GEO-ENVIRONMENTAL ASSESSMENT
PRINCES PARADE
HYTHE, KENT
SHEPWAY DISTRICT COUNCIL
GEA-17436AI-15-193 REV B
OCTOBER 2015

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Current Document Details

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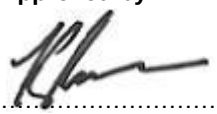

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EXECUTIVE SUMMARY

A Geo-Environmental Assessment was requested by Shepway District Council. The purpose of the assessment was to identify any contaminative or geotechnical issues associated with former land use at *Princes Parade, Hythe, Kent* which might impact on the site's redevelopment.

SITE DETAILS	
Approximate site area	7.5 ha
Current/previous use	Overgrown disused council-owned land, formerly an inert landfill
Proposed use	Development options comprise either a leisure centre or housing scenarios.

PHASE 1 NON-INTRUSIVE INVESTIGATION	
Expected geology	Made ground / Storm Beach Deposits / Tidal Flat Deposits to the north / Weald Clay Formation
Groundwater	Secondary 'A' Aquifer within the superficial strata. Not located within a Source Protection Zone.
Surface water	Surface water receptors in vicinity / abstractions / flooding

PHASE 2 EXPLORATORY INVESTIGATION	
Contamination	Contamination comprising metals, PAH, TPH and asbestos was encountered in made ground. PAH contamination in natural stratum immediately below made ground was encountered, consistent to overlying made ground.

RECOMMENDATIONS	
Geotechnical	Geotechnical recommendations comprised foundation solutions such as ground improvement (vibro stone / concrete columns) or a piled solution to be considered. Due to variable thicknesses of made ground it is recommended suspended floor slabs should be adopted.
Remediation	A 450 mm clean cover is recommended in landscaped areas under both scenarios to break linkages for human health and to supply a suitable growing medium.

SECTION 1 INTRODUCTION

1.1 Shepway District Council (SDC) proposes to develop an area of land located at Princes Parade, Hythe for mixed-use development purposes. A Cabinet Report, dated January 2014, provided by SDC indicates various development options. Development options discussed comprise a swimming pool and leisure facility with associated car parking and soft landscaping. Two housing scenario options are also referenced. Scenario 1 comprises 12 single storey low-rise homes and scenario 2 comprises 36 town-homes. Idom Merebrook Limited (Merebrook) has been commissioned by SDC to undertake preliminary site investigation works and to advise on the geo-environmental implications of the redevelopment of the site for the proposed end use.

1.2 The objectives of the investigation are to:

i. Assess surface and sub-surface ground conditions present at the site;

ii. Identify hazards associated with ground contamination which may place constraints on the site and the proposed development;

iii. Evaluate the risks associated with any identified hazards;

iv. Provide preliminary recommendations for the mitigation of any significant risks identified; and

v. Provide preliminary geotechnical recommendations.

1.3 A Phase 1 (Non-intrusive Investigation) and a Phase 2a (Preliminary Exploratory Investigation) have been undertaken for the subject site.

1.4 This report presents the findings of the geo-environmental investigation and provides an interpretation of the geo-environmental conditions that exist at the site. The contaminative status of the site and the implications with respect to development have been interpreted in accordance with the current government guidance on source-pathway-receptor risk assessment. This report uses a Tier 1 risk assessment to ascribe a conservative qualitative appraisal of the hazards associated with the site.

1.5 This report has been prepared for Shepway District Councilfor the sole purpose described above and no extended duty of care to any third party is implied or offered. Third parties making reference to the report should consult Shepway District Council and Merebrook as to the extent to which the findings may be appropriate for their use

SECTION 2 PHASE 1 (NON-INTRUSIVE INVESTIGATION)

2.1 INTRODUCTION

2.1.1 The non-intrusive investigation has been conducted with reference to the documents and sources detailed in Table 1 below:

Table 1: Published Data and Information Sources

SOURCE DATA	GROUNDSURE DATA
BGS 1:50,000 Series Geological Sheet 305	Ordnance Survey (OS) historical maps scaled at 1:10,560, 1:10,000, 1:2,500 and 1:1,250 dated 1872 - 2014
BGS Geology of Britain 1:50,000 online maps	Water abstraction, discharge and pollution data
Radon: guidance on protection measures for new dwellings	Registered waste management sites
Environment Agency (EA) online data maps	Mining records and natural ground stability data
UK National Air Quality Archive, online	Protected areas of environmentally sensitive land use or conservation
Planning Records	Other relevant designations and/or authorisations and Trade Directory entries

2.1.2 The above sources are all authoritative and it is believed that they are reasonably reliable. However, independent verification of the information supplied has not necessarily been carried out and Merebrook cannot be held liable for inaccuracies or deficiencies in the information.

2.2 SITE LOCATION AND SETTING

2.2.1 The site is located to the north of Princes Parade, Hythe, CT21 5QT.

2.2.2 The site occupies an area of approximately 7.5 hectares located at National Grid Reference 618523, 134832 and indicated on drawing 17436ai-304-001, presented in Appendix 1 of this report.

2.2.3 The site is bounded by the Royal Military Canal to the north, residential flats (under construction) to the east, Princes Parade Road and the beach to the south and a golf course to the west.

2.2.4 The majority of the site is disused. The site is an overgrown former inert landfill with much of the site comprising rough grass, weeds, scrubland and trees. A gated entrance onto the site is located in the southwestern corner with historical hardstanding noted in this area. The eastern portion of the site is developed with Seapoint Canoe Centre, playground and picnic area identified. A pathway was

identified north of Princes Parade through the central portion of the site and across the canal. A pathway encircles the western, northern and eastern perimeter of the site. No invasive species were noted during the site walkover, however, sporadic littering was noted on the site.

2.2.5 The elevation of the site is generally low-lying, ranging from 2.5 metres above Ordnance Datum (m AOD) to 5.0 m AOD.

2.3 SITE HISTORY

2.3.1 The site history, based on a review of the historic and current maps, dating from 1872 to 2014 is summarised below. Potentially contaminative land uses are shown in bold. Copies of key maps used in this review are provided in Appendix 2.

Table 2: Summary of the key features shown on historic maps

DATA SOURCE	SITE / SURROUNDINGS
1872 (1:10,560 scale).	The site was identified as undeveloped. A footpath was located in close proximity to the northern boundary.
	A station house was identified in close proximity to the eastern boundary while the **Royal Military Canal** was illustrated along the northern boundary of the site. The village of Seabrook was illustrated 75 m to the northeast. A **gas works** was noted 50 m to the northeast, while a **waterworks** was identified 260 m to the north. The Royal Military Road was noted 100 m to the northwest.
1897 (1: 10,560 scale).	Vegetation and a central pathway were noted on the site.
	Further residential development was noted in the village of Seabrook, while the gasworks was no longer identified. The **Hythe and Sandgate rail tracks** were developed 250 – 200 m to the north, with **Sandgate Station** 200 m to the northeast. A **gravel pit** was noted 50 m to the north. A **police station** was identified 60 m to the east while a **hospital** was developed 500 m to the east. Two **old quarries** were noted 250 m to the north and 400 m to the northwest.
1945 –1946 (1: 10,560 scale).	The central portion of the site was identified as a recreational ground.
	The railway tracks 200 m to the north of the site were removed. There was further residential development to the north of the site in Seabrook.
1961(1:10,560 scale).	A drain was identified along the northern portion of the western part of the site. An entrance into the site was constructed in the southwestern portion of the site with a slope also noted indicating that the site was being used.
	A large residential development was constructed 250 m to the north.
1973-75 (1:10,560	No significant changes identified to the site.
	A depot was constructed 200 m to the northwest of the site

DATA SOURCE	SITE / SURROUNDINGS
scale).	while a hospital was developed 250 m to the northwest of the site. Several buildings were developed along the former location of the railway tracks.
1987-89 (1:10,000 scale).	No significant changes to the site identified.
	No significant changes to the surrounding land uses.
2010 & 2014 (1:10,000 scale)	A car park was constructed in the eastern portion of the site.
	The site adjacent to the western boundary was identified as part of the golf course.

2.3.2 In summary, historic plans show that the majority of the site was undeveloped. A track and entrance onto the site was identified in 1963 which would indicate the presence of some site activity. A carpark was developed in the eastern portion of the site prior to 2010.

2.3.3 The historic maps indicate the presence of potentially significant contaminative land uses within 250 m of the site. These include:

i. An historic gasworks 50 m north of the site;

ii. The Royal Military Canal (possible presence of UXOs); and

iii. The historic rail tracks and associated station 200 – 250 m to the north / northwest.

2.3.4 Given the nature of the historical mapping process (scale, representation of conditions at discrete time intervals frequency etc.), any such maps and plans may not provide a comprehensive account of a site's history. Identification of pertinent land uses and associated potentially contaminative activities, may therefore be absent from mapping records.

2.4 GEOLOGY

2.4.1 The published geological map indicates the presence of superficial drift deposits of Storm Beach Deposits comprising gravel underlying the majority of the site. Tidal Flat Deposits comprising clay and silt are likely to underlie the northern portion of the site.

2.4.2 The underlying bedrock geology comprises clay and mudstone of the Weald Clay Formation.

2.4.3 The closest relevant British Geological Survey (BGS) historical borehole is a shallow 4.0 m borehole located 50 m to the northeast of the site (BGS Ref: TR13SE23). Topsoil was encountered to approximately 0.4 m bgl, with gravel encountered to 2.8 m bgl. This was underlain by silty sandy clay.

2.4.4 The Groundsure report did not make any reference to made ground, however, the report indicated that an historic landfill was located on the site.

2.5 HYDROGEOLOGY

2.5.1 The superficial geology underlying the site is classified by the Environmental Agency (EA) as a Secondary 'A' Aquifer. This indicates that the aquifer has permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.

2.5.2 The underlying Weald Clay Formation is classified by the EA as Unproductive Stratum.

2.5.3 The site is not located within a Groundwater Protection Zone.

2.5.4 According the Groundsure Report, there are three groundwater abstraction licences within one kilometre of the site. All three licences are related to potable water abstraction with the closest licence associated with Veolia and located 276 m to the north of the site. An additional Veolia licence is located 761 m to the north, while another licence is relating to Hotel Imperial and is located 847 m to the west.

2.6 HYDROLOGY

2.6.1 The closest surface water feature is the Royal Military Canal located three metres to the north of the site. A culverted watercourse flows into the central portion of the canal, while a tertiary river flows into the western portion of the canal. This canal flows in an eastern direction along the boundary of the site, before flowing into the Hythe Bay 50 m to the south.

2.6.2 There are no surface water abstractions within one kilometre of the site.

2.6.3 According the EA's Risk of Flooding from Rivers and Seas (RoFRaS), the site is located in an area at risk from flooding. The majority of the northern and eastern portion of the site is identified as having a medium to high RoFRaS risk. The surrounding areas are also identified as having a high RoFRaS risk from flooding.

2.6.4 The site is not located in an area benefitting from flood defences.

2.6.5 According to the Groundsure Report, the site is located within an area of susceptible to groundwater flooding (superficial deposits flooding). This is due to the shallow unconsolidated sedimentary aquifer which overlies an unproductive aquifer.

2.7 CURRENT SITE ISSUES

2.7.1 Potentially significant environmental issues have been investigated within relevant distances of the site, based on the database of records supplied by Groundsure. These relate to the following searches:

i. Water discharge or pollution incidents within 250 m of the site;

ii. Waste management sites within 250 m of the site;

iii. Statutory authorisations within 50 m of the site;

iv. Trade directory entries of possible contaminative use within 50 m of the site;

v. Special protection or conservation areas within 50 m of the site; and

vi. Any other relevant issues.

2.7.2 Potentially significant environmental issues identified by the above searches are summarised in Table 3 below.

Table 3: Potentially significant environmental issues

ENVIRONMENTAL CATEGORY	DESCRIPTION
Water discharge or pollution incidents within 250 m	There is one current and three revoked discharge consents relating to one sewer storm overflow located 16 m to the southeast. One historic pollution incident was identified on the site. This was related to crude sewage on site with no significant impact identified. One unspecified pollution incident was identified 24 m to the northeast, with no significant impact identified.
Waste management sites within 250 m	The site was identified as an historic EA landfill (reference SH6) receiving both inert and commercial waste between December 1946 – December 1974.
Statutory authorisations within 50 m	There are no statutory authorisations within 50 m of the site.
Trade directory entries of possible contaminative use within 50 m	There are no potentially contaminative land uses within a 50 m radius of the site. An electricity substation was, however, identified 60 m to the northeast while a service station was noted 110 m to the northeast.
Special protection or conservation areas within 50 m	Hythe Bay located 50 m to the south which is a marine conservation zone.

2.8 INDICATIVE GROUND STABILITY HAZARDS

2.8.1 The site has been classified by the BGS as having a negligible to low risk from clay shrink swells, landslides, soluble rocks and collapsible ground. A moderate to high risk has been identified for compressible deposits and running sand in the northern portion of the site.

2.8.2 The Groundsure Report has indicated that rare localised small-scale iron ore mining may have occurred on the site.

2.9 RADON GAS

2.9.1 The site does not lie within a Radon Affected Area as defined by the Health Protection Agency (1% of houses are above the action level) and therefore no radon protective measures are required.

2.10 AIR QUALITY

2.10.1 The site does not lie within a designated Air Quality Management Area (AQMA) for the Shepway Local Authority.

2.11 ECOLOGY

2.11.1 Information from environmental and ecological datasets was obtained from a review of the MAGIC (Multi-Agency Geographic Information for the Countryside) website and the Groundsure report. The data assessed indicates that several environmentally sensitive features are located within one kilometre of the site. This includes Hythe Bay located 50 m to the south which is a marine conservation zone. The Royal Military Canal to the north is identified as a scheduled monument, while deciduous woodlands were located 150 m to the northeast and 300 m to the northwest of the site.

2.11.2 The data also indicates that species of grey partridges and redshank have been recorded in close proximity to the site.

2.11.3 Information provided by Shepway District Council has indicated the presence of badger setts on the site.

2.12 PREVIOUS INVESTIGATIONS

2.12.1 A Phase 1 Assessment was undertaken by Ground Solutions Group Limited (GSG) in 2002 on behalf of Shepway District Council (Report ref: 44518_1/OJR). This report included a soil spike survey undertaken across the site.

2.12.2 The survey returned concentrations of methane (CH_4) below the instruments detection limit (<0.25 %v/v) with carbon dioxide (CO_2) was detected to a maximum of 7.0 % v/v. Thirty-seven locations recorded CO_2 between 1.5 to 5.0 v/v, with only five location recording concentrations greater than 5 % v/v.

2.13 PRELIMINARY CONCEPTUAL SITE MODEL AND RISK ASSESSMENT

2.13.1 From the Phase 1 assessment a preliminary site conceptual model and risk assessment have been produced using the framework established in Part IIA of the *Environmental Protection Act 1990* and detailed in Contaminated Land Report *CLR11 - Model Procedures for the Management of Land Contamination*.

2.13.2 Risk from contamination has been assessed using the source-pathway-receptor and pollutant linkage methodology, whereby a risk can only exist if all elements of: source, pathway and receptor, are present.

2.13.3 Potential Sources

i. Elevated concentrations of metals, PAH and TPH from the historic infilling across the site and the potential for associated soil gas / vapour generation;

ii. Soil and groundwater contamination associated with the site's former use as a landfill;

iii. Asbestos containing material (ACM) within the fill material imported to the site;

iv. Soil and groundwater contamination associated with historic off-site sources which includes the Royal Military Canal three metres to the north, within potential risk from UXO's and the historic gas works located 50 m to the north.

2.13.4 Potential Pathways

i. Direct contact;

ii. Ingestion and inhalation of contaminated soil and dust;

iii. Vertical migration to the underlying Secondary Aquifer to the south of the site;

iv. Vertical and horizontal migration to off-site surface water receptors; and

v. Accumulation of ground gas vapour ingress into buildings and voids.

2.13.5 Potential Receptors

i. The general public and current site users;

ii. Residents of future development;

iii. Construction workers;

iv. Groundwater in underlying Secondary Aquifer; and

v. Off-site surface water receptor the Royal Military Canal located to the north of the site and Hythe Bay 50 m to the south.

2.13.6 Pollutant Linkages and Risk Ratings

2.13.6.1 From the Phase 1 assessment a preliminary site conceptual model has been produced as Table 4 which identifies the potential pollutant linkages. These have

been used to inform the Phase 2 intrusive investigation presented in the subsequent sections.

Table 4: Preliminary Conceptual Model

POSSIBLE POLLUTANT LINKAGE			RISK CHARACTERISATION
POTENTIAL SOURCES	**PATHWAYS**	**RECEPTORS**	
Heavy metals and hydrocarbons (made ground and landfill material)	Contact with contaminated soil	Human health (current users)	**Moderate risk identified** Potential for made ground and landfill material which can contain elevated metals and hydrocarbons.
	Ingestion and inhalation of contaminated soil and dust	Human health (current users)	
Heavy metals and hydrocarbons (made ground and landfill material)	Contact with contaminated soil	Human health (future residents and construction workers)	**Moderate risk identified** Potential for made ground and landfill material which can contain elevated metals and hydrocarbons.
	Ingestion and inhalation of contaminated soil and dust	Human health (future residents and construction workers)	
Asbestos (made ground and landfill material)	Ingestion and inhalation of contaminated soil and dust	Human health (future residents and construction workers)	**Moderate risk** Potential for made ground and landfill material to contain asbestos.
Contamination (all forms)	Vertical migration to aquifer	Controlled waters	**Moderate risk identified** Potential for contamination to affect shallow gravel aquifer south of the site.
Contamination (all forms)	Horizontal migration to surface water	Controlled waters	**Moderate risk identified** Royal Military Canal located to the north of the site.
Hydrocarbons	Direct contact	Plastic water pipes	**Moderate risk identified** Cannot rule out presence of hydrocarbon contamination at this stage.
Hazardous Gas/Vapours In soil	Ingress into buildings and voids	Human health (future residents and construction workers)	**Moderate risk identified** Potential for made ground and landfill material which could act as source of hazardous gas. Cannot rule out fuel spillages as source of vapours

SECTION 3 SITE INVESTIGATION RATIONALE

3.1.1 A site investigation rationale has been devised in accordance with the findings of the Phase 1 investigation and the resultant preliminary conceptual site model and risk assessment. Priority contaminants were identified as heavy metals, hydrocarbons, PAHs and asbestos.

3.1.2 Intrusive sampling locations were chosen on the basis of providing broad spatial coverage of the site while also targeting the areas of suspected landfill material.

3.1.3 It should be noted that intrusive locations were limited due access restrictions ecological considerations. This included the steep slopes and bund surrounding the site, dense vegetation and the presence of nesting birds and possible badger setts identified in the northwestern and southeastern portion of the site.

3.2 SITE INVESTIGATION METHODS

3.2.1 An intrusive investigation was carried out by Merebrook on from 17 to 18 June 2015 and comprised the following scope of work:

i. Seven shallow windowless sample probe holes (MW1 to MWS7) to a maximum depth of 5.45 m bgl; and

ii. Five machine-dug trial holes (MTP1 to MTP5) to a maximum depth of 3.0 m bgl.

3.2.2 Exploratory hole locations are indicated on drawing 17436ai-304-001 in Appendix 1. Logging of exploratory holes was undertaken by a Merebrook Officer. Exploratory hole logs are contained in Appendix 3.

3.2.3 All intrusive locations were assessed by a representative from Ordtek due to the proximity to the Royal Military canal and the risk from potential unexploded ordnance (UXO). Additionally, a representative from Middlemarch Environmental supervised the site works due to the sensitive ecological receptors identified on site.

3.2.4 A tracked windowless sampling rig was used to advance MWS1 to MWS7. This comprised a rig-mounted drop hammer to drive a hollow steel barrel into the ground. The barrel is recovered along with a removable plastic sleeve, which lines the barrel and holds a core of soil which is retracted for logging and sampling. SPTs were performed at approximate 1 m intervals in all windowless sample holes.

3.2.5 MWS1, MWS4, MWS6 and MWS7 were installed to 4.0 m bgl for groundwater and gas monitoring.

3.2.6 Representative soil samples were taken from various depths and strata to assess the contaminative status of the site. Soil samples were submitted to an MCERTS/ UKAS accredited laboratory for chemical analysis of a broad suite of potential contaminants. The results are provided in Appendix 4.

SECTION 4 GROUND CONDITIONS

4.1 SURFACE GROUND CONDITIONS

4.1.1 The surface of the site was predominantly uneven and comprised rough grass, waist-high vegetation brambles, scrubland and medium-sized trees. A bund surrounded the site to the south, while steep densely vegetated slopes bounded the western and northern portion of the site.

4.2 SUB-SURFACE GROUND CONDITIONS

4.2.1 A significant proportion of infilled material was encountered within the former landfilled areas across the site. The areas where underlying natural geology was encountered were generally consistent with the published geology.

4.2.2 A summary of the ground conditions encountered is presented in Table 5, whilst a more detailed assessment of the strata is contained in the following sections of the report.

Table 5: Summary of Sub-surface Ground Conditions

STRATA	DEPTH TO TOP RANGE (m bgl)	THICKNESS RANGE (m)
Made Ground	0.0	0.2 – >3.0 m
Clay	0.6	2.0 m
Drift – Tidal Flats Deposits	2.0	>1.0 m
Drift – Storm Beach Deposits	1.9 – 2.8	>2.1
Solid – Weald Clay Formation	Not encountered	-

4.2.3 Made Ground

4.2.3.1 As the majority of the site was a former landfill, a significant amount of made ground was revealed across the site, ranging in thickness from 0.2 to > 3.0 m bgl, as the depth was not proven in MTP1 to MTP5. Made ground predominantly comprised an upper stratum of topsoil over made ground composed of brown sandy gravelly silt / clay with frequent rootlets. Gravel-sized materials consisted of minor quantities of flint, brick, concrete occasional glass, whole bricks and bituminous pieces. This was underlain by what appeared to be a layer of compacted silty clayey gravelly sand / sandy gravel with frequent whole red bricks, brick and concrete fragments occasional glass, slate and wooden fragments.

4.2.3.2 This was underlain by made ground comprising silty sandy gravelly clay / clayey gravel with variable quantities of red brick, concrete, ash, cinders and bituminous pieces. Significant quantities of landfill waste were encountered in MTP1 to MTP5. This included frequent whole red bricks, concrete fragments, wooden, metal and

bituminous fragments, glass bottles, plastic waste material (bags, bottles etc.) and ceramics.

4.2.3.3 Infilled material was revealed across the site, with landfill waste predominantly encountered at MTP1 to MTP5. Suspected asbestos clad pipe was encountered at MTP1 at 1.1 m bgl, while asbestos fragments were also encountered at MTP2 at 0.4 m bgl and MTP5 at 0.6 m bgl. Frequent quantities of ash, cinders, clinkers and bituminous pieces were encountered at MWS1 (0.4 – 1.6 m bgl), MWS2 (0.25 – 0.8 m bgl), MWS6 (0.1 – 2.5 m bgl) and MWS7 (0.4 – 1.1 m bgl). Minor quantities were encountered at MWS1 (2.2 – 2.7 m bgl), MWS2 (0.80 – 2.0 m bgl), MWS3 (0.3 – 1.8 m bgl) and MWS5 (1.5 – 1.9 m bgl).

4.2.3.4 Groundwater was encountered within the made ground at MWS6 at 3.5 m bgl.

4.2.3.5 SPTs carried out within predominantly cohesive made ground revealed 'N' values ranging from 4 to 9, indicating the presence of soft and firm (low and medium strength) ground conditions. SPT 'N' values of 4 and 5 were recorded in granular made ground suggesting loose conditions, whilst an 'N' value of 18 was obtained in MWS1, indicating medium dense conditions.

4.2.4 Natural Ground

4.2.4.1 Storm Beach Deposits were encountered beneath the made ground at MWS1, MWS2, MWS3, MWS4, MWS6 and MWS7 at depths ranging from 1.9 to 2.8 m bgl. The stratum was typically described as brown sandy gravel. The gravel content comprised fine to coarse sub rounded to rounded flint.

4.2.4.2 Firm greyish brown mottled orange clay was encountered at MWS5 from 0.6 to 2.6 m bgl. This was underlain by suspected Tidal Flats deposits comprising silty sandy gravel and soft grey clayey silt revealed to 3.0 m bgl.

4.2.4.3 The Weald Clay Formation was not encountered during the site investigation.

4.2.4.4 No visual or olfactory evidence of contamination was noted in the natural ground during the site investigation.

4.2.4.5 Groundwater was encountered at MWS1 to MWS6, within the superficial Storm Beach Deposits, ranging in depths from 2.5 – 3.5 m bgl.

4.2.4.6 SPTs performed within the granular soils recorded 'N' values generally in the range 4 to 16, indicating the presence of loose and medium dense ground conditions, whilst locally at depths of 4.0 and 5.0 m bgl SPT 'N' values of 28 and 35 were obtained. SPTs undertaken within cohesive deposits encountered in MWS5 recorded 'N' values of between 5 and 12, suggesting soft and firm (low and medium strength) ground conditions.

SECTION 5 PRELIMINARY GEOTECHNICAL RECOMMENDATIONS

5.1 FOUNDATIONS

5.1.1 The proposed development comprises a swimming pool and leisure facility with associated car parking and soft landscaped areas.

5.1.2 The recent ground investigation has revealed ground conditions consisting of typically significant thicknesses of made ground (0.2 - > 3.0 m) underlain by superficial deposits of sand and gravel (locally silt / clay). SPTs performed in the made ground revealed soft / firm (low / medium strength) and loose ground conditions, whilst the natural granular deposits were found to be loose and medium dense in nature. Localised deposits of natural cohesive soil were found to be soft and firm (low and medium strength) in nature.

5.1.3 Based on the ground conditions revealed across the site, traditional shallow foundations are considered unlikely to be feasible for the new structure (s). It is recommended that an alternative solution, such as ground improvement or piles is considered.

5.1.4 Ground improvement would involve techniques such as stone columns or vibro concrete columns (VCC). These would be installed along the lines of all load bearing walls and keyed into an underlying competent stratum in order to provide a more uniform founding medium. This would enable strip footings to be constructed on the improved ground. Allowable bearing pressures of around 100 kN/m² are likely to be achievable for footings up to 1 m wide. Light mesh reinforcement would need to be installed in all footings constructed on vibro treated ground. In order to assess the suitability of using ground improvement a specialist contractor should ideally be invited to attend site to view the ground conditions for themselves.

5.1.5 Alternatively, a piled solution could be adopted at the site. It is envisaged that bored / Continuous Flight Auger (CFA) piles will be feasible at the site. Driven piles could possibly be considered as they have the advantage that no arisings are generated, however, the effects of noise / vibrations are likely to be an issue given the proximity of the existing residential development and a canal.

5.1.6 The advantage of using bored / CFA piles is the low noise / vibration of the system, however, arisings are generated by this system. Piles would need to be taken through made ground and superficial deposits to found within an underlying competent stratum.

5.1.7 It is recommended that the advice of a specialist contractor be sought in order to determine the most appropriate / cost effective system and to advise on pile diameters, depths and safe working capacity. Ideally, boreholes would need to be undertaken to determine ground conditions at depth and to obtain parameters for pile design.

5.1.8 Any ground improvement or piling activities would need to consider their impact on the Royal Military Canal.

5.1.9 If a housing scenario is to be adopted as mentioned in the cabinet report similar ground geotechnical recommendations will need to be adopted, given the depth of made ground across the site. Detailed development plans were not provided within the cabinet report document and should such plans be made available recommendations may need to be reviewed.

5.2 EXCAVATIONS AND GROUNDWATER

5.2.1 Based on the ground conditions observed at the site, any shallow excavations have the potential to become unstable in the short term. Therefore, if man-entry is required excavations should be supported by shoring or otherwise battered back to a safe angle in order to protect the workforce from possible collapse.

5.2.2 Groundwater was encountered in the windowless sample holes at depths ranging from 2.3 to 3.6 m bgl. It is therefore possible that groundwater ingress could occur in any shallow excavations, and provision for dewatering during the construction period should be considered.

5.3 FLOOR SLABS

5.3.1 Due to the significant thicknesses of made ground present across the site it is recommended that suspended floor slabs are adopted for proposed new structures.

5.4 BURIED CONCRETE

5.4.1 Recommendations given in BRE Special Digest 1:2005 “Concrete in aggressive ground” have been followed in order to give recommendations with respect to buried concrete.

5.4.2 Water soluble sulphate analysis was carried out on eighteen soil samples obtained from depths of between 0.2 and 3.5 m bgl with soil pH determination also carried out on these samples. Water soluble sulphate contents ranged between 0.022 and 1.8 g/l. In accordance with BRE guidelines the characteristic value is calculated by determining the mean of the highest 20 % of results. In this case the characteristic value is 1.48 g/l. On this basis the Design Sulphate Class is DS-2.

5.4.3 The pH values in the soil samples varied between 7.2 and 9.0. The mean of the lowest 20 % of values is 7.4 which represents the characteristic value. Mobile groundwater conditions have been assumed and on this basis the Aggressive Chemical Environment for Concrete (ACEC) class for the site is AC-2.

5.5 ROADS AND PAVED AREAS

5.5.1 For preliminary design purposes a California Bearing Ratio (CBR) value of < 2 % should be assumed for roads / hardstanding at existing ground levels.

5.6 SOAKAWAYS

5.6.1 The presence of significant thicknesses of made ground beneath the site is likely to preclude the use of shallow soakaways for the proposed development.

SECTION 6 ENVIRONMENTAL ASSESSMENT

6.1 SOIL QUALITY

6.1.1 A total of eighteen soil samples were submitted to the laboratory for chemical analysis, including two samples from natural ground and sixteen samples from made ground. The laboratory chemical analysis certificates are contained in Appendix 4. The results of the analysis are summarised in Table 6 and 7.

6.1.2 An initial screening exercise has been undertaken whereby contaminant concentrations recorded in soils have been assessed against *Suitable for Use Levels* (S4ULs) published in 2015 by LQM/CIEH[1]. These precautionary screening levels are designed to be representative of minimal risk to human health in a number of land use scenarios. As different development scenarios are proposed, this report has assessed using two sets of screening levels.

i. POSresi (POS2) – Referring to the leisure centre with associated car parking and landscaping; and

ii. Residential without home-grown produce – Referring to residential scenarios. According to the cabinet report no private gardens are proposed.

6.1.3 For lead the DEFRA Category 4 Screening Level[2] has been used as this is based on updated toxicological data and a low risk to human health.

6.1.4 An additional set of phytotoxin screening levels have been adopted from 'The Code of Agricultural Practice for the Protection of Soil' Ministry of Agriculture, Fisheries and Food (MAFF), 1993, which are protective of healthy plant growth. Landscaped areas are proposed within all scenarios.

Table 6: Summary of Soils Chemical Analysis Results - POSresi (POS2)

CONTAMINANT	UNITS	MAX	MEAN	No of Tests	SCREENING LEVEL (SL)	No > SL*
HUMAN HEALTH RISK ASSESSMENT						
Asbestos in soil	-	Detected	-	5	Detected	5
pH	-	9	7.96	18	5 – 9	-
Arsenic	$mg.kg^{-1}$	50	16.92	18	79	0
Cadmium	$mg.kg^{-1}$	1.1	0.32	18	120	0

[1] Nathanail, C. P., McCaffrey, C., Gillett, A. G., Ogden, R. C. and Nathanail, J. F. 2015. The LQM / CIEH S4ULs for Human Health Risk Assessment. Land Quality Press, Nottingham. Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3100. All rights reserved.

[2] SP1010 *Development of Category 4 Screening Levels Main Report* (Dec 2013) and SP1010 *Policy Companion Document* (Mar 2014).

CONTAMINANT	UNITS	MAX	MEAN	No of Tests	SCREENING LEVEL (SL)	No > SL*
HUMAN HEALTH RISK ASSESSMENT						
Chromium (total)	$mg.kg^{-1}$	110	33.11	18	1500	0
Hexavalent Chromium	$mg.kg^{-1}$	<4.0	<4.0	18	7.7	0
Lead	$mg.kg^{-1}$	850	200.5	18	630	2
Mercury	$mg.kg^{-1}$	1.3	0.41	18	120	0
Nickel	$mg.kg^{-1}$	87	33.5	18	230	0
Selenium	$mg.kg^{-1}$	2.7	1.21	18	1100	0
TPH Aliphatic >EC_5 - EC_6	$mg.kg^{-1}$	<0.1	<0.1	18	600000	0
TPH Aliphatic >EC_6 - EC_8	$mg.kg^{-1}$	<0.1	<0.1	18	620000	0
TPH Aliphatic >EC_8 - EC_{10}	$mg.kg^{-1}$	<0.1	<0.1	18	13000	0
TPH Aliphatic >EC_{10} - EC_{12}	$mg.kg^{-1}$	1.2	1.01	18	13000	0
TPH Aliphatic >EC_{12} - EC_{16}	$mg.kg^{-1}$	35	4.03	18	13000	0
TPH Aliphatic >EC_{16} - EC_{21}	$mg.kg^{-1}$	62	11.18	18	250000	0
TPH Aliphatic >EC_{21} - EC_{35}	$mg.kg^{-1}$	120	28.25	18	250000	0
TPH Aromatic >EC_5 - EC_7	$mg.kg^{-1}$	<0.1	<0.1	18	56000	0
TPH Aromatic >EC_7 - EC_8	$mg.kg^{-1}$	<0.1	<0.1	18	56000	0
TPH Aromatic >EC_8 - EC_{10}	$mg.kg^{-1}$	<0.1	<0.1	18	5000	0
TPH Aromatic >EC_{10} - EC_{12}	$mg.kg^{-1}$	2.7	1.25	18	5000	0
TPH Aromatic >EC_{12} - EC_{16}	$mg.kg^{-1}$	380	30.84	18	5000	0
TPH Aromatic >EC_{16} - EC_{21}	$mg.kg^{-1}$	2200	217.33	18	3800	0
TPH Aromatic >EC_{21} - EC_{35}	$mg.kg^{-1}$	2500	328.06	18	3800	0
Benzene	$mg.kg^{-1}$	<1.0	<1.0	18	73	0
Toluene	$mg.kg^{-1}$	<1.0	<1.0	18	25000	0
Ethylbenzene	$mg.kg^{-1}$	<1.0	<1.0	18	56000	0
Xylene	$mg.kg^{-1}$	<1.0	<1.0	18	43000	0
Acenaphthene	$mg.kg^{-1}$	23	2.07	18	15000	0
Acenaphthylene	$mg.kg^{-1}$	4	0.9	18	15000	0
Anthracene	$mg.kg^{-1}$	53	5.48	18	74000	0
Benz(a)anthracene	$mg.kg^{-1}$	130	16.42	18	29	3
Benzo(a)pyrene	$mg.kg^{-1}$	91	13.29	18	5.7	7
Benzo(b)fluoranthene	$mg.kg^{-1}$	110	16.03	18	7.2	7
Benzo(ghi)perylene	$mg.kg^{-1}$	57	6.83	18	640	0
Benzo(k)fluoranthene	$mg.kg^{-1}$	56	7.72	18	190	0
Chrysene	$mg.kg^{-1}$	100	13.5	18	57	1
Dibenz(ah)anthracene	$mg.kg^{-1}$	11	1.58	18	0.57	9
Fluoranthene	$mg.kg^{-1}$	300	34.82	18	3100	0
Fluorene	$mg.kg^{-1}$	22	2.26	18	9900	0
Indeno(123-cd)pyrene	$mg.kg^{-1}$	50	7.61	18	82	0
Naphthalene	$mg.kg^{-1}$	1.2	0.29	18	4900	0
Phenanthrene	$mg.kg^{-1}$	190	19.69	18	3100	0
Pyrene	$mg.kg^{-1}$	230	27.93	18	7400	0
Phenol	$mg.kg^{-1}$	<1.0	<1.0	18	1300	0

CONTAMINANT	UNITS	MAX	MEAN	No of Tests	SCREENING LEVEL (SL)	No > SL*
HUMAN HEALTH RISK ASSESSMENT						
PHYTOTOXICITY RISK ASSESSMENT						
	Units	**Max**	**Mean**	**No of Test**	**Screening Level (SL)**	**No > SL**
Copper	$mg.kg^{-1}$	850	97.09	18	200	2
Nickel	$mg.kg^{-1}$	87	33.5	18	110	0
Zinc	$mg.kg^{-1}$	1200	279.11	18	300	4

Notes: * Number of samples exceeding screening level nd = not detected

Table 7: Summary of Soils Chemical Analysis Results – Residential without home-grown produce.

CONTAMINANT	UNITS	MAX	MEAN	No of Tests	SCREENING LEVEL (SL)	No > SL*
HUMAN HEALTH RISK ASSESSMENT						
Asbestos in soil	-	Detected	-	5	Detected	5
pH	-	9	7.96	18	5 – 9	0
Arsenic	$mg.kg^{-1}$	50	16.92	18	40	1
Cadmium	$mg.kg^{-1}$	1.1	0.32	18	85	0
Chromium (total)	$mg.kg^{-1}$	110	33.11	18	910	0
Hexavalent Chromium	$mg.kg^{-1}$	<4.0	<4.0	18	6	0
Lead	$mg.kg^{-1}$	850	200.5	18	310	3
Mercury	$mg.kg^{-1}$	1.3	0.41	18	56	0
Nickel	$mg.kg^{-1}$	87	33.5	18	180	0
Selenium	$mg.kg^{-1}$	2.7	1.21	18	430	0
TPH Aliphatic >EC_5 - EC_6	$mg.kg^{-1}$	<0.1	<0.1	18	160	0
TPH Aliphatic >EC_6 - EC_8	$mg.kg^{-1}$	<0.1	<0.1	18	530	0
TPH Aliphatic >EC_8 - EC_{10}	$mg.kg^{-1}$	<0.1	<0.1	18	150	0
TPH Aliphatic >EC_{10} - EC_{12}	$mg.kg^{-1}$	1.2	1.01	18	770	0
TPH Aliphatic >EC_{12} - EC_{16}	$mg.kg^{-1}$	35	4.03	18	4400	0
TPH Aliphatic >EC_{16} - EC_{21}	$mg.kg^{-1}$	62	11.18	18	110000	0
TPH Aliphatic >EC_{21} - EC_{35}	$mg.kg^{-1}$	120	28.25	18	110000	0
TPH Aromatic >EC_5 - EC_7	$mg.kg^{-1}$	<0.1	<0.1	18	1400	0
TPH Aromatic >EC_7 - EC_8	$mg.kg^{-1}$	<0.1	<0.1	18	3900	0
TPH Aromatic >EC_8 - EC_{10}	$mg.kg^{-1}$	<0.1	<0.1	18	270	0
TPH Aromatic >EC_{10} - EC_{12}	$mg.kg^{-1}$	2.7	1.25	18	1200	0
TPH Aromatic >EC_{12} - EC_{16}	$mg.kg^{-1}$	380	30.84	18	2500	0
TPH Aromatic >EC_{16} - EC_{21}	$mg.kg^{-1}$	2200	217.33	18	1900	0
TPH Aromatic >EC_{21} - EC_{35}	$mg.kg^{-1}$	2500	328.06	18	1900	1
Benzene	$mg.kg^{-1}$	<1.0	<1.0	18	1.4	0
Toluene	$mg.kg^{-1}$	<1.0	<1.0	18	440	0
Ethylbenzene	$mg.kg^{-1}$	<1.0	<1.0	18	3900	0
Xylene	$mg.kg^{-1}$	<1.0	<1.0	18	430	0
Acenaphthene	$mg.kg^{-1}$	23	2.07	18	6000	0

CONTAMINANT	UNITS	MAX	MEAN	No of Tests	SCREENING LEVEL (SL)	No > SL*
HUMAN HEALTH RISK ASSESSMENT						
Acenaphthylene	$mg.kg^{-1}$	4	0.9	18	6000	0
Anthracene	$mg.kg^{-1}$	53	5.48	18	37000	0
Benz(a)anthracene	$mg.kg^{-1}$	130	16.42	18	15	5
Benzo(a)pyrene	$mg.kg^{-1}$	91	13.29	18	3.2	11
Benzo(b)fluoranthene	$mg.kg^{-1}$	110	16.03	18	4	11
Benzo(ghi)perylene	$mg.kg^{-1}$	57	6.83	18	360	1
Benzo(k)fluoranthene	$mg.kg^{-1}$	56	7.72	18	110	0
Chrysene	$mg.kg^{-1}$	100	13.5	18	32	2
Dibenz(ah)anthracene	$mg.kg^{-1}$	11	1.58	18	0.32	11
Fluoranthene	$mg.kg^{-1}$	300	34.82	18	1600	0
Fluorene	$mg.kg^{-1}$	22	2.26	18	4500	0
Indeno(123-cd)pyrene	$mg.kg^{-1}$	50	7.61	18	46	0
Naphthalene	$mg.kg^{-1}$	1.2	0.29	18	13	0
Phenanthrene	$mg.kg^{-1}$	190	19.69	18	1500	0
Pyrene	$mg.kg^{-1}$	230	27.93	18	3800	0
Phenol	$mg.kg^{-1}$	<1.0	<1.0	18	1200	0
PHYTOTOXICITY RISK ASSESSMENT						
	Units	**Max**	**Mean**	**No of Test**	**Screening Level (SL)**	**No > SL**
Copper	$mg.kg^{-1}$	850	97.09	18	200	2
Nickel	$mg.kg^{-1}$	87	33.5	18	110	0
Zinc	$mg.kg^{-1}$	1200	279.11	18	300	4

Notes: * Number of samples exceeding screening level nd = not detected

6.1.5 Zootoxic Metals (harmful to human health)

6.1.5.1 With reference to POSresi, two exceedances of lead were recorded in made ground samples at MTP2 (1.9-2.0 m) and MTP5 (1.5 m). Both were samples from within the landfill waste medium.

6.1.5.2 When compared to screening levels for residential without home-grown produce an additional exceedance with reference to lead was also recorded in shallower made ground at MWS2 (0.4-0.6 m). At MTP5 (1.5 m), an elevation of arsenic was also recorded based on a screening level of 40 mg/kg at 50 mg/kg.

6.1.6 Phytotoxic Metals (harmful to plant health)

6.1.6.1 Exceedances of copper and zinc were recorded in made ground across the site at depths ranging from 0.3 to 1.9 m bgl within MTP2, MTP5, MWS2 and MWS6 exploratory holes.

6.1.7 Organic Contaminants

6.1.7.1 Exceedances of polyaromatic hydrocarbons (PAH) were recorded in made ground samples in landfill waste across the site under both scenarios.

6.1.7.2 A sample of natural material tested (MWS2 2.5-2.8 m) immediately below made ground also recorded elevated concentrations of PAH above screening levels under both scenarios. This contamination was consistent with the overlying made ground.

6.1.7.3 An elevation of TPH (aromatic C21-C35) was encountered at MWS1, 1.4 – 1.7 m at a concentration of 2500 mg/kg, when compared to a residential without home-grown produce screening level. This material was above the groundwater level.

6.1.8 Inorganic Contaminants

6.1.8.1 Five samples of made ground were tested for asbestos presence all of which were positive. Asbestos presence was then quantified in three of the five samples tested from depths ranging from 0.3 to 0.9 m bgl. These recorded concentrations ranging from < 0.001 to 0.015 %.

6.1.9 Summary

6.1.9.1 The made ground across the site comprised concentrations of PAH exceeding relevant screening levels for both assessment criteria compared against. Localised metal contamination with reference to lead and arsenic was also encountered within the landfill waste made ground. Five out of five samples tested recorded asbestos presence however where quantified were recorded at non-hazardous concentrations (< 0.1%).

6.1.9.2 Two samples of natural strata were tested immediately below made ground. One sample at MWS2 recorded elevated concentrations when compared to both assessment criteria which suggest contamination has possibly leached to underlying natural geology. The sample was also collected just below where groundwater was encountered therefore it must be considered that contamination recorded could be associated with groundwater contamination.

6.2 GROUNDWATER

6.2.1 It is important to mention that although groundwater is likely to be tidally influenced the adjacent Royal Military Canal to the north does not fluctuate with the tide which indicates the groundwater and the canal are not in hydraulic continuity.

6.3 HAZARDOUS GAS

6.3.1 Gas monitoring has been undertaken on one occasion in June 2015. Levels of methane, carbon dioxide and oxygen were recorded in each standpipe, together with associated parameters including borehole flow and ambient air pressure. The results of these gas monitoring rounds are contained in Appendix 5.

6.3.2 The monitoring rounds were undertaken at barometric pressures ranging from 1021 to 1022 mb. Positive flow was not recorded during the monitoring round. Methane (CH_4) was not detected during the monitoring round however carbon

dioxide (CO_2) was detected to a maximum of 9.3 % v/v with a corresponding depleted oxygen concentration of 14.2 % v/v.

6.4 WASTE CLASSIFICATION AND OFF-SITE DISPOSAL

6.4.1 Materials, including waste soils which are not to be retained on site, should be removed and disposed of in accordance with all relevant statues including the *Environmental Protection Act 1990*, *The Controlled Waste Regulations 2012* as amended, *The Waste Regulations 2011* as amended, *The List of Wastes Regulations 2005* as amended, *The Hazardous Waste Regulations 2005* as amended, *The Waste Management Regulations 2006* and *The Environmental Permitting Regulations 2010* as amended.

6.4.2 It is a requirement of these regulations that waste sent to landfill should have been subject to measures to reduce the amount of waste, reduce harmful or hazardous properties and facilitate recycling. These requirements may be satisfied by measures such as segregation and screening of wastes to recover suitable fill and material for crushing, segregation of inert materials and putrescible wastes.

SECTION 7 RISK ASSESSMENT

7.1 The potential sources of contamination at the site and the implications with respect to development have been interpreted in accordance with the current government guidance on source-pathway-receptor risk assessment.

7.2 The investigations demonstrate that the former uses of the site, particularly with reference to landfilling, have resulted in widespread contamination comprising metals, PAH and asbestos. These materials are considered for their potential to act as sources for a number of pollutant linkages.

7.3 The potential impacts of contamination sources have been considered with respect to the following receptors:

i. The general public and present site users,

ii. Residents of future development,

iii. Groundwater,

iv. Surface water,

v. Construction workers,

vi. Adjacent land, and

vii. Infrastructure.

7.4 In each case the existence of a pollutant linkage requires a pathway by which the receptor could be exposed to the source. A qualitative assessment of risk is thus

considered in the first instance with respect to the site in its current condition and is summarised in the sections below.

7.5 **The general public and present site users**

7.5.1 As the majority of the site is heavily vegetated, potential exposure is significantly reduced therefore the risk to the general public and current site users is considered to be low.

7.6 **Residents of future development**

7.6.1 Soil contamination (chemical)

7.6.1.1 Soil contamination is widespread particularly within the made ground material. Elevations of PAH, lead, a single elevation of arsenic were recorded within the upper soil profile (upper 1.0 m) across the site. The cabinet report demonstrates the leisure centre development scenario is predominantly surrounded by hardstanding which would break pathways, reducing exposure. No outdoor pitches or play areas are proposed. The risk to future potential residents under the residential scenario is also only marginal due to only a small amount of proposed landscaping and no private gardens being proposed. The risk of exposure for both scenarios is therefore considered to be low to moderate.

7.6.2 Asbestos

7.6.2.1 Asbestos was detected in all samples where tested both in upper and lower profiles. As all samples that were tested for asbestos presence were positive asbestos is expected to be widespread within the made ground. Where concentrations have been quantified, low concentrations were recorded at non-hazardous levels. Due to small amount of proposed landscaped areas the risk of exposure is considered to be low to moderate providing clean cover is used.

7.6.3 Hazardous Soil Gas/Vapours (including hydrocarbon vapours/radon)

7.6.3.1 NHBC guidance has been followed to assess the recorded soil gas and flow conditions. Calculations indicate that a gas screening level (GSV) of 0.0001 l/h for methane and 0.0093 l/h for carbon dioxide based on one round of gas monitoring. This would typically classify the site as ‘green’ indicating no gas protection measures are required. However, according to the NHBC, if carbon dioxide exceeds five percent it is necessary to increase to ‘amber 1’. As shown in the gas monitoring results, carbon dioxide exceeded five percent at MWS1. Further monitoring will be required to confirm this classification and can be undertaken when groundwater samples are recovered. The risk is therefore considered to be moderate based on current monitoring results.

7.6.3.2 As mentioned in section 2.12.1, the Phase 1 Assessment undertaken by Ground Solutions Group Limited also recorded carbon dioxide levels above five percent at five locations.

7.7 Controlled waters

7.7.1 Although hydrocarbon contamination was recorded in made ground at concentrations which could pose a risk to human health, the concentrations were not sufficiently mobile to pose a risk to controlled waters. It is considered that groundwater is likely to be tidally influenced and samples are proposed to be collected in July during a period of high tide. Proposed sampling results will clarify risk to the underlying secondary 'A' Aquifer.

7.7.2 The Royal Military Canal to the north is contained and during the site works was observed to not be tidally influenced. The risk of leachable contaminants to migrate to the canal is also considered to be low as it is not in hydraulic continuity with the groundwater. As groundwater is likely to be tidally influenced, this is a dynamic environment where leachate is unlikely to accumulate beneath the site preventing groundwater from being stagnant.

7.8 Construction workers

7.8.1 Potentially, construction workers are initially at the greatest risk from exposure to hazardous contamination due to excavation works and during the handling of materials including imported soils. Providing that dust levels are kept within statutory limits and appropriate health and safety procedures are adhered to during the construction phase, the levels of chemical contamination recorded to date are not considered to present an acute risk to human health.

7.9 Infrastructure

7.9.1 Phytotoxic metals were detected in exceedance of relevant screening levels across the site in made ground which may affect plant growth. Clean cover will be required in proposed landscaped areas to ensure an adequate growing medium is present.

7.9.2 Contamination with the potential to permeate polymeric services has been identified by this investigation, and it is recommended that the utility provider is consulted with respect to their requirements for water supply pipes.

7.9.3 Utility companies apply strict guideline levels on use of polymeric pipes and may consider all made ground unsuitable for typical plastic pipe materials to be used.

SECTION 8 UPDATED CONCEPTUAL MODEL

8.1 Following completion of phases 1 and 2 of the investigation and a qualitative risk assessment, the conceptual model for the site, with relation to pollutant linkages, has been updated. The revised model is presented in Table 9 below.

Table 9: Revised Conceptual Model

POSSIBLE POLLUTANT LINKAGE			RISK CHARACTERISATION
POTENTIAL SOURCES	**PATHWAYS**	**RECEPTORS**	
Heavy metals and hydrocarbons (made ground)	Contact with contaminated soil	Human health (current users)	**Low risk identified** Although made ground does contain elevated metals and hydrocarbons the site is fenced and contained reducing risk of exposure.
	Ingestion and inhalation of contaminated soil and dust	Human health (current users)	
Heavy metals and hydrocarbons (made ground)	Contact with contaminated soil	Human health (future residents and construction workers)	**Low to Moderate risk identified** Although made ground does contain elevated metals and hydrocarbons, proposed scenarios suggest predominantly hard standing and limited landscaping areas thus reducing exposure risk.
	Ingestion and inhalation of contaminated soil and dust	Human health (future residents and construction workers)	
Asbestos (made ground)	Ingestion and inhalation of contaminated soil and dust	Human health (future residents and construction workers)	**Low to Moderate risk** Shallow contamination was recorded although limited landscaping is proposed. Providing clean cover is introduced will lower exposure.
Contamination (all forms)	Vertical migration to aquifer	Controlled waters	**Moderate risk identified** Given soil contamination being detected, groundwater contamination is possible. Proposed monitoring will clarify and be reported under separate cover.
Contamination (all forms)	Horizontal migration to surface water	Controlled waters	**Low risk identified** The Royal Military Canal to the north is contained and is not tidally influenced.
Hydrocarbons	Direct contact	Plastic water pipes	**Moderate risk identified** Contamination with the potential to permeate polymeric pipes was detected across the site.
Hazardous Gas/Vapours In soil	Ingress into buildings and voids	Human health (future residents and construction workers)	**Low to Moderate risk identified** Elevated carbon dioxide at MWS1 has indicated potential risk however further monitoring is recommended.

SECTION 9 PRELIMINARY REMEDIATION STRATEGY

9.1 The identified risks at the site can be mitigated by removal of either; the source, pathway or receptor. With reference to the conceptual model for the site a remediation strategy, based on source or pathway removal, has been designed.

9.2 There are two proposed development scenarios comprising a leisure centre or residential land, both of which include limited landscaped areas. No private gardens are proposed. Contamination has been identified within the made ground and locally in underlying natural ground. Groundwater is yet to be assessed and will be reported under separate cover.

9.3 Remedial measures will be required that are protective of human health and groundwater:

9.4 Human health – Clean cover will be required in areas of soft landscaping. This should comprise 450 mm of clean imported soil in landscaped areas. Material imported for the formation of landscaped areas should be obtained from a validated source. The validation should incorporate an assessment of the provenance of the material and chemical analysis.

9.5 Based on monitoring data to date, ground gas and vapour protection measures will also be required however additional monitoring is recommended to confirm this.

9.6 Potential risks to construction workers have been identified and the adoption of appropriate Health and Safety procedures will ensure that risks to operatives from hazardous materials at the site are minimised. Operatives should not be allowed to eat, drink or smoke on site except in designated areas and should be required to wash all exposed skin at the end of each shift. Operatives should be informed of the potential hazards at the site and should be required to report any observations of suspect material.

9.7 Materials, including waste soils which are not to be retained on site, should be removed and disposed of in accordance with all relevant statues including the *Environmental Protection Act 1990*, *The Controlled Waste Regulations 2012* as amended, *The Waste Regulations 2011* as amended, *The List of Wastes Regulations 2005* as amended, *The Hazardous Waste Regulations 2005* as amended, *The Waste Management Regulations 2006* and *The Environmental Permitting Regulations 2010* as amended.

9.8 Further monitoring is recommended at the detailed design stage to assess the ground gas, groundwater and vapour risk from the site, as well as to ascertain precisely the underlying ground conditions.

9.9 Any observations of ground conditions atypical of those already described should be reported to Merebrook immediately so that an assessment of appropriate action can be made.

SECTION 10 CONCLUSIONS

10.1 The ground conditions encountered confirmed published geology along with expected made ground associated with former on site land filling.

10.2 Geotechnical recommendations comprised foundation solutions such as ground improvement (vibro stone / concrete columns) or a piled solution to be considered. Due to variable thicknesses of made ground it is recommended suspended floor slabs should be adopted.

10.3 A 450 mm clean cover is also recommended in landscaped areas under both scenarios break linkages for human health and to supply a suitable growing medium.

10.4 Further groundwater and ground gas monitoring is recommended and will be reported under separate cover.

APPENDIX 1 ▪ Drawings

Legend

- Site boundary
- MTPref — Merebrook trial pit with location reference
- MWSref — Merebrook window sample with location reference

Based on OS	14-07-2015		-
	PDT	-	-
Issue Details	Dwn	Chd	App'd

Client/Project

Shepway District Council
Princes Parade
Seabrook, Hythe

Dwg Title

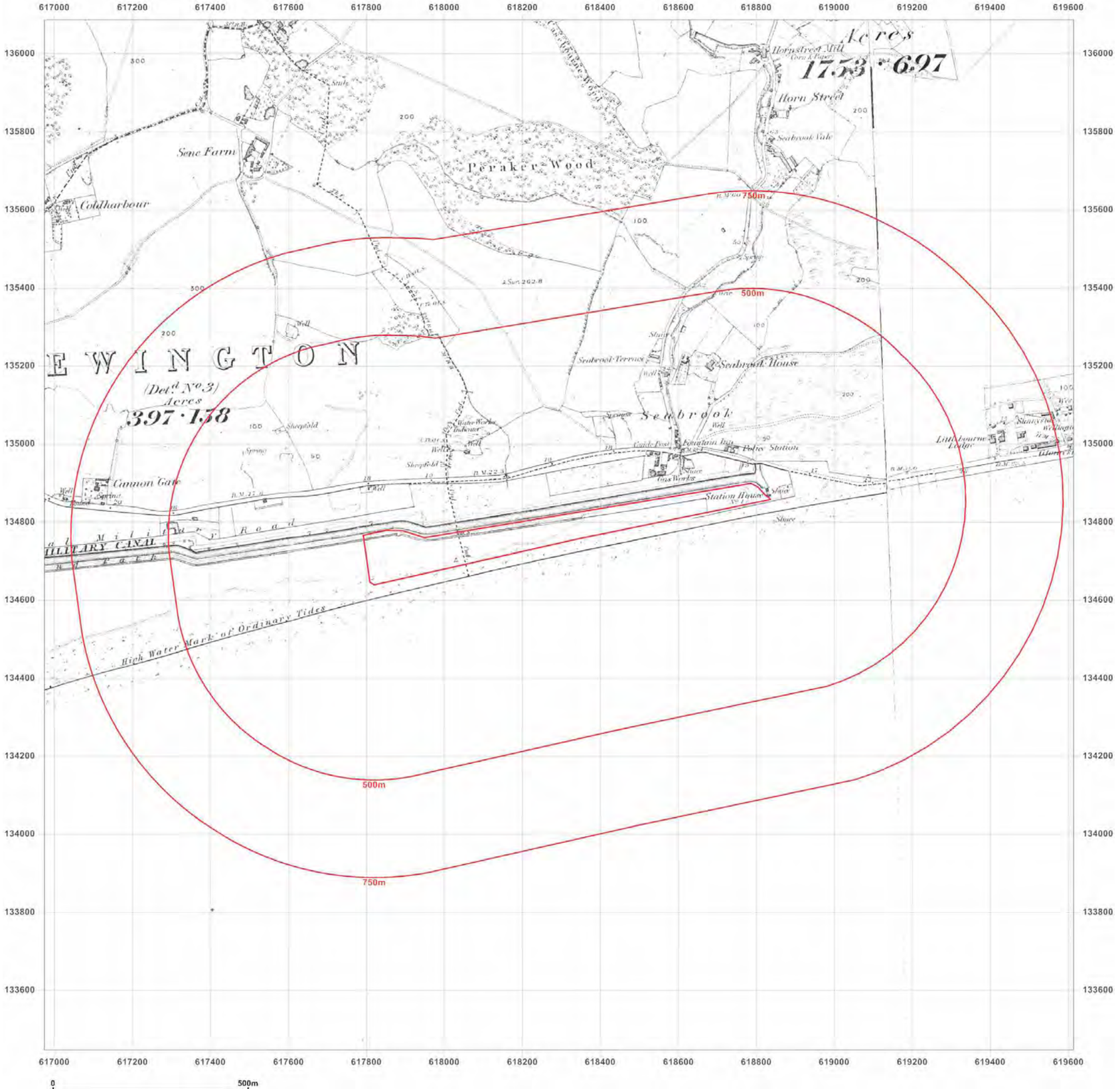
Site Investigation Locations

Job No.	Dwg No.	Revision
17436ai	304-001	-
Scale: NTS	Date: July 2015	Frame Dimensions mm: (A3) 400 x 280
Drawn: PDT	Checked: -	Approved: -

London
Kent
Derby
Cardiff
Manchester

idom merebrook
East Mill, Bridgefoot, Belper, Derbyshire, England. DE56 2UA
tel +44(0)1773 829988 fax +44(0)1773 829393 email info@merebrook.co.uk

APPENDIX 2 ▪ Historic Plans



Groundsure INSIGHTS

Site Details:

PRINCES PARADE, SEABROOK, HYTHE

Client Ref: 15-S642-FDO-17436ai
Report Ref: HMD-154-2188204
Grid Ref: 618293, 134766

Map Name: County Series

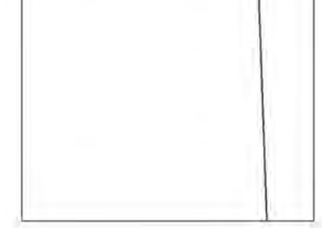
Map date: **1872**

Scale: 1:10,560

Printed at: 1:10,560

N
W E
S

Surveyed 1872
Revised 1872
Edition N/A
Copyright N/A
Levelled N/A



Surveyed 1872
Revised 1872
Edition N/A
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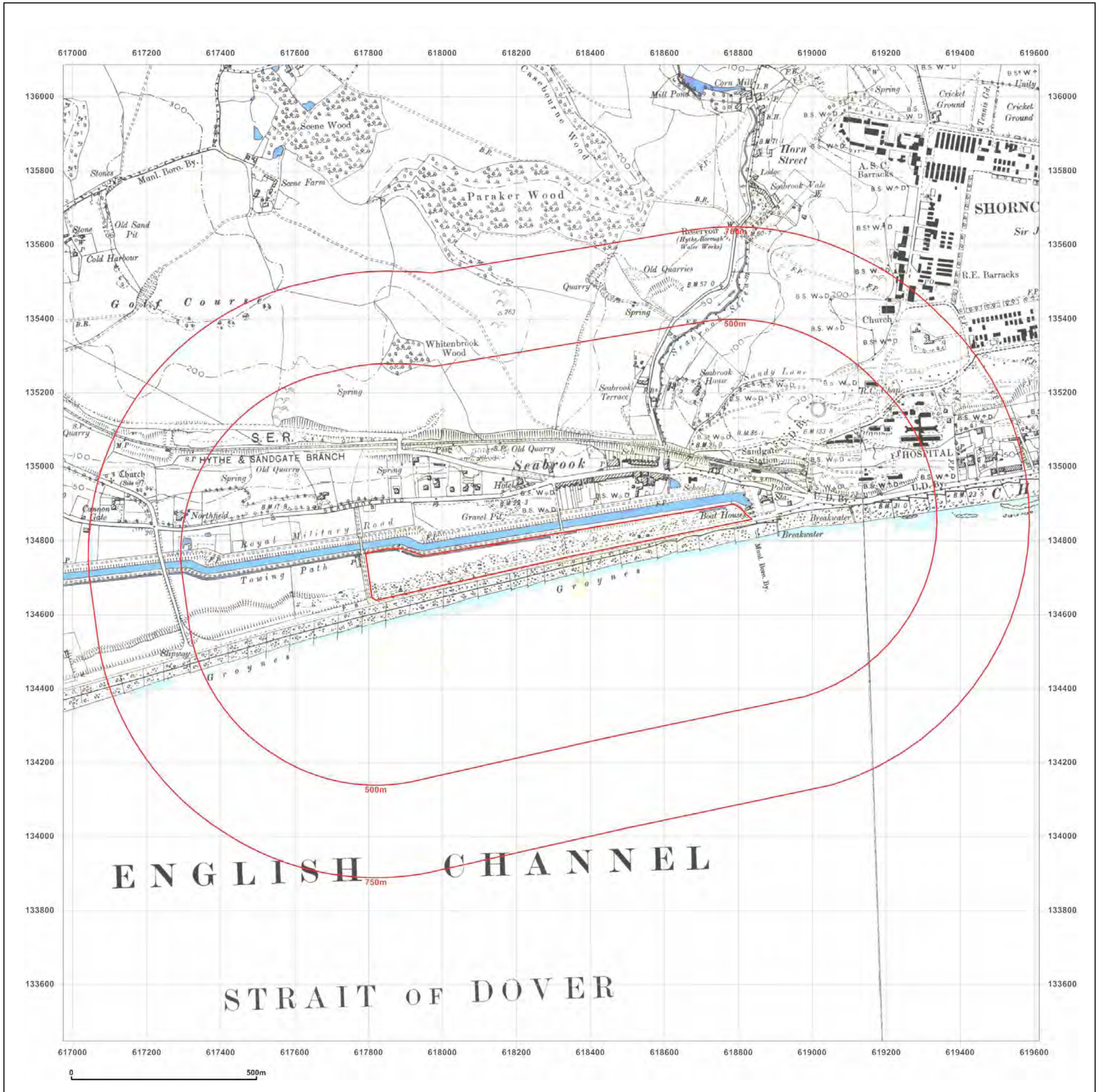

Groundsure INSIGHTS

Site Details:

PRINCES PARADE, SEABROOK, HYTHE

Client Ref: 15-S642-FDO-17436ai
Report Ref: HMD-154-2188204
Grid Ref: 618293, 134766

Map Name: County Series

Map date: **1897**

Scale: 1:10,560

Printed at: 1:10,560

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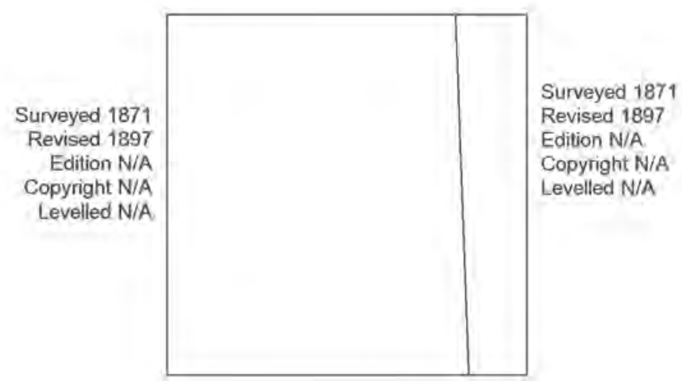

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Production date: 18 June 2015

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Groundsure INSIGHTS

Site Details:

PRINCES PARADE, SEABROOK, HYTHE

Client Ref: 15-S642-FDO-17436ai
Report Ref: HMD-154-2188204
Grid Ref: 618293, 134766

Map Name: County Series

Map date: **1906**

Scale: 1:10,560

Printed at: 1:10,560

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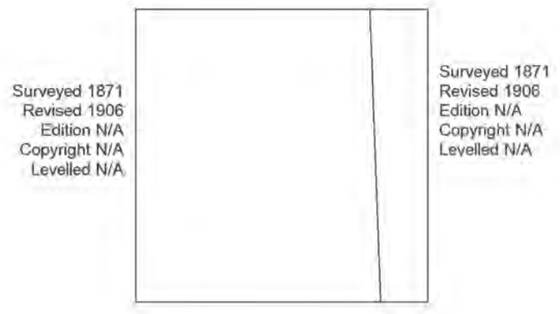

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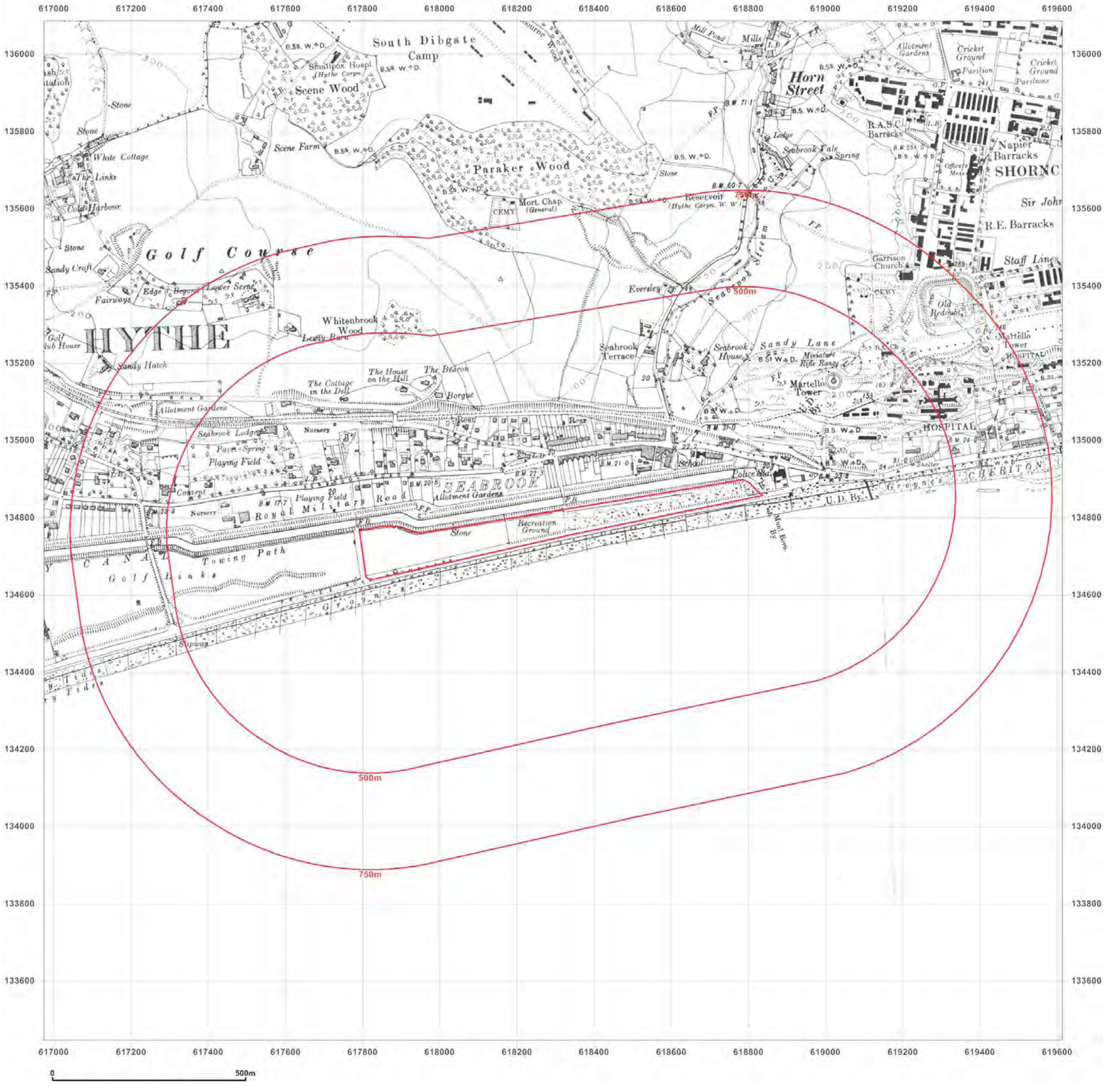

Groundsure INSIGHTS

Site Details:

PRINCES PARADE, SEABROOK, HYTHE

Client Ref: 15-S642-FDO-17436ai
Report Ref: HMD-154-2188204
Grid Ref: 618293, 134766

Map Name: County Series

Map date: **1931**

Scale: 1:10,560

Printed at: 1:10,560

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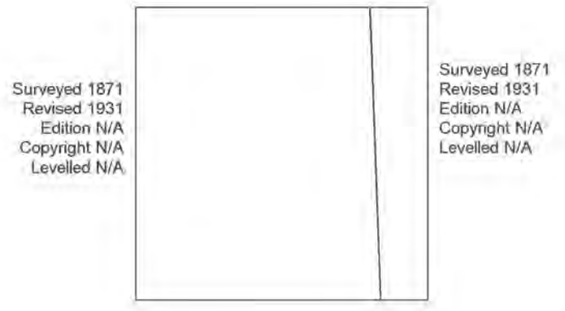

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Production date: 18 June 2015

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Groundsure INSIGHTS

Site Details:

PRINCES PARADE, SEABROOK, HYTHE

Client Ref: 15-S642-FDO-17436ai
Report Ref: HMD-154-2188204
Grid Ref: 618293, 134766

Map Name: County Series

Map date: **1938**

Scale: 1:10,560

Printed at: 1:10,560

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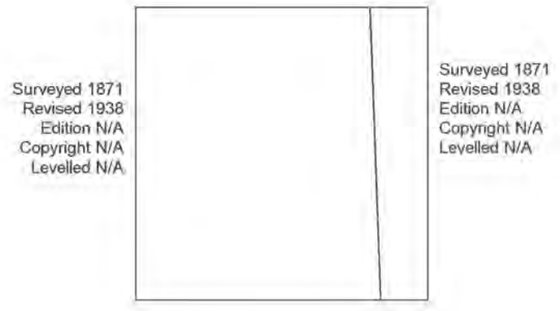

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Production date: 18 June 2015

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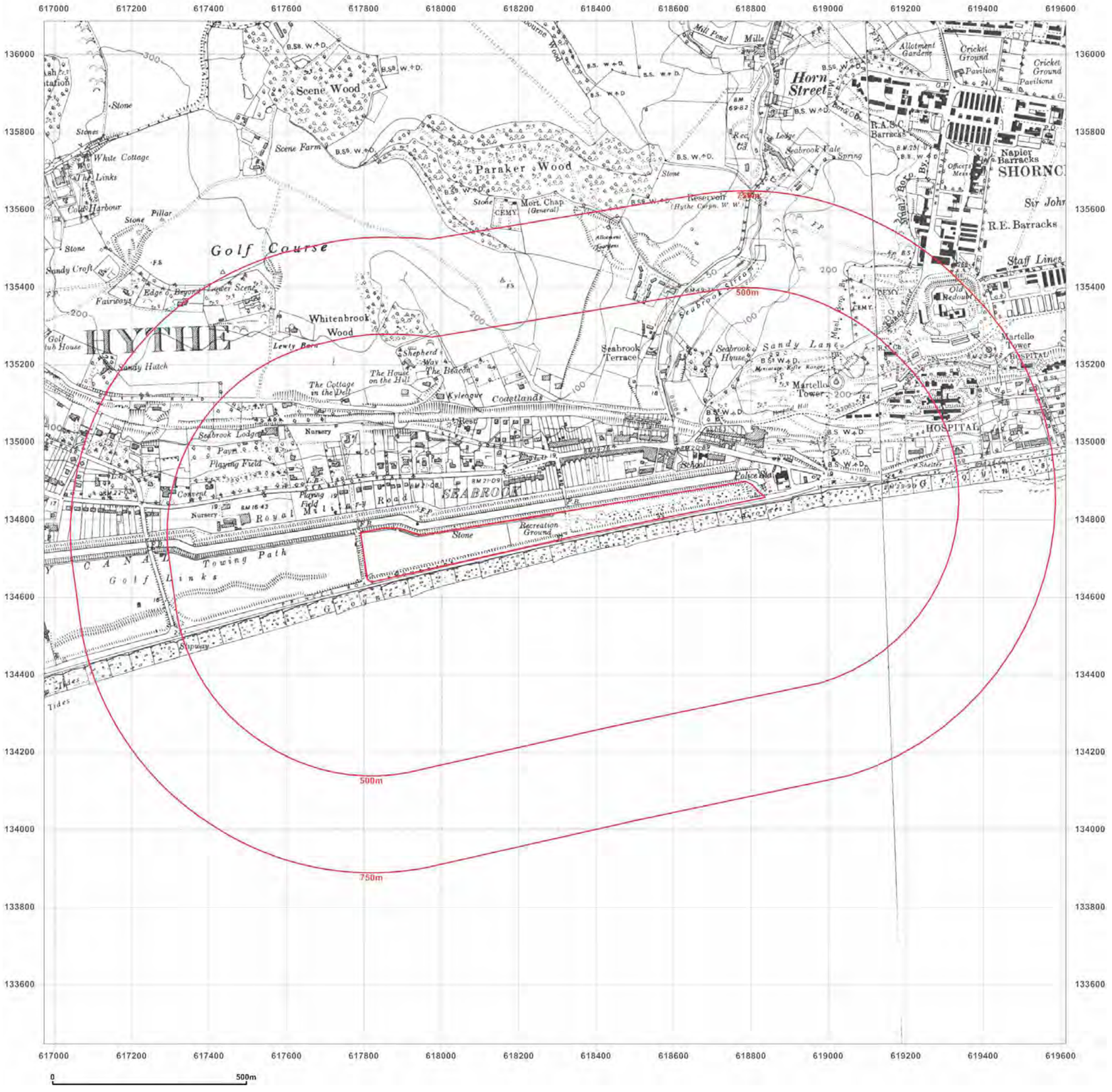

Groundsure INSIGHTS

Site Details:

PRINCES PARADE, SEABROOK, HYTHE

Client Ref: 15-S642-FDO-17436ai
Report Ref: HMD-154-2188204
Grid Ref: 618293, 134766

Map Name: County Series

Map date: **1945-1946**

Scale: 1:10,560

Printed at: 1:10,560

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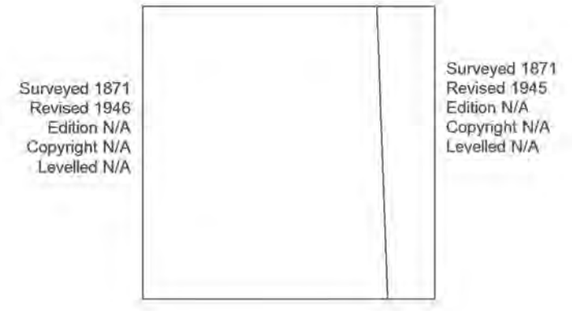

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Groundsure INSIGHTS

Site Details:

PRINCES PARADE, SEABROOK, HYTHE

Client Ref: 15-S642-FDO-17436ai
Report Ref: HMD-154-2188204
Grid Ref: 618293, 134766

Map Name: Provisional

Map date: **1961**

Scale: 1:10,560

Printed at: 1:10,560

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Revised 1961
Edition N/A
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Levelled N/A

Surveyed 1961
Revised 1961
Edition N/A
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Production date: 18 June 2015

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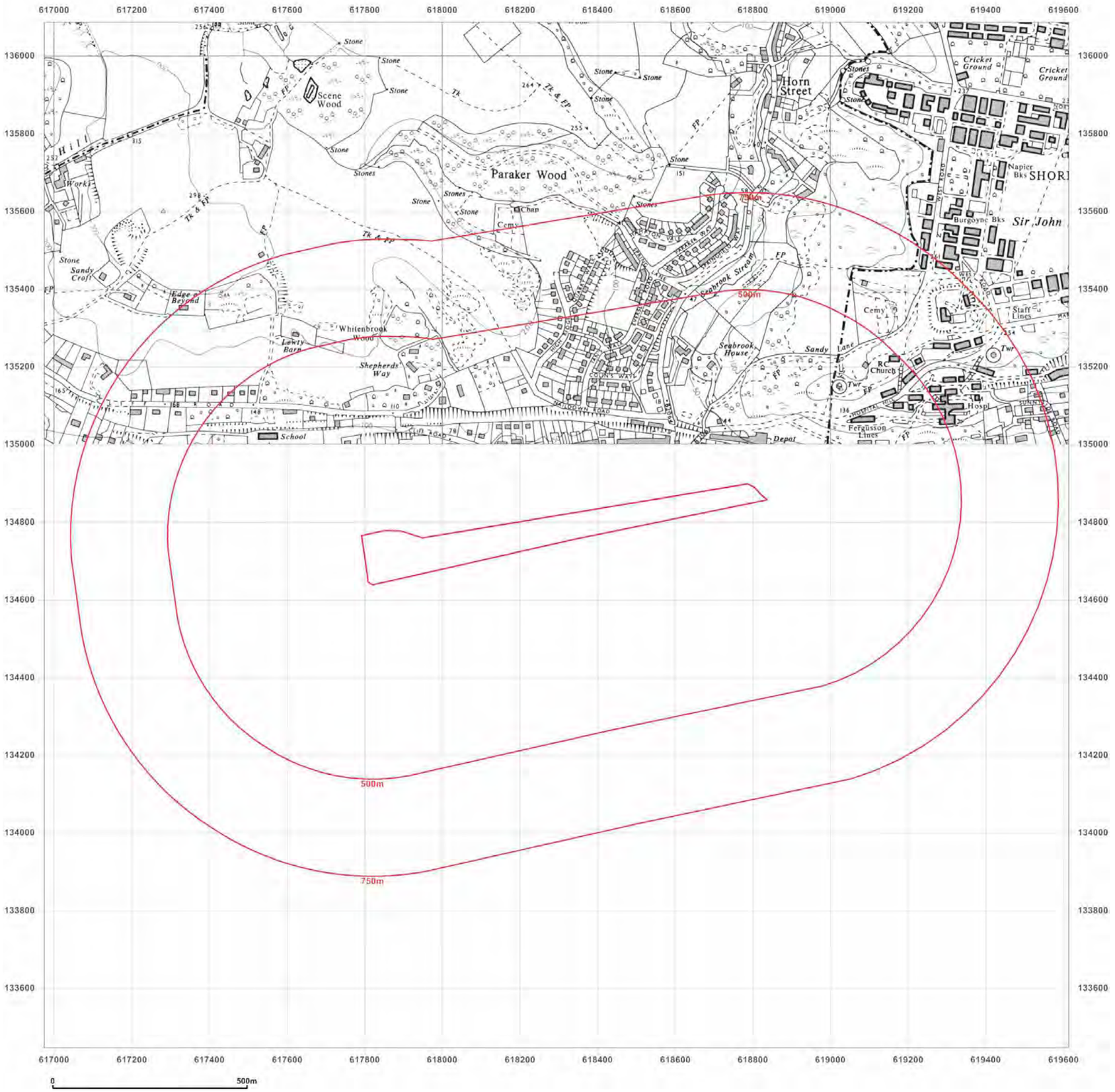

Groundsure INSIGHTS

Site Details:

PRINCES PARADE, SEABROOK, HYTHE

Client Ref: 15-S642-FDO-17436ai
Report Ref: HMD-154-2188204
Grid Ref: 618293, 134766

Map Name: Provisional

Map date: **1961**

Scale: 1:10,560

Printed at: 1:10,560

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Revised 1961
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Production date: 18 June 2015

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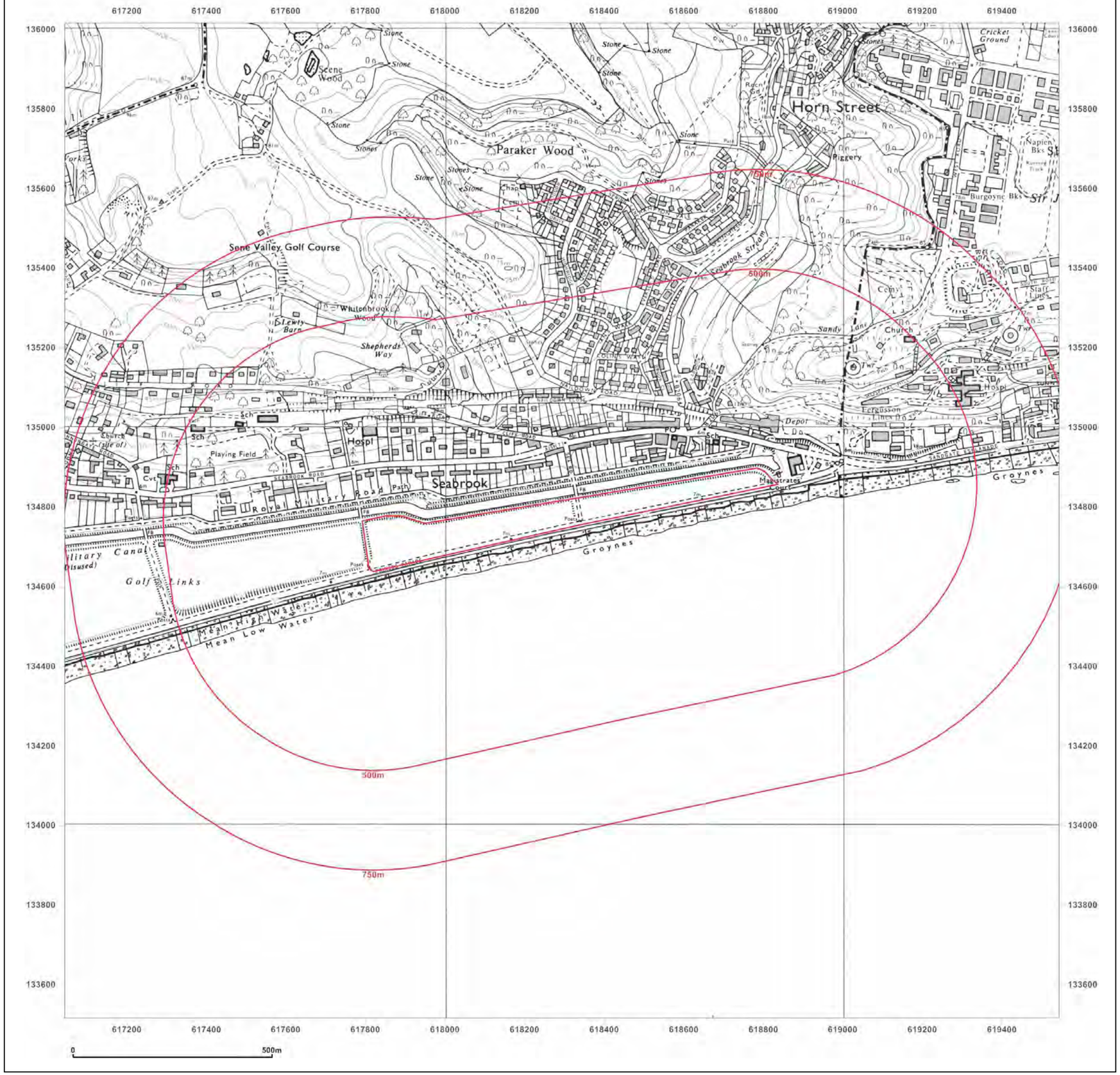

Groundsure INSIGHTS

Site Details:

PRINCES PARADE, SEABROOK, HYTHE

Client Ref: 15-S642-FDO-17436ai
Report Ref: HMD-154-2188204
Grid Ref: 618293, 134766

Map Name: National Grid

Map date: **1973-1975**

Scale: 1:10,000

Printed at: 1:10,000

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Surveyed 1974
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Production date: 18 June 2015

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Site Details:

PRINCES PARADE, SEABROOK, HYTHE

Client Ref: 15-S642-FDO-17436ai
Report Ref: HMD-154-2188204
Grid Ref: 618293, 134766

Map Name: National Grid

Map date: **1987-1989**

Scale: 1:10,000

Printed at: 1:10,000

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Surveyed 1987
Revised 1989
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Production date: 18 June 2015

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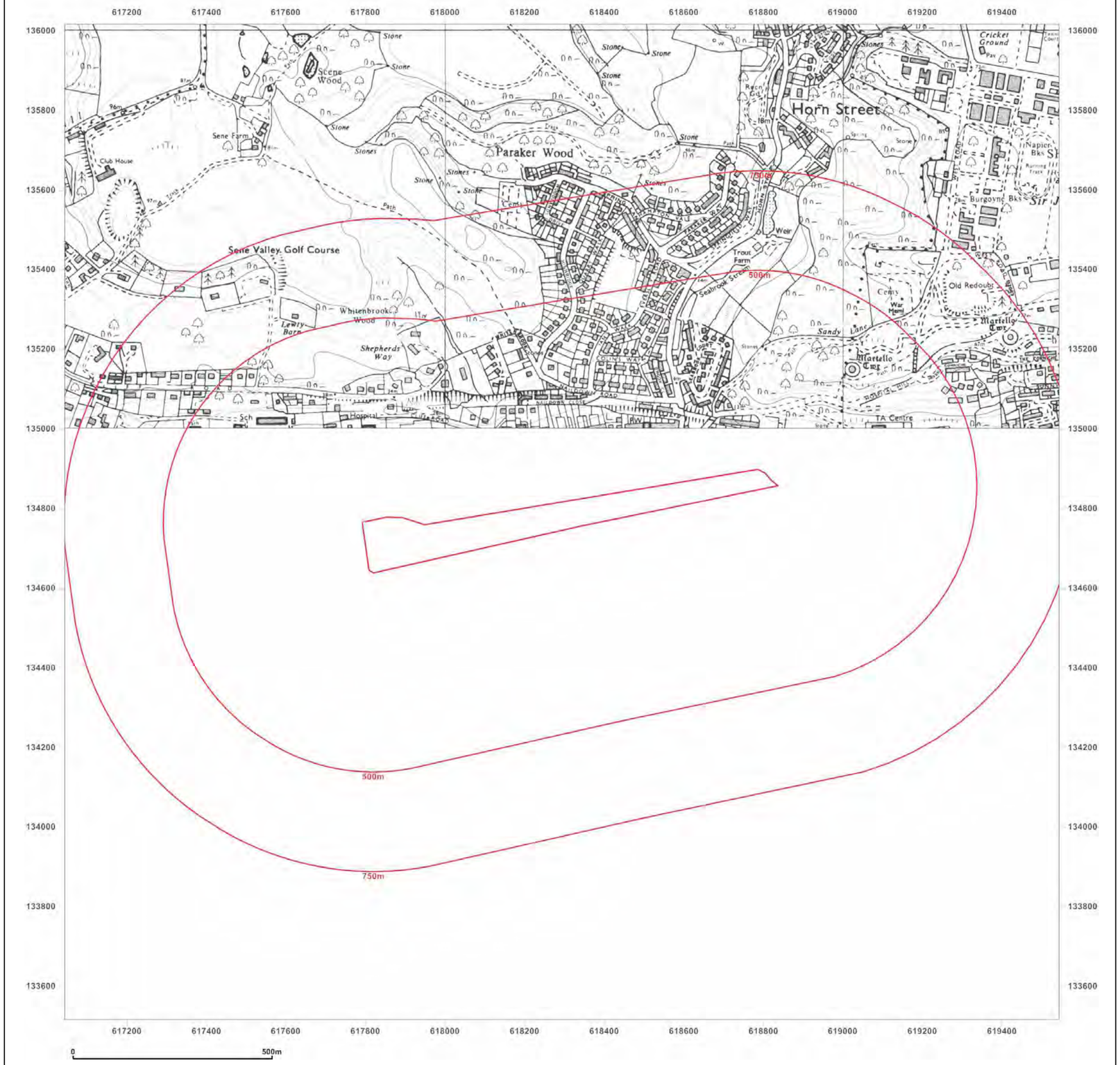

Groundsure INSIGHTS

Site Details:

PRINCES PARADE, SEABROOK, HYTHE

Client Ref: 15-S642-FDO-17436ai
Report Ref: HMD-154-2188204
Grid Ref: 618293, 134766

Map Name: National Grid

Map date: **1993**

Scale: 1:10,000

Printed at: 1:10,000

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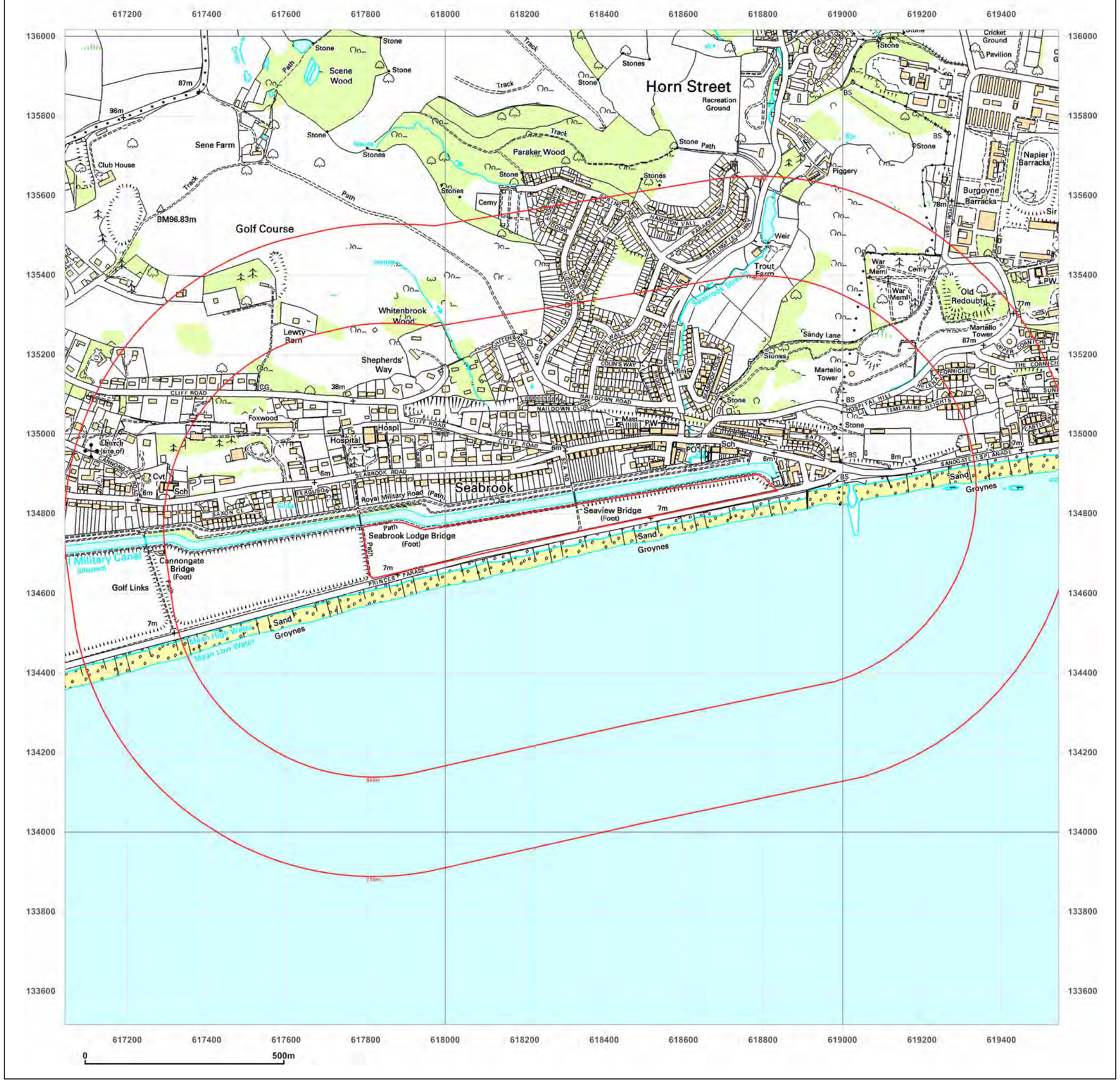

Groundsure INSIGHTS

Site Details:

PRINCES PARADE, SEABROOK, HYTHE

Client Ref: 15-S642-FDO-17436ai
Report Ref: HMD-154-2188204
Grid Ref: 618293, 134766

Map Name: 1:10,000 Raster

Map date: **2002**

Scale: 1:10,000

Printed at: 1:10,000

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Production date: 18 June 2015

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Groundsure INSIGHTS

Site Details:

PRINCES PARADE, SEABROOK, HYTHE

Client Ref: 15-S642-FDO-17436ai
Report Ref: HMD-154-2188204
Grid Ref: 618293, 134766

Map Name: National Grid

Map date: **2010**

Scale: 1:10,000

Printed at: 1:10,000

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Production date: 18 June 2015

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Groundsure INSIGHTS

Site Details:

PRINCES PARADE, SEABROOK, HYTHE

Client Ref: 15-S642-FDO-17436ai
Report Ref: HMD-154-2188204
Grid Ref: 618293, 134766

Map Name: National Grid

Map date: **2014**

Scale: 1:10,000

Printed at: 1:10,000

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W: www.groundsure.com

Production date: 18 June 2015

To view map legend click here *Legend*

APPENDIX 3

- Exploratory Hole Logs
- BGS Borehole Logs

idom merebrook
Offices:
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Keston: 01689 889980
email: consulting@merebrook.co.uk

Equipment and Methods
Premier windowless sample drilling rig

Window Sample No
MWS1
Sheet 1 of 1

Project Name	**Project No.**	**Co-ords**	**Hole Type**
Princes Parade	17436A1	-	WLS
Location: Hythe, Kent		**Level** 0.000	**Scale** 1:25
Client: Shepway District Council		**Dates:** 18/06/2015	**Logged By** GOB

Well	Water Strike	Samples & In Situ Testing: Depth (m)	Type	Results	Depth in metres (thickness)	Legend	Stratum Description
					(0.40)		Rough grasses over TOPSOIL composed of firm brown dry slightly sandy gravelly clayey SILT with occasional glass and tarmac pieces.
		0.40-0.50	D,J		0.40 (0.30)		MADE GROUND composed of firm slightly sandy gravelly silty CLAY with frequent tarmac gravels, ash, clinkers red brick fragments and occasional ceramics
					0.70		MADE GROUND composed of loose black sandy GRAVEL [ash and clinkers].
		1.00	CPT	N=8 (2,2,2,2,2,2)	0.80 (0.50)		MADE GROUND composed of firm slightly sandy gravelly silty CLAY with frequent tarmac gravels, ash, clinkers red brick fragments and occasional ceramics
					1.30 (0.30)		MADE GROUND composed of loose black / dark brown sandy GRAVEL [ash and clinkers].
		1.40-1.70	D,J		1.60 (0.60)		MADE GROUND composed of soft to firm brownish grey mottled orange slightly sandy gravelly CLAY with occasional red brick fragments. Gravels medium to coarse sub angular to sub rounded.
		2.00	CPT	N=18 (1,0,1,0,1,16)			
					2.20 (0.50)		MADE GROUND composed of loose dark brown SAND AND GRAVEL with ash, clinkers and red brick fragments.
		2.50-2.80	D,J		2.70		CONCRETE LAYER
					2.80		Medium dense grey clayey sandy GRAVEL.
		3.00	CPT	N=10 (3,4,3,2,2,3)	(0.80)		
	▽				3.60 (0.50)		Medium dense brown wet sandy GRAVEL. Gravel is fine to coarse sub angular to sub rounded. Sand fine to coarse.
		4.00	CPT	N=4 (2,2,1,1,1,1)	4.10 (0.50)		Loose brown wet slightly sandy GRAVEL. Gravel fine to coarse rounded to sub rounded.
		4.50-4.80	D,J		4.60		Medium dense brown wet sandy GRAVEL. Gravel is fine to coarse sub angular to sub rounded. Sand fine to coarse.
					4.80		Grey silty gravelly fine SAND. Gravel fine to medium rounded to
			Type	Results			Continued next sheet

Remarks:

IVN - in-situ hand vane
IPP - in-situ pocket penetrometer
SPT - in-situ standard penetration test
PID - in-situ photoionization detector

D - small disturbed sample (tub)
J - amber glass jar (250ml)
V - amber glass jar (60ml)
B - bulk disturbed sample

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Equipment and Methods
Premier windowless sample drilling rig

Window Sample No
MWS1
Sheet 1+ of 1

Project Name	**Project No.**	**Co-ords**	**Hole Type**
Princes Parade	17436A1	-	WLS
Location: Hythe, Kent		**Level** 0.000	**Scale** 1:25
Client: Shepway District Council		**Dates:** 18/06/2015	**Logged By** GOB

Well	Water Strike	Samples & In Situ Testing: Depth (m)	Type	Results	Depth in metres (thickness)	Legend	Stratum Description
		5.00	CPT	N=14 (6,5,5,3,3,3)	5.00		sub angular.
							End of Window Sample at 5.00 m
			Type	Results			

6
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Remarks:

IVN - in-situ hand vane
IPP - in-situ pocket penetrometer
SPT - in-situ standard penetration test
PID - in-situ photoionization detector

D - small disturbed sample (tub)
J - amber glass jar (250ml)
V - amber glass jar (60ml)
B - bulk disturbed sample

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Keston: 01689 889980
email: consulting@merebrook.co.uk

Equipment and Methods
Premier windowless sample drilling rig

Window Sample No
MWS2
Sheet 1 of 1

Project Name
Princes Parade

Project No.
17436A1

Co-ords
-

Hole Type
WLS

Location: Hythe, Kent

Level
1.000

Scale
1:25

Client: Shepway District Council

Dates: 19/06/2015

Logged By
GOB

Well	Water Strike	Samples & In Situ Testing: Depth (m)	Type	Results	Depth in metres (thickness)	Legend	Stratum Description
					0.20		Rough grasses over TOPSOIL composed of firm brown dry slightly sandy gravelly clayey SILT.
					0.25		CONCRETE LAYER
		0.40-0.60	D,J		(0.30) 0.50		MADE GROUND composed of firm brown / grey friable slightly sandy gravelly CLAY with occasional rootlets, red brick and tarmac fragments. Gravels fine to medium sub angular to angular of mixed lithologies.
					0.80		MADE GROUND composed of dark brown / light brown silty gravelly SAND with frequent red brick and tarmac pieces, ash and cinders.
		1.00	CPT	N=4 (1,1,1,1,1,1)	(0.80)		MADE GROUND composed of soft to firm brownish grey mottled orange clayey SILT with occasional lenses of fine grey sand, gravels, rootlets, red brick fragments and rare tarmac gravels.
		1.00-1.50	D,J		1.60		Loose grey silty gravelly SAND with occasional red brick and tarmac fragments.
		2.00	CPT	N=16 (3,3,4,4,4,4)	(0.40) 2.00		Loose grey silty gravelly fine to coarse SAND. Gravels fine to coarse sub rounded.
	▽				(0.30) 2.30		Loose brown wet sandy GRAVEL. Gravels fine to coarse rounded to sub rounded.
		2.50-2.80	D,J		(0.40) 2.70		Medium dense brown wet sandy GRAVEL. Gravel is fine to medium sub angular to rounded, with occasional coarse gravels. Sand fine to coarse.
		3.00	CPT	N=12 (5,3,3,3,3,3)	(1.30)		
		4.00	CPT	N=35 (7,9,10,9,8,8)	4.00		End of Window Sample at 4.00 m
			Type	Results			

1 2 3 4

Remarks:

IVN - in-situ hand vane
IPP - in-situ pocket penetrometer
SPT - in-situ standard penetration test
PID - in-situ photoionization detector

D - small disturbed sample (tub)
J - amber glass jar (250ml)
V - amber glass jar (60ml)
B - bulk disturbed sample

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email: consulting@merebrook.co.uk

Equipment and Methods
Premier windowless sample drilling rig

Window Sample No
MWS3
Sheet 1 of 1

Project Name	**Project No.**	**Co-ords**	**Hole Type**
Princes Parade	17436A1	-	WLS
Location: Hythe, Kent		**Level** 2.000	**Scale** 1:25
Client: Shepway District Council		**Dates:** 20/06/2015	**Logged By** GOB

Well	Water Strike	Samples & In Situ Testing: Depth (m)	Type	Results	Depth in metres (thickness)	Legend	Stratum Description
					(0.30)		Rough grasses over TOPSOIL composed of firm brown dry slightly sandy gravelly clayey SILT with frequent rootlets.
					0.30		
		0.40-0.50	D,J		(0.30)		MADE GROUND composed of loose light brown silty sandy GRAVEL with occasional red brick fragments and rare bituminous pieces. Large concrete fragment recovered at 0.5 m bgl.
					0.60		
		1.00	CPT	N=4 (1,1,1,1,1,1)	(1.20)		MADE GROUND composed of soft light brown sandy gravelly CLAY with occasional glass, red brick, clinkers and concrete fragments.
		1.50-2.00	D,J		1.80		
		2.00	CPT	N=5 (2,1,1,1,1,2)	(0.70)		MADE GROUND composed of loose light brown clayey gravelly SAND.
	▽				2.50		
					(0.40)		Loose greyish brown wet slightly sandy GRAVEL. Gravels fine to coarse rounded to sub rounded.
					2.90		
		3.00	CPT	N=28 (6,6,7,7,7,7)	(0.45)		Medium dense orangish grey sandy GRAVEL. Gravel fine to coarse rounded to sub rounded, fine is fine.
					3.35		End of Window Sample at 3.35 m
			Type	Results			

1
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Remarks:

IVN - in-situ hand vane
IPP - in-situ pocket penetrometer
SPT - in-situ standard penetration test
PID - in-situ photoionization detector

D - small disturbed sample (tub)
J - amber glass jar (250ml)
V - amber glass jar (60ml)
B - bulk disturbed sample

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email: consulting@merebrook.co.uk

Equipment and Methods
Premier windowless sample drilling rig

Window Sample No
MWS4
Sheet 1 of 1

Project Name
Princes Parade

Project No.
17436A1

Co-ords
-

Hole Type
WLS

Location: Hythe, Kent

Level
3.000

Scale
1:25

Client: Shepway District Council

Dates: 21/06/2015

Logged By
GOB

Well	Water Strike	Samples & In Situ Testing: Depth (m)	Type	Results	Depth in metres (thickness)	Legend	Stratum Description
					(0.30)		Rough grasses / thistles / nettles over TOPSOIL composed of firm brown dry slightly sandy gravelly clayey SILT.
					0.30		
		0.30-0.50	D,J				MADE GROUND composed of soft brown mottled orange and grey slightly gravelly silty CLAY [reworked] with occasional sandy, red brick and concrete fragments.
					(1.20)		
		1.00	CPT	N=9 (1,2,2,2,2,3)			
		1.00-2.00	D,J		1.50		
							MADE GROUND composed of soft brown / grey clayey SAND with rare red brick, concrete and tarmac fragments.
					(0.40)		
					1.90		
		2.00	CPT	N=6 (2,2,1,2,2,1)	(0.30)		Loose brown clayey sandy GRAVEL. Gravel fine to coarse sub angular to sub rounded.
		2.00-2.50	D,J		2.20		Loose brown sandy GRAVEL. Gravel fine to coarse sub angular to sub rounded.
					(0.90)		
	▽	3.00	CPT	N=15 (3,3,3,4,4,4)			
					3.10		Medium dense clayey slightly sandy GRAVEL. Gravel fine to coarse sub angular to sub rounded.
					(0.90)		
		4.00	CPT	N=9 (3,2,2,2,2,3)	4.00		End of Window Sample at 4.00 m

Remarks:

IVN - in-situ hand vane
IPP - in-situ pocket penetrometer
SPT - in-situ standard penetration test
PID - in-situ photoionization detector

D - small disturbed sample (tub)
J - amber glass jar (250ml)
V - amber glass jar (60ml)
B - bulk disturbed sample

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Equipment and Methods
Premier windowless sample drilling rig

Window Sample No
MWS5
Sheet 1 of 1

Project Name	**Project No.**	**Co-ords**	**Hole Type**
Princes Parade	17436A1	-	WLS
Location: Hythe, Kent		**Level** 4.000	**Scale** 1:25
Client: Shepway District Council		**Dates:** 22/06/2015	**Logged By** GOB

Well	Water Strike	Samples & In Situ Testing: Depth (m)	Type	Results	Depth in metres (thickness)	Legend	Stratum Description
					0.20		Rough grasses over TOPSOIL composed of firm brown slightly sandy gravelly clayey SILT with frequent rootlets.
					0.40		Firm brown silty sandy gravelly CLAY.
					0.60		Medium dense brown sandy GRAVEL. Gravel fine to coarse sub angular t sub rounded.
		1.00	CPT	N=9 (1,2,2,2,2,3)	(2.00)		Firm greyish brown mottled orange CLAY with occasional sand and gravels.
	▽	2.00	CPT	N=12 (1,1,1,1,3,7)	2.60		Medium dense brown wet silty sandy GRAVEL.
					2.80		Soft grey clayey SILT.
		3.00	CPT	N=5 (1,1,1,1,1,2)	3.00		End of Window Sample at 3.00 m
			Type	Results			

Remarks:

IVN - in-situ hand vane
IPP - in-situ pocket penetrometer
SPT - in-situ standard penetration test
PID - in-situ photoionization detector

D - small disturbed sample (tub)
J - amber glass jar (250ml)
V - amber glass jar (60ml)
B - bulk disturbed sample

idom merebrook
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Equipment and Methods
Premier windowless sample drilling rig

Window Sample No
MWS6
Sheet 1 of 1

Project Name	**Project No.**	**Co-ords**	**Hole Type**
Princes Parade	17436A1	-	WLS
Location: Hythe, Kent		**Level** 5.000	**Scale** 1:25
Client: Shepway District Council		**Dates:** 23/06/2015	**Logged By** GOB

Well	Water Strike	Samples & In Situ Testing: Depth (m)	Type	Results	Depth in metres (thickness)	Legend	Stratum Description
					0.10		Rough grasses / shrubs over TOPSOIL composed of firm brown slightly sandy gravelly clayey SILT with frequent rootlets and occasional red brick fragments.
					0.30		MADE GROUND composed of dense brown sandy silty GRAVEL with occasional red brick and bituminous fragments. Gravels fine to coarse angular to sub angular.
		0.40-0.50	D,J		0.50		
					0.55		MADE GROUND composed of dark brown / brown sandy gravelly CLAY with occasional red brick and bituminous fragments.
					(0.40)		TARMAC LAYER
							MADE GROUND composed of greyish brown clayey gravelly SAND with frequent red brick and bituminous fragments.
					0.95		
		1.00	CPT	N=7 (2,3,2,2,2,1)	1.00		CONCRETE COBBLE
							MADE GROUND composed of soft black / beige sandy gravelly SILT with frequent red brick fragments, glass, ash and clinkers.
					(0.60)		
					1.60		MADE GROUND composed of loose dark brown / grey sandy GRAVELS with frequent clinkers.
		2.00	CPT	N=4 (1,1,1,1,1,1)	(0.90)		
					2.50		MADE GROUND composed of loose beige / yellow gravelly SAND.
					(0.40)		
					2.90		MADE GROUND composed of loose brown sandy GRAVEL with occasional concrete and bituminous fragments. Gravels fine to coarse sub angular to sub rounded of mixed lithologies.
		3.00	CPT	N=4 (1,1,2,2,0,0)	(0.70)		
	▽				3.60		MADE GROUND composed of black / dark brown loose clayey sandy GRAVEL. Gravel fine to coarse sub angular to sub rounded.
					(0.40)		
		4.00	CPT	N=8 (4,3,2,2,2,2)	4.00		Loose brown sandy GRAVEL. Gravel fine to coarse sub rounded to rounded.
					(0.80)		
					4.80		Soft to firm dark grey clayey sandy SILT.
			Type	Results			End of Window Sample at 5.00 m

Remarks:

IVN - in-situ hand vane
IPP - in-situ pocket penetrometer
SPT - in-situ standard penetration test
PID - in-situ photoionization detector

D - small disturbed sample (tub)
J - amber glass jar (250ml)
V - amber glass jar (60ml)
B - bulk disturbed sample

idom merebrook
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Equipment and Methods
Premier windowless sample drilling rig

Window Sample No
MWS7
Sheet 1 of 1

Project Name	**Project No.**	**Co-ords**	**Hole Type**
Princes Parade	17436A1	-	WLS
Location: Hythe, Kent		**Level** 6.000	**Scale** 1:25
Client: Shepway District Council		**Dates:** 24/06/2015	**Logged By** GOB

Well	Water Strike	Samples & In Situ Testing: Depth (m)	Type	Results	Depth in metres (thickness)	Legend	Stratum Description
					0.20		Rough grasses over TOPSOIL composed of firm brown slightly sandy gravelly clayey SILT with frequent rootlets.
					(0.70)		MADE GROUND composed of medium dense brown clayey sandy GRAVEL with occasional red brick fragments.
					1.10		MADE GROUND composed of firm dark grey gravelly CLAY with occasional red brick and bituminous fragments.
					(0.40)		MADE GROUND composed of soft brown / grey slightly sandy clayey SILT with red brick fragments, occasional bituminous fragments and lenses of clayey sand. Possible ashen odour.
					1.50		MADE GROUND composed of dark grey / dark brown clayey silty SAND with occasional gravels and red brick fragments.
					(2.00)		
					3.50		Soft dark grey slightly sandy clayey SILT.
					(0.30)		
					3.80		Medium dense dark brown clayey sandy GRAVEL. Gravel fine to coarse rounded to sub rounded, sand medium to coarse.
					(0.40)		
					4.20		Medium dense brown / dark brown sandy GRAVEL. Gravel fine to coarse rounded to sub rounded, sand medium to coarse.
					(0.80)		
			Type	Results			End of Window Sample at 5.00 m

1 2 3 4

Remarks:

IVN - in-situ hand vane
IPP - in-situ pocket penetrometer
SPT - in-situ standard penetration test
PID - in-situ photoionization detector

D - small disturbed sample (tub)
J - amber glass jar (250ml)
V - amber glass jar (60ml)
B - bulk disturbed sample

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Equipment and Methods

Window Sample No
MWS7A
Sheet 1 of 1

Project Name
Princes Parade

Project No.
17436A1

Co-ords
-

Hole Type

Location: Hythe, Kent

Level
-

Scale
1:25

Client: Shepway District Council

Dates: -

Logged By

Well	Water Strike	Samples & In Situ Testing: Depth (m)	Type	Results	Depth in metres (thickness)	Legend	Stratum Description
							End of Window Sample at 0.00 m
		1.00	CPT	N=4 (1,1,1,1,1,1)			
		2.00	CPT	N=4 (1,1,1,1,1,1)			
		3.00	CPT	N=5 (1,1,1,1,1,2)			
		4.00	CPT	N=18 (5,4,4,4,4,6)			
			Type	Results			

Remarks:

IVN - in-situ hand vane
IPP - in-situ pocket penetrometer
SPT - in-situ standard penetration test
PID - in-situ photoionization detector

D - small disturbed sample (tub)
J - amber glass jar (250ml)
V - amber glass jar (60ml)
B - bulk disturbed sample

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email: consulting@merebrook.co.uk

Plant: JCB Excavator

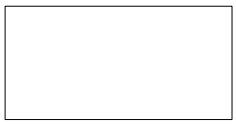
Co-ords: -

Trialpit No
MTP1
Sheet 1 of 1

Project Name
Princes Parade

Project No.
17436A1

Dimensions (m):



Depth (m)
2.60

Date
17/06/2015

Location: Hythe, Kent

Scale
1:25

Client: Shepway District Council

Logged By
GOB

Samples & In Situ Testing			Water Strike	Depth in metres (thickness)	Legend	Stratum Description
Depth (m)	Type	Results				
				0.20		Rough grasses over TOPSOIL composed of firm brown slightly sandy clayey SILT with frequent rootlets, gravels and occasional red brick fragments.
0.30-0.40	D,J			0.40		MADE GROUND composed of firm brown slightly sandy clayey SILT with frequent rootlets, gravels, red brick fragments, occasional plastic, glass, rubbish and rare shells and cobbles.
				0.60		MADE GROUND composed of dense brown silty sandy GRAVEL with frequent red brick fragments, concrete and rootlets.
1.00-1.20	D,J			(0.90)		MADE GROUND composed of firm brown silty gravelly CLAY with frequent whole brocks, concrete fragments, cobbles, plastic, glass and rubbish. Large concrete slabs at 0.7 m bgl. Large rusted electrical appliance encountered at 0.8 m bgl. Old wiring at 1.0 m bgl. Suspected asbestos pipe encountered at 1.1 m bgl. Large wooden fragments at 1.3 m bgl.
				1.50		MADE GROUND comprised dense brown gravelly clayey SAND with frequent landfill waste. Waste included rusted metals, red bricks, concrete fragments, glass bottles, wooden fragments, batteries, a wheel, textiles, plastic bottles (detergent, bleach, shampoo etc.), aerosol cans. Two large animal bones encountered at 1.9 m bgl
2.00-2.20	D,J			(1.10)		
				2.60		Trialpit Complete at 2.60 m

1
2
3
4

Remarks: Backfilled with arisings

IVN - in-situ hand vane
IPP - in-situ pocket penetrometer
PID - in-situ photoionization detector

D - small disturbed sample (tub)
J - amber glass jar (250ml)
V - amber glass jar (60ml)
B - bulk disturbed sample

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Offices:
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Plant: JCB Excavator

Co-ords: -

Trialpit No
MTP2
Sheet 1 of 1

Project Name
Princes Parade

Project No.
17436A1

Dimensions (m):
2.00
Depth (m) 2.60
1.00

Date
17/06/2015

Location: Hythe, Kent

Scale
1:25

Client: Shepway District Council

Logged By
GOB

Samples & In Situ Testing			Water Strike	Depth in metres (thickness)	Legend	Stratum Description
Depth (m)	Type	Results				
				(0.50)		Rough grasses / thistles / nettles over TOPSOIL comprised of brown soft to firm clayey sandy slight gravelly SILT with frequent rootlets, occasional red brick fragmeents and glass. Possible asbestos cement fragment encountered at 0.4 m bgl.
0.30-0.50	D,J					
0.40	D					
				0.50		
				(0.40)		MADE GROUND composed of possibly medium dense brown clayey silty slightly sandy GRAVEL with occasional red brick, concrete and wooded fragments, occasional shells and plastics. Large concrete slab recovered at 0.8 m bgl.
				0.90		MADE GROUND comprised brown clayey slightly sandy GRAVEL. Gravel fine to coarse sub angular to sub rounded of mixed lithologies.
1.00-1.20	D,J			1.10		MADE GROUND composed of firm brown silty sandy gravelly CLAY with frequent landfill waste. Wastes included red bricks, plastics, slate, glass bottles and fragments, rusted metals pieces, plastic bottles (detergent, bleach, shampoo etc.). Wastes became more prominent at 1.5 m bgl. Silty ash and clinkers encountered at 1.8 m bgl.
				(0.90)		
				2.00		MADE GROUND composed of loose dark grey silty gravelly SAND with frequent red brick and concrete blocks and fragments and occasional glass, plastic and metals.
				(0.60)		
				2.60		Trialpit Complete at 2.60 m
3.00	D,J					

1 2 3 4

Remarks: Backfilled with arisings

IVN - in-situ hand vane
IPP - in-situ pocket penetrometer
PID - in-situ photoionization detector

D - small disturbed sample (tub)
J - amber glass jar (250ml)
V - amber glass jar (60ml)
B - bulk disturbed sample

idom merebrook
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Plant: JCB Excavator

Co-ords: -

Trialpit No
MTP3
Sheet 1 of 1

Project Name
Princes Parade

Project No.
17436A1

Dimensions (m):
2.00
Depth (m) 3.00
1.00

Date
17/06/2015

Location: Hythe, Kent

Scale
1:25

Client: Shepway District Council

Logged By
GOB

Samples & In Situ Testing			Water Strike	Depth in metres (thickness)	Legend	Stratum Description
Depth (m)	Type	Results				
				(0.60) 0.60		Rough grasses / thistles / nettles over MADE GROUND comprised of brown soft to firm clayey sandy slight gravelly SILT with frequent rootlets and red brick fragments, occasional plastic, tarmac and glass fragmeents, ceramics and whole red bricks.
1.00-1.10	D,J			(0.90) 1.50		MADE GROUND composed of firm dark brown silty sandy gravelly CLAY with frequent landfill waste. Waste included rusted metals, red bricks, concrete, ceramics, glass bottles, wooden fragments, wiring, tarmac, plastic bags, plastic bottles (detergent, bleach, shampoo etc.) and textiles.
				1.60		MADE GROUND composed of firm grey reworked CLAY.
				(0.40) 2.00		MADE GROUND composed of firm dark brown silty sandy gravelly CLAY with frequent landfill waste. Waste included rusted metals, red bricks, concrete, ceramics, glass bottles, wooden fragments, wiring, tarmac, plastic bags, plastic bottles (detergent, bleach, shampoo etc.) and textiles.
2.00-2.20	D,J			(0.50) 2.50		MADE GROUND composed of dark brown sandy gravelly SILT with frequent red bricks, tarmac and wooden fragments and plastic landfill waste. Slight hydrocarbon odour.
				(0.50) 3.00		MADE GROUND composed of firm brown / dark grey silty gravelly CLAY with lenses of dark grey sandy silt and occasional landfill waste. Waste included glass bottles, ash, clinkers, red bricks, wooden fragments and plastics. Large concrete slab encountered at 2.2 m bgl.
						Trialpit Complete at 3.00 m

1 2 3 4

Remarks: Backfilled with arisings

IVN - in-situ hand vane
IPP - in-situ pocket penetrometer
PID - in-situ photoionization detector

D - small disturbed sample (tub)
J - amber glass jar (250ml)
V - amber glass jar (60ml)
B - bulk disturbed sample

idom merebrook
Offices:
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email: consulting@merebrook.co.uk

Plant: JCB Excavator

Co-ords: -

Trialpit No
MTP4
Sheet 1 of 1

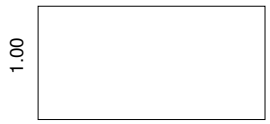
Project Name	**Project No.**
Princes Parade	17436A1

Location: Hythe, Kent

Client: Shepway District Council

Dimensions (m):

Depth (m) 2.70



Date 17/06/2015

Scale 1:25

Logged By GOB

Samples & In Situ Testing			Water Strike	Depth in metres (thickness)	Legend	Stratum Description
Depth (m)	Type	Results				
				(0.40)		Rough grasses / thistles / nettles over TOPSOIL composed of brown soft to firm clayey sandy slight gravelly SILT with frequent rootlets and occasional red brick fragmeents.
0.30-0.50	D,J			0.40		
						MADE GROUND composed of possibly medium dense clayey silty sandy GRAVEL with frequent red brick fragments, occasional glass, rootlets, plastics and wooden fragments.
				0.60		
						MADE GROUND composed of possibly loose silty gravelly SAND with frequent red brick fragments, occasional slate and glass.
				(0.50)		
0.90-1.00	D,J					
				1.10		
						MADE GROUND composed of brown silty sandy gravelly CLAY with frequent landfill waste. Waste included rusted metals, red bricks, concrete fragments, batteries, glass bottles, wooden fragments, tarmac fragments, plastic bags and bottles (detergent, bleach, shampoo etc.).
				(1.60)		
2.00-2.20	D,J					
				2.70		Trialpit Complete at 2.70 m

1
2
3
4

Remarks: Backfilled with arisings

IVN - in-situ hand vane
IPP - in-situ pocket penetrometer
PID - in-situ photoionization detector

D - small disturbed sample (tub)
J - amber glass jar (250ml)
V - amber glass jar (60ml)
B - bulk disturbed sample

idom merebrook
Offices:
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Plant: JCB Excavator

Co-ords: -

Trialpit No
MTP5
Sheet 1 of 1

Project Name
Princes Parade

Project No.
17436A1

Dimensions (m):
2.00
Depth (m) 1.70
1.00

Date
17/06/2015

Location: Hythe, Kent

Scale
1:25

Client: Shepway District Council

Logged By
GOB

Samples & In Situ Testing			Water Strike	Depth in metres (thickness)	Legend	Stratum Description
Depth (m)	Type	Results				
				(0.30)		Rough grass / nettles / weeds over TOPSOIL composed of brown soft to firm clayey sandy slight gravelly SILT with frequent rootlets and occasional red brick fragmeents.
				0.30		
0.40-0.60	D,J			(0.50)		MADE GROUND composed of firm brown silty sandy gravelly CLAY with occasional rootlets and bricks and rare shells and glass. Suspected asbestos cement fragment encountered at 0.6 m bgl.
0.60	D					
				0.80		MADE GROUND composed of brown / orange / light brown silty sandy GRAVEL with frequent landfill waste. Waste included red bricks and fragments, glass, metals, wood plastic bags and bottles.
				(0.90)		
1.50	D,J					
				1.70		Trialpit Complete at 1.70 m

Remarks: Excavator broke down during excavation. Backfilled with arisings

IVN - in-situ hand vane
IPP - in-situ pocket penetrometer
PID - in-situ photoionization detector

D - small disturbed sample (tub)
J - amber glass jar (250ml)
V - amber glass jar (60ml)
B - bulk disturbed sample

APPENDIX 4

- Soil Chemistry
- Summary Spreadsheet
- Laboratory Analysis Certificates

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Analytical Report Number : 15-74167

Replaces Analytical Report Number : 15-74167, issue no. 1

Project / Site name:	Princes Parade , Hythe	**Samples received on:**	24/06/2015
Your job number:	17436A1	**Samples instructed on:**	24/06/2015
Your order number:	15-S2-FDO-LABS	**Analysis completed by:**	08/07/2015
Report Issue Number:	2	**Report issued on:**	08/07/2015
Samples Analysed:	2 bulk samples - 18 soil samples		

Signed:

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

Signed:

Emma Winter
Assistant Reporting Manager
For & on behalf of i2 Analytical Ltd.

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

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

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

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

Analytical Report Number: 15-74167

Project / Site name: Princes Parade , Hythe

Your Order No: 15-S2-FDO-LABS

Lab Sample Number				458142	458143	458144	458145	458146
Sample Reference				MTP1	MTP1	MTP2	MTP2	MTP3
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30-0.40	1.00-1.20	0.20-0.40	1.90-2.00	0.30-0.50
Date Sampled				17/06/2015	17/06/2015	17/06/2015	17/06/2015	17/06/2015
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	43
Moisture Content	%	N/A	NONE	6.0	7.1	9.6	20	9.0
Total mass of sample received	kg	0.001	NONE	1.1	1.3	1.1	0.89	1.2
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	-	Amosite & Chrysotile
Asbestos in Soil	Type	N/A	ISO 17025	-	-	-	-	Detected
Asbestos Quantification	%	0.001	ISO 17025	-	-	-	-	0.002
General Inorganics								
pH	pH Units	N/A	MCERTS	7.9	7.7	7.3	7.7	8.0
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Water Soluble Sulphate (Soil Equivalent)	g/l	0.0025	MCERTS	0.16	0.12	0.044	0.87	0.13
Water Soluble Sulphate as SO_4 (2:1)	mg/kg	2.5	MCERTS	160	120	44	870	130
Water Soluble SO4 (BRE SD 2:1 Leach Equivalent)	g/l	0.00125	MCERTS	0.079	0.060	0.022	0.44	0.067
Sulphide	mg/kg	1	MCERTS	19	1.6	2.8	2.8	3.5
Organic Matter	%	0.1	MCERTS	3.2	3.3	4.3	3.8	2.1
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	0.22	< 0.05	< 0.05	0.13
Acenaphthylene	mg/kg	0.1	MCERTS	0.38	0.42	0.18	< 0.10	0.41
Acenaphthene	mg/kg	0.1	MCERTS	0.17	0.55	< 0.10	< 0.10	0.17
Fluorene	mg/kg	0.1	MCERTS	0.17	0.83	< 0.10	< 0.10	0.24
Phenanthrene	mg/kg	0.1	MCERTS	2.2	7.6	1.1	0.99	2.6
Anthracene	mg/kg	0.1	MCERTS	0.62	2.2	0.26	0.29	0.96
Fluoranthene	mg/kg	0.1	MCERTS	7.2	14	2.9	2.2	8.8
Pyrene	mg/kg	0.1	MCERTS	6.6	12	2.5	1.9	7.8
Benzo(a)anthracene	mg/kg	0.1	MCERTS	3.5	7.1	1.4	1.3	5.9
Chrysene	mg/kg	0.05	MCERTS	4.4	6.8	1.6	1.5	4.4
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	4.2	7.8	1.7	0.94	5.7
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	3.4	4.5	0.82	0.66	4.0
Benzo(a)pyrene	mg/kg	0.1	MCERTS	4.5	7.5	1.6	0.93	5.6
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	2.6	3.7	0.80	0.50	3.1
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	0.22	0.40	< 0.10	< 0.10	0.75
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	3.4	4.9	1.1	0.59	3.7
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	43.5	79.9	15.8	11.8	54.2

Analytical Report Number: 15-74167

Project / Site name: Princes Parade , Hythe

Your Order No: 15-S2-FDO-LABS

Lab Sample Number				458142	458143	458144	458145	458146
Sample Reference				MTP1	MTP1	MTP2	MTP2	MTP3
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30-0.40	1.00-1.20	0.20-0.40	1.90-2.00	0.30-0.50
Date Sampled				17/06/2015	17/06/2015	17/06/2015	17/06/2015	17/06/2015
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	14	14	13	35	9.1
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	0.8	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	35	24	25	36	18
Copper (aqua regia extractable)	mg/kg	1	MCERTS	46	45	27	850	30
Lead (aqua regia extractable)	mg/kg	1	MCERTS	150	190	91	150	82
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	1.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	24	22	25	72	18
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	150	150	130	710	120
Monoaromatics								
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	52	< 8.0	< 8.0	48	< 8.0
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	52	< 10	< 10	48	< 10
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	2.6	< 2.0	< 2.0	< 2.0
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	44	46	< 10	14	31
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	170	100	18	50	67
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	220	150	18	64	98

Analytical Report Number: 15-74167

Project / Site name: Princes Parade , Hythe

Your Order No: 15-S2-FDO-LABS

Lab Sample Number				458147	458148	458149	458150	458151
Sample Reference				MTP3	MTP4	MTP5	MTP5	MWS1
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				2.00-2.50	0.90-1.00	0.40-0.60	1.50	0.40-0.50
Date Sampled				17/06/2015	17/06/2015	17/06/2015	17/06/2015	18/06/2015
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	20	< 0.1
Moisture Content	%	N/A	NONE	12	15	16	16	9.4
Total mass of sample received	kg	0.001	NONE	1.5	1.2	1.0	0.60	1.2
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	Amosite & Chrysotile	-	-	Amosite
Asbestos in Soil	Type	N/A	ISO 17025	-	Detected	-	-	Detected
Asbestos Quantification	%	0.001	ISO 17025	-	0.015	-	-	< 0.001
General Inorganics								
pH	pH Units	N/A	MCERTS	7.9	7.4	7.6	7.2	8.5
Total Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	9	< 1
Water Soluble Sulphate (Soil Equivalent)	g/l	0.0025	MCERTS	0.99	3.6	0.62	3.6	0.35
Water Soluble Sulphate as SO_4 (2:1)	mg/kg	2.5	MCERTS	990	3600	620	3600	350
Water Soluble SO4 (BRE SD 2:1 Leach Equivalent)	g/l	0.00125	MCERTS	0.50	1.8	0.31	1.8	0.17
Sulphide	mg/kg	1	MCERTS	11	< 1.0	7.0	6.0	< 1.0
Organic Matter	%	0.1	MCERTS	1.0	2.4	3.8	4.1	1.8
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	1.2	< 0.05	0.07	0.16	0.85
Acenaphthylene	mg/kg	0.1	MCERTS	0.71	< 0.10	0.24	0.27	1.4
Acenaphthene	mg/kg	0.1	MCERTS	2.7	< 0.10	0.15	0.17	2.5
Fluorene	mg/kg	0.1	MCERTS	3.6	< 0.10	< 0.10	0.18	2.8
Phenanthrene	mg/kg	0.1	MCERTS	20	0.89	2.2	2.4	28
Anthracene	mg/kg	0.1	MCERTS	5.5	0.30	0.70	0.95	7.8
Fluoranthene	mg/kg	0.1	MCERTS	24	2.9	6.4	8.5	41
Pyrene	mg/kg	0.1	MCERTS	19	2.5	5.2	7.4	33
Benzo(a)anthracene	mg/kg	0.1	MCERTS	11	1.8	3.3	5.3	21
Chrysene	mg/kg	0.05	MCERTS	8.4	1.6	2.9	4.4	17
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	9.0	2.3	2.7	5.2	22
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	6.0	1.0	2.5	3.8	9.6
Benzo(a)pyrene	mg/kg	0.1	MCERTS	8.2	1.8	2.7	4.9	19
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	4.8	1.1	1.7	2.8	10
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	0.97	0.22	0.35	0.66	2.0
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	5.0	1.2	1.9	3.3	12
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	129	17.7	33.1	50.4	230

Analytical Report Number: 15-74167

Project / Site name: Princes Parade , Hythe

Your Order No: 15-S2-FDO-LABS

Lab Sample Number				458147	458148	458149	458150	458151
Sample Reference				MTP3	MTP4	MTP5	MTP5	MWS1
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				2.00-2.50	0.90-1.00	0.40-0.60	1.50	0.40-0.50
Date Sampled				17/06/2015	17/06/2015	17/06/2015	17/06/2015	18/06/2015
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	11	15	9.7	50	16
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	0.3	0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	20	19	23	110	28
Copper (aqua regia extractable)	mg/kg	1	MCERTS	12	16	27	210	120
Lead (aqua regia extractable)	mg/kg	1	MCERTS	280	63	110	660	190
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	0.6	0.5
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	25	19	23	87	44
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	2.7	< 1.0	< 1.0	2.2
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	89	91	120	1100	230
Monoaromatics								
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	2.7	< 2.0	< 2.0	< 2.0	2.2
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	< 8.0	< 8.0	19	55	16
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	< 10	19	55	18
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	2.7	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	28	2.4	< 2.0	< 2.0	28
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	150	17	23	19	210
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	180	39	47	31	260
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	360	58	70	49	500

Analytical Report Number: 15-74167

Project / Site name: Princes Parade , Hythe

Your Order No: 15-S2-FDO-LABS

Lab Sample Number				458152	458153	458154	458155	458156
Sample Reference				MWS1	MWS2	MWS2	MWS4	MWS6
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.40-1.70	0.40-0.60	2.50-2.80	0.30-0.50	0.30-0.50
Date Sampled				18/06/2015	18/06/2015	18/06/2015	18/06/2015	18/06/2015
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	6.9	4.3	3.8	11	7.5
Total mass of sample received	kg	0.001	NONE	1.3	1.3	1.2	0.87	1.3
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	Chrysotile- Loose fibres	-	-	Chrysotile- Loose fibres
Asbestos in Soil	Type	N/A	ISO 17025	-	Detected	-	-	Detected
Asbestos Quantification	%	0.001	ISO 17025	-	-	-	-	-
General Inorganics								
pH	pH Units	N/A	MCERTS	8.5	8.5	8.6	7.8	9.0
Total Cyanide	mg/kg	1	MCERTS	< 1	2	1	< 1	< 1
Water Soluble Sulphate (Soil Equivalent)	g/l	0.0025	MCERTS	0.37	0.29	0.25	0.055	0.54
Water Soluble Sulphate as SO_4 (2:1)	mg/kg	2.5	MCERTS	370	290	250	55	540
Water Soluble SO4 (BRE SD 2:1 Leach Equivalent)	g/l	0.00125	MCERTS	0.18	0.15	0.13	0.027	0.27
Sulphide	mg/kg	1	MCERTS	1.1	81	11	< 1.0	9.8
Organic Matter	%	0.1	MCERTS	2.9	2.7	1.7	1.0	2.3
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	0.70	0.59	0.63	< 0.05	0.24
Acenaphthylene	mg/kg	0.1	MCERTS	3.4	1.9	4.0	< 0.10	1.8
Acenaphthene	mg/kg	0.1	MCERTS	23	2.2	3.0	< 0.10	1.9
Fluorene	mg/kg	0.1	MCERTS	22	2.5	5.0	< 0.10	2.6
Phenanthrene	mg/kg	0.1	MCERTS	190	30	41	0.21	21
Anthracene	mg/kg	0.1	MCERTS	53	6.0	12	< 0.10	6.8
Fluoranthene	mg/kg	0.1	MCERTS	300	76	73	0.54	45
Pyrene	mg/kg	0.1	MCERTS	230	63	61	0.48	38
Benzo(a)anthracene	mg/kg	0.1	MCERTS	130	41	32	0.27	24
Chrysene	mg/kg	0.05	MCERTS	100	33	30	0.31	18
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	110	46	34	0.28	28
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	56	20	12	0.15	9.1
Benzo(a)pyrene	mg/kg	0.1	MCERTS	91	37	26	0.24	21
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	50	23	15	< 0.10	13
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	11	4.4	3.0	< 0.10	3.0
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	57	24	17	< 0.05	15
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	1430	411	369	2.48	248

Analytical Report Number: 15-74167

Project / Site name: Princes Parade , Hythe

Your Order No: 15-S2-FDO-LABS

Lab Sample Number				458152	458153	458154	458155	458156
Sample Reference				MWS1	MWS2	MWS2	MWS4	MWS6
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.40-1.70	0.40-0.60	2.50-2.80	0.30-0.50	0.30-0.50
Date Sampled				18/06/2015	18/06/2015	18/06/2015	18/06/2015	18/06/2015
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	10	10	14	23	16
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	0.8
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	18	29	35	64	26
Copper (aqua regia extractable)	mg/kg	1	MCERTS	150	31	47	4.0	48
Lead (aqua regia extractable)	mg/kg	1	MCERTS	68	340	110	23	150
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	0.5	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	24	20	56	52	26
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	1.9	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	78	120	170	66	370
Monoaromatics								
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	1.2	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	35	3.6	3.1	< 2.0	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	62	11	< 8.0	< 8.0	8.2
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	120	51	29	< 8.0	45
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	220	66	32	< 10	54
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	1.5	1.7	2.1	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	380	30	38	< 2.0	22
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	2200	470	340	< 10	250
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	2500	1200	550	12	490
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	5000	1700	930	12	760

Analytical Report Number: 15-74167

Project / Site name: Princes Parade , Hythe

Your Order No: 15-S2-FDO-LABS

Lab Sample Number				458157	458158	458159		
Sample Reference				MWS6	MWS7	MWS7		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				1.00-1.50	1.00-1.40	3.50-3.80		
Date Sampled				18/06/2015	18/06/2015	18/06/2015		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1		
Moisture Content	%	N/A	NONE	18	15	19		
Total mass of sample received	kg	0.001	NONE	1.2	1.1	1.1		
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-		
Asbestos in Soil	Type	N/A	ISO 17025	-	-	-		
Asbestos Quantification	%	0.001	ISO 17025	-	-	-		
General Inorganics								
pH	pH Units	N/A	MCERTS	7.9	8.1	7.8		
Total Cyanide	mg/kg	1	MCERTS	2	< 1	< 1		
Water Soluble Sulphate (Soil Equivalent)	g/l	0.0025	MCERTS	3.5	0.16	0.95		
Water Soluble Sulphate as SO_4 (2:1)	mg/kg	2.5	MCERTS	3500	160	950		
Water Soluble SO4 (BRE SD 2:1 Leach Equivalent)	g/l	0.00125	MCERTS	1.8	0.080	0.47		
Sulphide	mg/kg	1	MCERTS	1.1	< 1.0	3.9		
Organic Matter	%	0.1	MCERTS	1.5	1.2	2.4		
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	0.11	< 0.05	< 0.05		
Acenaphthylene	mg/kg	0.1	MCERTS	0.52	< 0.10	0.23		
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Fluorene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Phenanthrene	mg/kg	0.1	MCERTS	1.9	1.3	1.1		
Anthracene	mg/kg	0.1	MCERTS	0.53	0.34	0.30		
Fluoranthene	mg/kg	0.1	MCERTS	7.4	2.7	4.3		
Pyrene	mg/kg	0.1	MCERTS	6.4	2.2	3.7		
Benzo(a)anthracene	mg/kg	0.1	MCERTS	3.7	1.2	1.7		
Chrysene	mg/kg	0.05	MCERTS	4.8	1.1	2.7		
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	5.3	0.84	2.6		
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	3.7	0.51	1.3		
Benzo(a)pyrene	mg/kg	0.1	MCERTS	4.7	0.63	1.9		
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	3.1	0.30	1.3		
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	0.78	< 0.10	0.23		
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	3.2	0.43	1.6		
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	46.1	11.4	23.0		

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Lab Sample Number				458157	458158	458159		
Sample Reference				MWS6	MWS7	MWS7		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				1.00-1.50	1.00-1.40	3.50-3.80		
Date Sampled				18/06/2015	18/06/2015	18/06/2015		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	20	8.7	16		
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	1.1	< 0.2	< 0.2		
Chromium (hexavalent)	mg/kg	4	MCERTS	< 4.0	< 4.0	< 4.0		
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	27	25	34		
Copper (aqua regia extractable)	mg/kg	1	MCERTS	40	8.6	36		
Lead (aqua regia extractable)	mg/kg	1	MCERTS	840	39	73		
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.6	< 0.3	< 0.3		
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	19	21	26		
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	1200	55	75		
Monoaromatics								
Benzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Toluene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Ethylbenzene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
p & m-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
o-xylene	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1		
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1		
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1		
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0		
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0		
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	9.5	< 8.0	< 8.0		
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	< 10	< 10		
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1		
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1		
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.1	MCERTS	< 0.1	< 0.1	< 0.1		
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	1.5	< 1.0		
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	2.7	5.4	< 2.0		
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	33	22	23		
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	97	32	62		
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	130	62	85		

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Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

The samples were analysed qualitatively for asbestos by polarising light and dispersion staining as described by the Health and Safety Executive in HSG 248.

Quantitative Analysis

"The analysis was carried out using our documented in-house method A006 based on HSE Contract Research Report No: 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies et al, 1996) and HSG 248. Our method includes initial examination of the entire representative sample, then fractionation and detailed analysis of each fraction, with quantification by hand picking and weighing.

Any material greater than 16mm is considered as Bulk sample and reported separately, asbestos content (if any) is not included in the final Quantitative analysis. The limit of detection (reporting limit) of this method is 0.001 %.

The method has been validated using samples of at least 100 g, results for samples smaller than this should be interpreted with caution.
Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample
458146	MTP3	0.30-0.50	115	Insulation Lagging & Loose Fibres	**Amosite & Chrysotile**	0.002	**0.002**
458148	MTP4	0.90-1.00	103	Insulation Board/Tile & Loose Fibres	**Amosite & Chrysotile**	0.015	**0.015**
458151	MWS1	0.40-0.50	127	Loose Fibres	**Amosite**	< 0.001	**< 0.001**

Opinions and interpretations expressed herein are outside the scope of UKAS accreditatior

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Lab Sample Number				458160	458161			
Sample Reference				MTP2	MTP5			
Sample Number				None Supplied	None Supplied			
Depth (m)				0.40	0.60			
Date Sampled				17/06/2015	17/06/2015			
Time Taken				None Supplied	None Supplied			
Analytical Parameter (Bulk Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Asbestos Identification Name	Type	N/A	ISO 17025	Chrysotile-Hard/cement type material	Chrysotile-Hard/cement type material			

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

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

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
458142	MTP1	None Supplied	0.30-0.40	Beige loam and sand with gravel and vegetation.
458143	MTP1	None Supplied	1.00-1.20	Beige loam and sand with gravel and vegetation.
458144	MTP2	None Supplied	0.20-0.40	Beige loam and sand with gravel and vegetation.
458145	MTP2	None Supplied	1.90-2.00	Beige loam and sand with gravel and vegetation.
458146	MTP3	None Supplied	0.30-0.50	Beige loam and sand with gravel and vegetation.
458147	MTP3	None Supplied	2.00-2.50	Beige loam and sand with gravel and vegetation.
458148	MTP4	None Supplied	0.90-1.00	Beige loam and sand with gravel and vegetation.
458149	MTP5	None Supplied	0.40-0.60	Beige loam and sand with gravel and vegetation.
458150	MTP5	None Supplied	1.50	Beige loam and sand with gravel and vegetation.
458151	MWS1	None Supplied	0.40-0.50	Beige loam and sand with gravel and vegetation.
458152	MWS1	None Supplied	1.40-1.70	Beige loam and sand with gravel and vegetation.
458153	MWS2	None Supplied	0.40-0.60	Beige loam and sand with gravel and vegetation.
458154	MWS2	None Supplied	2.50-2.80	Beige loam and sand with gravel and vegetation.
458155	MWS4	None Supplied	0.30-0.50	Beige loam and sand with gravel and vegetation.
458156	MWS6	None Supplied	0.30-0.50	Beige loam and sand with gravel and vegetation.
458157	MWS6	None Supplied	1.00-1.50	Beige loam and sand with gravel and vegetation.
458158	MWS7	None Supplied	1.00-1.40	Beige loam and sand with gravel and vegetation.
458159	MWS7	None Supplied	3.50-3.80	Beige loam and sand with gravel and vegetation.

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

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in Bulks	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	W	ISO 17025
Asbestos Quantification	The analysis was carried out using documented in-house method based on references.	HSE Report No: 83/1996, HSG 248, HSG 264 & SCA Blue Book (draft).	A006	D	ISO 17025
BTEX and MTBE in soil	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073S-PL	W	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Organic matter in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L023-PL	D	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS
Sulphide in soil	Determination of sulphide in soil by acidification and heating to liberate hydrogen sulphide, trapped in an alkaline solution then assayed by ion selective electrode.	In-house method	L010-PL	D	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method	L076-PL	W	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

APPENDIX 5

- Field Monitoring Records
- Groundwater Level Data
- Hazardous Soil Gas Data

Location Reference	Time	Flow and Pressure Measurements				Gas Measurements								VOC Measurements				Dip Measurements	
		Flow		Atmospheric Pressure	Differential Pressure	Methane	Methane LEL	Carbon Dioxide	Oxygen	Carbon Monoxide	Hydrogen Sulphide	Hydrogen Sulphide Live Zero	Hydrogen Sulphide Actual	Hexane	PID Compensation Factor	PID	PID Actual	Depth to Water	Depth to Base
		max	steady																
		l hr^{-1}		mb	Pa	%	%	%	%	ppm	ppm	ppm	ppm	%	units	ppm	ppm	m	m
MWS1	-	0.0	0.0	1021	-	0.0	0.0	9.3	14.2	0	0	0	0	0.007	1.0	-	nr	Dry	4.05
MWS4	-	0.0	0.0	1022	-	0.0	0.0	3.7	16.3	0	0	0	0	0.017	1.0	-	nr	Dry	3.95
MWS6	-	0.0	0.0	1022	-	0.0	0.0	2.1	18.4	0	0	0	0	0.007	1.0	-	nr	Dry	4.04
MWS7	-	0.0	0.0	1022	-	0.0	0.0	1.0	20.5	0	0	0	0	0.011	1.0	-	nr	Dry	4.08
-	-	-	-	-	-	-	-	-	-	-	-	0	nr	-	-	-	nr	-	-
-	-	-	-	-	-	-	-	-	-	-	-	0	nr	-	-	-	nr	-	-
-	-	-	-	-	-	-	-	-	-	-	-	0	nr	-	-	-	nr	-	-

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