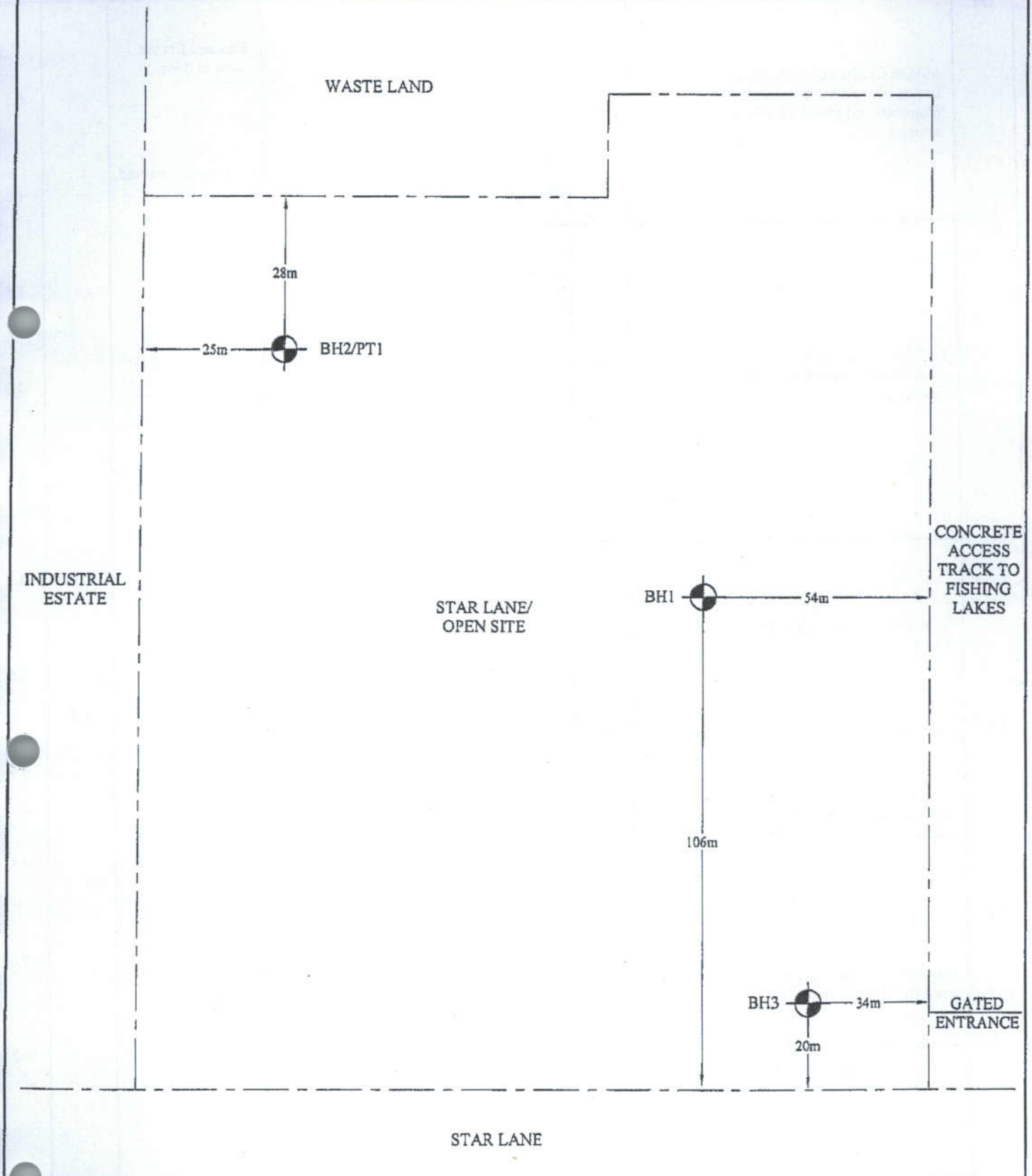
The depth, thickness and engineering description of the strata encountered were logged. Section 3.0 provides the site location plan and log for each borehole, Section 4.0 provides the geotechnical test results.

3.0

SITE LOCATION PLAN & BOREHOLE LOGS

Chelmer Site Investigations
Unit 15 East Hanningfield Industrial Estate
Old Church Road, East Hanningfield, Essex CM3 8AB
Telephone: 01245 400930 Fax: 01245 400933
Email: info@siteinvestigations.co.uk Website: www.siteinvestigations.co.uk

Client:	Ken Rush Associates	Scale: N.T.S.	Sheet: 1 of 1	Date: 25.5.11	
Location:	Star Lane, Great Wakering, Essex	Job No: 2640	Weather: Fine	Drawn by: MM	Checked by: ME



Notes:

On site tree identification for guidance only. Not authenticated.

Key:

Tree/Shrub | Borehole | Trial Pit | G Gully | Tree Stump | Rain Water/ Soil Pipe | MH Manhole

Unit 15 East Hanningfield Industrial Estate
Old Church Road, East Hanningfield, Essex CM3 8AB
Telephone: 01245 400930 Fax: 01245 400933
Email: info@siteinvestigations.co.uk Website: www.siteinvestigations.co.uk

Client:	Ken Rush Associates	Scale: N.T.S.	Sheet No: 1 of 1	Weather: Fine	Date: 2
Site:	Star Lane, Great Wakering, Essex	Job No: 2640	Borehole No: 1	Boring method:	GEO 205 (150mmØ) C.F.A.

Depth Mtrs.	Description of Strata	Thick-ness	Legend	Sample	Test Type Result	Root Information	Depth to Water	Depth Mtrs
G.L.	MADE GROUND: medium compact mid brown silty clay with numerous brick fragments and gravel. (Tar/fluid present in samples).	1.2		D D		Hair and fibrous roots to 0.9m. No roots observed below 0.9m.		0.5 1.0
1.2	Stiff moist mid brown sandy very silty CLAY thickly laminated with brown silt and fine sand.	1.6		D D D	150 SPT 05, 03, 04, 04, 05 N = 16			1.5 2.0 2.5
2.8	Medium dense moist mid brown clayey silty fine SAND.	1.0		D D	150 CPT 11, 05, 05, 05, 05 N = 20			3.0 3.5
3.8	Medium dense wet mid brown silty fine and medium SAND with numerous fine gravel.	1.0		D D			3.7	4.0 4.5
4.8	Medium dense wet mid brown/orange gravelly silty coarse SAND.	0.7		D D				5.0 5.5
5.5	Borehole ends at 5.5m As instructed on site by Engineer.							

Drawn by: MM Approved by: ME

Remarks: *Water seepage at 3.7m.*
Unable to carry out CPT at 4.5m due to collapsing sand - Engineer on site and aware.
Borehole wet and collapsed at 4.0m on completion.

Key: T.D.T.D. Too Dense to Drive
D Small Disturbed Sample J Jar Sample
B Bulk Disturbed Sample V Pilcon Van (kPa)
U Undisturbed Sample (U100) M Mackintosh Probe
W Water Sample N Standard Penetration Test Blow Count

Unit 15 East Hanningfield Industrial Estate
Old Church Road, East Hanningfield, Essex CM3 8AB
Telephone: 01245 400930 Fax: 01245 400933
Email: info@siteinvestigations.co.uk Website: www.siteinvestigations.co.uk

Client: Ken Rush Associates	Scale: N.T.S.	Sheet No: 1 of 1	Weather: Fine	Date: 25.5.11
Star Lane, Great Wakering, Essex	Job No: 2640	Borehole No: 2	Boring method: GEO 205 (150mmØ) C.F.A.	

Depth Mtrs.	Description of Strata	Thick-ness	Legend	Sample	Test Type Result	Root Information	Depth to Water	Depth Mtrs
G.L.	Turf/weeds over MADE GROUND: medium compact reddish brown silty fine sand with numerous brick fragments and occasional gravel.	0.7		D		Hair and fibrous roots observed to 0.8m.		0.5
0.7	MADE GROUND: medium compact mid to dark brown clayey silty fine sand with numerous brick fragments and occasional gravel.	0.6		D		No roots observed below 0.8m.		1.0
1.3	Stiff moist mid brown sandy very silty CLAY thickly laminated with brown silt and fine sand.	1.5		D D D	150 SPT 06, 04, 04, 04, 05 N = 17			1.5 2.0 2.5
2.8	Medium dense wet mid brown/orange silty gravelly coarse SAND.	1.2		D D D	150 CPT 11, 06, 05, 05, 06 N = 22		*2.8*	3.0 3.5 4.0
4.0	Borehole ends at 4.0m							

Drawn by: MM | Approved by: ME

Remarks: *Water seepage at 2.8m.*
Borehole wet at base and open on completion.

Key: T.D.T.D. Too Dense to Drive
D Small Disturbed Sample J Jar Sample
B Bulk Disturbed Sample V Pilcon Van (kPa)
U Undisturbed Sample (U100) M Mackintosh Probe
W Water Sample N Standard Penetration Test Blow Count

Unit 15 East Hanningfield Industrial Estate
Old Church Road, East Hanningfield, Essex CM3 8AB
Telephone: 01245 400930 Fax: 01245 400933
Email: info@siteinvestigations.co.uk Website: www.siteinvestigations.co.uk

Client:	Ken Rush Associates	Scale: N.T.S.	Sheet No: 1 of 1	Weather: Fine	Date: 25.[illegible].11
Site:	Star Lane, Great Wakering, Essex	Job No: 2640	Borehole No: 3	Boring method:	GEO 205 (150mmØ) C.F.A.

Depth Mtrs.	Description of Strata	Thick-ness	Legend	Sample	Test Type Result	Root Information	Depth to Water	Depth Mtrs
G.L.	Turf/moss over MADE GROUND: medium compact reddish brown gravelly silt with numerous brick fragments.	0.4				Hair and fibrous roots observed to 0.5m.		
0.4	Stiff mid brown very silty CLAY thinly laminated with red and brown silt and fine sand and occasional carbon flecks.	0.5		D		No roots observed below 0.5m.		0.5
0.9	Stiff moist mid brown very silty CLAY thickly laminated with brown silt and fine sand.			D				1.0
				D	150 SPT 07, 04, 04, 05, 05 N = 18			1.5
				D				2.0
				D				2.5
2.8	Medium dense moist light brown silty gravelly fine and medium SAND.	1.2		D	150 CPT 14, 07, 06, 07, 08 N = 28			3.0
				D				3.5
4.0	Borehole ends at 4.0m			D				4.0

Drawn by: MM Approved by: ME

Remarks: Borehole wet at base and open on completion.

Key: T.D.T.D. Too Dense to Drive
D Small Disturbed Sample J Jar Sample
B Bulk Disturbed Sample V Pilcon Van (kPa)
U Undisturbed Sample (U100) M Mackintosh Probe
W Water Sample N Standard Penetration Test Blow Count

Chelmer Site Investigations,
Unit 15, East Hanningfield Industrial Estate, Old Church Road.
East Hanningfield, Essex CM3 8AB
Telephone: 01245 400930 Fax: 01245 400933
Email: info@siteinvestigations.co.uk Website: www.siteinvestigations.co.uk

Client:	Ken Rush Associates	Sheet No: 1 of 1	Date: 25.5.11
Site:	Star Lane, Great Wakering, Essex		C S I Ref: 2640
Borehole No:	2 (150mm)		
Depth of Trial pit:	4.0m		

PERCOLATION TEST RESULTS

Time Taken (Minutes)	Test 1 (Depth mm)	Test 2 (Depth mm)	Test 3 (Depth mm)
0	4000		
1	3700		
2	3600		
3	3525		
4	3475		
5	3400		
6	3375		
7	3350		
8	3325		
9	3300		
10	3275		
15	3200		
20	3125		
25	3050		
30	3025		
35	3000		
40	2975		
45	2975		
50	2975		
55	2965		
60	2950		
70	2950		
80	2925		
90	2900		
100	2900		
120	2850		
150	2800		
180	2750		

Comments:

4.0

LABORATORY TESTS

Chelmer Geotechnical Laboratories

Unit 15 East Hanningfield Industrial Estate Old Church Road East Hanningfield Essex CM3 8AB Tel: 01245 401393 Fax: 01245 400933 Email: info@soillabs.co.uk

Laboratory Testing Results

Job No: CGL02186
Client: Ken Rush Associates CSI Ref: 2640
Site: Star Lane Great Wakering

Received: 25.05.11
Tested: 31.05.11
Complete: 02.06.11

Sample Ref BH / Sample No	Depth (m)	Type	Moisture Content (%) [1]	Soil Fraction >0.425mm (%) [2]	Liquid Limit (%) [3]	Plastic Limit (%) [4]	Plasticity Index (%) [5]	Liquidity Index [5]	Modified Plasticity Index (%) [6	Soil Class [7]	Filter Paper Contact Time (h) [8]	Soil Sample Suction (kPa)	In situ Shear Vane Strength (kPa) [9]	Organic Content (%) [10]	pH Value [11]	Sulphate Content (g/l) SO_3 [12]	Sulphate Content (g/l) SO_4 [13]	Class [14]
1/018206	1.0	D	19	<5	43	18	25	0.04	25	CI								
1/018207	1.5	D													8.0	0.00	0.00	DS-1

Test Methods / Notes

[1] BS 1377 : Part 2 : 1990, Test No 3.2
[2] Estimated if <5%, otherwise measured
[3] BS 1377 : Part 2 : 1990, Test No 4.4
[4] BS 1377 : Part 2 : 1990, Test No 5.3
[5] BS 1377 : Part 2 : 1990, Test No 5.4
[6] BRE Digest 240 : 1993
[7] BS 5930 : 1981 : Figure 31 - Plasticity Chart for the classification of fine soils
[8] In-house method S9a adapted from BRE IP 4/93
[9] Values of shear strength were determined in situ by Chelmer Site Investigations using a Pilcon hand vane or Geonor vane (GV).
[10] BS 1377 : Part 3 : 1990, Test No 4
[11] BS 1377 : Part 2 : 1990, Test No 9
[12] BS 1377 : Part 3 : 1990, Test No 5.6
[13] $SO_4 = 1.2 \times SO_3$
[14] BRE Special Digest One (Concrete in Aggressive Ground) 2005
Note that if the SO_4 content falls into the DS-4 or DS-5 class, it would be prudent to consider the sample as falling into the DS-4m or DS-5m class respectively unless water soluble magnesium testing is undertaken to prove otherwise

Key

D	Disturbed sample
B	Bulk sample
U	U100 (undisturbed sample)
W	Water sample
ENP	Essentially Non-Plastic by inspection
U/S	Underside Foundation

Chelmer Geotechnical Laboratories

Unit 15 East Hanningfield Industrial Estate Old Church Road East Hanningfield Essex CM3 8AB Tel: 01245 401393 Fax: 01245 400933 Email: info@soillabs.co.uk

Laboratory Testing Results

Job No: CGL02186
Client: Ken Rush Associates CSI Ref: 2640
Site: Star Lane Great Wakering

Received: 25.05.11
Tested: 31.05.11
Complete: 02.06.11

Sample Ref. BH / Sample No	Depth (m)	Type	Moisture Content (%) [1]	Soil Fraction >0.425mm (%) [2]	Liquid Limit (%) [3]	Plastic Limit (%) [4]	Plasticity Index (%) [5]	Liquidity Index [5]	Modified Plasticity Index (%) [6	Soil Class [7]	Filter Paper Contact Time (h) [8]	Soil Sample Suction (kPa)	In situ Shear Vane Strength (kPa) [9]	Organic Content (%) [10]	pH Value [11]	Sulphate Content (g/l) SO_3 [12]	Sulphate Content (g/l) SO_4 [13]	Class [14]
2/018208	2.0	D	20	<5	34	19	15	0.09	15	CL								

Test Methods / Notes

[1] BS 1377 : Part 2 : 1990, Test No 3.2
[2] Estimated if <5%, otherwise measured
[3] BS 1377 : Part 2 : 1990, Test No 4.4
[4] BS 1377 : Part 2 : 1990, Test No 5.3
[5] BS 1377 : Part 2 : 1990, Test No 5.4
[6] BRE Digest 240 : 1993
[7] BS 5930 : 1981 : Figure 31 - Plasticity Chart for the classification of fi
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[11] BS 1377 : Part 2 : 1990, Test No 9
[12] BS 1377 : Part 3 : 1990, Test No 5.6
[13] $SO_4 = 1.2 \times SO_3$
[14] BRE Special Digest One (Concrete in Aggressive Ground) 2005
Note that if the SO_4 content falls into the DS-4 or DS-5 class, it would be prudent to consider the sample as falling int 4m or DS-5m class respectively unless water soluble magnesium testing is undertaken to rwise

Key

D	Disturbed sample
B	Bulk sample
U	U100 (undisturbed sample)
W	Water sample
ENP	Essentially Non-Plastic by inspection
U/S	Underside Foundation

Chelmer Geotechnical Laboratories

Unit 15 East Hanningfield Industrial Estate Old Church Road East Hanningfield Essex CM3 8AB Tel: 01245 401393 Fax: 01245 400933 Email: info@soillabs.co.uk

Laboratory Testing Results

Job No: CGL02186
Client: Ken Rush Associates CSI Ref: 2640
Site: Star Lane Great Wakering

Received: 25.05.11
Tested: 31.05.11
Complete: 02.06.11

Sample Ref. BH / Sample No	Depth (m)	Type	Moisture Content (%) [1]	Soil Fraction > 0.425mm (%) [2]	Liquid Limit (%) [3]	Plastic Limit (%) [4]	Plasticity Index (%) [5]	Liquidity Index [5]	Modified Plasticity Index (%) [6	Soil Class [7]	Filter Paper Contact Time (h) [8]	Soil Sample Suction (kPa)	In situ Shear Vane Strength (kPa) [9]	Organic Content (%) [10]	pH Value [11]	Sulphate Content (g/l) SO_3 [12]	Sulphate Content (g/l) SO_4 [13]	Class [14]
3/018209	0.5	D	18	<5	39	20	19	-0.11	19	CI								
3/018210	2.5	D													7.9	0.00	0.00	DS-1

Test Methods / Notes

[1] BS 1377 : Part 2 : 1990, Test No 3.2
[2] Estimated if <5%, otherwise measured
[3] BS 1377 : Part 2 : 1990, Test No 4.4
[4] BS 1377 : Part 2 : 1990, Test No 5.3
[5] BS 1377 : Part 2 : 1990, Test No 5.4
[6] BRE Digest 240 : 1993
[7] BS 5930 : 1981 : Figure 31 - Plasticity Chart for the classification of fine soils
[8] In-house method S9a adapted from BRE IP 4/93
[9] Values of shear strength were determined in situ by Chelmer Site Investigations using a Pilcon hand vane or Geonor vane (GV).
[10] BS 1377 : Part 3 : 1990, Test No 4
[11] BS 1377 : Part 2 : 1990, Test No 9
[12] BS 1377 : Part 3 : 1990, Test No 5.6
[13] $SO_4 = 1.2 \times SO_3$
[14] BRE Special Digest One (Concrete in Aggressive Ground) 2005
Note that if the SO_4 content falls into the DS-4 or DS-5 class, it would be prudent to consider the sample as falling into the DS-4m or DS-5m class respectively unless water soluble magnesium testing is undertaken to prove otherwise

Key

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B	Bulk sample
U	U100 (undisturbed sample)
W	Water sample
ENP	Essentially Non-Plastic by inspection
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Chelmer Geotechnical Laboratories

Unit 15 East Hanningfield Industrial Estate Old Church Road East Hanningfield Essex CM3 8AB Tel: 01245 401393 Fax: 01245 400933 Email: info@soillabs.co.uk

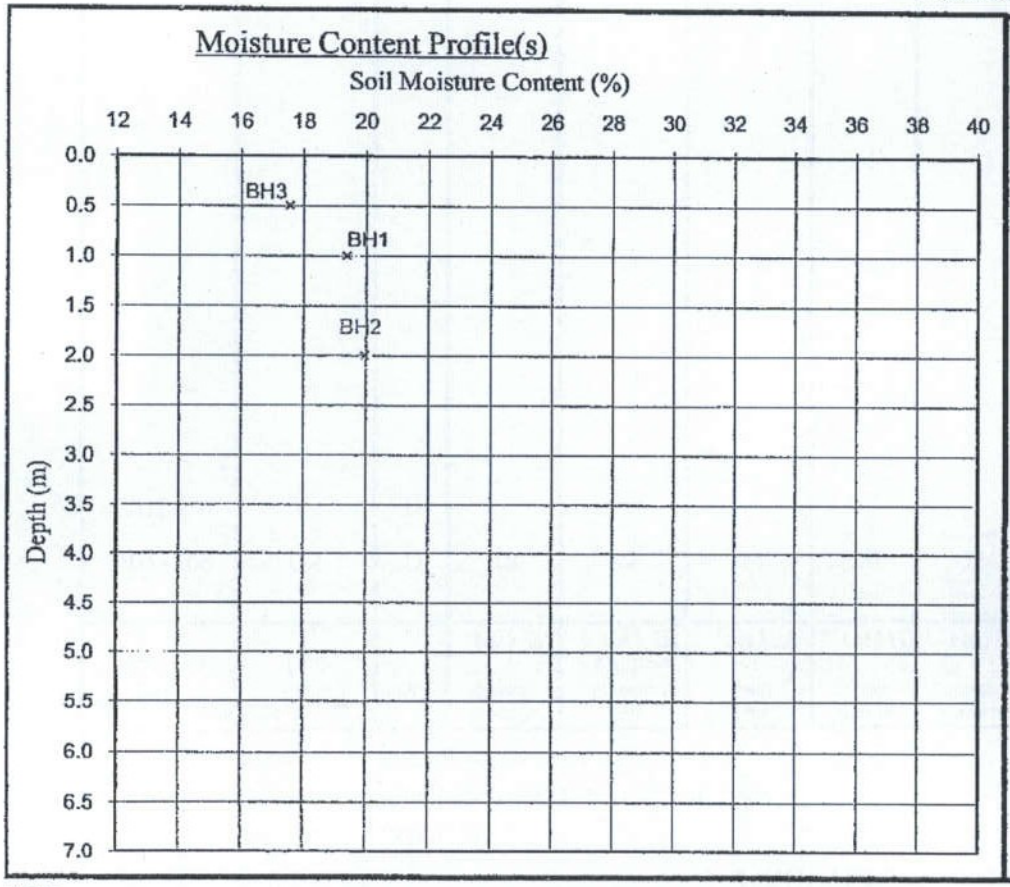
Moisture Content and Shear Strength Profiles

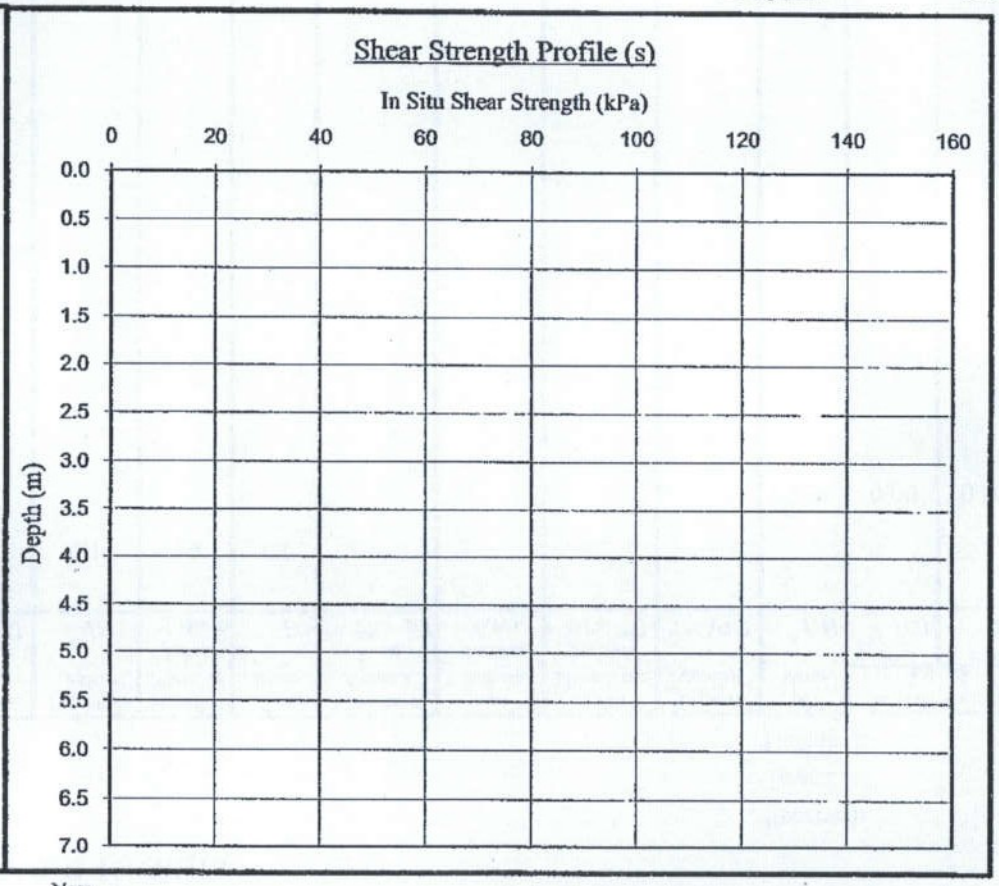
Client: Ken Rush Associates CSI Ref: 2640

Site: Star Lane Great Wakering

Note : Unless specifically noted the profiles have not been related to a site datum.

Job No: CGL02186
Received: 25.05.11
Tested: 31.05.11
Complete: 02.06.11





Notes

1. If the Soil Fraction > 0.425mm exceeds 5% the Equivalent Moisture Content of the remainder (calculated in accordance with BS 1377: Part 2 : 1990, cl.3.2.4 note 1) is also plotted and the alternative profile additionally shown as an appropriately coloured broken line.
2. If plotted, 0.4 LL and PL+2 (after Driscoll, 1983) should only be applied to London Clay (and similarly overconsolidated clays) at shallow depths.

Note

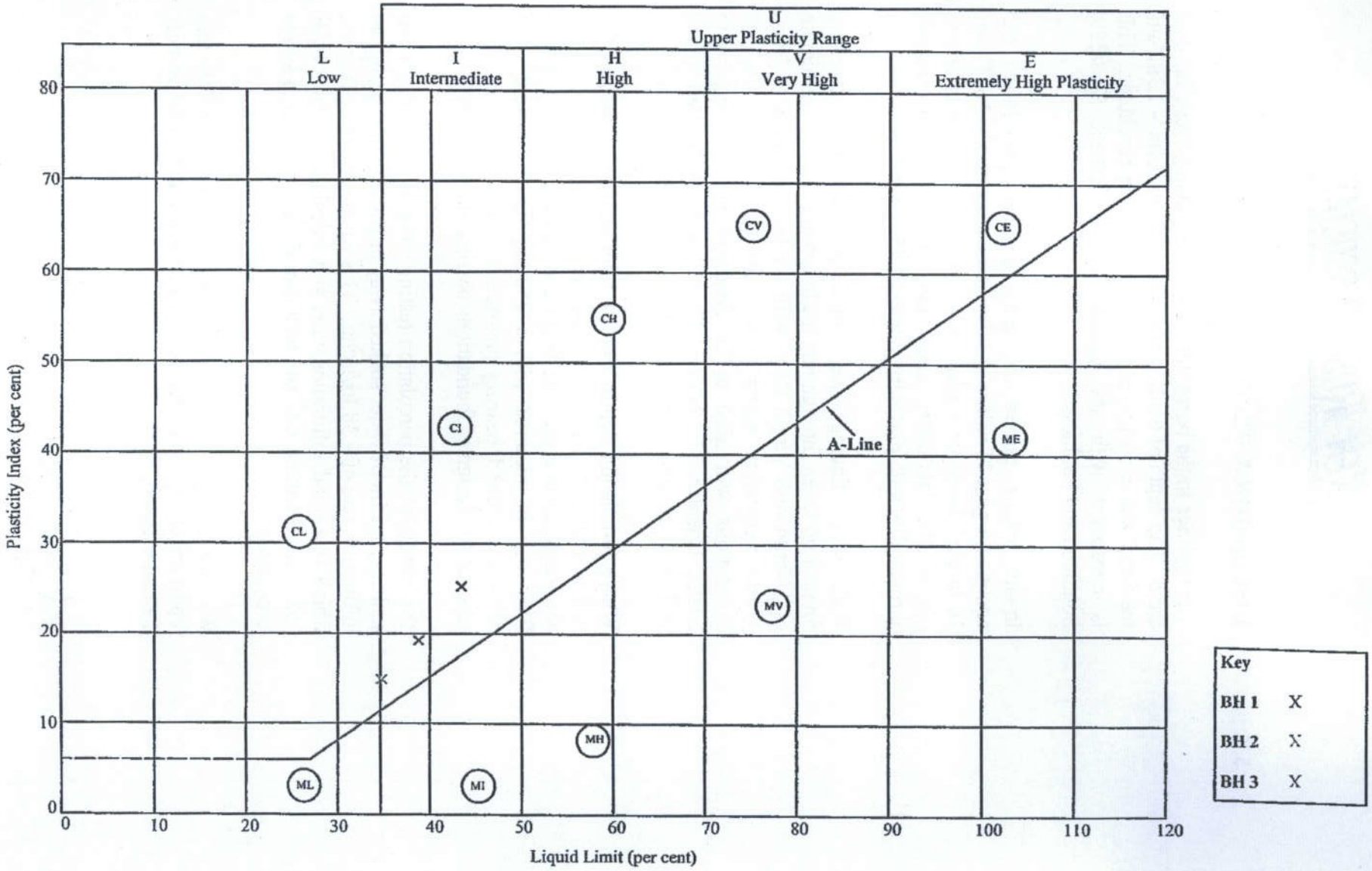
Unless otherwise stated, values of Shear Strength were determined in situ by Chelmer Site Investigations using a Pilcon Hand Vane the calibration of which is limited to a maximum reading of 140 kPa.

Chelmer Geotechnical Laboratories

Unit 15 East Hanningfield Industrial Estate Old Church Road East Hanningfield Essex CM3 8AB Tel: 01245 401393 Fax: 01245 400933 Email: info@soillabs.co.uk

Job No: CGL02186
Client: Ken Rush Associates CSI Ref: 2640
Site: Star Lane Great Wakering

Received: 25.05.11
Tested: 31.05.11
Complete: 02.06.11



Plasticity Chart for the classification of fine soils and the finer part of coarse soils.

In Compliance with BS 5930 : 1981

SILT (M-SOIL), M, plots below A-Line
CLAY, C, plots above A-Line
} M and C may be combined as FINE SOIL, F.

5.0 DISCUSSION & RECOMMENDATIONS

The findings in the boreholes were made ground over Clay over Sand. The depth of made ground varied from 0.4m – 1.3m, and the Sand was encountered at 2.8m in all three boreholes. This is consistent with the Geological Data Sheet (258/259) Southend and Foulness.

In-situ testing carried out using standard penetration test equipment gave N-values at 1.5m in the Clay of N = 16, 17 and 18 in each borehole respectively. Atterberg limit tests carried out in the laboratory show the Clay to be of medium shrinkability with plasticity indices of 25, 15 and 19.

With these findings we would recommend a deepstrip foundation taken through any made ground to bear a minimum of 150mm into Virgin Clay, with a minimum depth of 1.0m. Where vegetation exists around the perimeter of the site foundations will need to be deepened in accordance with NHBC Chapter 4.2 "*Building Near Trees*". A detailed survey will be required to identify tree type and accurate location.

Where foundation depths exceed 1.5m anti heave precautions will be required. Due to the made ground encountered and the shrinkable soils a pre cast beam and block suspended ground floor will be required with a 250mm ventilated void. An allowable ground bearing pressure of 150 kN/m² should be adopted for design of foundations bearing into stiff Clays.

The results of the percolation testing showed reasonably good soakage, 1.25m of water soaked away in 180 minutes, giving an infiltration rate of 9.38 lts/m^2/hr. This equates to 2.6 x 10^{-3}m/s, which is a good infiltration rate, and calculations under BRE 365 will determine size and technical details of the soakaways to be used.

We trust that the comments and recommendations within this report are clear, should further advice be required please contact the undersigned.

A.J.Rush BSc
KEN RUSH ASSOCIATES

Appendix C - Ground Sure

EnviroInsight Report

GroundSure EnviroInsight

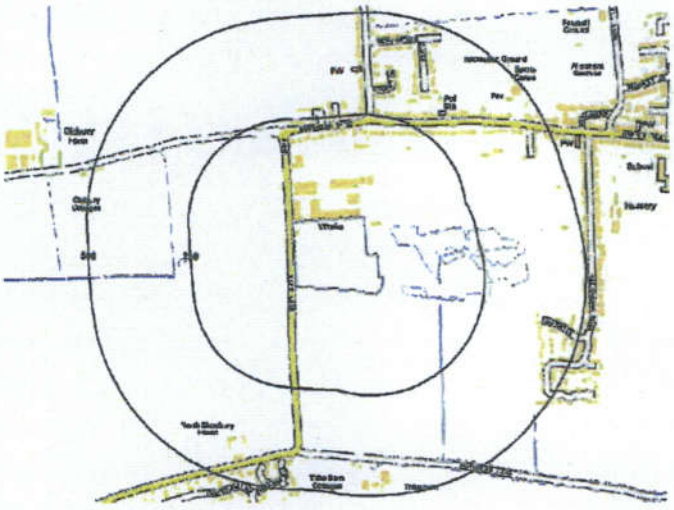
Address: STAR LANE, GREAT WAKERING, SOUTHEND-ON-SEA, SS3 0PJ

Date: Oct 11, 2011

GroundSure Reference: GS-173303

Your Reference: C12519

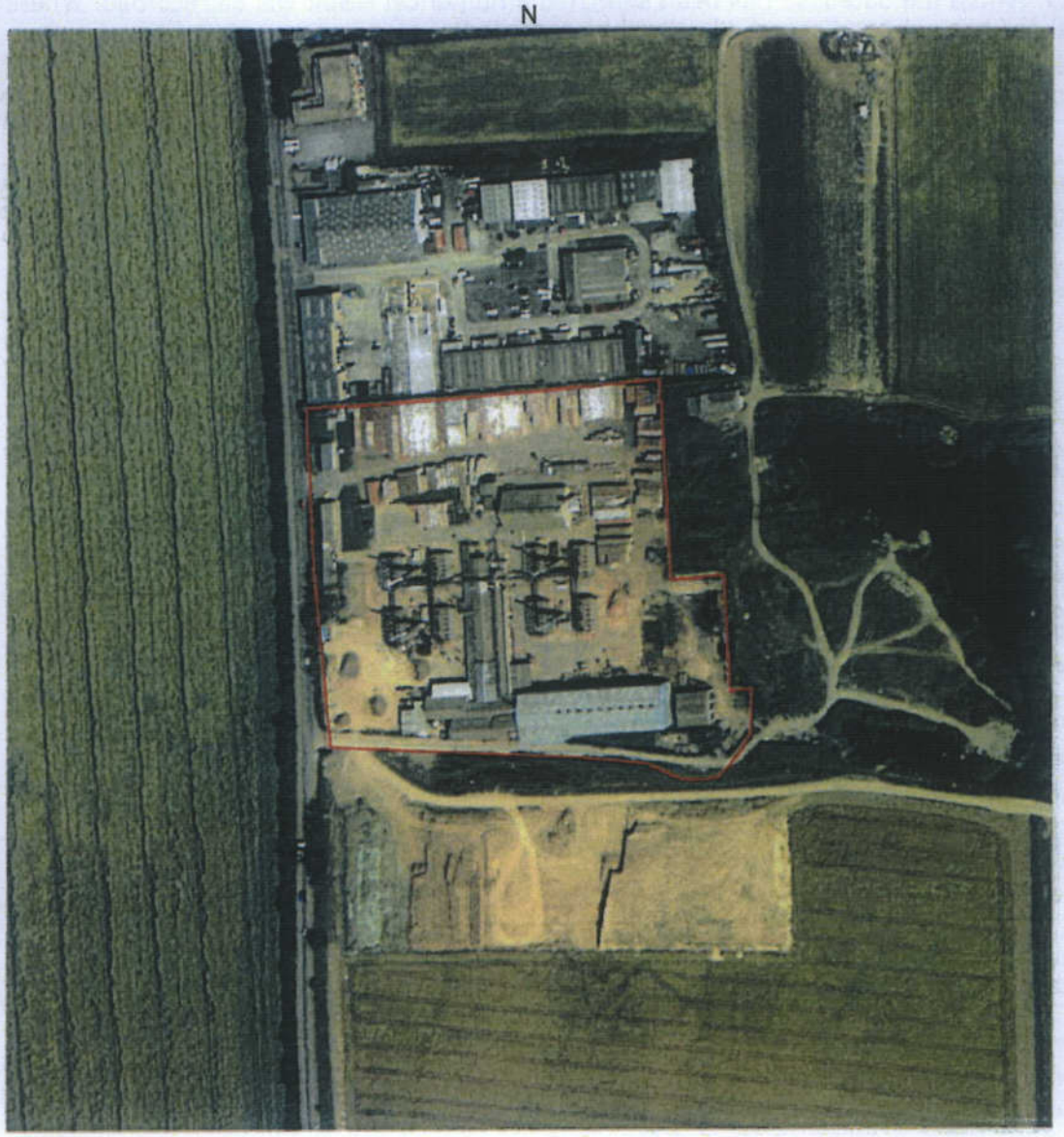
Client: Ground Engineering Limited



Brought to you by GroundSure

Aerial Photograph of Study Site

NW ▲ N NE

◄W  E►

SW ▼ S SE

Site Name: STAR LANE, GREAT WAKERING, SOUTHEND-ON-SEA, SS3 0PJ
Grid Reference: 593451,187419
Size of Site: 3.31 ha

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.

Report Section	Number of records found within (X) m of the study site boundary					
1. Environmental Permits, Incidents and Registers	on-site	0-50	51-250	251-500	501-1000	1000-1500
1.1 Industrial Sites Holding Environmental Permits and/or Authorisations						
Records of historic IPC Authorisations	0	0	0	0	-	-
Records of Part A(1) and IPPC Authorised Activities	0	0	0	0	-	-
Records of Water Industry Referrals (potentially harmful discharges to the public sewer)	0	0	0	0	-	-
Records of Red List Discharge Consents (potentially harmful discharges to controlled waters)	0	0	0	0	-	-
Records of List 1 Dangerous Substances Inventory sites	0	0	0	0	-	-
Records of List 2 Dangerous Substances Inventory sites	0	0	0	0	-	-
Records of Part A(2) and Part B Activities and Enforcements	0	0	2	0	-	-
Records of Category 3 or 4 Radioactive Substances Authorisations	0	0	0	0	-	-
Records of Licensed Discharge Consents	0	0	1	3	-	-
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						
National Incidents Recording System, List 2	0	1	2	-	-	-
National Incidents Recording System, List 1	0	0	0	-	-	-
1.4 Sites Determined as Contaminated Land under Part IIA EPA 1990	0	0	0	0	-	-

2. Landfill and Other Waste Sites	on-site	0-50	51-250	251-500	501-1000	1000-1500
2.1 Landfill Sites						
Environment Agency Registered Landfill Sites	0	0	0	0	0	-
Landfill Data - Operational Landfill Sites	0	0	0	0	0	-
Environment Agency Historic Landfill Sites	0	0	0	0	1	1
Landfill Data - Non-Operational Landfill Sites	0	0	0	0	0	-
BGS/DoE Landfill Site Survey	0	0	0	0	0	0
GroundSure Local Authority Landfill Sites Data	0	0	0	0	0	0
2.2 Landfill and Other Waste Sites Findings						
Operational Waste Treatment, Transfer and Disposal Sites	1	0	0	0	-	-
Non-Operational Waste Treatment, Transfer and Disposal Sites	0	0	0	0	-	-
Environment Agency Licensed Waste Sites	0	5	0	0	0	2

3. Current Land Uses	on-site	0-50	51-250	251-500	501-1000	1000-1500
3.1 Current Industrial Sites Data	0	9	13	-	-	-
3.2 Records of Petrol and Fuel Sites	0	0	1	0	-	-
3.3 Underground High Pressure Oil and Gas Pipelines	0	0	0	0	-	-

4. Geology	Description
4.1 Are there any records of Artificial Ground and Made Ground present beneath the study site? *	Yes
4.2 Are there any records of Superficial Ground and Drift Geology present beneath the study site? *	Yes
4.3 For records of Bedrock and Solid Geology beneath the study site* see the detailed findings section.	

Source: Scale: 1:50,000 BGS Sheet 258

* This includes an automatically generated 50m buffer zone around the site.

5. Hydrogeology and Hydrology	on-site	0-50	51-250	251-500	501-1000	1001-2000
5.1 Are there any records of Productive Strata in the Superficial Geology within 500m of the study site?				Yes		
5.2 Are there any records of Productive Strata in the Bedrock Geology within 500m of the study site?				Yes		
5.3 Groundwater Abstraction Licences (within 1000m of the study site).	0	0	2	5	1	-
5.4 Surface Water Abstraction Licences (within 1000m of the study site).	0	0	0	0	1	-
5.5 Potable Water Abstraction Licences (within 2000m of the study site).	0	0	0	0	0	0
5.6 Are there any Source Protection Zones within 500m of the study site?					No	

5.7 River Quality	on-site	0-50	51-250	251-500	501-1000	1001-1500
Is there any Environment Agency information on river quality within 1500m of the study site?	No	No	No	No	No	No
5.8 Detailed River Network entries within 500m of the site	0	0	0	1	-	-
5.9 Surface water features within 250m of the study site	No	Yes	Yes	-	-	-

6. Flooding	
6.1 Are there any Environment Agency indicative Zone 2 floodplains within 250m of the study site?	No
6.2 Are there any Environment Agency indicative Zone 3 floodplains within 250m of the study site?	No
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?	Very High
6.7 What is the BGS confidence rating for the Groundwater Flooding susceptibility areas?	Moderate

7. Designated Environmentally Sensitive Sites	on-site	0-50	51-250	251-500	501-1000	1001-1500
7.1 Records of Sites of Special Scientific Interest (SSSI)	0	0	0	0	-	-
7.2 Records of National Nature Reserves (NNR)	0	0	0	0	-	-

7.1 Records of Sites of Special Scientific Interest (SSSI)	0	0	0	0	-	-
7.3 Records of Local Nature Reserves (LNR)	0	0	0	0	-	-
7.4 Records of Special Areas of Conservation (SAC)	0	0	0	0	-	-
7.5 Records of Special Protection Areas (SPA)	0	0	0	0	-	-
7.6 Records of Ramsar sites	0	0	0	0	-	-
7.7 Records of World Heritage Sites	0	0	0	0	-	-
7.8 Records of Environmentally Sensitive Areas	0	0	0	0	-	-
7.9 Records of Areas of Outstanding Natural Beauty (AONB)	0	0	0	0	-	-
7.10 Records of National Parks	0	0	0	0	-	-
7.11 Records of Nitrate Sensitive Areas	0	0	0	0	-	-
7.12 Records of Nitrate Vulnerable Zones	0	0	0	0	-	-

8. Natural Hazards

8.1 What is the maximum risk of natural ground subsidence?	Moderate

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

Using this Report

The following report is designed by Environmental Consultants for Environmental Professionals bringing together the most up-to-date market leading environmental data. This report is provided under and subject to the Terms & Conditions agreed between GroundSure and the Client. The document contains the following sections:

1. Environmental Permits, Incidents and Registers

Provides information on Regulated Industrial Activities and Pollution Incidents as recorded by Regulatory Authorities, and sites determined as Contaminated Land. This search is conducted using radii up to 500m.

2. Landfills and Other Waste Sites

Provides information on landfills and other waste sites that may pose a risk to the study site. This search is conducted using radii up to 1500m.

3. Current Land Uses

Provides information on current land uses that may pose a risk to the study site in terms of potential contamination from activities or processes. These searches are conducted using radii of up to 500m. This includes information on potentially contaminative industrial sites, petrol stations and fuel sites as well as high pressure underground oil and gas pipelines.

4. Geology

Provides information on artificial and superficial deposits and bedrock beneath the study site.

5. Hydrogeology and Hydrology

Provides information on productive strata within the bedrock and superficial geological layers, abstraction licenses, Source Protection Zones (SPZs) and river quality. These searches are conducted using radii of up to 2000m.

6. Flooding

Provides information on surface water flooding, flood defences, flood storage areas and groundwater flood areas. This search is conducted using radii of up to 250m.

7. Designated Environmentally Sensitive Sites

Provides information on the Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR), Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar sites, Local Nature Reserves (LNR), Areas of Outstanding Natural Beauty (AONB), National Parks (NP), Environmentally Sensitive Areas, Nitrate Sensitive Areas, Nitrate Vulnerable Zones and World Heritage Sites. These searches are conducted using radii of up to 500m.

8. Natural Hazards

Provides information on a range of natural hazards that may pose a risk to the study site. These factors include natural ground subsidence.

9. Mining

Provides information on areas of coal and shallow mining.

10. Contacts

This section of the report provides contact points for statutory bodies and data providers that may be able to provide further information on issues raised within this report. Alternatively, GroundSure provide a free Technical Helpline (08444 159000) for further information and guidance.

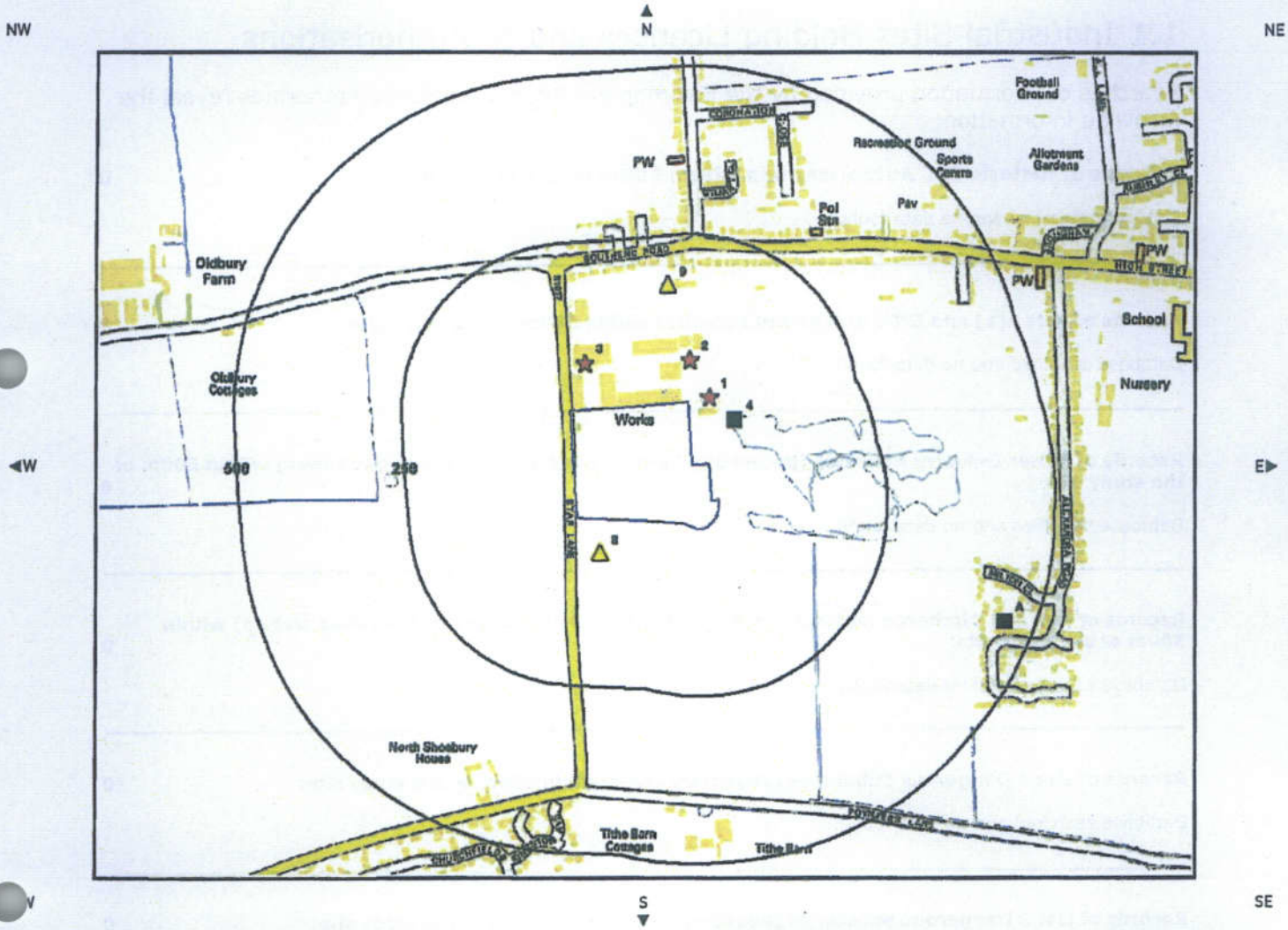
Note: Maps

Only certain features are placed on the maps within the report. All features represented on maps found within this search are given an identification number. This number identifies the feature on the mapping and correlates it to the additional information provided below. This identification number precedes all other information and takes the following format -Id: 1, Id: 2, etc. Where numerous features on the same map are in such close proximity that the numbers would obscure each other a letter identifier is used instead to represent the features. (e.g. Three features which overlap may be given the identifier "A" on the map and would be identified separately as features 1A, 3A, 10A on the data tables provided).

Where a feature is reported in the data tables to a distance greater than the map area, it is noted in the data table as "Not Shown".

All distances given in this report are in Metres (m). Directions are given as compass headings such as N: North, E: East, NE: North East from the nearest point of the study site boundary.

1. Environmental Permits, Incidents and Registers Map



Authorisations, Incidents and Registers Legend

- Site Outline
- Search Buffers (m) — 250 — 500
- Recorded Pollution Incident
- Dangerous Substances (List 1)
- Dangerous Substances (List 2)
- Water Industry Referrals
- Licenced Discharge Consents
- Red List Discharge Consents
- RAS 3 & 4 Authorisations
- Part A(1) Authorised Processes and Historic IPC Authorisations
- Part A(2) and Part B Authorised Processes
- COMAH / NIHHS Sites
- Sites Determined as Contaminated Land
- Hazardous Substance Consents and Enforcements

1.Environmental Permits, Incidents and Registers

1.1 Industrial Sites Holding Licences and/or Authorisations

Searches of information provided by the Environment Agency and Local Authorities reveal the following information:

Records of historic IPC Authorisations within 500m of the study site: **0**

Database searched and no data found.

Records of Part A(1) and IPPC Authorised Activities within 500m of the study site: **0**

Database searched and no data found.

Records of Water Industry Referrals (potentially harmful discharges to the public sewer) within 500m of the study site: **0**

Database searched and no data found.

Records of Red List Discharge Consents (potentially harmful discharges to controlled waters) within 500m of the study site: **0**

Database searched and no data found.

Records of List 1 Dangerous Substances Inventory Sites within 500m of the study site: **0**

Database searched and no data found.

Records of List 2 Dangerous Substance Inventory Sites within 500m of the study site: **0**

Database searched and no data found.

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

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

ID	Distance	Direction	NGR	Details	
8	51.0	S	593400, 187100	Address: Hanson Bricks Star Lane, Gt Wakering,ss6 0pp Process: Ceramics/clay/plaster/brick Process Status: Unknown Permit Type: Part B	Enforcement: Data requested, not received. Date of Enforcement: Data requested, not received. Comment: Data requested, not received.

9	175.0	N	593500, 187500	Address: Service Gge Gt Wakering Process: Petrol Vapour Recovery Process Status: Revoked Permit Type: Part B	Enforcement: Data requested, not received. Date of Enforcement: Data requested, not received. Comment: Data requested, not received.

Records of Category 3 or 4 Radioactive Substance Licences within 500m of the study site: 0

Database searched and no data found.

Records of Licensed Discharge Consents within 500m of the study site: 4

The following Licensed Discharge Consents records are represented as points on the Authorisations, Incidents and Registers map:

ID	Distance	Direction	NGR	Details	
4	67.0	E	593600, 187300	Address: Star Lane - Gt Wakering, Essex Effluent Type: Miscellaneous Discharges - Surface Water Permit Number: PR2NFE26566 Permit Version: 1	Receiving Water: Trib River Thames Status: Surrendered Under Epr 2010 Issue date: 16/8/1966 Effective Date: 16/8/1966 Revocation Date: 28/2/2011
5A	452.0	E	594000, 187000	Address: St.gilgen, Rebels Lane, Gt Wakering, Southend On Sea, Essex, SS3 0QE Effluent Type: Sewage Discharges - Final/treated Effluent - Not Water Company Permit Number: PR2LFS04878 Permit Version: 1	Receiving Water: Land Status: Pre Nra Legislation Where Issue Date < 01-sep-89 (historic Only) Issue date: 4/7/1978 Effective Date: 4/7/1978 Revocation Date: -
6A	452.0	E	594000, 187000	Address: Merrihaven, Rebels Lane, Gt Wakering, Southend On Sea, Essex, SS3 0QE Effluent Type: Sewage Discharges - Final/treated Effluent - Not Water Company Permit Number: PR2LFS23168 Permit Version: 1	Receiving Water: Land Status: Pre Nra Legislation Where Issue Date < 01-sep-89 (historic Only) Issue date: - Effective Date: - Revocation Date: -
7A	452.0	E	594000, 187000	Address: Millers Farm, New Road, Gt Wakering, Southend On Sea, Essex, SS3 0AW Effluent Type: Sewage Discharges - Final/treated Effluent - Not Water Company Permit Number: PR2LFS05883 Permit Version: 1	Receiving Water: Land Status: Pre Nra Legislation Where Issue Date < 01-sep-89 (historic Only) Issue date: 3/8/1983 Effective Date: 3/8/1983 Revocation Date: -

Records of Planning Hazardous Substance Consents and Enforcements within 500m of the study site: 0

Database searched and no data found.

1.2 Dangerous or Hazardous Sites

Records of COMAH & NIHHS sites within 500m of the study site: 0

Database searched and no data found.

1.3 Environment Agency Recorded Pollution Incidents

Records of National Incidents Recording System, List 2 within 250m of the study site: 3

The following NIRS List 2 records are represented as points on the Authorisations, Incidents and Registers Map:

ID	Distance	Direction	NGR	Details	
1	32.0	E	593562, 187334	Incident Date: 19/9/2002 Incident Identification: 109059 Pollutant: Pollutant Not Identified Pollutant Description: Not Identified	Water Impact: Category 4 (No Impact) Land Impact: Category 4 (No Impact) Air Impact: Category 3 (Minor)
2	63.0	N	593533, 187390	Incident Date: 10/1/2002 Incident Identification: 51616 Pollutant: Atmospheric Pollutants and Effects Pollutant Description: Smoke	Water Impact: Category 4 (No Impact) Land Impact: Category 4 (No Impact) Air Impact: Category 3 (Minor)
3	69.0	N	593375, 187384	Incident Date: 17/4/2002 Incident Identification: 72413 Pollutant: Contaminated Water Pollutant Description: Other Contaminated Water	Water Impact: Category 3 (Minor) Land Impact: Category 4 (No Impact) Air Impact: Category 4 (No Impact)

Records of National Incidents Recording System, List 1 within 250m of the study site: **0**

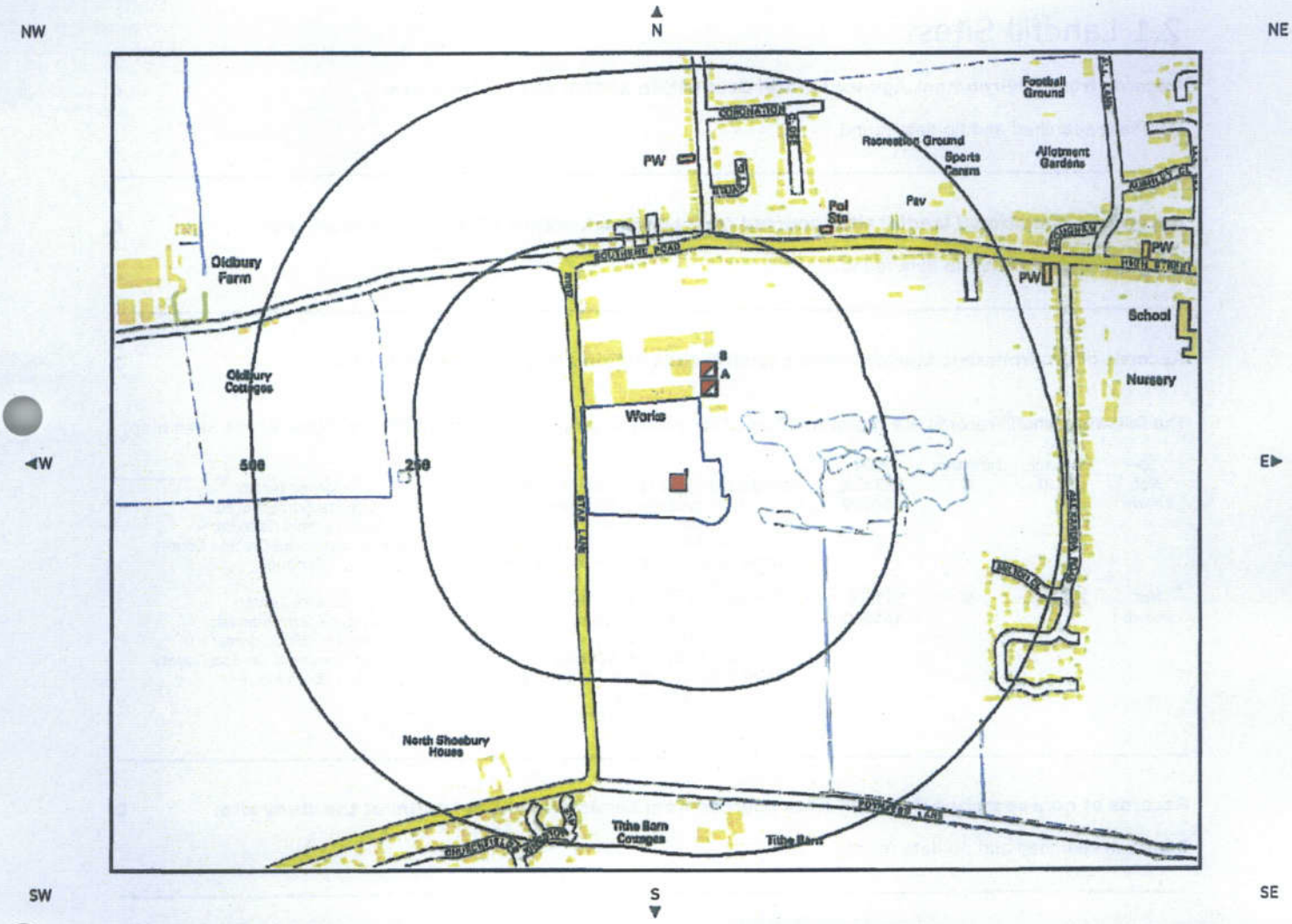
Database searched and no data found.

1.4 Sites Determined as Contaminated Land under Part IIA EPA 1990

How many records of sites determined as contaminated land under Section 78R of the Environmental Protection Act 1990 are there within 500m of the study site? **0**

Database searched and no data found.

2. Landfill and Other Waste Sites Map



Landfill & Other Waste Sites Legend

- Site Outline
- Search Buffers (m): 250, 500
- E.A. Active Landfill
- E.A. Historic Landfill (Area Data)
- E.A. Historic Landfill (Point Data)
- BGS / DoE Survey Landfill
- Local Authority Landfill (Area Data)
- Local Authority Landfill (Point Data)
- Operational Waste Treatment Licence
- Closed Waste Treatment Licence
- REGIS Waste Licence
- Operational Landfill
- Closed Landfill

2. Landfill and Other Waste Sites

2.1 Landfill Sites

Records from Environment Agency landfill data within 1000m of the study site: **0**

Database searched and no data found.

Records of operational landfill sites sourced from Landmark within 1000m of the study site: **0**

Database searched and no data found.

Records of Environment Agency historic landfill sites within 1500m of the study site: **2**

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

ID	Distance	Direction	NGR	Details	
Not shown	681.0	N	593300, 188000	Site Address: Little Wakering, Havenside, Little Wakering, Rochford Waste Licence: - Site Reference: ROC011 Waste Type: Commercial, Household Regis Reference: -	Licence Issue: Licence Surrendered: Licence Hold Address: - Operator: Southend On Sea County Borough
Not shown	1427.0	S	593900, 185600	Site Address: Elm Road, Elm Road, Shoeburyness, Southend Waste Licence: - Site Reference: SOS002 Waste Type: Industrial, Commercial, Household Regis Reference: -	Licence Issue: Licence Surrendered: Licence Hold Address: - Operator: Southend On Sea County Borough

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Records of non-operational landfill sites sourced from Landmark within 1000m of the study site: **0**

Database searched and no data found.

Records of BGS/DoE non-operational landfill sites within 1500m of the study site: **0**

Database searched and no data found.

Records of Local Authority landfill sites within 1500m of the study site: **0**

Database searched and no data found.

2.2 Other Waste Sites

Records of operational waste treatment, transfer or disposal sites within 500m of the study site: **1**

The following waste treatment, transfer or disposal sites records are represented as points on the Landfill and Other Waste Sites map:

ID	Distance	Direction	NGR	Details

1	0.0	On Site	593500, 187200	Site Address: Plot 36 Star Lane Industrial Estate, Great Wakering, SOUTHEND ON SEA, Essex, Landfill Licence: 150APYAL EA Reference: EAWML70275 Waste Type: Non-Hazardous Rating: Non-Hazardous Transfer Known Restrictions: Waste produced/controlled by licence holder	Record Date: 01-Sep-1987 Transfer Date: 01-Aug-1993 Modification Date: 01-Mar-1997 Status: Operational as far as is known Category: TRANSFER Regulator: EA - Anglian Region - Eastern Area (Kelvedon) Size: Very Small (<10,000 tonnes/year)

Records of non-operational waste treatment, transfer or disposal sites within 500m of the study site: 0

Database searched and no data found.

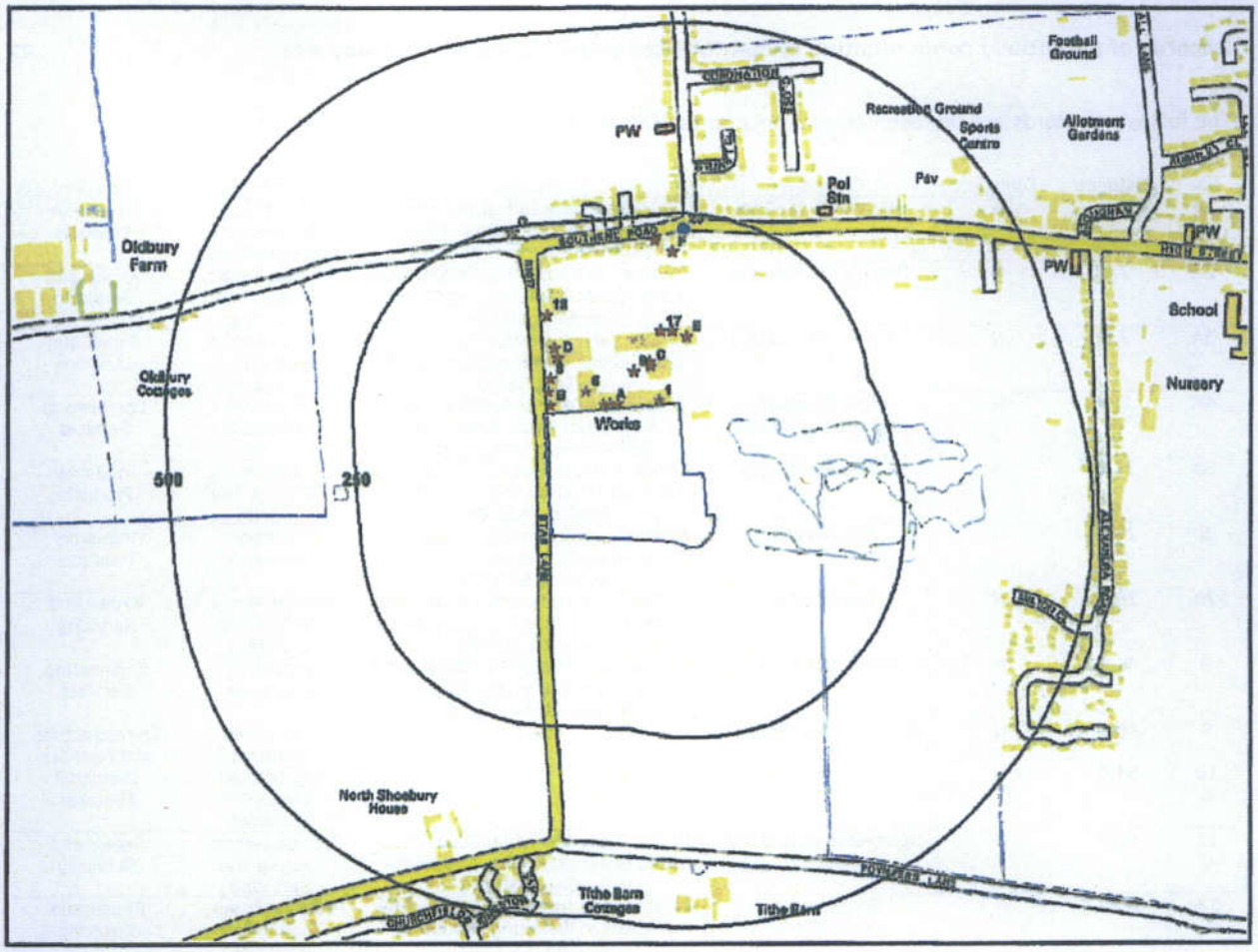
Records of Environment Agency licensed waste sites within 1500m of the study site: 7

The following waste treatment, transfer or disposal sites records are represented as points on the Landfill and Other Waste Sites map:

ID	Distance	Direction	NGR	Details	
4A	22.0	NE	593547, 187342	Site Address: 37, Star Lane Industrial Estate, Great Wakering, Essex, SS3 0PG Type: Household, Commercial & Industrial Waste T Stn Size: < 25000 tonnes Regis Licence Number: CHU002 EPR reference: - Operator: Churn Gary Waste Management licence No: 71285 Annual Tonnage: 0.0	Issue Date: 04/11/2002 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: - Correspondence Address: 1, Townfield Villas, Southend Road, Great Wakering, Essex, SS3 0PG
5A	22.0	NE	593547, 187342	Site Address: 37, Star Lane Industrial Estate, Great Wakering, Essex, SS3 0PG Type: Household, Commercial & Industrial Waste T Stn Size: < 25000 tonnes Regis Licence Number: CHU002 EPR reference: - Operator: Churn Waste Management Ltd Waste Management licence No: 71285 Annual Tonnage: 24999.0	Issue Date: 11/4/2002 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: Churn Waste Correspondence Address: 103, High Street, Waltham Cross, Hertfordshire, EN8 7AN
6A	22.0	NE	593547, 187342	Site Address: 37, Star Lane Industrial Estate, Great Wakering, Essex, SS3 0PG Type: Household, Commercial & Industrial Waste T Stn Size: < 25000 tonnes Regis Licence Number: CHU025 EPR reference: EA/EPR/BP3394NA/A001 Operator: Churn Waste Management Ltd Waste Management licence No: 71285 Annual Tonnage: 24999.0	Issue Date: 04/11/2002 Effective Date: 19/03/2008 Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Transferred Site Name: Churn Waste Correspondence Address: -
7A	22.0	NE	593547, 187342	Site Address: 37, Star Lane Industrial Estate, Great Wakering, Essex, SS3 0PG Type: Household, Commercial & Industrial Waste T Stn Size: < 25000 tonnes Regis Licence Number: CHU002 EPR reference: - Operator: Churn Gary Waste Management licence No: 71285 Annual Tonnage: 0.0	Issue Date: 04/11/2002 Effective Date: - Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Issued Site Name: - Correspondence Address: 1, Townfield Villas, Southend Road, Great Wakering, Essex, SS3 0PG

8	45.0	N	593545, 187370	Site Address: Plot 36, Star Lane Industrial Estate, Great Wakering, Southend On Sea, Essex, SS3 0PG Type: Household, Commercial & Industrial Waste T Stn Size: < 25000 tonnes Regis Licence Number: GOO001 EPR reference: EA/EPR/SP3399NY/S002 Operator: Goodwin A J Waste Management licence No: 70275 Annual Tonnage: 18559.0	Issue Date: 08/09/1987 Effective Date: - Modified: - Surrendered Date: 31/03/2004 Expiry Date: - Cancelled Date: - Status: Surrendered Site Name: Churn Waste Correspondence Address: -
Not shown	1228.0	SE	594600, 186480	Site Address: Wakering Road, Shoeburyness, Essex, SS3 9TR Type: Composting Facility Size: < 25000 tonnes Regis Licence Number: TRE002 EPR reference: - Operator: Tree Fella Plc Waste Management licence No: 71098 Annual Tonnage: 0.0	Issue Date: 26/05/1998 Effective Date: 24/01/2002 Modified: - Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Transferred Site Name: Stewards Yard Correspondence Address: Stewards Yard, Wakering Road, Shoeburyness, Essex, SS3 9TR
Not shown	1228.0	SE	594600, 186480	Site Address: Land / Premises At, Wakering Road, Showburyness, Southend On Sea, Essex, SS3 9TR Type: Composting Facility Size: < 25000 tonnes Regis Licence Number: TRE002 EPR reference: EA/EPR/NP3198NH/V003 Operator: Tree Fella Limited Waste Management licence No: 71098 Annual Tonnage: 15000.0	Issue Date: 26/05/1998 Effective Date: 24/01/2002 Modified: 24/04/2009 Surrendered Date: - Expiry Date: - Cancelled Date: - Status: Modified Site Name: Stewards Yard Correspondence Address: -

3. Current Land Use Map



Current Land Use Legend

- Site Outline
- Search Buffers (m) — 250 / 500
- 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: **22**

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

ID	Distance	Direction	Company	Address	Activity	Category
1	6.0	N	Wiggle Wiggle Ltd	9-10 Star Lane Industrial Estate, Star Lane, Great Wakering, Southend-on-Sea, SS3 0PJ	Clothing, Components and Accessories	Consumer Products
2A	7.0	N	Two A's Coachworks	16 Star Lane Industrial Estate, Star Lane, Great Wakering, Southend-on-Sea, SS3 0PJ	Vehicle Repair, Testing and Servicing	Repair and Servicing
3A	7.0	N	A & P Motors Ltd	17 Star Lane Industrial Estate, Star Lane, Great Wakering, Southend-on-Sea, SS3 0PJ	Vehicle Repair, Testing and Servicing	Repair and Servicing
4A	7.0	N	Clark Campion Engineering Co Ltd	13-15 Star Lane Industrial Estate, Star Lane, Great Wakering, Southend-on-Sea, SS3 0PJ	Industrial Engineers	Engineering Services
5B	11.0	N	M Wheeler Plastics	27 Star Lane Industrial Estate, Star Lane, Great Wakering, Southend-on-Sea, SS3 0PJ	Rubber, Silicones and Plastics	Industrial Products
6	27.0	N	Vimpex Ltd	38 Star Lane Industrial Estate, Star Lane, Great Wakering, Southend-on-Sea, SS3 0PJ	Electronic Equipment	Industrial Products
7B	28.0	N	Colin Cutler	25 Star Lane Industrial Estate, Star Lane, Great Wakering, Southend-on-Sea, SS3 0PJ	Vehicle Repair, Testing and Servicing	Repair and Servicing
8	46.0	N	Renik Solutions	23 Star Lane Industrial Estate, Star Lane, Great Wakering, Southend On Sea, Essex, SS3 0PJ	Industrial Engineers	Engineering Services
9	48.0	N	Electricity Sub Station	SS3	Electrical Features	Infrastructure and Facilities
10 C	54.0	N	Factory	SS3	Unspecified Works Or Factories	Industrial Features
11 C	58.0	N	Sportwagen Car Body Repairs	21 Star Lane Industrial Estate, Star Lane, Great Wakering, Southend-on-Sea, SS3 0PJ	Vehicle Repair, Testing and Servicing	Repair and Servicing
12 C	58.0	N	Southchurch Refinishers	21 Star Lane Industrial Estate, Star Lane, Great Wakering, Southend-on-Sea, SS3 0PJ	Vehicle Repair, Testing and Servicing	Repair and Servicing
13 D	73.0	N	Eurolube Ltd	Unit 8 34 Star Lane Industrial Estate, Star Lane, Great Wakering, Southend-on-Sea, SS3 0FF	Vehicle Repair, Testing and Servicing	Repair and Servicing
14 D	87.0	N	Marchetti Stone Ltd	Unit 1-2 34 Star Lane Industrial Estate, Star Lane, Great Wakering, Southend-on-Sea, SS3 0FF	Stone Quarrying and Preparation	Extractive Industries
15E	90.0	N	Ellis Transport	35 Star Lane Industrial Estate, Star Lane, Great Wakering, Southend-on-Sea, SS3 0PJ	Distribution and Haulage	Transport, Storage and Delivery
16E	96.0	N	Quantech Environmental Ltd	Quantech House 33 Star Lane Industrial Estate, Star Lane, Great Wakering, Southend-on-Sea, SS3 0PJ	Cooling and Refrigeration	Industrial Products
17	97.0	N	Specializes Welding & Fabrication Ltd	7 Star Lane Industrial Estate, Star Lane, Great Wakering, Southend-on-Sea, SS3 0PJ	Cutting, Drilling and Welding Services	Construction Services
18	130.0	N	Telephone Exchange	SS3	Telecommunications Features	Infrastructure and Facilities
19F	201.0	N	Just Fiestas	Southend Road, Great Wakering, Southend-on-Sea, SS3 0PF	Secondhand Vehicles	Motoring
20F	217.0	N	Electricity Sub Station	SS3	Electrical Features	Infrastructure and Facilities
21 G	243.0	N	Gas Valve Compound	SS3	Gas Features	Infrastructure and Facilities
22 G	244.0	N	Gas Valve Compound	SS3	Gas 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	Direction	NGR	Company	Address	LPG	Status
23	230.0	N	593535, 187557	Total	Service Garage, Southend Road, Southend Road, Great Wakering, Southend-on-sea, Essex, SS3 0PF	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.

4. Geology

4.1 Artificial Ground and Made Ground

The database has been searched on site, including a 50m buffer.

LEX Code	Description	Rock Type
WGR-OPEN	WORKED GROUND (UNDIVIDED)	VOID

(Derived from the BGS 1:50,000 Digital Geological Map of Great Britain)

4.2 Superficial Ground and Drift Geology

The database has been searched on site, including a 50m buffer.

Lex Code	Description	Rock Type
RTD1-CLSI	RIVER TERRACE DEPOSITS, 1	CLAY AND SILT
RTD1-SAGR	RIVER TERRACE DEPOSITS, 1	SAND AND GRAVEL

(Derived from the BGS 1:50,000 Digital Geological Map of Great Britain)

4.3 Bedrock and Solid Geology

The database has been searched on site, including a 50m buffer.

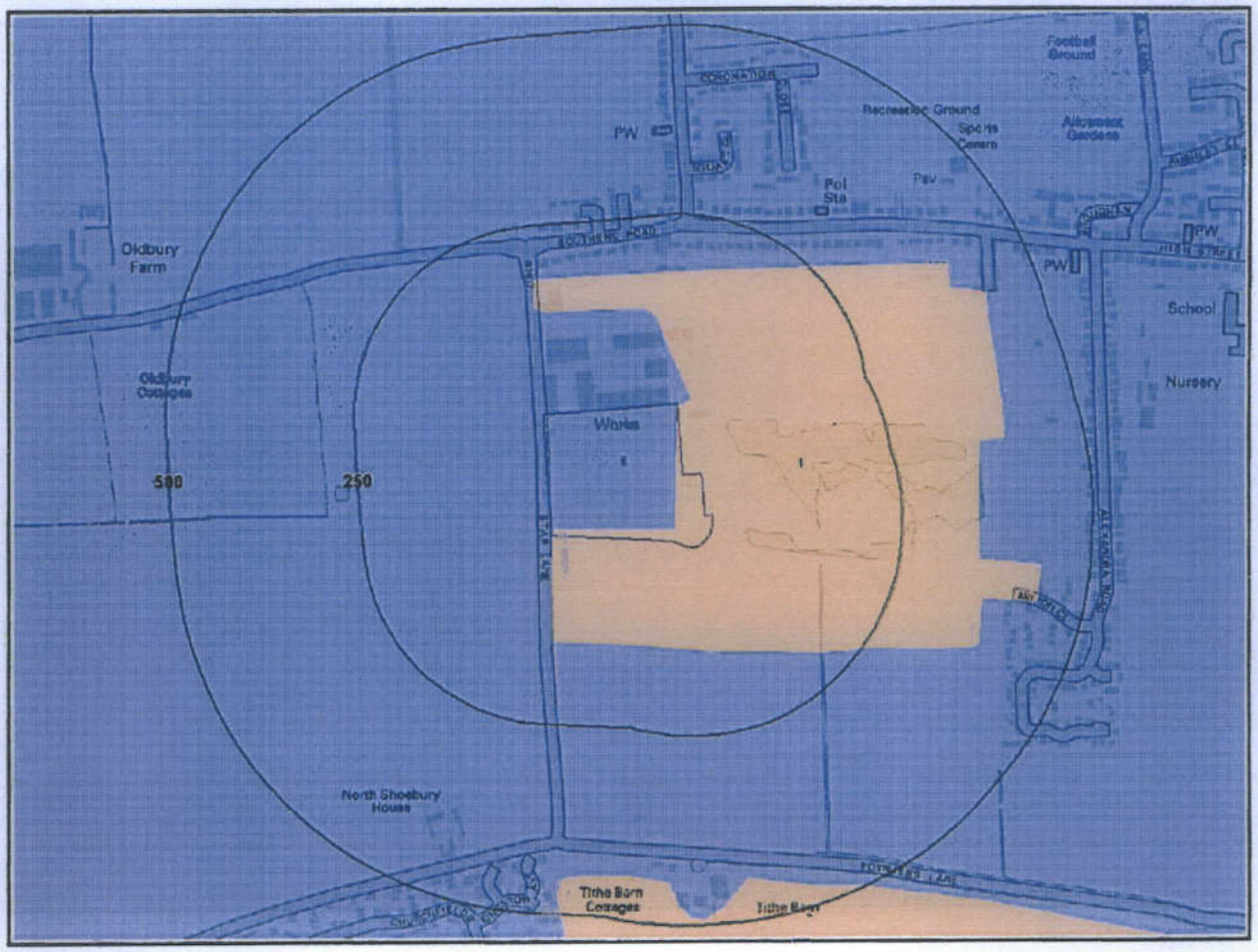
LEX Code	Description	Rock Type
LC-CLSS	LONDON CLAY FORMATION	CLAY, SILT AND SAND

(Derived from the BGS 1:50,000 Digital Geological Map of Great Britain)

For more detailed geological and ground stability data please refer to the "GroundSure GeoInsight". Available from our website.

5a. Hydrogeology - Aquifer Within Superficial Geology

NW N NE



W E

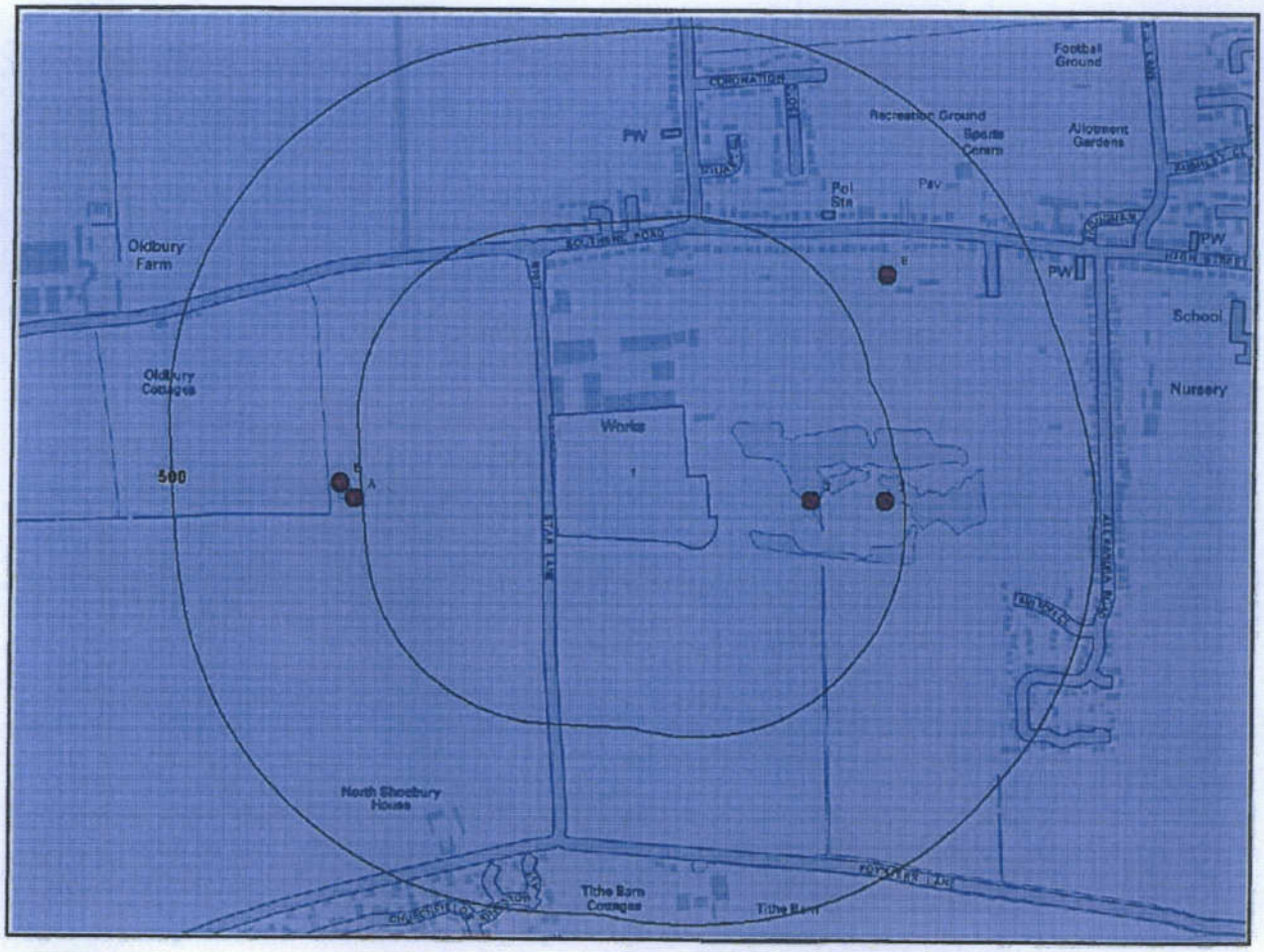
S SE

Aquifer Within Superficial Geology Legend

Enabled by Ordnance Survey

- Site Outline
- 250 / 500 — Search Buffers (m)
- Principal Aquifer
- Secondary (A) Aquifer - Permeable Layers
- Secondary (B) Aquifer - Lower Permeability Layers
- Secondary Aquifer - Undifferentiated Layers
- Unproductive
- Unknown (lakes and landslip)

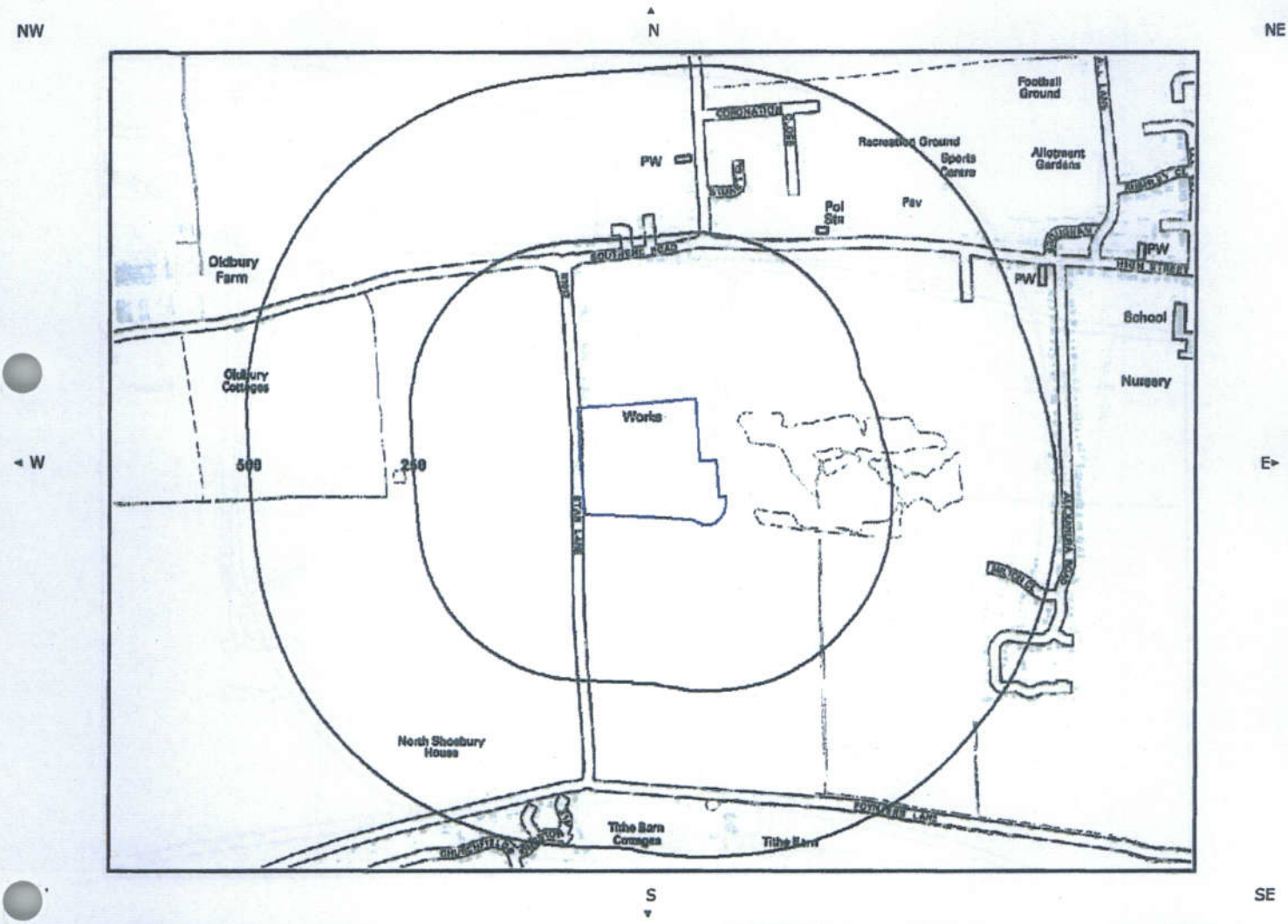
5b. Hydrogeology - Aquifer Within Bedrock Geology and Abstraction Licenses



Aquifer Within Bedrock Geology Legend

- Site Outline
- Search Buffers (m): 250, 500
- Principal Aquifer
- Secondary (A) Aquifer - Permeable Layers
- Secondary (B) Aquifer - Lower Permeability Layers
- Groundwater Abstraction Licence
- Secondary Aquifer - Undifferentiated Layers
- Unproductive
- Unknown (lakes and landslip)
- Surface Water Abstraction Licence

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

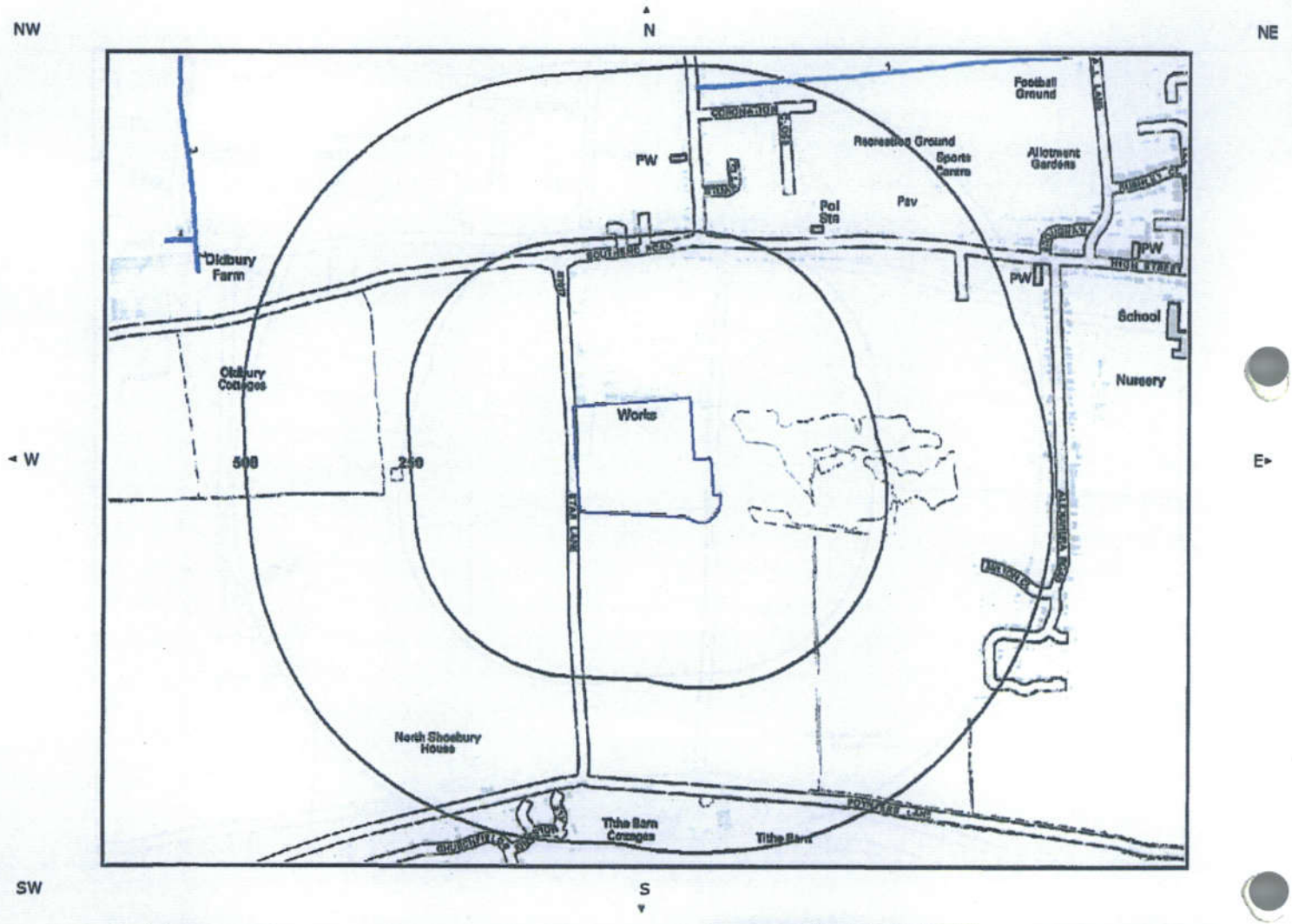


SPZ and Potable Water Abstraction Licenses
Legend

Enabled by Ordnance Survey

- Site Outline
- Search Buffers (m): 250, 500
- Source Protection Zone 1 - Inner Catchment
- Source Protection Zone 2 - Outer Catchment
- Source Protection Zone 3 - Total Catchment
- Source Protection Zone 4 - Zone of Special Interest
- Potable Water Abstraction Licence

5d. Hydrology – Detailed River Network and River Quality



Hydrology Legend

Enabled by Ordnance Survey

- Site Outline
- Search Buffers (m): 250, 500
- Primary River
- Secondary River
- Tertiary River
- Lake/Reservoir
- Underground River (inferred)
- General Quality Assessment: Chemistry
- Canal
- Canal Tunnel
- Extended Culvert (greater than 50m)
- D/S of High Water Mark
- D/S seaward extension
- General Quality Assessment: Biology

5.Hydrogeology and Hydrology

5.1 Aquifer within Superficial Deposits

Are there records of productive strata 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	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
6	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	440.0	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

5.2 Aquifer within Bedrock Deposits

Are there records of productive strata 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	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow

5.3 Groundwater Abstraction Licences

Are there any Groundwater Abstraction Licences within 1000m of the study site? **Yes**

The following Abstraction Licences records are represented as points, lines and regions on the Aquifer within Bedrock Geology Map (5b):

ID	Distance	Direction	NGR	Details	
2	125.0	E	593700, 187200	Licence No: 8/37/44/*G/0048 Details: General use relating to Secondary Category (Medium Loss) Direct Source: Ground Water Source Of Supply Point: Star Lane, Great Wakering Data Type: Point	Annual Volume (m³): - Max Daily Volume (m³): - Original Application No: - Original Start Date: 1/2/1967 Expiry Date: - Issue No: 100 Version Start Date: 1/9/1996 Version End Date:

3	224.0	E	593800, 187200	Licence No: 8/37/44/*G/0059 Details: Spray Irrigation - Direct Direct Source: Ground Water Source Of Supply Point: Star Lane, Great Wakering Data Type: Point	Annual Volume (m³): 5000 Max Daily Volume (m³): 164 Original Application No: - Original Start Date: 1/11/1976 Expiry Date: - Issue No: 100 Version Start Date: 1/11/1976 Version End Date:
4A	260.0	W	593100, 187200	Licence No: 8/37/44/*G/0076 Details: Spray Irrigation - Storage Direct Source: Ground Water Source Of Supply Point: Borehole At Great Wakering Data Type: Point	Annual Volume (m³): 45750 Max Daily Volume (m³): 520 Original Application No: - Original Start Date: 1/9/1998 Expiry Date: 31/3/2008 Issue No: 100 Version Start Date: 1/9/1998 Version End Date:
5A	260.0	W	593100, 187200	Licence No: 8/37/44/*G/0076 Details: Spray Irrigation - Direct Direct Source: Ground Water Source Of Supply Point: Borehole At Great Wakering Data Type: Point	Annual Volume (m³): 45750 Max Daily Volume (m³): 520 Original Application No: - Original Start Date: 1/9/1998 Expiry Date: 31/3/2008 Issue No: 100 Version Start Date: 1/9/1998 Version End Date:
6B	279.0	W	593080, 187220	Licence No: 8/37/44/*G/0076A Details: Spray Irrigation - Direct Direct Source: Ground Water Source Of Supply Point: Bore At Oldbury Farm Gt Wakering Data Type: Point	Annual Volume (m³): 45750 Max Daily Volume (m³): 520 Original Application No: NPS/WR/002483 Original Start Date: 1/4/2008 Expiry Date: 31/3/2016 Issue No: 2 Version Start Date: 30/7/2009 Version End Date:
7B	279.0	W	593080, 187220	Licence No: 8/37/44/*G/0076A Details: Spray Irrigation - Storage Direct Source: Ground Water Source Of Supply Point: Bore At Oldbury Farm Gt Wakering Data Type: Point	Annual Volume (m³): 45750 Max Daily Volume (m³): 520 Original Application No: NPS/WR/002483 Original Start Date: 1/4/2008 Expiry Date: 31/3/2016 Issue No: 2 Version Start Date: 30/7/2009 Version End Date:
8	320.0	NE	593800, 187500	Licence No: 8/37/44/*G/0035 Details: General Farming & Domestic Direct Source: Ground Water Source Of Supply Point: Star Lane, Gt. Wakering Data Type: Point	Annual Volume (m³): - Max Daily Volume (m³): - Original Application No: - Original Start Date: 1/5/1967 Expiry Date: - Issue No: 100 Version Start Date: 1/5/1967 Version End Date:
Not shown	777.0	W	592600, 187500	Licence No: 8/37/44/*G/0042 Details: Spray Irrigation - Direct Direct Source: Ground Water Source Of Supply Point: Oldbury Farm, Southchurch Data Type: Point	Annual Volume (m³): 13650 Max Daily Volume (m³): 546 Original Application No: - Original Start Date: 1/4/1966 Expiry Date: - Issue No: 100 Version Start Date: 1/5/1994 Version End Date:

5.4 Surface Water Abstraction Licences

Are there any Surface Water Abstraction Licences within 1000m of the study site? **Yes**

The following Surface Water Abstraction Licences records are represented as points, lines and regions on the Aquifer within Bedrock Geology Map (5b):

ID	Distance	Direction	NGR	Details	
Not shown	874.0	N	593500, 188200	Licence No: 8/37/44/*S/0036 Details: Spray Irrigation - Direct Direct Source: Surface Water Source Of Supply Point: Knights Nurseries, Lt.wakering Data Type: Point	Annual Volume (m³): - Max Daily Volume (m³): - Application No: - Original Start Date: 1/7/1966 Expiry Date: - Issue No: 100 Version Start Date: 1/7/1966 Version End Date:

5.5 Potable Water Abstraction Licences

Are there any Potable Water Abstraction Licences within 2000m of the study site? **No**

Database searched and no data found.

5.6 Source Protection Zones

Are there any Source Protection Zones within 500m of the study site? **No**

Database searched and no data found.

5.7 River Quality

Is there any Environment Agency information on river quality within 1500m of the study site? **No**

Biological Quality:

Database searched and no data found.

Chemical Quality:

Database searched and no data found.

5.8 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 (5d):

ID	Distance	Direction	Details	
1	468.0	N	River Name: Drain Water Course Name: - Welsh River Name: - Alternative Name: -	River Type: Tertiary River Catchment: - Drain: YES Main River Status: Currently Undefined

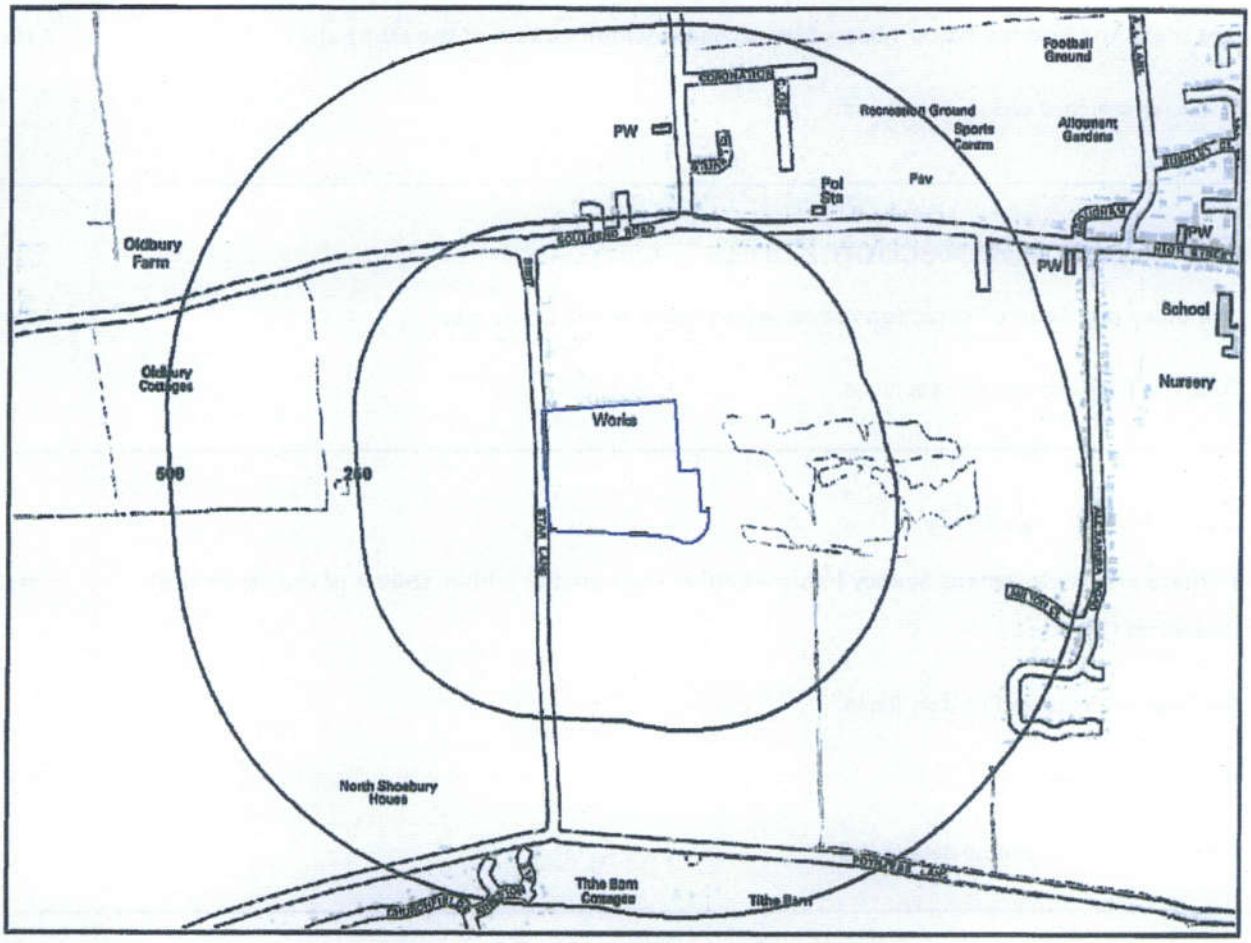
5.9 Surface Water Features

Are there any surface water features within 250m of the study site? **Yes**

The following surface water records are not represented on mapping:

Distance to Surface Water (m)	on-site	0-50	51-250
Surface water features within 250m of the study site	No	Yes	Yes

6. Environment Agency Flood Map



Environment Agency Flood Legend

- Site Outline
- Search Buffers (m) — 250 / 500
- Zone 2 Floodplain
- Zone 3 Floodplain
- Flood Storage Area
- Area Benefiting from Flood Defences
- Flood Defences

6. Flooding

6.1 Zone 2 Flooding

Zone 2 floodplain estimates the annual probability of flooding as one in one thousand (0.1%) or greater from rivers and the sea but less than 1% from rivers or 0.5% from the sea. Alternatively, where information is available they may show the highest known flood level.

Is the site within 250m of an Environment Agency indicative Zone 2 floodplain? **No**

Database searched and no data found.

6.2 Zone 3 Flooding

Zone 3 estimates the annual probability of flooding as one in one hundred (1%) or greater from rivers and a one in two hundred (0.5%) or greater from the sea. Alternatively, where information is available they may show the highest known flood level.

Is the site within 250m of an Environment Agency indicative Zone 3 floodplain? **No**

Database searched and no data found.

6.3 Flood Defences

Are there any Flood Defences within 250m of the study site? **No**

6.4 Areas benefiting from Flood Defences

Are there any areas benefiting from Flood Defences within 250m of the study site? **No**

6.5 Areas used for Flood Storage

Are there any areas used for Flood Storage within 250m of the study site? **No**

6.6 Groundwater Flooding Susceptibility Areas

Are there any British Geological Survey groundwater flooding susceptibility flood areas within 50m of the boundary of the study site? **Yes**

What is the highest susceptibility to groundwater flooding in the search area based on the underlying geological conditions? **Very High**

6.7 Groundwater Flooding Confidence Areas

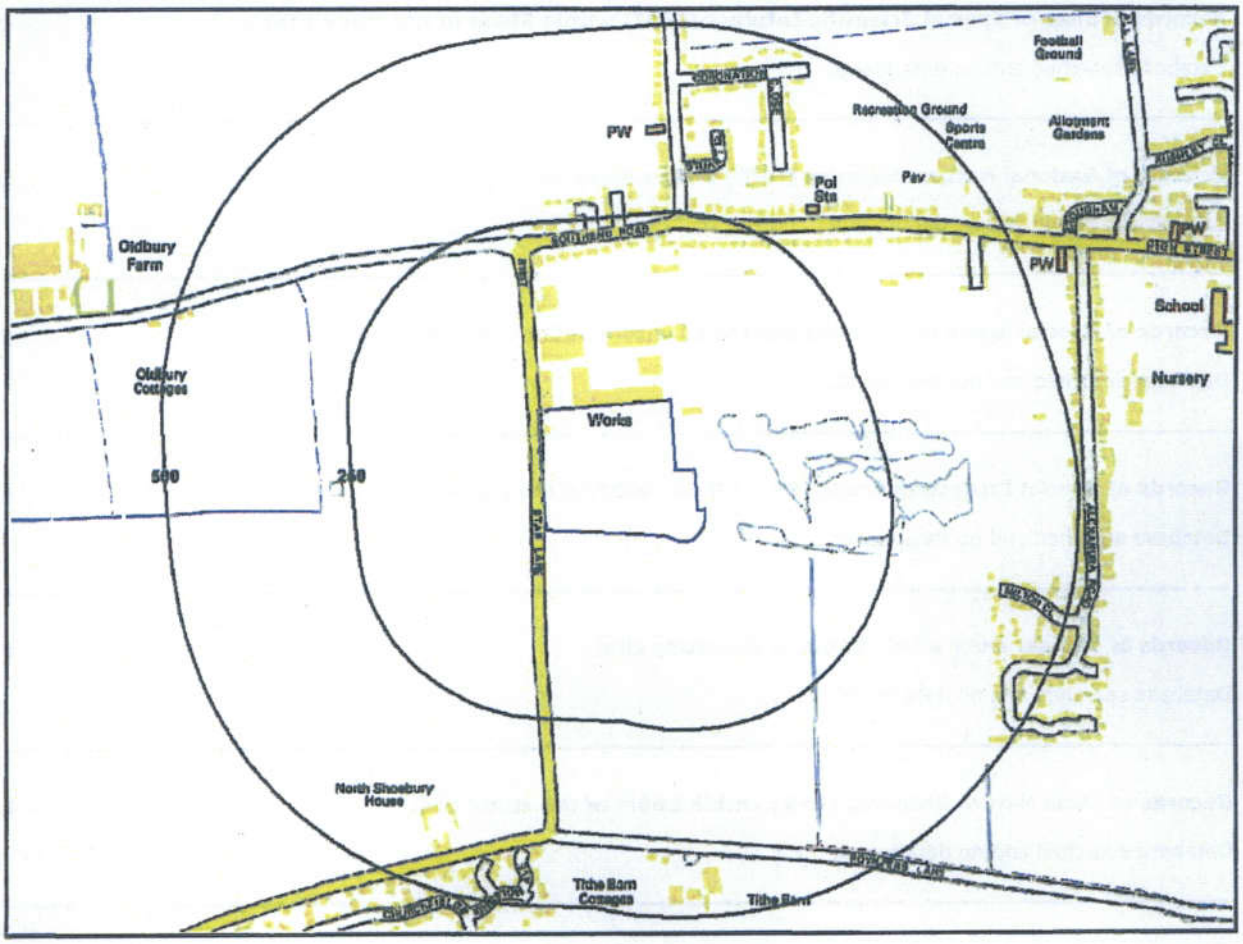
What is the British Geological Survey confidence rating in this result? **Moderate**

Notes:

Groundwater flooding is defined as the emergence of groundwater at the ground surface or the rising of groundwater into man-made ground under conditions where the normal range of groundwater levels is exceeded.

The **confidence rating** is on a threefold scale - Low, Moderate and High. This provides a relative indication of the BGS confidence in the accuracy of the susceptibility result for groundwater flooding. This is based on the amount and precision of the information used in the assessment. In areas with a relatively lower level of confidence the susceptibility result should be treated with more caution. In other areas with higher levels of confidence the susceptibility result can be used with more confidence.

7.Designated Environmentally Sensitive Sites Map



Designated Environmentally Sensitive Sites Legend

Enabled by Ordnance Survey

- Site Outline
- Search Buffers (m) 250 500
- SAC
- SSSI
- NNR
- World Heritage Sites
- SPA
- Ramsar
- LNR
- Environmentally Sensitive Areas
- Areas of Outstanding Natural Beauty
- Nitrate Sensitive Areas
- National Parks

7.Designated Environmentally Sensitive Sites

Presence of Designated Environmentally Sensitive Sites within 500m of the study site?	**No**

Records of Sites of Special Scientific Interest (SSSI) within 500m of the study site: **0**

Database searched and no data found.

Records of National Nature Reserves (NNR) within 500m of the study site: **0**

Database searched and no data found.

Records of Special Areas of Conservation (SAC) within 500m of the study site: **0**

Database searched and no data found.

Records of Special Protection Areas (SPA) within 500m of the study site: **0**

Database searched and no data found.

Records of Ramsar sites within 500m of the study site: **0**

Database searched and no data found.

Records of Local Nature Reserves (LNR) within 500m of the study site: **0**

Database searched and no data found.

Records of World Heritage Sites within 500m of the study site: **0**

Database searched and no data found.

Records of Environmentally Sensitive Areas within 500m of the study site: **0**

Database searched and no data found.

Records of Areas of Outstanding Natural Beauty (AONB) within 500m of the study site: **0**

Database searched and no data found.

Records of National Parks (NP) within 500m of the study site: **0**

Database searched and no data found.

Records of Nitrate Sensitive Areas within 500m of the study site: 0

Database searched and no data found.

Records of Nitrate Vulnerable Zones within 500m of the study site: 0

Database searched and no data found.

8. Natural Hazards Findings

8.1 Detailed BGS GeoSure Data

BGS GeoSure Data has been searched to 50m. The data is included in tabular format. If you require further information on geology and ground stability, please obtain a GroundSure GeoInsight, available from our website. The following information has been found:

8.1.1 Shrink Swell

What is the maximum Shrink-Swell* hazard rating identified on the study site? **Moderate**

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Ground conditions predominantly high plasticity. Do not plant or remove trees or shrubs near to buildings without expert advice about their effect and management. For new build, consideration should be given to advice published by the National House Building Council (NHBC) and the Building Research Establishment (BRE). There is a probable increase in construction cost to reduce potential shrink-swell problems. For existing property, there is a probable increase in insurance risk during droughts or where vegetation with high moisture demands is present.

8.1.2 Landslides

What is the maximum Landslide* hazard rating identified on the study site? **Very Low**

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Slope instability problems are unlikely to be present. No special actions required to avoid problems due to landslides. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with landslides.

8.1.3 Soluble Rocks

What is the maximum Soluble Rocks* hazard rating identified on the study site? **Null - Negligible**

Soluble rocks are not present in the search area. No special actions required to avoid problems due to soluble rocks. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with soluble rocks.

8.1.4 Compressible Ground

What is the maximum Compressible Ground* hazard rating identified on the study site? **Negligible**

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
No indicators for compressible deposits identified. No special actions required to avoid problems due to compressible deposits. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with compressible deposits.

8.1.5 Collapsible Rocks

What is the maximum Collapsible Rocks* hazard rating identified on the study site? **Moderate**

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Potential for collapsible deposit problems after relatively small changes in loading or groundwater conditions. Avoid large amounts of water entering the ground through pipe leakage or soak-aways. Do not increase loading on existing foundations without technical advice. For new build, assess the possibility of collapsible (loessic) deposits in ground investigation. If present do not exceed safe bearing capacity during or after construction and maintain site drainage, or carry out ground stabilisation. For existing property, possible increase in insurance risk from collapsible deposits may be present if the load on the ground is increased or saturated by leakage or localised flooding.

8.1.6Running Sand

What is the maximum Running Sand* hazard rating identified on the study site? **Very Low**

The following natural subsidence information provided by the British Geological Survey is not represented on mapping:

Hazard
Very low potential for running sand problems if water table rises or if sandy strata are exposed to water. No special actions required, to avoid problems due to running sand. No special ground investigation required, and increased construction costs or increased financial risks are unlikely due to potential problems with running sand.

* This indicates an automatically generated 50m buffer and site.

9.Mining

9.1 Coal Mining

Are there any coal mining areas within 75m of the study site? **No**

Database searched and no data found.

9.2 Shallow Mining

What is the subsidence hazard relating to shallow mining on-site*? **Negligible**

*Please note this data is searched with a 150m buffer.

9.3 Brine Affected Areas

Are there any brine affected areas within 75m of the study site? **No**

Database searched and no data found.

10.Contacts

GroundSure Helpline
Telephone: 08444 159 000
info @ groundsure.com

British Geological Survey (England & Wales)
Kingsley Dunham Centre
Keyworth, Nottingham NG12 5GG
Tel: 0115 936 3143. Fax: 0115 936 3276. Email: enquiries@bgs.ac.uk
Web: www.bgs.ac.uk
BGS Geological Hazards Reports and general geological enquiries

Environment Agency
National Customer Contact Centre
PO Box 544
Rotherham
S60 1BY
Tel: 08708 506 506
Web: www.environment-agency.gov.uk
Email: enquiries@environment-agency.gov.uk

Health Protection Agency
Chilton, Didcot, Oxon, OX11 0RQ
Tel: 01235 822622 www.hpa.org.uk/radiation
Radon measures and general radon information and guidance

The Coal Authority
200 Lichfield Lane, Mansfield, Notts NG18 4RG
Tel: 0845 762 6848. DX 716176 Mansfield 5
www.coal-authority.co.uk
Coal mining reports and related enquiries

Ordnance Survey
Romsey Road
Southampton SO16 4GU
Tel: 08456 050505

Local Authority
Authority: Rochford District Council
Phone: 01702 546 366
Web: www.rochford.gov.uk
Address: Council Offices, South Street, Rochford, Essex, SS4 1BW

Get Mapping PLC
Virginia Villas, High Street, Hartley Witney, Hampshire RG27 8NW
Tel: 01252 845444

Acknowledgements
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GroundSure RadonCheck

Address: STAR LANE, GREAT WAKERING, SOUTHEND-ON-SEA, SS3 0PJ

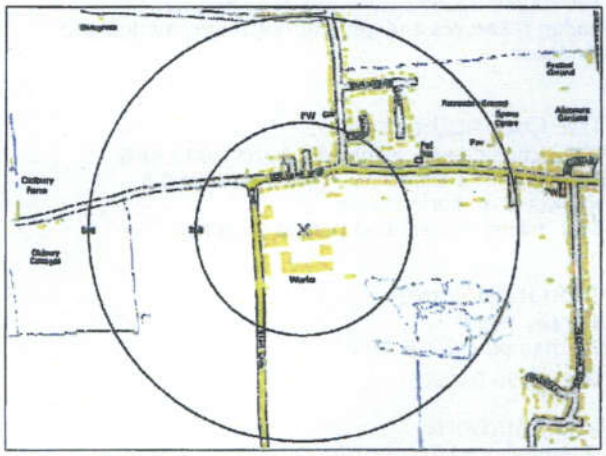
Date: Oct 11, 2011

GroundSure Reference: GS-173304

Your Reference: C12519

Grid Reference: 593451,187419

Client: Ground Engineering Limited



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1. Residential Radon Potential Result

1.1 Is the property in a Radon Affected Area?

The information in this section provides an answer to one of the standard legal enquiries on house purchase in England and Wales, known as CON29 standard Enquiry of Local Authority; 3.13 Radon Gas: Location of the Property in a Radon Affected Area.

Question: Is the property in a Radon Affected Area as defined by the Health Protection Agency (HPA) and if so what percentage of homes are above the Action Level?

Answer: The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.

1.2 Are Radon Protective Measures required?

The information in this section will detail the level of protection required for new dwellings under as described in the latest Building Research Establishment guidance on radon protective measures for new dwellings. This may include extensions to the property.

Question: Is the property in an area where Radon Protection Measures are required for new properties or extensions to existing ones as described in publication BR211 by the Building Research Establishment?

Answer: No Radon Protective Measures are necessary.

1.3 Combined Radon Guidance

Radon is a colourless, odourless radioactive gas which is present in all areas of the United Kingdom, usually at levels that pose a negligible risk to homebuyers. However, in some areas levels of radon are much higher than in others, and in these cases it can pose a health risk. The data supplied by the Health Protection Agency (HPA) and the British Geological Survey (BGS)is not able to determine exact Radon levels, as this information can only be obtained through site-specific, in-situ testing. As less than 1% of properties in the area may be radon affected, the HPA do not consider that further action is necessary.

The responses given on the level of Radon Protective Measures required are based on a joint radon potential dataset from the Health Protection Agency (HPA) and the British Geological Survey (BGS). No Radon Protective Measures are required for new builds or extensions.

1.4 Further details on Radon

Radon is a naturally occuring radioactive gas, which enters buildings from the ground. Outdoors, it is diluted to very low levels. However, in some cases the radon level indoors can build up to high concentrations. In such cases, it does pose a serious risk to health. Exposure to high concentrations increases the risk of lung

cancer. The Health Protection Agency recommends that radon levels should be reduced in homes where the annual average is at or above 200 becquerels per cubic metre (200 Bq m^{-3}). This is termed the Action Level. The Health Protection Agency defines Radon Affected Areas as those with 1% chance or more of a house having a radon concentration at or above the Action Level of 200 Bq m^{-3}.

The joint HPA-BGS digital Radon Potential Dataset used in this report provides the current definitive map of Radon Affected Areas in England and Wales.

Indoor radon levels can usually be substantially reduced at a cost comparable to many home improvements, such as replacing carpets. Details of methods of reducing radon levels are given on the Building Research Establishment Website. http://www.bre.co.uk/radon/index.html

2. Contact Details

GroundSure
ENVIRONMENTAL INSIGHT

GroundSure Helpline
Telephone: 08444 159 000
info @ groundsure.com

Local Authority - Rochford District Council. Address: Council Offices, South Street, Rochford, Essex, SS4 1BW. Web: www.rochford.gov.uk. Tel: 01702 546 366

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Keyworth, Nottingham NG12 5GG
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Web: www.bgs.ac.uk
BGS Geological Hazards Reports and general geological enquiries

British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

Health Protection Agency
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Tel: 01235 822622 (www.hpa.org.uk/radiation)

Health Protection Agency

Ordnance Survey
Romsey Road, Southampton SO16 4GU
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Enabled by Ordnance Survey

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COPSO

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This report has been prepared in accordance with the GroundSure Ltd standard Terms and Conditions of business for work of this nature.

Appendix D – Drawings.


187260N 187260N
TP3.
WS5.
593460E
593500E
593540E
593580E
187220N 187220N
BH1.
TP4.
TP5.
187180N 187180N
TP6
WS6.
B.
C.