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STATS

Specialist Engineering, Materials and Environmental Consultants

DOCUMENT CONTROL

Document Title: Site Investigation Report for Langstone Technology Park, Havant, Hampshire

The Client: Havant International Limited

STATS Geotechnical, a division of STATS Limited (STATS), has prepared this report in accordance with the instructions of Glanville Consultants Limited on behalf of Havant International ("the Client") by fax of 18th August 2003 under the terms of appointment for site investigation services. This report is for the sole and specific use of the Client, and STATS shall not be responsible for any use of the report or its contents for any purpose other than that for which it was prepared and provided. Should the Client require to pass copies of the report to other parties for information, the whole of the report should be so copied, but no professional liability or warranty shall be extended to other parties by STATS in this connection without the explicit written agreement thereto by STATS.

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SITE INVESTIGATION REPORT
FOR
SITE AT LANGSTONE TECHNOLOGY PARK

1. INTRODUCTION

1.1 Purpose of Investigation

On the instructions of Glanville Consultants Consulting Engineers on behalf of Havant International Limited, STATS Geotechnical has carried out a site investigation of an area within Langstone Technology Park. The project was commissioned in order to obtain information on the ground conditions in relation to the proposed new paved car park and roundabout on the site.

1.2 Project Brief

The project was carried out to an agreed brief, as set out in STATS proposal letter of 7th August 2003, and has included the following tasks:

Desk Study

- A study of local geology and hydrogeology
- A study of the land-use and development history of the site and its surroundings from archival Ordnance Survey mapping
- The identification of aquifer vulnerability rating beneath the site and local water abstraction points from Environment Agency records
- The identification of potential geotechnical hazards
- The identification of potential targets at risk from possible contamination

Site Investigation

- Machine excavation of 13No. trial pits.
- 8No. Dynamic Cone Penetration Tests to assess CBR values.
- Associated sampling and on-site testing.
- Laboratory chemical testing of 10No soil samples for common contaminants.
- Laboratory geotechnical testing of soil samples for classification purposes.
- Interpretative reporting

1.3 Limitations

The opinions and recommendations expressed in this report are based on the ground conditions encountered during the site work, the results of field and laboratory testing and interpretation between exploratory holes. The material encountered and samples obtained represent only a small proportion of the materials present on-site, therefore other conditions may prevail at the site which have not been revealed by this investigation.

The investigation itself was designed generally to meet the objectives of an exploratory investigation, as defined by BS 10175:2001 Code of Practice for the Investigation of Potentially Contaminated Site. As an exploratory investigation, the results may not provide sufficient data to make detailed estimates of the quantities involved in any remediation work, if required.

The results of laboratory tests are covered by UKAS (formerly NAMAS) accreditation, but opinions and interpretations expressed in the report and on the fieldwork records are outside the scope of this accreditation.

2. SITE DETAILS

2.1 Site Location

The site, which may be located by National Grid reference SU 712059, is situated just south of the A27, on Langstone Technology Park, Havant, Hampshire.

An extract of the *1:50 000 Ordnance Survey* map showing the location of the site is included in Figure 1.

2.2 Site Description

The site, which covers approximately 0.65 hectares, encompasses a roughly rectangular grassed area running along the north side length of Building 1000 (occupied by Xyratex).

The site contains a number of mature and semi-mature trees predominantly of the Maple, Sycamore and Laburnum variety. The trees are scattered in a linear fashion running the length of the site. In addition to this there are a number of mature herbaceous shrubs as well as a 13m high closely planted row of conifers forming the western most boundary to the site.

The immediate boundaries to the site comprise:

- North A 1.5m chain-link fence and a footpath running parallel with the A27 slip-road.
- East Open grassed area with adjoining car park serving Building 1000.
- South Grass-crete roadway and a 1.5m high grassed bank backing onto Building 1000.
- West 13m high row of conifers, semi-detached residential housing an industrial units.

Ground levels at the site range from 5.28mAOD to 6.03mAOD approximately and with the general fall towards the west.

Some investigative work (excavation of 2No. trial pits) was carried out in the rear garden of the house on the corner of Brookside Road.

A site plan showing the main features of the site is given in Figure 2.

2.3 Local Geology and Hydrogeology

The published 1:63,360 scale geological map of the area (Sheet No 316 "Fareham") indicates the site to be underlain by Quaternary Brickearth and Alluvium deposits, overlying White Chalk (formerly the Upper Chalk) of the Cretaceous System.

The existing topography and history of development of the site suggests that, in addition to these natural strata, made ground may be present on the site.

The hydrogeology of the site is likely to be characterised by the presence of an unconfined shallow aquifer comprising Alluvial Deposits, overlying the Cretaceous Chalk, which is a major aquifer. Variability in the nature of the alluvial deposits may result in perched groundwater being present.

According to the Environment Agency Groundwater Vulnerability Classification (Sheet No.45 "West Sussex & Surrey"), the Alluvial Deposits are a Minor Aquifer and the underlying White Chalk is a major aquifer, both of High Vulnerability.

An abstraction well is located approximately 400m north of the site.

3. DEVELOPMENT HISTORY

The history of the site's land-use and development from Victorian times onwards has been researched from early Ordnance Survey (OS) maps.

Extracts of the OS maps and plans are presented in Figures 3 to 12.

Reference to historical maps provides invaluable information regarding the land use history of the site, but historical evidence will be incomplete for the period pre-dating the first edition and between successive maps.

OS Map, Sheet Hants. 76.11 Dated 1866 at Scale 1:2,534 (Figure 3)

The Ordnance Survey edition of 1866 shows the site to be undeveloped fields. Havant Mill is located approximately 1.6km to the east-north-east.

OS Map, Sheet Hants. 76.11 Dated 1896 at Scale 1:2,534 (Figure 4)

The site and surroundings remain unchanged.

OS Map, Sheet Hants. 76.11 Dated 1907 at Scale 1:2,534 (Figures 5 & 6)

A sewage works has been constructed immediately to the east of the site and an engine house on the western boundary of the sewage works appears to exist on the eastern margin of the site. Filter beds associated with the sewage works are shown immediately to the southeast.

OS Map, Sheet Hants. 76.11 Dated 1931 at Scale 1:2,534 (Figures 7& 8)

The sewage works has extended so that associated buildings would have occupied the eastern part of the site, approximately 170m in from the east site boundary.

OS Map, Sheet SU 7105 Dated 1972 at Scale 1:2,500 (Figure 9)

The site is occupied by a landscaped area that contains some trees. The A27 Havant by-pass is located along the northern site boundary and a large 'works' has been constructed immediately to the south of the site. The sewage works and associated buildings mentioned above have been removed.

OS Map, Sheet SU 7105 Dated 1984 (Figure 10 – not to scale)

The site is unchanged and the immediate surroundings remain essentially unchanged.

OS Map, Sheet SU 7105 Dated 1996-7 at Scale 1:2,000 (Figures 11 &12)

The site is little changed, although an east-north-east, west-south-west running drain is shown near the centre of the site.

4. GROUND INVESTIGATION

4.1 Fieldwork

The fieldwork was carried out on 18th and 19th September 2003 and involved the following:-

Table 4.1 Summary of ground investigation fieldwork items

Investigation Type	Number	Location/ Designation	Appendix
Trial Pits - excavated by mechanical excavator	13	TP1 to TP13	A1 to A13
In situ Dynamic Cone Penetrometer	8	DCP1 to DCP8	A14 to A21
Trial Pit Soakaways	2	TP9 & TP10	A22 & A23

The location of all investigation points is shown on the site layout plan in Figure 2. The depths of boreholes, descriptions of strata encountered and comments on the groundwater conditions are given in the trial pit records in Appendix A.

The exploratory points were located approximately by reference to physical features present on the site at the time of investigation using the site plan provided by Glanville Consultants Ltd (drawing ref: ML 230287/101). The ground levels at the borehole locations have not been determined.

4.2 Laboratory Testing

A programme of geotechnical and chemical laboratory testing, scheduled by STATS, was carried out on selected samples taken from various strata. The results are presented in Appendices B and C, respectively.

The chemical analyses were carried out by ALcontrol Geochem (Geochem) under sub-contract to STATS. Geochem are an approved subcontractor in accordance with the requirements of STATS' quality system and are themselves UKAS accredited for a range of chemical analyses (UKAS Laboratory Testing No 1291).

5. GROUND CONDITIONS

5.1 Ground

5.1.1 General Succession of Strata

The exploratory holes revealed that the site is underlain by a variable thickness of made ground over alluvial deposits comprising sandy Clay over sandy Gravel. This appears to confirm the published geological records, although the White Chalk was not proven due to the shallow depth of investigation. For the purpose of discussion, the ground conditions are summarised in Table 5.1 below.

Table 5.1 General succession of strata

Brief Description	Depth to top of stratum m.bgl (mAOD)	Thickness (m)
Made Ground	Ground Level	0.35 to 2.9 (generally 0.65 to 0.8)
Sandy Clay (locally absent in TP11 and TP12)	0.35 to 1.1	Absent to 1.75
Sandy Gravel	1.1 to 2.3	0.9 Proven in TP10

5.1.2 Topsoil / Made Ground

The exploratory holes encountered a variable thickness of topsoil / made ground across the site. The maximum thickness of made ground was encountered in TP13 where a sub-surface concrete tank was uncovered, presumably related to the sewage works that were present on the site. The tank was found to be in-filled with a clayey sand Fill containing many whole bricks and occasional metalwork.

In general the made ground comprises a 0.1m thick superficial layer of topsoil over sandy gravelly clay with frequent sand sized brick and sand to gravel sized flint fragments with occasional chalk pieces.

5.1.3 Sandy CLAY

The sandy CLAY typically comprised stiff to very stiff light brown sandy clay with occasional to frequent sub-angular to sub-rounded gravel to cobble sized flints and flint fragments. A layer of soft silty CLAY with lenses of organic material was found to separate the sandy CLAY and sandy GRAVEL in TP9 between depths of 1.75m and 2.25m.

The measured and inferred soil parameters for the stratum are listed in Table 5.2 below.

Table 5.2 Summary of soil parameters for sandy Clay

Soil Parameters	Range	Results
Liquid Limit (%)	46% (71%)	Appendix B
Plastic Limit (%)	23% – 26% (34%)	Appendix B
Plastic Index (%)	20% – 23% (37%)	Appendix B
Plasticity Term	Intermediate plasticity (very high)	Figure 13
Shrinkage Potential (NHBC)	Medium	-
Moisture Content (%)	13% – 21%	-
Strength Term	Stiff to very stiff (soft)	-
Shear Strength Inferred by Pocket Penetrometer (kN/m^2)	158 – 225 (25)	-

Note: value in brackets refers to soft silty clay encountered in TP9 from 1.75m to 2.25m.

5.1.4 Sandy Gravel

The sandy GRAVEL typically comprised dark brown to light grey clay-bound sandy gravel. The gravel is sub-angular to sub-rounded flints and flint fragments with occasional sand sized chalk pieces. Within some of the trial pits (i.e. TP1, TP2, TP3 & TP8) white communited chalk is noted on the surface of the flints some 0.3m from the top of the unit. Further down the gravel sequence the clay is absent and the unit appears light orange brown in colour.

5.2 Groundwater

Groundwater was encountered in TP1, TP9 & TP10 at depths of between 2.25m and 2.7m depth. Groundwater was only seen to flow within trial pits TP9 & TP10 and the inflow was noted as slow.

It should be noted that groundwater levels might fluctuate for a number of reasons including seasonal variations. On-going monitoring would be required to establish both the full range of conditions and any trends in groundwater levels.

5.3 Chemical Analysis of Soil Samples

5.3.1 Introduction

Chemical analyses have been performed on a total of 10no. soil samples, including both fill materials and natural soils, down to a maximum depth of 0.75m below existing ground level. The test results are reported in Sheet C1.

5.3.2 Data Summary

With respect to the current CLEA Soil Guideline Values (SGV) and, where applicable, the former Dutch Guidelines the following summary can be made.

6. ENGINEERING CONSIDERATIONS

6.1 Details of Proposed Development

It is understood that the proposed development will comprise a new paved car park and roundabout (easing access to/from the west) to the side and rear of Building 1000.

6.2 Alleviation Measures in Respect of Ground Contamination

The results of the chemical analyses on the samples tested indicate that the materials on-site do not exceed the CLEA SGV's (and are acceptable within the Dutch guidelines) for commercial land use. Therefore, there is no evidence of significant ground contamination on the site in relation to the proposed end-use.

In view of the above findings, no special measures are required in terms of remediation, subject to ensuring that suitable topsoil is present in landscaped areas.

Suitable health and safety precautions should be adopted during the site works and care should be taken to minimise the amount of dust generated on-site. Site workers engaged in earthworks and working in trenches/excavations should, as a precautionary measure, minimise physical contact with the soil, and be rigorous in matters of personal hygiene.

With respect to off site disposal, the results of the chemical analyses indicate that the majority of soils will be classified as "uncontaminated". This is in accordance with the Environment Agency Interim Guidance on the Disposal of "Contaminated Soils".

6.3 Geotechnical Hazards

A summary of commonly occurring geotechnical hazards is given in Table 6.1 together with an assessment of whether the site may be affected by each of the stated hazards.

Table 6.1 Summary of main potential geotechnical hazards that may affect site

Hazard category (excluding contamination issues)	Hazard status based on investigation findings and proposed development			Engineering considerations if hazard affects site
	Found to be present on site	Could be present but not found	Unlikely to be present and/or affect site	
Sudden lateral changes in ground conditions		✓		Likely to affect ground engineering and foundation design and construction
Shrinkable clay soils	✓	Silty Clay and sandy Clay – medium potential		Design to NHBC Standards Chapter 4 or similar
Highly compressible and low bearing capacity soils, (including peat and soft clay)	✓	Soft Silty Clay with organic-rich lenses in TP9 only		Likely to affect ground engineering and foundation design and construction
Silt-rich soils susceptible to rapid loss of strength in wet conditions	✓	Silty / Sandy Clay		Likely to affect ground engineering and foundation design and construction
Karstic dissolution features (including 'swallow holes' in Chalk terrain)		✓		May affect ground engineering and foundation design and construction
Evaporite dissolution features and/or subsidence			✓	May affect ground engineering and foundation design and construction
Ground subject to or at risk from landslides			✓	Likely to require special stabilisation measures

Ground subject to peri-glacial valley cambering with gulls possibly present			✓	Likely to affect ground engineering and foundation design and construction
Ground subject to or at risk from coastal or river erosion			✓	Likely to require special protection/stabilisation measures
High groundwater table (including waterlogged ground)		✓		May affect temporary and permanent works
Rising groundwater table due to diminishing abstraction in urban area			✓	May affect deep foundations, basements and tunnels
Underground mining			✓	Likely to require special stabilisation measures
Existing sub-structures (e.g. tunnels, foundations, basements, and adjacent sub-structures)	✓	Buried sub-structure found in TP13		Likely to affect ground engineering and foundation design and construction
Filled and made ground (including embankments, infilled ponds and quarries)	✓	Maximum of 2.9m of made ground present in TP13.		Likely to affect ground engineering and foundation design and construction
Adverse ground chemistry (including expansive slags and weathering of sulphides to sulphates)			✓	May affect ground engineering and foundation design and construction

Seismicity is not included in Table 5.1 as this is not normally a design consideration in the UK.

The likely presence of chalk at shallow depth indicates that subsidence related to chalk dissolution features might be a possibility. Based on the Edmond's risk assessment model for natural dissolution features referred to in CIRIA Project Report II (1994), the site falls into the "moderately low subsidence risk" category. With reference to Edmund's data-base of known natural/man-made chalk solution features there are no such features in the immediate vicinity of the site.

6.4 Sub-grade Conditions for Road Pavements

Sub-grade materials present and groundwater levels

It is understood that the finished ground level of the proposed development will be at approximately the existing ground level.

In the 1m to 1.1m below the proposed finished ground level the exploratory holes have revealed a soil profile comprising made ground composed of clayey sand overlying sandy clay. The potentially poorest sub-grade material within this profile is the made ground due to its variable nature and unknown history of compaction.

The groundwater conditions are anticipated to comprise a low water-table, i.e. at least 1m below the pavement formation level. The ground investigation revealed the shallowest water strike to be 2.25m b.g.l, however, groundwater levels should be expected to be higher in the winter months

Estimated minimum CBR under long-term conditions

The estimated minimum, equilibrium soil-suction, CBR value for the soils (sandy clay) and groundwater conditions described above under a completed pavement is 4%, after Table C1 in TRRL Report LR1132 (1984).

CBR values determined under current conditions

The in situ sub-grade soils CBR values have been assessed under present conditions using the DCP test apparatus and the results are summarised in Table 6.2.

Table 6.2 Summary of CBR values derived from in situ DCP tests

Test Location	Material Type	Minimum CBR value determined at or just below anticipated formation level
TP1	Made Ground	5% (typically above 10%)
TP2	Made Ground	6%
	Sandy Clay	10%
TP3	Made Ground	6% (typically above 10%)
	Sandy Clay	9%
TP4	Made Ground	12%
TP5	Made Ground	12% (typically above 20%)
TP6	Made Ground	12% (typically above 30%)
TP7	Made Ground	5%
TP8	Made Ground	7%
	Sandy Clay	4%

The made ground materials in the vicinity of test locations may be susceptible to improvement by rolling with conventional compaction plant.

Recommended CBR value for road pavement design
The recommended sub-grade soil CBR value for road pavement design is therefore 6%. This value assumes that during construction the formation level will be carefully compacted and any soft spots dug out and replaced by compacted suitable fill material.

Frost-susceptibility of sub-grade soils
The sandy clay sub-grade soils can be regarded as non-frost-susceptible (PI>15%), after the criteria given in Appendix 1 of TRRL Report Road Note 29 (Ref). The made ground may be frost susceptible due to the presence of chalk gravel. When the sub-grade is frost-susceptible the thickness of sub-base must be sufficient to give a total thickness of non-frost-susceptible pavement construction over the soil of not less than 450mm.

6.5 Chemical Attack on Buried Concrete

The results of chemical tests carried out on soil samples indicate 2:1 water soil extract sulphate contents of up to 0.06g/l with generally near neutral pH values.

These results indicate that, in accordance with BRE Special Digest 1: 2001 *Concrete in aggressive ground*, the Aggressive Chemical Environment for Concrete (ACEC) Classification is **AC-1s** with a Design Sulfate Class for the site of **DS-**1. This assumes nominally static groundwater conditions and that no significantly disturbed clay comes into contact with concrete foundations or structures.

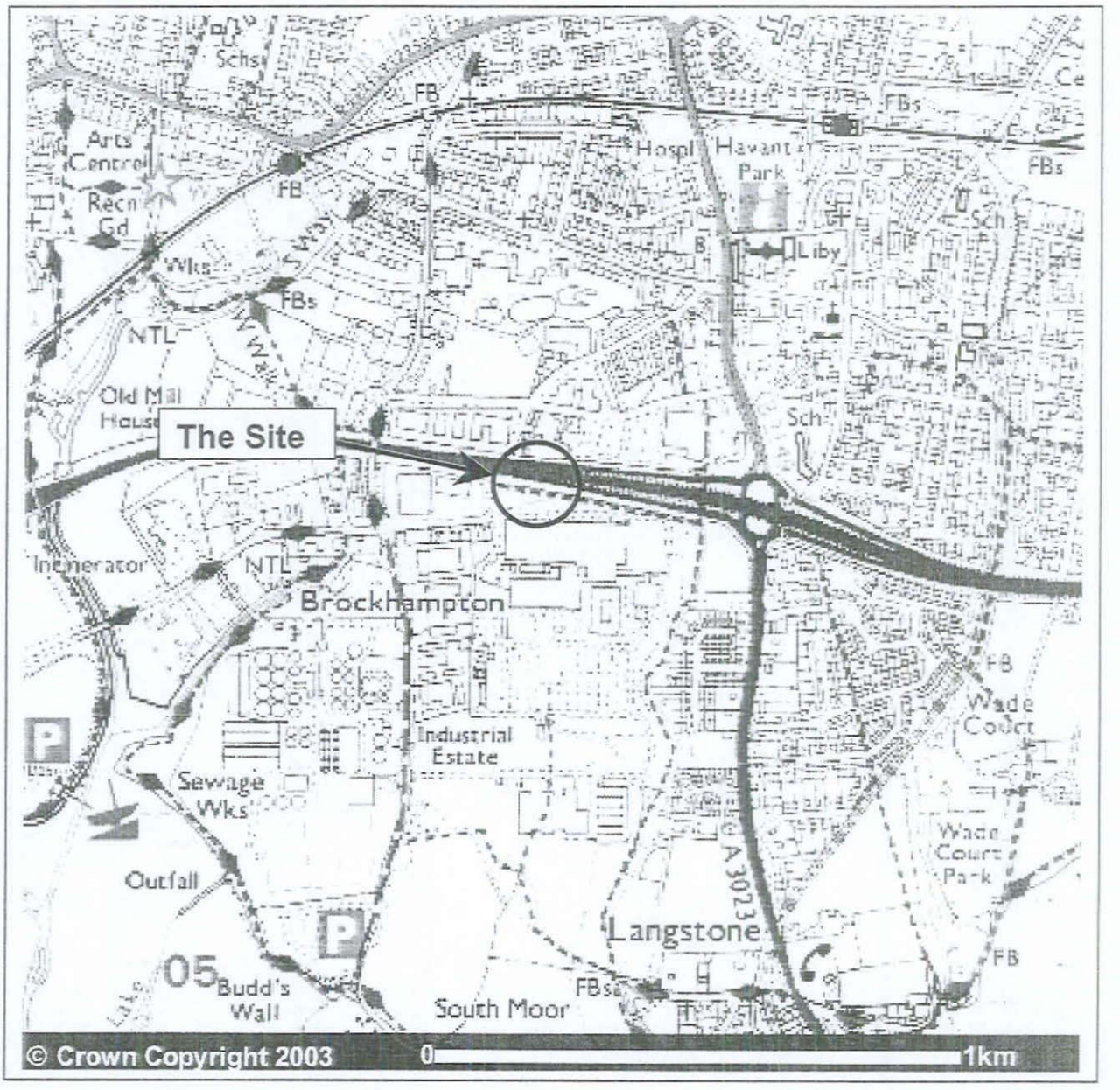
If significantly disturbed clay is likely to come into contact with concrete foundations or structures it will be necessary to carry out additional tests on the soil to investigate its total potential sulphate content. This will facilitate a revaluation of the ACEC Classification and Design Sulfate Class for the material, to take into consideration potential oxidation of available sulphides (e.g. pyrite), as defined in Table 2 BRE Special Digest 1: 2001.

6.6 Soakaways

Soakage tests were carried out in trial pits TP9 and TP10 in general accordance with BRE 365 and the results are given in Appendix A, Sheets A22 and A23.

The test results both show some infiltration. By adjusting the soakage calculations to consider infiltration through the permeable gravel horizontally, infiltration rates of 2.66x10-5 and 1.99x10-5 have been calculated for TP9 and TP10, respectively.

FIGURES



Extract of 1:50,000 Ordnance Survey Landranger Map

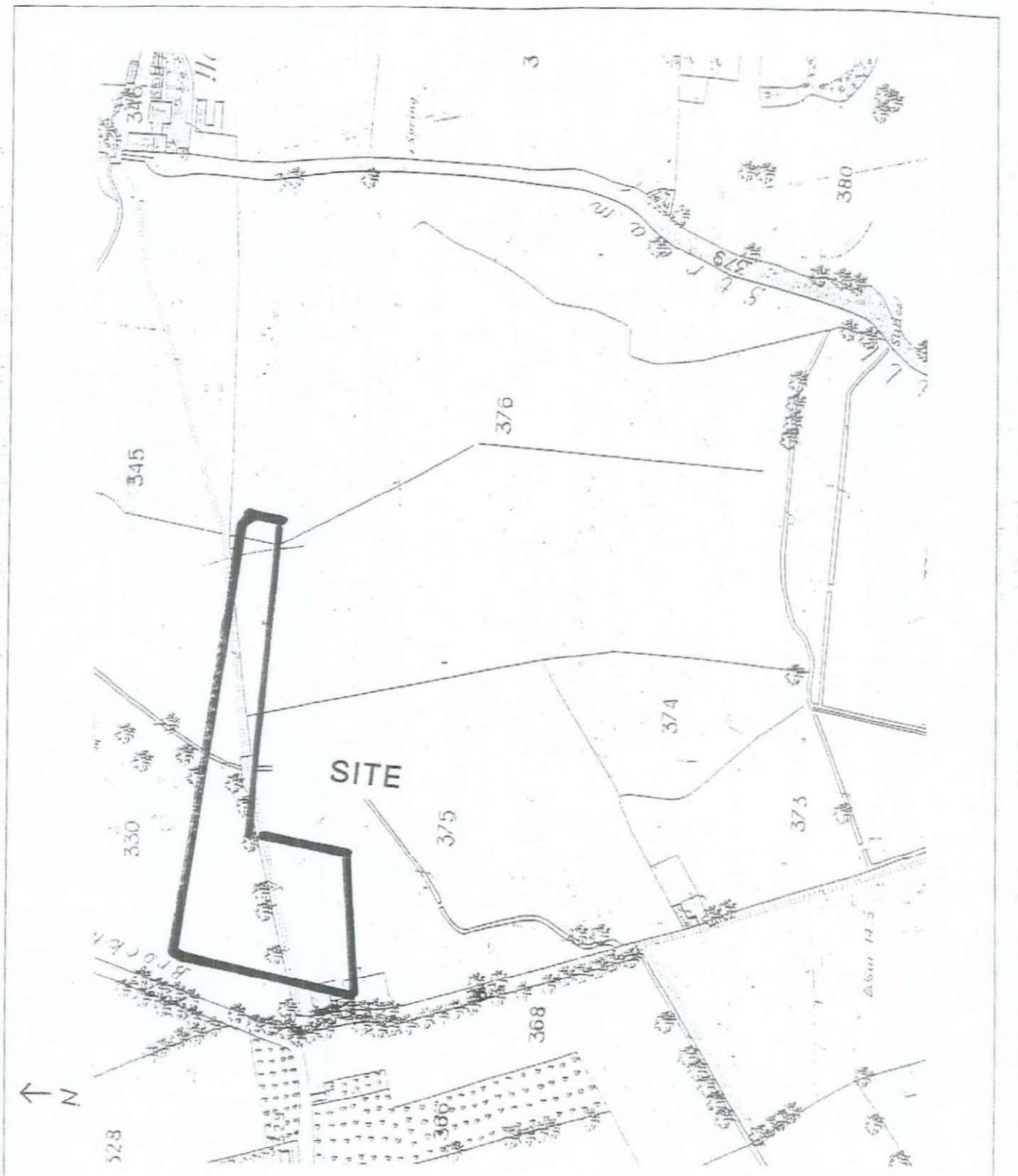
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Site: Langstone Technology Park	Client: Havant International
National Grid Reference: SU 7105 NW	Scale: See attached scale

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SITE LOCATION PLAN

Job No:	33893/01
Fig No:	1



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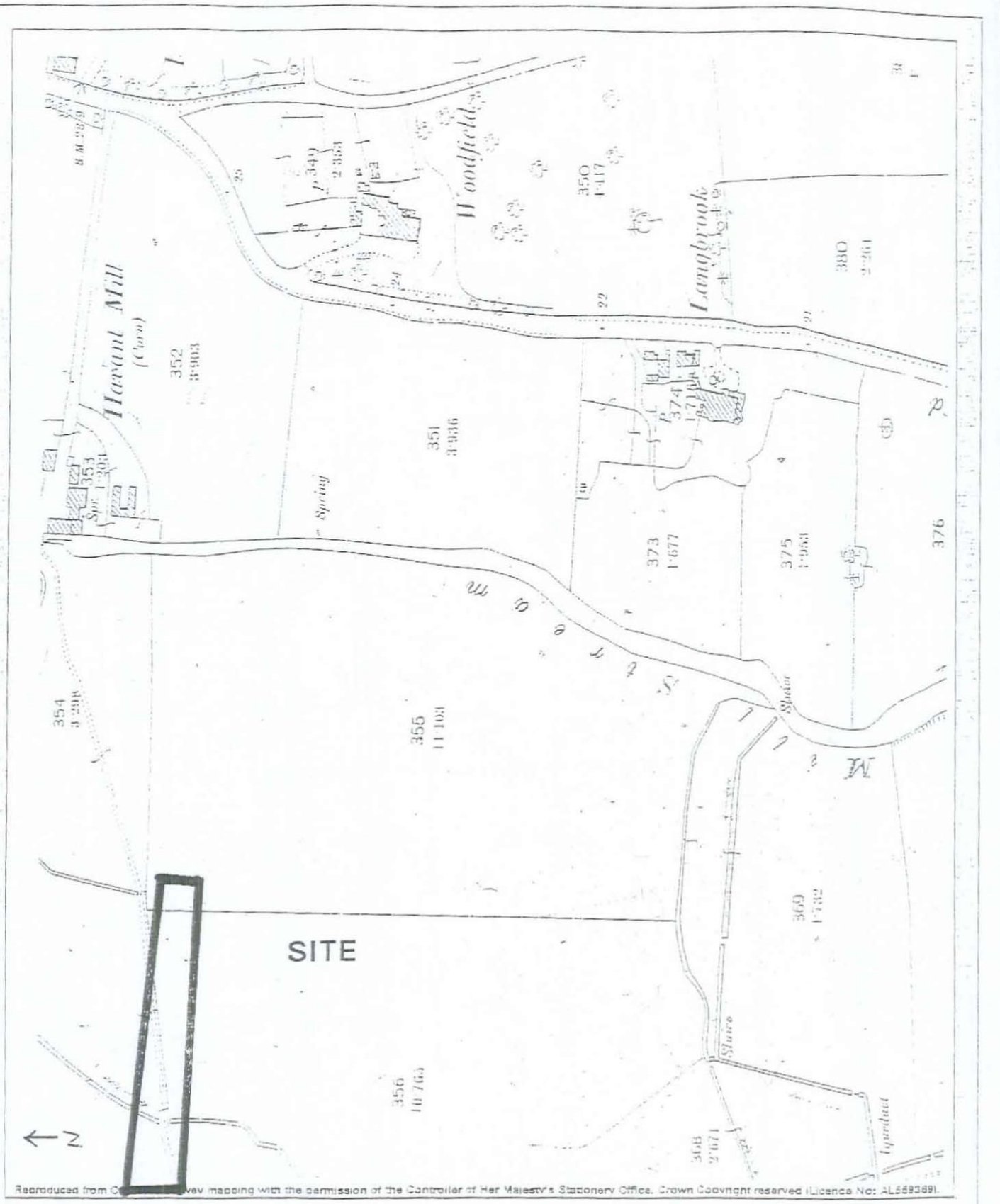
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Source:	OS Map Hampshire Sheet 76.11	Scale:	1:2534

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EXTRACT FROM HISTORICAL MAP DATED 1866

Job No: 33893

Fig No: 3



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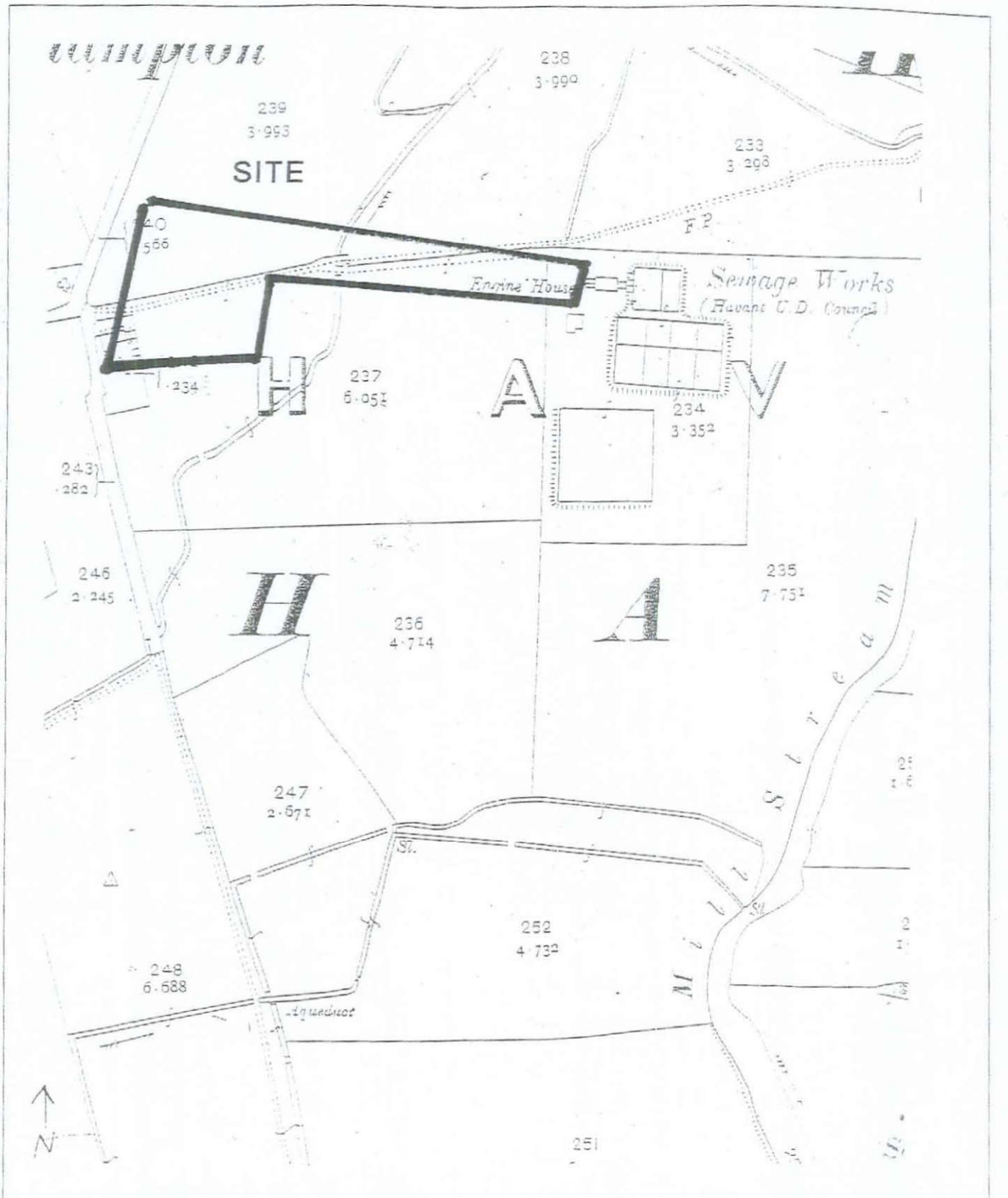
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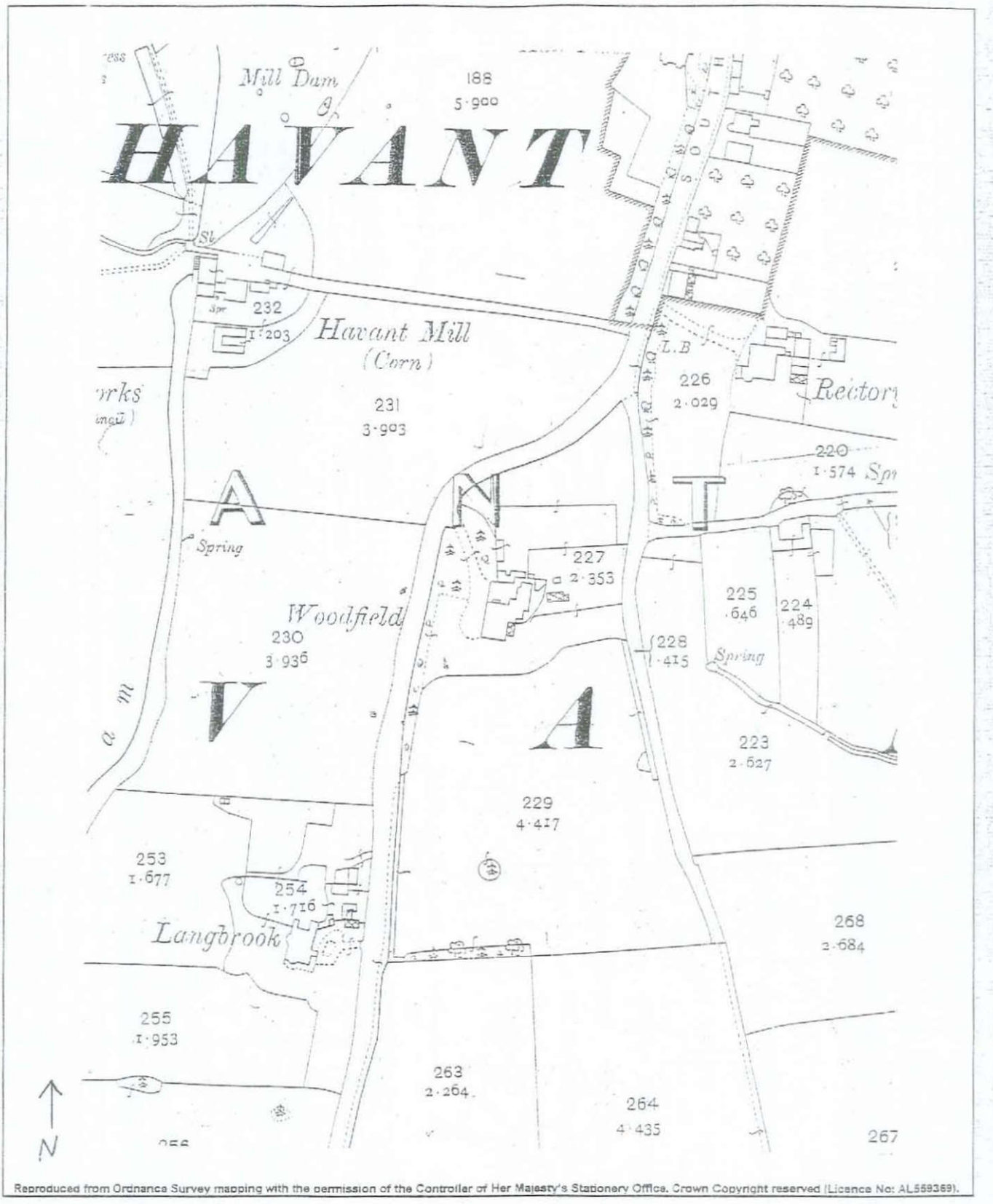
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EXTRACT FROM HISTORICAL MAP DATED 1907

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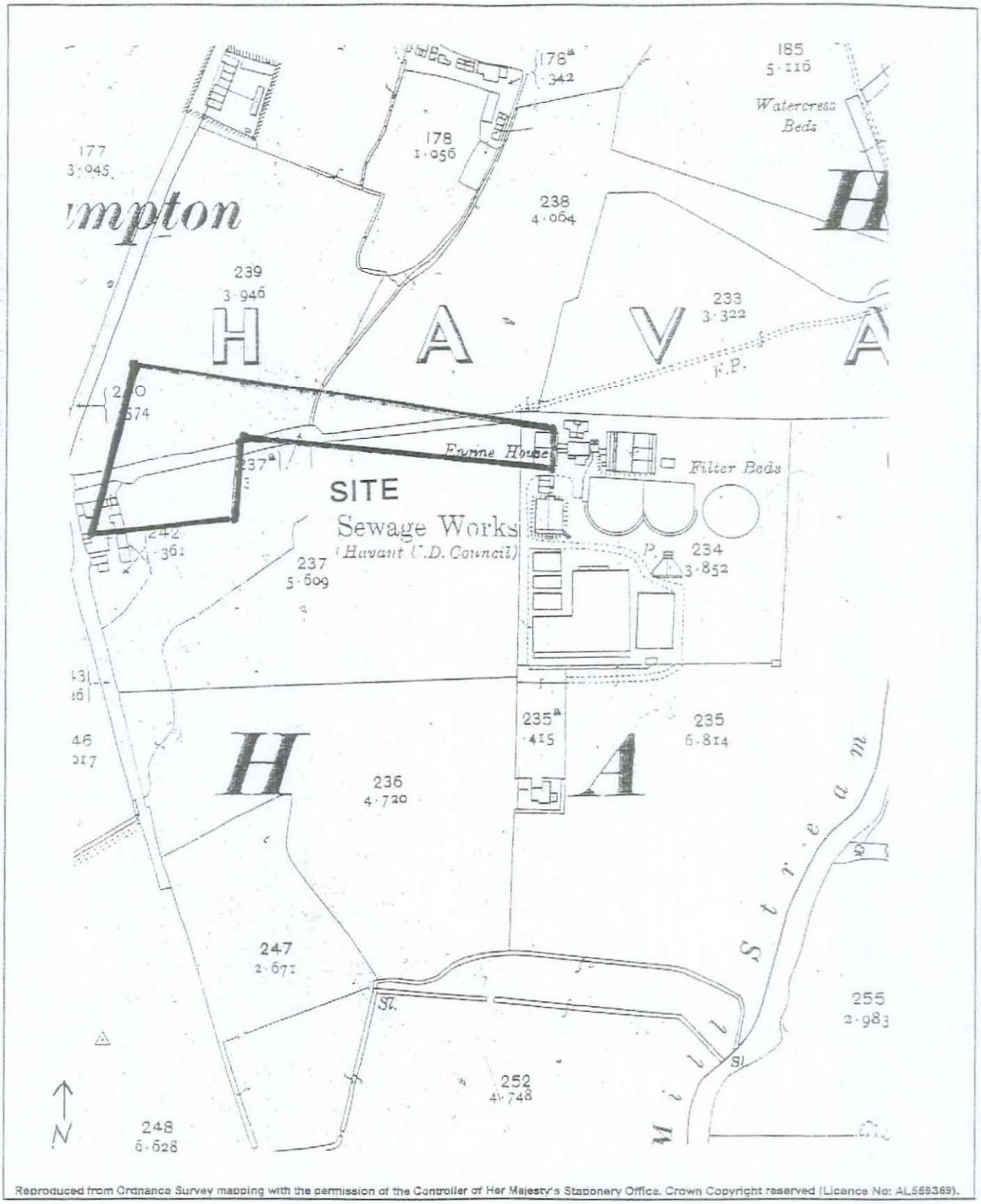
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EXTRACT FROM HISTORICAL MAP DATED 1907

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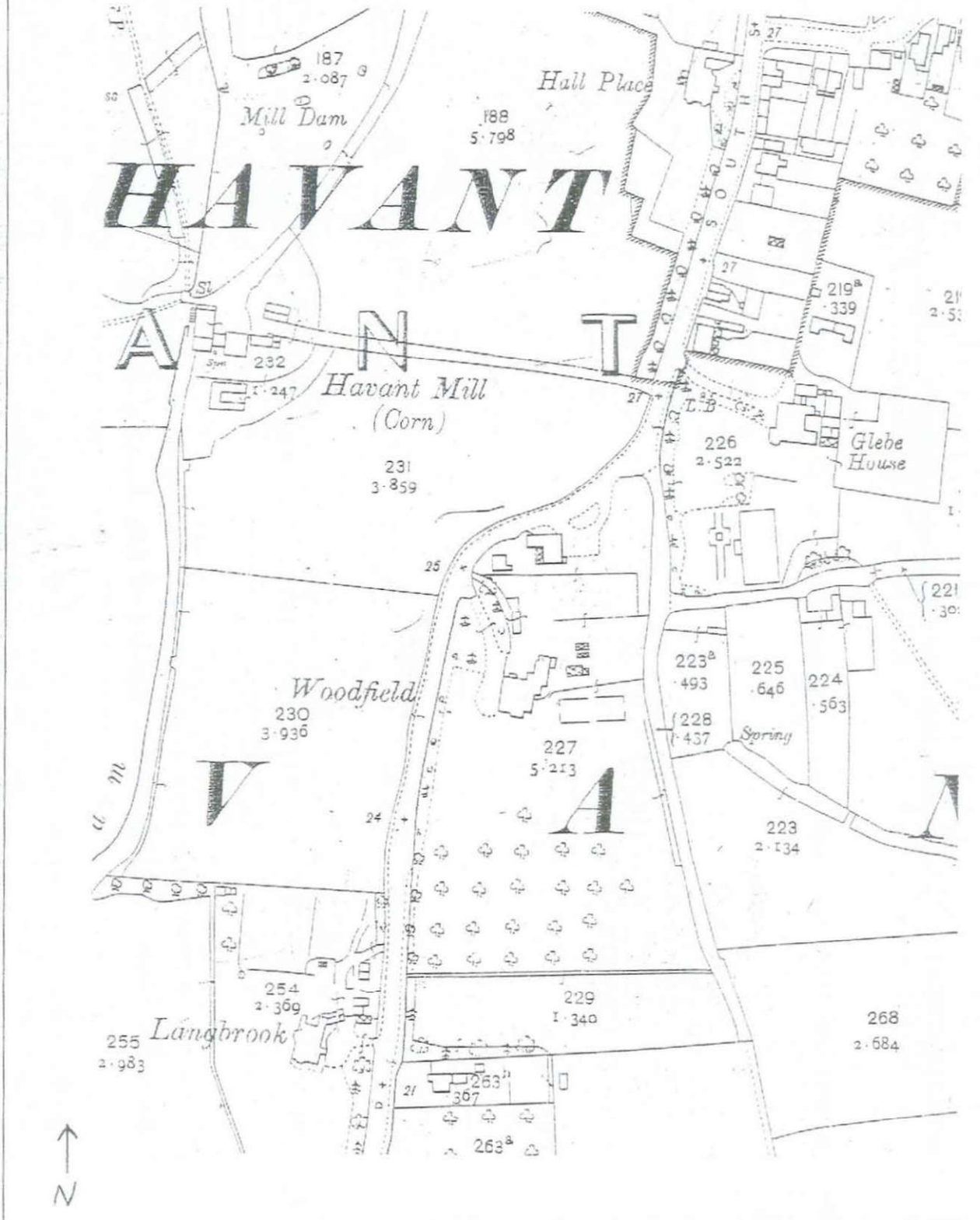
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EXTRACT FROM HISTORICAL MAP DATED 1932

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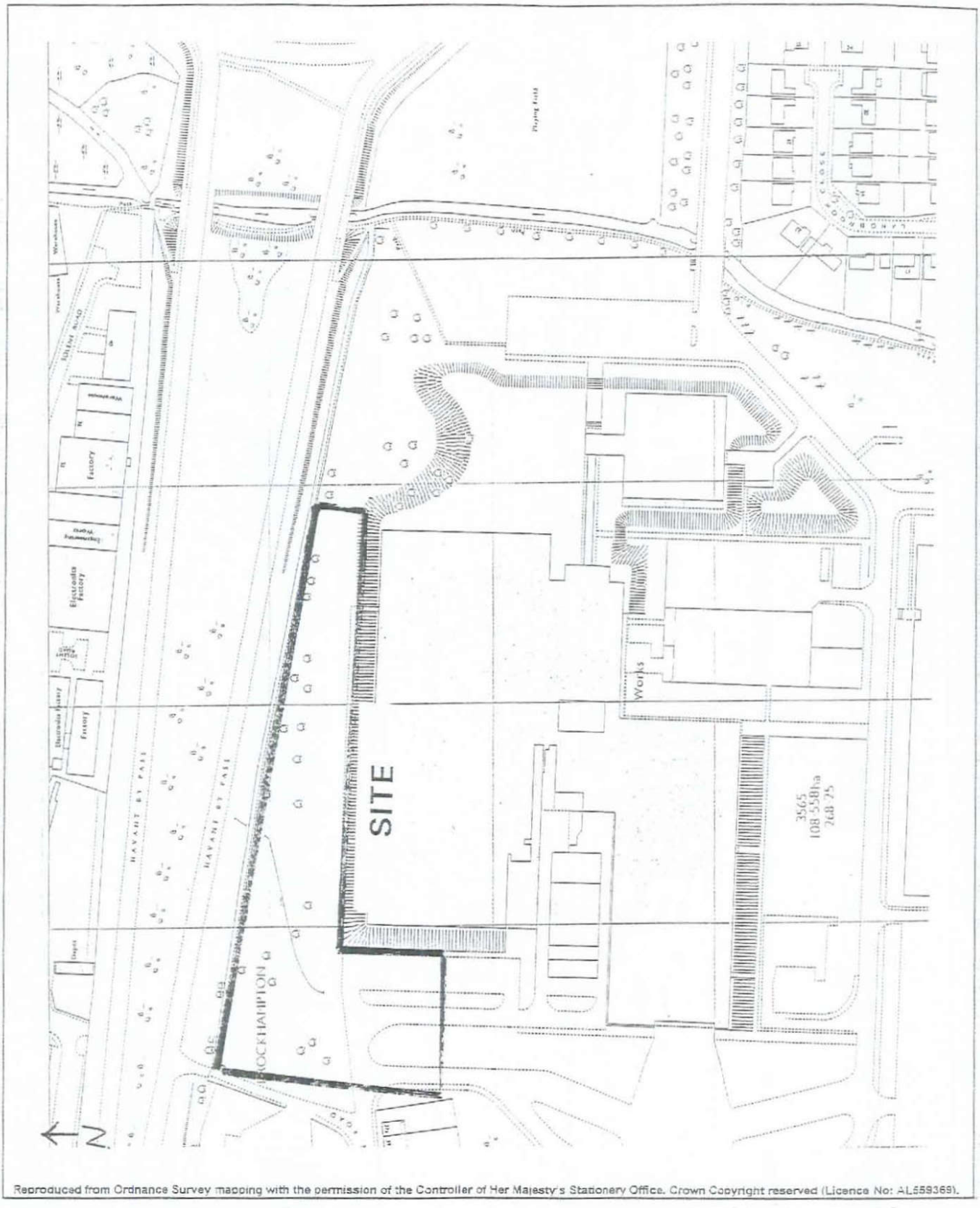
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Site: Langstone Park, Havant	Client: Glanville Consultants Ltd.
Source: OS Map Hampshire Sheet 76.11 (2 of 2)	Scale: 1:2534

STATS

EXTRACT FROM HISTORICAL MAP DATED 1932

Job No:	33893
Fig No:	8



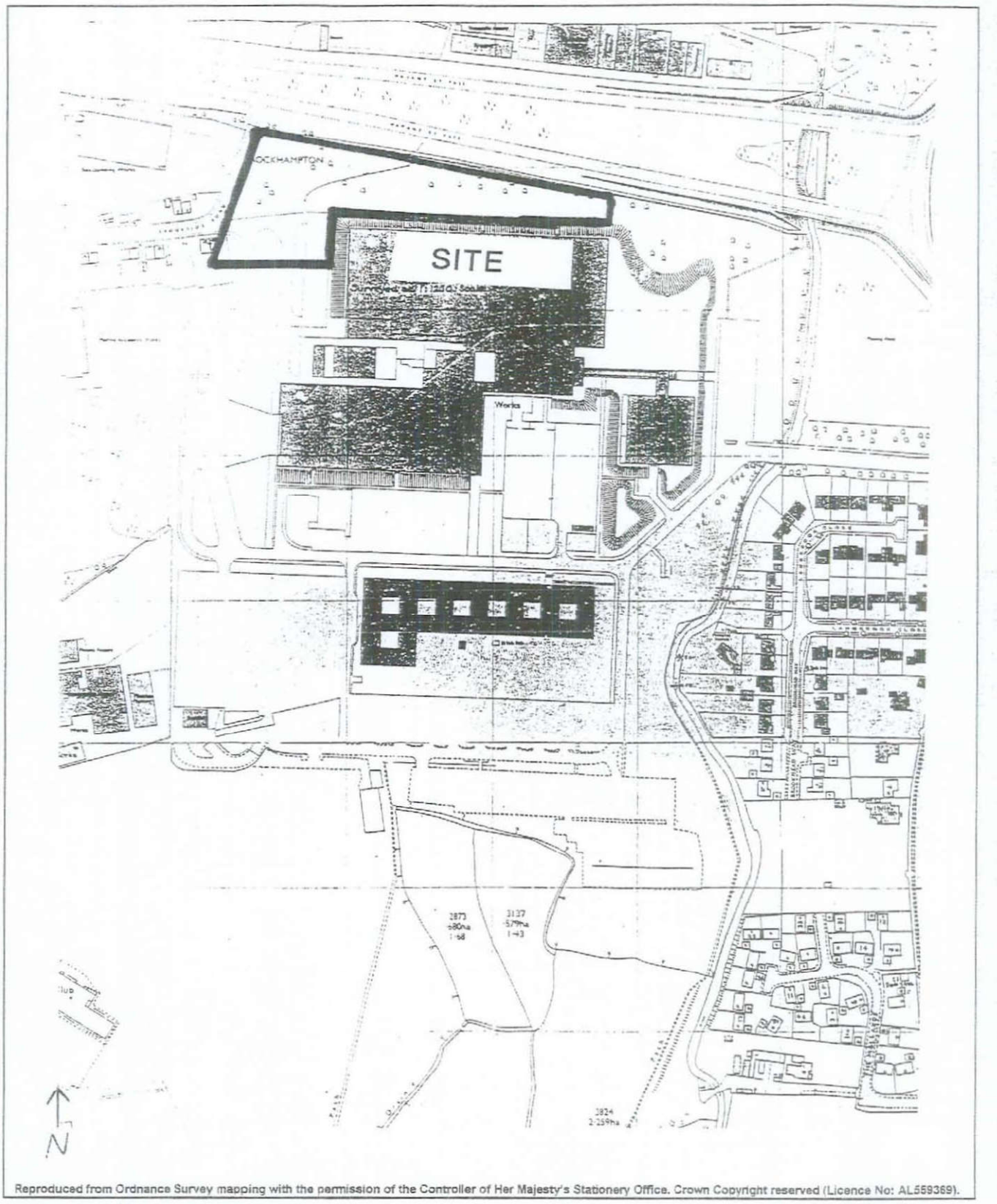
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Site: Langstone Park, Havant	Client: Glanville Consultants Ltd.
Source: OS Map Sheet SU 7105	Scale: 1:2500

STATS

EXTRACT FROM HISTORICAL MAP DATED 1972

Job No:	33893
Fig No:	9



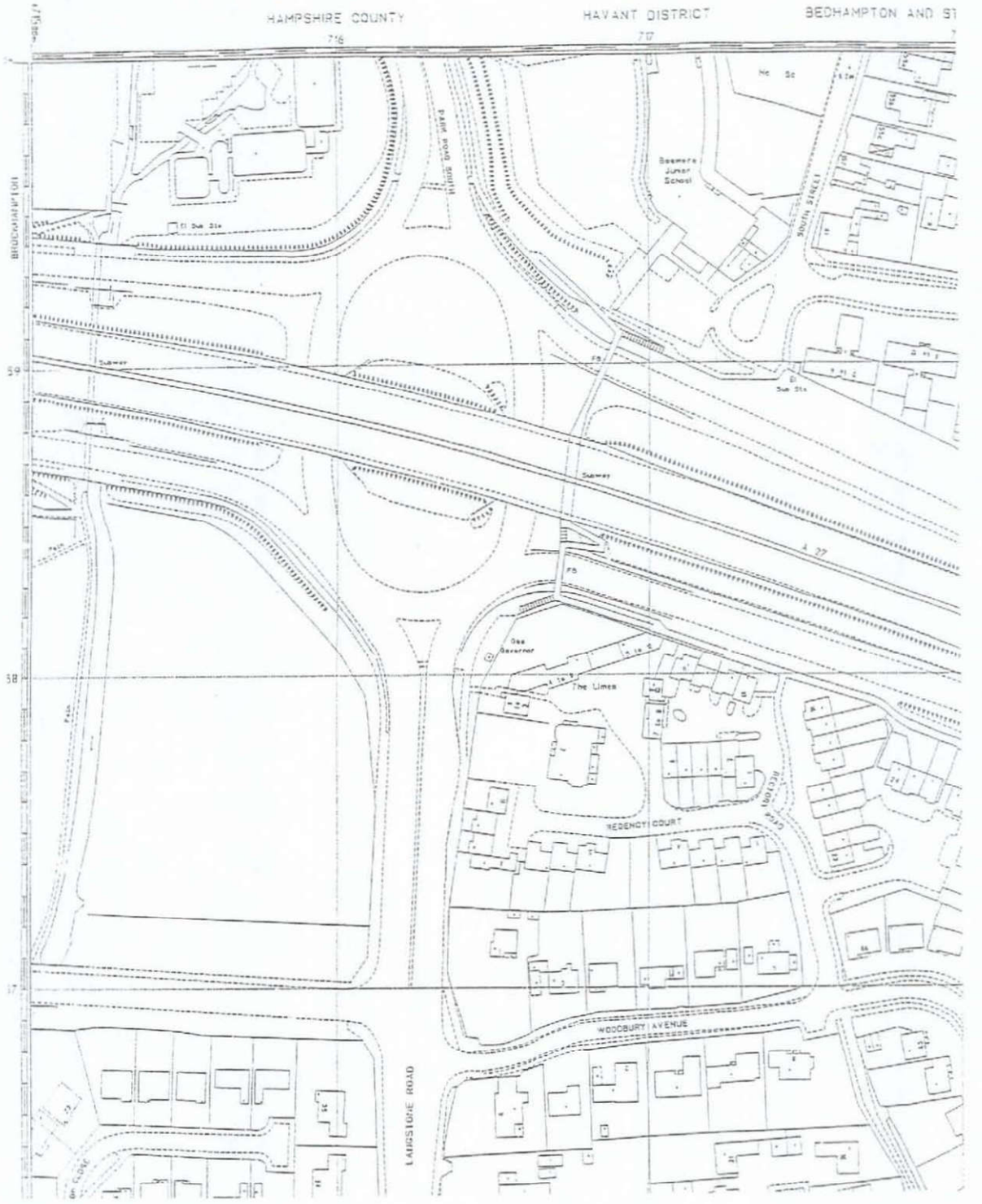
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Site: Langstone Park, Havant	Client: Glanville Consultants Ltd.
Source: OS Map Sheet SU 7105	Scale: NTS

STATS

EXTRACT FROM HISTORICAL MAP DATED 1984

Job No:	33893
Fig No:	10



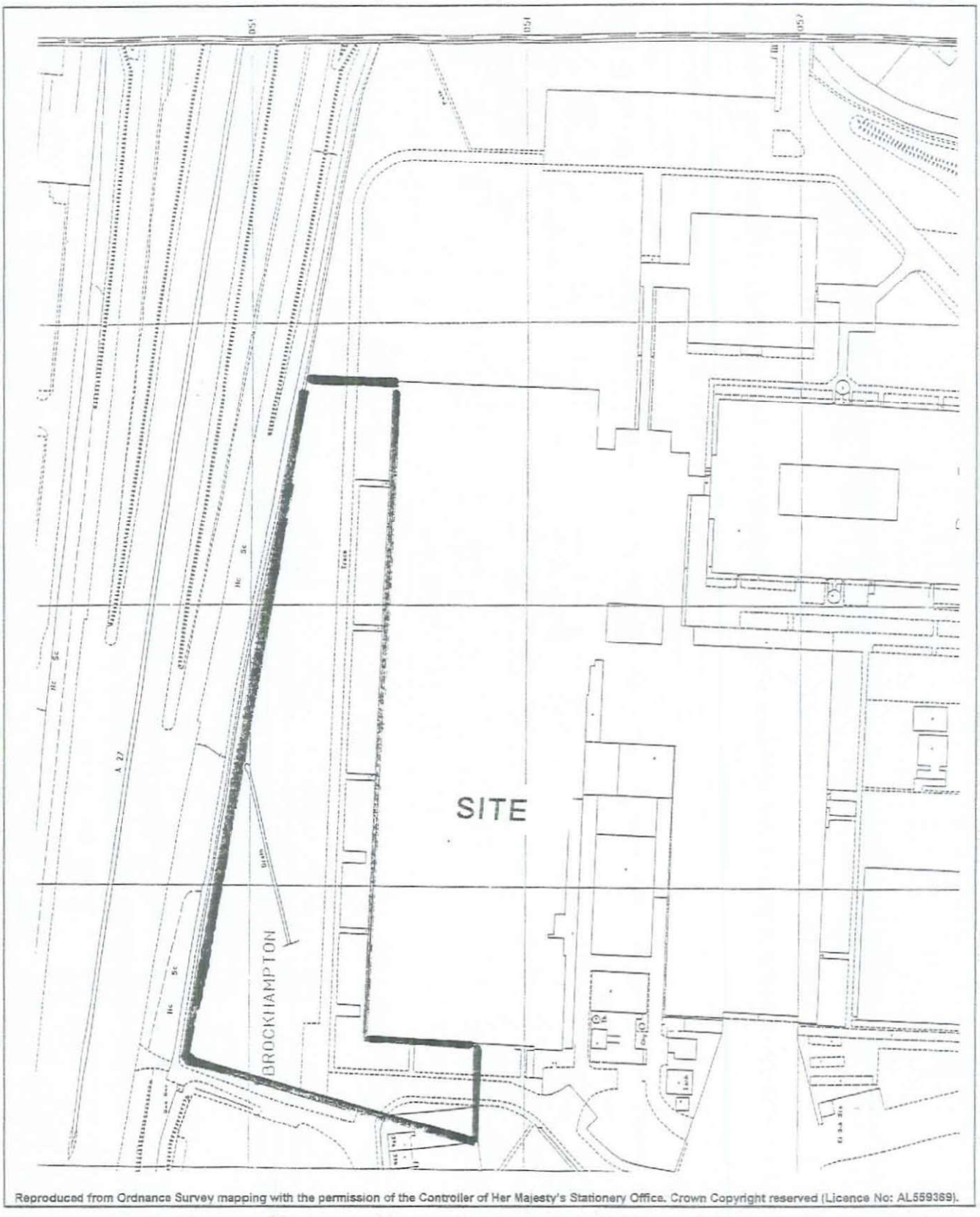
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Site:	Langstone Park, Havant	Client:	Glanville Consultants Ltd.
Source:	OS Map Sheet SU 7105 NE	Scale:	1:2000

STATS

EXTRACT FROM HISTORICAL MAP DATED 1996

Job No:	33893
Fig No:	11



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Site: Langstone Park, Havant	Client: Glanville Consultants Ltd.
Source: OS Map Sheet SU 7105 NW	Scale: 1:2000

STATS

EXTRACT FROM HISTORICAL MAP DATED 1997

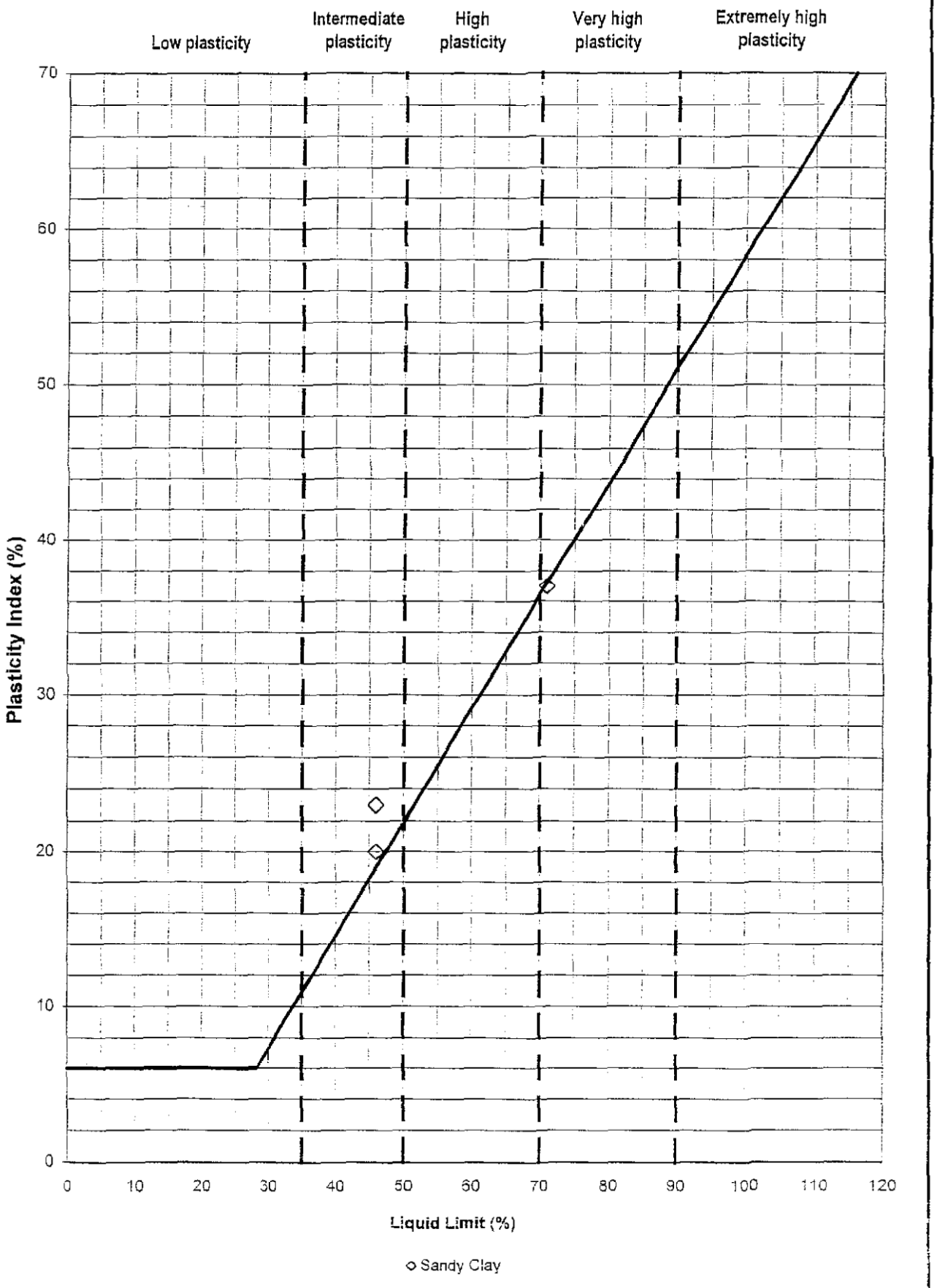
Job No:	33893
Fig No:	12

STATS

Specialist Engineering, Materials and Environmental Consultants

PLASTICITY CLASSIFICATION CHART

Site:	Client:	Job Number: 33893
Langstone Technology Park	Glanville Consultants Limited	Figure: 13



APPENDIX A

FIELDWORK RECORDS

STATS

STATS *Specialist Engineering, Materials and Environmental Consultants*

TRIAL PIT RECORD

Trial Pit Number: TP1

Site:	Location:	
Langstone Technology Park	Langstone Road, Havant	
Client:	**Ground Level:**	**Dates:** / **Job No.:**
Glanville Consultants Ltd	GL not measured	18 Sep 03 / 33893

GROUND WATER | SAMPLES/TESTS | STRATA RECORD | Sheet 1 of 1

Strike	Well	Depth (m)	Type/Depth (m)	In-situ Tests	Depth (m)	Level (mAOD)	Key	Description
			D1 0.00-0.10	0.00	0.10	0.10		MADE GROUND: Grass cover over topsoil. Frequent rootlets (mm scale).
								MADE GROUND: Dark brown clayey sand with frequent sub-angular to sub-rounded gravel sized flint fragments and occasional brick fragments to cobble size. Occasional to frequent rootlets. Rare to occasional sub-angular chalk pieces to gravel size.
			D2 0.85	PP 0.85 158	0.80	0.70		Stiff light brown sandy CLAY with frequent sub-angular gravel sized flints to pebble size.
		1	D3 1.40					
			D4 1.90					
		2	D5 2.05		2.05	1.25		Light to dark brown clay-bound sandy GRAVEL. Gravel is angular to sub-rounded flint fragments.
▼			D6 2.25					...@2.25m white communited chalk mixed with sandy Gravel.
			D7 2.70		2.70	0.65		*End of Trial Pit at 2.70 m*
		3						
		4						

Remarks and Water Observations

Pit terminated at 2.7m depth. sandy Gravel is noticeably damp.

Key for Insitu tests

HV-Hand Vane (kN/m2)
PP-Pocket Penotometer (kN/m2)
MP-Mackintosh Probe (N150)

Scale: 1:25
Logged by: NAW
Figure: A1

STATS *Specialist Engineering, Materials and Environmental Consultants*

TRIAL PIT RECORD

Trial Pit Number: TP2

Site: Langstone Technology Park

Location: Langstone Road, Havant

Client: Glanville Consultants Ltd

Ground Level: GL not measured

Dates: 18 Sep 03

Job No.: 33893

Sheet 1 of 1

GROUND WATER		SAMPLES/TESTS			STRATA RECORD			
Strike	Well	Depth (m)	Type/Depth (m)	In-situ Tests	Depth (m)	Level (mAOD)	Key	Description
			D1 0.00-0.10	0.00	0.10	0.10		MADE GROUND: Grass cover over topsoil. Frequent rootlets (mm scale).
					0.35	0.25		MADE GROUND: Dark brown clayey sand with frequent sub-angular to sub-rounded gravel sized flint fragments and occasional brick fragments to cobble size. Occasional to frequent rootlets. Rare to occasional sub-angular chalk pieces to gravel size.
				PP 0.65 200				Stiff to very stiff light brown sandy CLAY with frequent sub-angular gravel sized flints to pebble size.
		1	D2 1.10					
								...@1.4m very frequent sub-rounded to sub-angular flint nodules to cobble size.
			D3 1.75					
		2						...@2.0m communited chalk noted on flint surfaces
			D4 2.15		2.10	1.75		
			D5 2.25		2.30	0.20		Light to dark brown clay-bound sandy GRAVEL. Gravel is angular to sub-rounded flint fragments.
								End of Trial Pit at 2.30 m
		3						
		4						

Remarks and Water Observations

Pit terminated at 2.3m depth. No groundwater encountered.

Key for Insitu tests

HV-Hand Vane (kN/m2)
PP-Pocket Penetrometer (kN/m2)
MP-Mackintosh Probe (N:50)

Scale: 1:25
Logged by: NAW
Figure: A2

STATS *Specialist Engineering, Materials and Environmental Consultants*

TRIAL PIT RECORD

Trial Pit Number: TP3

Site: Langstone Technology Park

Location: Langstone Road, Havant

Client: Glanville Consultants Ltd

Ground Level: GL not measured

Dates: 18 Sep 03

Job No.: 33893

GROUND WATER | SAMPLES/TESTS | STRATA RECORD | Sheet 1 of 1

Strike	Well	Depth (m)	Type/Depth (m)	In-situ Tests	Depth (m)	Level (mAOD)	Key	Description
			D1 0.00-0.10	0.00	0.10	0.10		MADE GROUND: Grass cover over topsoil. Frequent rootlets (mm scale).
			D2 0.60	PP 0.65 225	0.65	0.55		MADE GROUND: Dark brown clayey sand with frequent sub-angular to sub-rounded gravel sized flint fragments and occasional brick fragments to cobble size. Occasional to frequent rootlets. Rare to occasional sub-angular chalk pieces to gravel size.
		1	D3 0.75					Very stiff light brown sandy CLAY with frequent sub-angular gravel sized flints to pebble size.
			D4 1.20					...@1.2m very frequent flints
			D5 1.60		1.60	0.95		Light to dark brown clay-bound sandy GRAVEL. Gravel is angular to sub-rounded flint fragments.
		2						...@1.9m communited chalk appearing on flint surfaces
					2.10	0.50		*End of Trial Pit at 2.10 m*
		3						
		4						

Remarks and Water Observations

Pit terminated at 2.1m depth. No groundwater encountered.

Key for Insitu tests

HV-Hand Vane (kN/m2)

PP-Pocket Penetrometer (kN/m2)

MP-Mackintosh Probe (N150)

Scale: 1:25

Logged by: NAW

Figure: A3

STATS *Specialist Engineering, Materials and Environmental Consultants*

TRIAL PIT RECORD

Trial Pit Number: TP4

Site: Langstone Technology Park

Location: Langstone Road, Havant

Client: Glanville Consultants Ltd

Ground Level: GL not measured

Dates: 18 Sep 03

Job No.: 33893

Sheet 1 of 1

GROUND WATER		SAMPLES/TESTS			STRATA RECORD		
Strike	Well	Depth (m)	Type/Depth (m)	In-situ Tests	Depth (m)	Level (mAOD)	Key / Description
			D1 0.00-0.10	0.00	0.10	0.10	MADE GROUND: Grass cover over topsoil. Frequent rootlets (mm scale).
			D2 0.40		0.30	0.20	MADE GROUND: Light brown sandy gravel. Gravel is sub-angular to sub-rounded flint fragments. Rare to occasional sand sized brick fragments and sub-angular chalk pieces to gravel size.
					0.65	0.35	MADE GROUND: Dark brown clayey sand with frequent sub-angular to sub-rounded gravel sized flint fragments and occasional brick fragments to cobble size. Occasional to frequent rootlets. Rare to occasional sub-angular chalk pieces to gravel size.
	1		D3 1.20	PP 1.20 213			Stiff to very stiff light brown sandy CLAY with frequent sub-angular gravel sized flints to pebble size.
			D4 1.80		1.70	1.05	Light to dark brown clay-bound sandy GRAVEL. Gravel is angular to sub-rounded flint fragments.
	2				2.00	0.30	*End of Trial Pit at 2.00 m*
	3						
	4						

Remarks and Water Observations

Pit terminated at 2m. No groundwater encountered.

Key for Insitu tests

HV-Hand Vane (kN/m2)
PP-Pocket Penotometer (kN/m2)
MP-Mackintosh Probe (N150)

Scale: 1:25

Logged by: NAW

Figure: A4

STATS *Specialist Engineering, Materials and Environmental Consultants*

TRIAL PIT RECORD

Trial Pit Number: TP5

Site:	Location:		
Langstone Technology Park	Langstone Road, Havant		
Client:	**Ground Level:**	**Dates:**	**Job No.:**
Glanville Consultants Ltd	GL not measured	18 Sep 03	33893

GROUND WATER | SAMPLES/TESTS | STRATA RECORD | Sheet 1 of 1

Strike	Well	Depth (m)	Type/Depth (m)	In-situ Tests	Depth (m)	Level (mAOD)	Key	Description
			D1 0.00-0.10		0.10	0.10		MADE GROUND: Grass cover over topsoil. Frequent rootlets (mm scale).
			D2 0.60		0.70	0.60		MADE GROUND: Light brown sandy gravel. Gravel is sub-angular to sub-rounded flint fragments. Rare to occasional sand sized brick fragments and sub-angular chalk pieces to gravel size.
		1						*End of Trial Pit at 0.70 m*
		2						
		3						
		4						

Remarks and Water Observations

Pit terminated at 0.7m depth due to presence of east-west trending 200mm diameter concrete drainage pipe. No groundwater encountered. Trial pit left open.

Key for Insitu tests

HV-Hand Vane (kN/m2)
PP-Pocket Penetrometer (kN/m2)
MP-Mackintosh Probe (N150)

Scale: 1:25
Logged by: NAW
Figure: A5

STATS *Specialist Engineering, Materials and Environmental Consultants*

TRIAL PIT RECORD

Trial Pit Number: TP6

Site: Langstone Technology Park

Location: Langstone Road, Havant

Client: Glanville Consultants Ltd

Ground Level: GL not measured

Dates: 18 Sep 03

Job No.: 33893

Sheet 1 of 1

GROUND WATER		SAMPLES/TESTS				STRATA RECORD	
Strike	Well	Depth (m)	Type/Depth (m)	In-situ Tests	Depth (m)	Level (mAOD)	Key	Description
			D1 0.00-0.10	0.00	0.10	0.10		MADE GROUND: Grass cover over topsoil. Frequent rootlets (mm scale).
			D2 0.40		0.65	0.55		MADE GROUND: Light brown sandy gravel. Gravel is sub-angular to sub-rounded flint fragments. Rare to occasional sand sized brick fragments and sub-angular chalk pieces to gravel size.
		1	D3 1.00		1.10	0.45		MADE GROUND: Dark brown clayey sand with frequent sub-angular to sub-rounded gravel sized flint fragments and occasional brick fragments to cobble size. Occasional to frequent rootlets. Rare to occasional sub-angular chalk pieces to gravel size.
			D4 1.30	PP 1.20 225	1.80	0.70		Very stiff light brown sandy CLAY with frequent sub-angular gravel sized flints to pebble size.
		2			2.10	0.30		Light to dark brown clay-bound GRAVEL. Gravel is sub-angular to sub-rounded flint fragments. Occasional to frequent sand to fine gravel sized chalk fragments.
								End of Trial Pit at 2.10 m
		3						
		4						

Remarks and Water Observations

Pit terminated at 2.1m depth. No groundwater encountered.

Key for Insitu tests

HV-Hand Vane (kN/m2)

PP-Pocket Penetrometer (kN/m2)

MP-Mackintosh Probe (N150)

Scale: 1:25

Logged by: NAW

Figure: A6

STATS *Specialist Engineering, Materials and Environmental Consultants*

TRIAL PIT RECORD

Trial Pit Number: TP7

Site: Langstone Technology Park

Location: Langstone Road, Havant

Client: Glanville Consultants Ltd

Ground Level: GL not measured

Dates: 18 Sep 03

Job No.: 33893

Sheet 1 of 1

GROUND WATER		SAMPLES/TESTS			STRATA RECORD			
Strike	Well	Depth (m)	Type/Depth (m)	In-situ Tests	Depth (m)	Level (mAOD)	Key	Description
			D1 0.00-0.25					MADE GROUND: Dense overgrowth over light to dark brown clayey sand with occasional brick and concrete pieces. Occasional whole bricks.
			D2 0.80-0.90					...@0.8m to 0.9m brick FILL
			D3 0.90-1.05		0.90	0.90		Stiff to very stiff light brown sandy CLAY with frequent sub-angular gravel sized flints to pebble size.
		1			1.10	0.20		Light to dark brown clay-bound GRAVEL. Gravel is sub-angular to sub-rounded flint fragments. Occasional sand to fine gravel sized chalk fragments.
			D4 1.50					
					1.70	0.60		*End of Trial Pit at 1.70 m*
		2						
		3						
		4						

Remarks and Water Observations

Pit terminated at 1.7m. No groundwater encountered.

Key for Insitu tests

HV-Hand Vane (kN/m2)

PP-Pocket Penetrometer (kN/m2)

MP-Mackintosh Probe (N150)

Scale: 1:25

Logged by: NAW

Figure: A7

STATS *Specialist Engineering, Materials and Environmental Consultants*

TRIAL PIT RECORD

Trial Pit Number: TP8

Site: Langstone Technology Park	**Location:** Langstone Road, Havant		
Client: Glanville Consultants Ltd	**Ground Level:** GL not measured	**Dates:** 18 Sep 03	**Job No.:** 33893

GROUND WATER | SAMPLES/TESTS | STRATA RECORD | Sheet 1 of 1

Strike	Well	Depth (m)	Type/Depth (m)	In-situ Tests	Depth (m)	Level (mAOD)	Key	Description
			D1 0.10					MADE GROUND: Dense overgrowth over light to dark brown clayey sand with occasional brick and concrete pieces. Occasional whole bricks.
			D2 0.50		0.50	0.50		Very stiff light brown sandy CLAY with frequent sub-angular gravel sized flints to pebble size.
		1	D3 1.40		1.40	0.90		Light to dark brown clay-bound GRAVEL. Gravel is sub-angular to sub-rounded flint fragments. Occasional sand to fine gravel sized chalk fragments.
			D4 1.60		1.80	0.40		...@1.6m communited chalk noted on flint surfaces
		2						*End of Trial Pit at 1.80 m*
		3						
		4						

Remarks and Water Observations

Pit terminated at 1.8m depth. No groundwater encountered.

Key for insitu tests

HV-Hand Vane (kN/m2)
PP-Pocket Penotometer (kN/m2)
MP-Mackintosh Probe (N150)

Scale: 1:25
Logged by: NAW
Figure: A8

STATS *Specialist Engineering, Materials and Environmental Consultants*

TRIAL PIT RECORD

Trial Pit Number: TP9

Site: Langstone Technology Park

Location: Langstone Road, Havant

Client: Glanville Consultants Ltd

Ground Level: GL not measured

Dates: 19 Sep 03

Job No.: 33893

Sheet 1 of 1

GROUND WATER		SAMPLES/TESTS				STRATA RECORD	
Strike	Well	Depth (m)	Type/Depth (m)	In-situ Tests	Depth (m)	Level (mAOD)	Key / Description
			D1 0.00-0.10	0.00			
			D2 0.10-0.30		0.10	0.10	MADE GROUND: Grass cover over topsoil. Frequent rootlets (mm scale).
							MADE GROUND: Dark brown clayey sand with frequent sub-angular to sub-rounded gravel sized flint fragments and occasional brick fragments to cobble size. Occasional to frequent rootlets. Rare to occasional sub-angular chalk pieces to gravel size.
			D3 0.80-0.90		0.80	0.70	Stiff light brown sandy CLAY with frequent sub-angular gravel sized flints to pebble size.
		1					
			D4 1.80	PP 1.80 25	1.75	0.95	Soft light brown grey silty CLAY with occasional to frequent lenses of brown black organic material 150mm diameter.
		2					
▼					2.25	0.50	Light grey clay-bound sandy GRAVEL. Gravel is sub-angular to sub-rounded flint fragments.
			D5 2.50				...@2.75m no longer clay-bound, light orange brown in colour
		3			3.10	0.85	*End of Trial Pit at 3.10 m*
		4					

Remarks and Water Observations

Pit terminated at 3.1m depth. Groundwater struck at 2.25m depth. Inflow slow to fair at base of pit. Some collapse of pit side walls from 2.2m. Trial pit 2.6m long, 0.7m wide. 1No soakaway test conducted in pit.

Key for insitu tests

HV-Hand Vane (kN/m2)

PP-Pocket Penetrometer (kN/m2)

MP-Mackintosh Probe (N150)

Scale: 1:25

Logged by: NAW

Figure: A9

STATS *Specialist Engineering, Materials and Environmental Consultants*

TRIAL PIT RECORD

Trial Pit Number: TP10

Site: Langstone Technology Park

Location: Langstone Road, Havant

Client: Glanville Consultants Ltd

Ground Level: GL not measured

Dates: 19 Sep 03

Job No.: 33893

GROUND WATER | SAMPLES/TESTS | STRATA RECORD | Sheet 1 of 1

Strike	Well	Depth (m)	Type/Depth (m)	In-situ Tests	Depth (m)	Level (mAOD)	Key	Description
			D1 0.00-0.10		0.10	0.10		MADE GROUND: Grass cover over topsoil. Frequent rootlets (mm scale).
			D2 0.30-0.50		0.50	0.40		MADE GROUND: Dark brown clayey sand with frequent sub-angular to sub-rounded gravel sized flint fragments and occasional brick fragments to cobble size. Occasional to frequent rootlets. Rare to occasional sub-angular chalk pieces to gravel size.
			D3 0.70					Stiff light brown sandy CLAY with frequent sub-angular gravel sized flints to pebble size.
		1						
			D4 1.90		1.80	1.30		Light grey clay-bound sandy GRAVEL. Gravel is sub-angular to sub-rounded flint fragments.
▼		2			2.40	0.60		Light orange brown sandy GRAVEL. Gravel is sub angular to rounded flint fragments, damp. ... @2.40m no longer clay-bound, light orange brown in colour
			D5 2.50		2.70	0.30		*End of Trial Pit at 2.70 m*
		3						
		4						

Remarks and Water Observations

Pit terminated at 2.7m depth . Groundwater struck at 2.4m depth. Inflow slow at base of pit. Some collapse of pit side walls from 2.4m. Trial pit 2.9m long, 0.7m wide. 1No soakaway test conducted in pit.

Key for insitu tests

HV-Hand Vane (kN/m2)

PP-Pocket Penetometer (kN/m2)

MP-Mackintosh Probe (N150)

Scale: 1:25

Logged by: NAW

Figure: A10

STATS *Specialist Engineering, Materials and Environmental Consultants*

TRIAL PIT RECORD

Trial Pit Number: TP11

Site: Langstone Technology Park

Location: Langstone Road, Havant

Client: Glanville Consultants Ltd

Ground Level: GL not measured

Dates: 19 Sep 03

Job No.: 33893

Sheet 1 of 1

GROUND WATER		SAMPLES/TESTS			STRATA RECORD		
Strike	Well	Depth (m)	Type/Depth (m)	In-situ Tests	Depth (m)	Level (mAOD)	Key	Description
			D1 0.00-0.10		0.10	0.10		MADE GROUND: Grass cover over topsoil. Frequent rootlets (mm scale).
			D2 0.30-0.35					MADE GROUND: Dark brown clayey sand with frequent sub-angular to sub-rounded gravel sized flint fragments and occasional brick fragments to cobble size. Occasional to frequent rootlets. Rare to occasional sub-angular chalk pieces to gravel size.
		1	D3 0.90-1.00		0.90	0.80		Medium dense (estimated) clayey SAND with occasional to frequent flints to cobble size.
			D4 1.80		1.60	0.70		Dark brown clay-bound sandy GRAVEL. Gravel is sub-angular to sub-rounded flints, occasionally to cobble size. ...@1.8m becoming light brown due to presence of sand to fine gravel sized chalk pieces.
		2	D5 2.20		2.35	0.75		*End of Trial Pit at 2.35 m*
		3						
		4						

Remarks and Water Observations

Pit terminated at 2.35m depth. No groundwater encountered.

Key for insitu tests

HV-Hand Vane (kN/m2)
PP-Pocket Penetrometer (kN/m2)
MP-Mackintosh Probe (N150)

Scale: 1:25

Logged by: NAW

Figure: A11

STATS *Specialist Engineering, Materials and Environmental Consultants*

TRIAL PIT RECORD

Trial Pit Number: TP12

Site:	Location:	
Langstone Technology Park	Langstone Road, Havant	
Client:	**Ground Level:**	**Dates:** / **Job No.:**
Glanville Consultants Ltd	GL not measured	19 Sep 03 / 33893

GROUND WATER | SAMPLES/TESTS | STRATA RECORD | Sheet 1 of 1

Strike	Well	Depth (m)	Type/Depth (m)	In-situ Tests	Depth (m)	Level (mAOD)	Key	Description
			D1 0.00-0.10		0.10	0.10		MADE GROUND: Grass cover over topsoil. Frequent rootlets (mm scale).
			D2 0.30-0.35					MADE GROUND: Dark brown clayey sand with frequent sub-angular to sub-rounded gravel sized flint fragments and occasional brick fragments to cobble size. Occasional to frequent rootlets. Rare to occasional sub-angular chalk pieces to gravel size.
		1						
		2			2.30	2.20		Light to dark brown clay-bound GRAVEL. Gravel is sub-angular to sub-rounded flint fragments. Occasional sand to fine gravel sized chalk fragments.
			D3 2.40					... @2.8m becoming light brown white in colour due to increased presence of chalk pieces
			D4 2.90					
		3			3.00	0.70		*End of Trial Pit at 3.00 m*
		4						

Remarks and Water Observations

Pit terminated at 3m depth. No groundwater encountered.

Key for Insitu tests

HV-Hand Vane (kN/m2)
PP-Pocket Penetrometer (kN/m2)
MP-Mackintosh Probe (N150)

Scale: 1:25
Logged by: NAW
Figure: A12

STATS *Specialist Engineering, Materials and Environmental Consultants*

TRIAL PIT RECORD

Trial Pit Number: TP13

Site: Langstone Technology Park	**Location:** Langstone Road, Havant	
Client: Glanville Consultants Ltd	**Ground Level:** GL not measured	**Dates:** 19 Sep 03
		Job No.: 33893

GROUND WATER | SAMPLES/TESTS | STRATA RECORD | Sheet 1 of 1

Strike	Well	Depth (m)	Type/Depth (m)	In-situ Tests	Depth (m)	Level (mAOD)	Key	Description
			D1 0.00-0.10		0.10	0.10		MADE GROUND: Grass cover over topsoil. Frequent rootlets (mm scale).
			D2 0.50-0.75					MADE GROUND: Brick fill mixed with dark brown clayey sand with frequent gravel sized concrete pieces. Frequent whole bricks and occasional metal work.
		1						
		2						
					2.90	2.90		*End of Trial Pit at 2.90 m*
		3						
		4						

Remarks and Water Observations

Pit terminated at 2.9m depth. No groundwater encountered. Sub-surface wall encountered down to 2.9m. base of wall not determined.

Key for Insitu tests

HV-Hand Vane (kN/m2)
PP-Pocket Penetrometer (kN/m2)
MP-Mackintosh Probe (N150)

Scale: 1:25
Logged by: NAW
Figure: A16

STATS *Specialist Engineering, Materials and Environmental Consultants*

IN-SITU DCP TEST

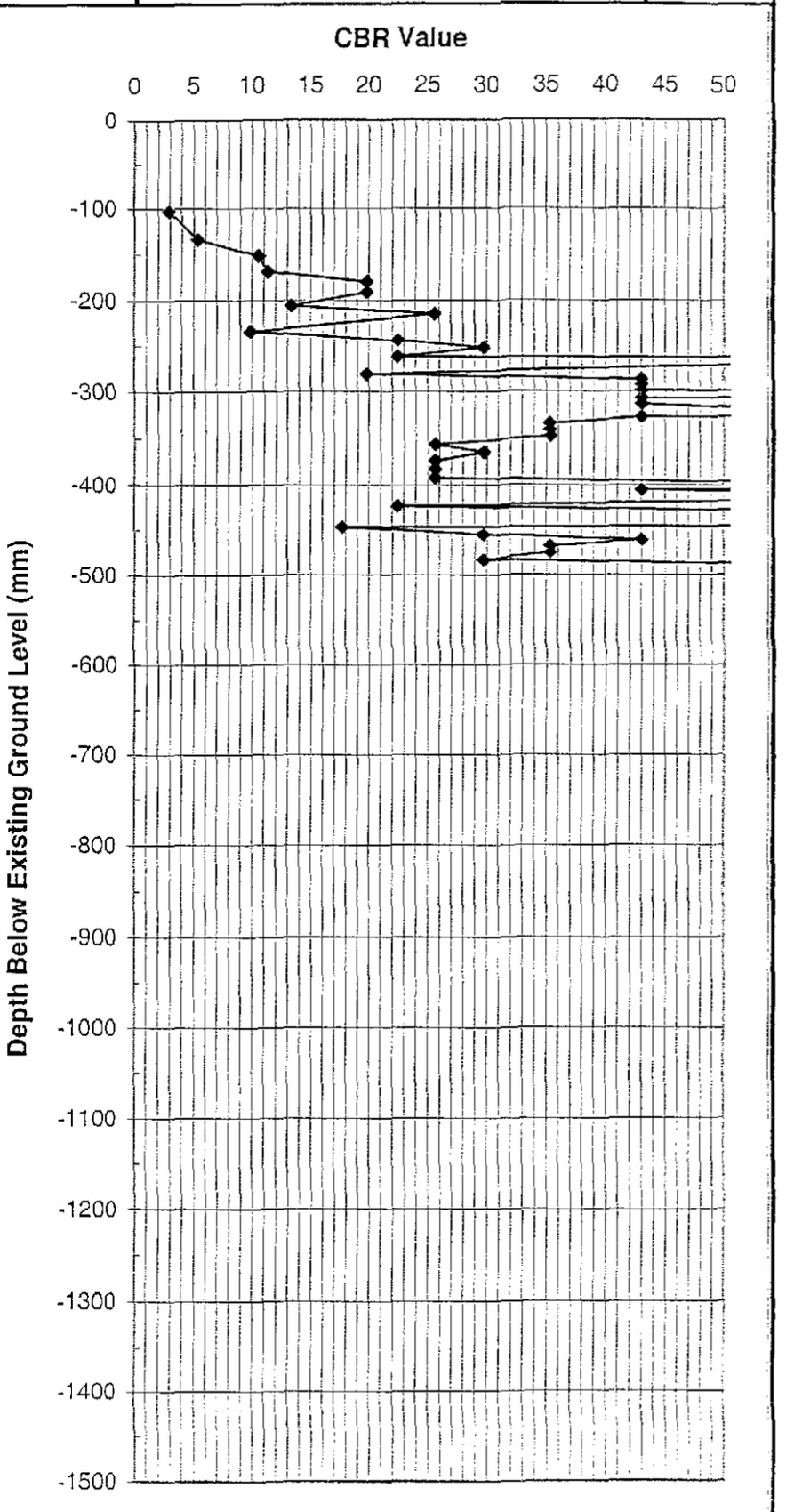
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Site: Langstone Techology Park, Langstone Road, Havant

Client: Glanville Consultants

Depth (mm): -54

Reading (mm)	Depth (mm)	Number of Blows (mm)	Penetration (mm)	CBR Value
54	-54	0		
103	-103	1	49	3
134	-134	2	31	5
152	-152	3	18	11
169	-169	4	17	11
180	-180	5	11	20
191	-191	6	11	20
206	-206	7	15	13
215	-215	8	9	26
234	-234	9	19	10
244	-244	10	10	22
252	-252	11	8	30
262	-262	12	10	22
265	-265	13	3	104
270	-270	14	5	54
281	-281	15	11	20
287	-287	16	6	43
293	-293	17	6	43
299	-299	18	6	43
302	-302	19	3	104
308	-308	20	6	43
314	-314	21	6	43
319	-319	22	5	54
321	-321	23	2	175
327	-327	24	6	43
334	-334	25	7	35
341	-341	26	7	35
348	-348	27	7	35
357	-357	28	9	26
365	-365	29	8	30
374	-374	30	9	26
383	-383	31	9	26
392	-392	32	9	26
397	-397	33	5	54
400	-400	34	3	104
406	-406	35	6	43
410	-410	36	4	72
410	-410	37	0	426
414	-414	38	4	72
424	-424	39	10	22
429	-429	40	5	54
434	-434	41	5	54
435	-435	42	1	426
447	-447	43	12	18
455	-455	44	8	30
461	-461	45	6	43
468	-468	46	7	35
475	-475	47	7	35
483	-483	48	8	30
488	-488	49	5	54
492	-492	50	4	72
495	-495	51	3	104
499	-499	52	4	72



Comments: Test complete to 500mm depth.

Job Number: 33893

Figure: A14

STATS *Specialist Engineering, Materials and Environmental Consultants*

IN-SITU DCP TEST

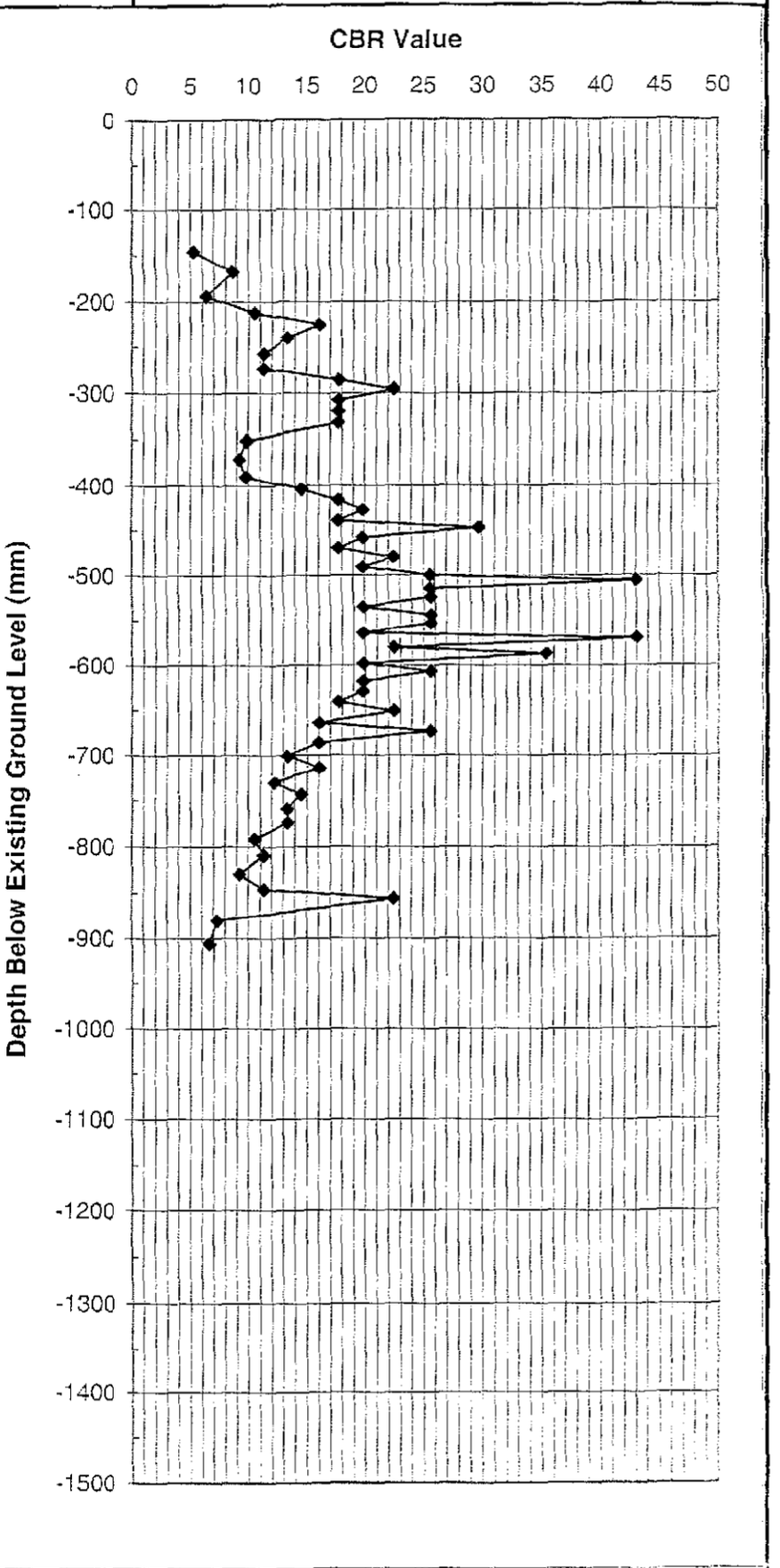
3

Site: Langstone Techology Park, Langstone Road, Havant

Client: Glanville Consultants

Depth (mm): -115

Reading (mm)	Depth (mm)	Number of Blows (mm)	Penetration (mm)	CBR Value
115	-115	0		
146	-146	1	31	5
167	-167	2	21	9
194	-194	3	27	6
212	-212	4	18	11
225	-225	5	13	16
240	-240	6	15	13
257	-257	7	17	11
274	-274	8	17	11
286	-286	9	12	18
296	-296	10	10	22
308	-308	11	12	18
320	-320	12	12	18
332	-332	13	12	18
351	-351	14	19	10
371	-371	15	20	9
390	-390	16	19	10
404	-404	17	14	15
416	-416	18	12	18
427	-427	19	11	20
439	-439	20	12	18
447	-447	21	8	30
458	-458	22	11	20
470	-470	23	12	18
480	-480	24	10	22
491	-491	25	11	20
500	-500	26	9	26
506	-506	27	6	43
515	-515	28	9	26
524	-524	29	9	26
535	-535	30	11	20
544	-544	31	9	26
553	-553	32	9	26
564	-564	33	11	20
570	-570	34	6	43
580	-580	35	10	22
587	-587	36	7	35
598	-598	37	11	20
607	-607	38	9	26
618	-618	39	11	20
629	-629	40	11	20
641	-641	41	12	18
651	-651	42	10	22
664	-664	43	13	16
673	-673	44	9	26
686	-686	45	13	16
701	-701	46	15	13
714	-714	47	13	16
730	-730	48	16	12
744	-744	49	14	15
759	-759	50	15	13
774	-774	51	15	13
792	-792	52	18	11
809	-809	53	17	11
829	-829	54	20	9
846	-846	55	17	11
856	-856	56	10	22
880	-880	57	24	7
906	-906	58	26	7



Comments: Test complete to 906mm depth.

Job Number: 33893

Figure: A16

STATS *Specialist Engineering, Materials and Environmental Consultants*

IN-SITU DCP TEST

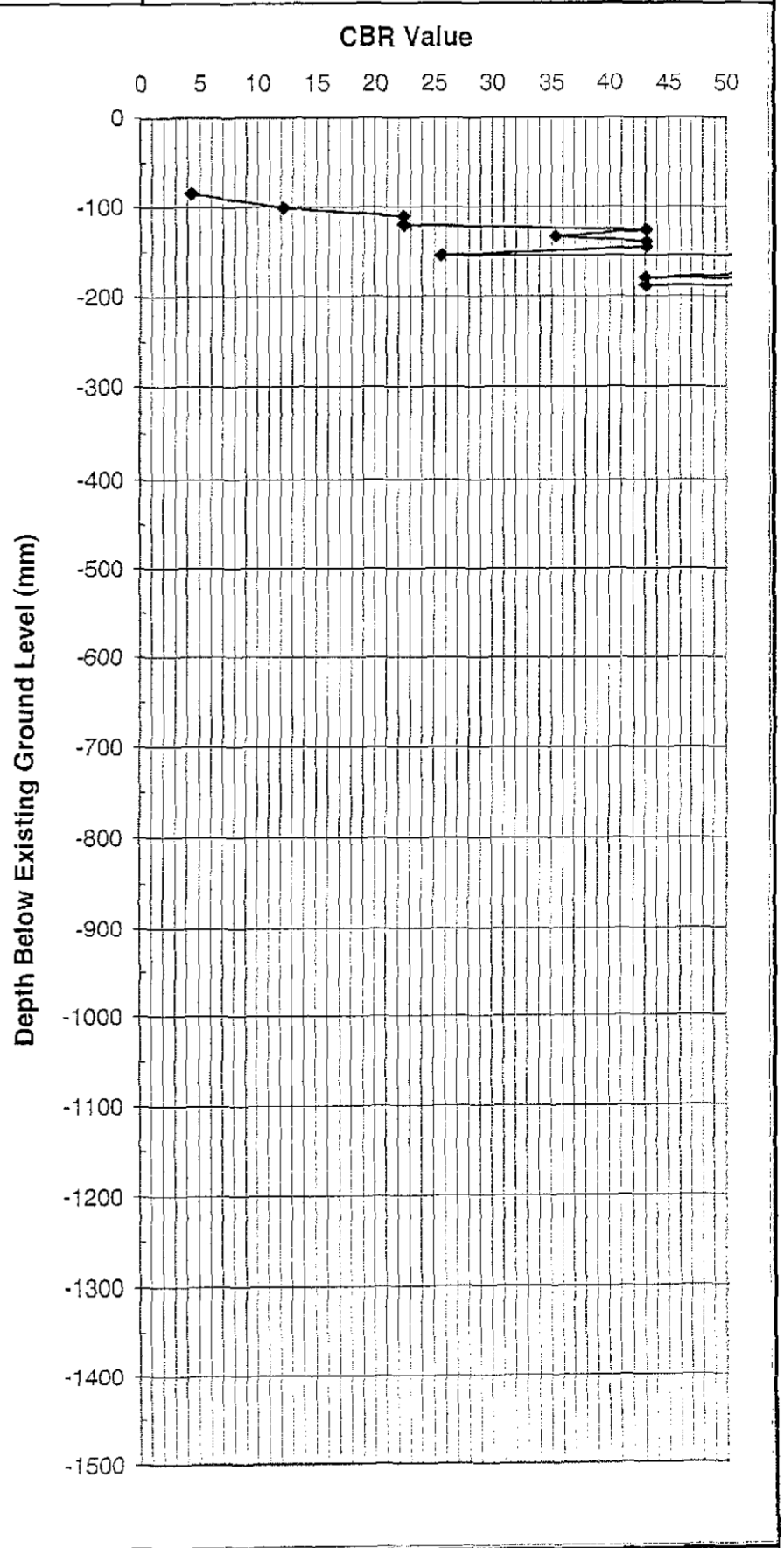
4

Site: Langstone Techology Park, Langstone Road, Havant

Client: Glanville Consultants

Depth (mm): -49

Reading (mm)	Depth (mm)	Number of Blows (mm)	Penetration (mm)	CBR Value
49	-49	0		
85	-85	1	36	4
101	-101	2	16	12
111	-111	3	10	22
121	-121	4	10	22
127	-127	5	6	43
134	-134	6	7	35
140	-140	7	6	43
146	-146	8	6	43
155	-155	9	9	26
157	-157	10	2	175
161	-161	11	4	72
165	-165	12	4	72
169	-169	13	4	72
174	-174	14	5	54
180	-180	15	6	43
181	-181	16	1	426
182	-182	17	1	425
188	-188	18	6	43
191	-191	19	3	104
195	-195	20	4	72
196	-196	21	1	426
200	-200	22	4	72
201	-201	23	1	426
204	-204	24	3	104
206	-206	25	2	175
209	-209	26	3	104
210	-210	27	1	426
211	-211	28	1	426
212	-212	29	1	426
213	-213	30	1	426



Comments: Test refusal at 213mm depth due to flint fragments.

Job Number: 33893

Figure: A17

STATS *Specialist Engineering, Materials and Environmental Consultants*

IN-SITU DCP TEST

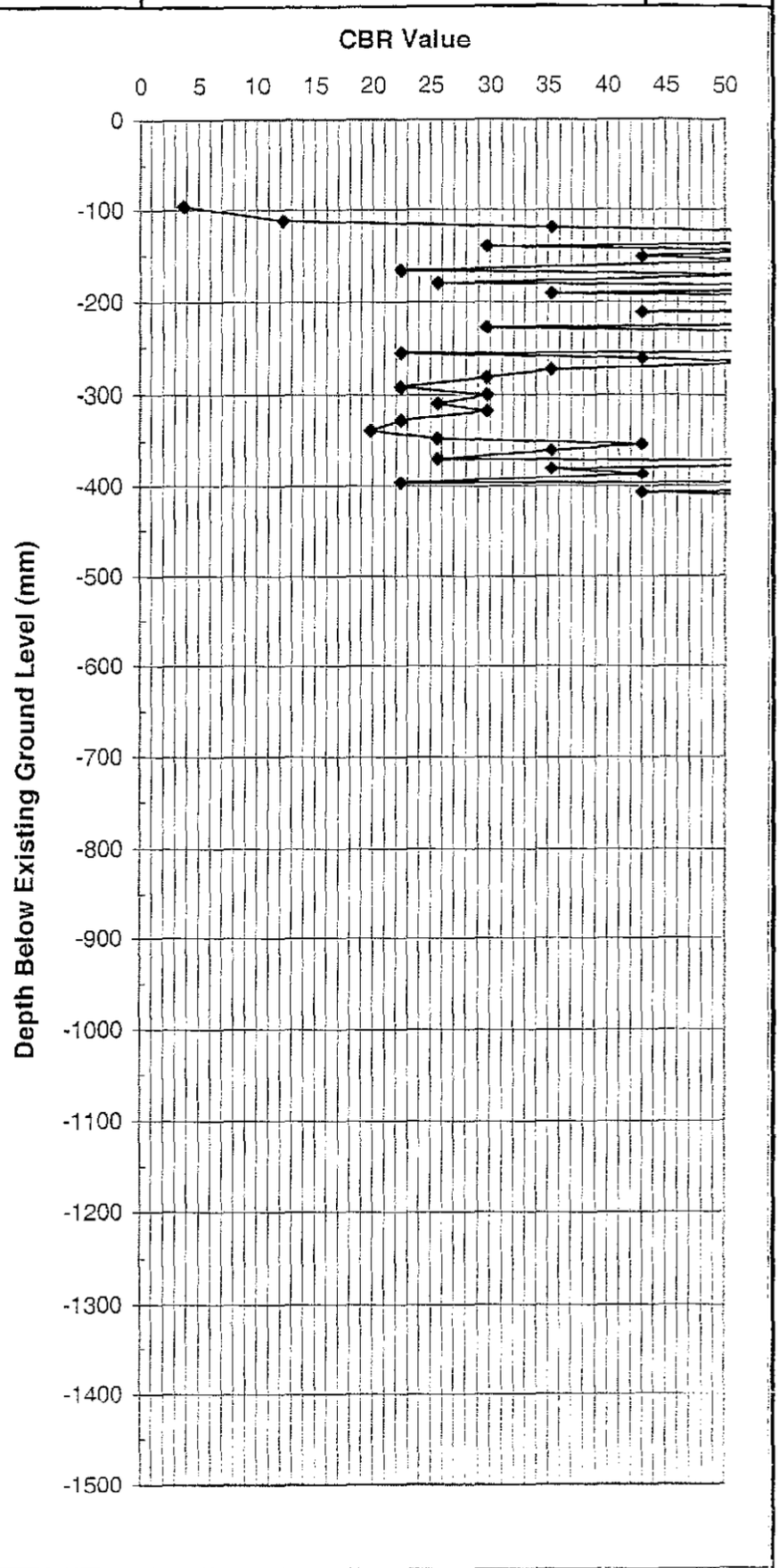
5

Site: Langstone Techology Park, Langstone Road, Havant

Client: Glanville Consultants

Depth (mm): -55

Reading (mm)	Depth (mm)	Number of Blows (mm)	Penetration (mm)	CBR Value
55	-55	0		
96	-96	1	41	4
112	-112	2	16	12
119	-119	3	7	35
124	-124	4	5	54
129	-129	5	5	54
132	-132	6	3	104
140	-140	7	8	30
145	-145	8	5	54
151	-151	9	6	43
156	-156	10	5	54
166	-166	11	10	22
171	-171	12	5	54
180	-180	13	9	26
184	-184	14	4	72
191	-191	15	7	35
195	-195	16	4	72
198	-198	17	3	104
201	-201	18	3	104
202	-202	19	1	426
205	-205	20	3	104
211	-211	21	6	43
214	-214	22	3	104
217	-217	23	3	104
220	-220	24	3	104
228	-228	25	8	30
233	-233	26	5	54
237	-237	27	4	72
242	-242	28	5	54
245	-245	29	3	104
246	-246	30	1	426
256	-256	31	10	22
262	-262	32	6	43
267	-267	33	5	54
274	-274	34	7	35
282	-282	35	8	30
292	-292	36	10	22
300	-300	37	8	30
309	-309	38	9	26
317	-317	39	8	30
327	-327	40	10	22
338	-338	41	11	20
347	-347	42	9	26
353	-353	43	6	43
360	-360	44	7	35
369	-369	45	9	26
373	-373	46	4	72
380	-380	47	7	35
386	-386	48	6	43
396	-396	49	10	22
398	-398	50	2	175
401	-401	51	3	104
407	-407	52	6	43
412	-412	53	5	54
417	-417	54	5	54
422	-422	55	5	54
425	-425	56	3	104
430	-430	57	5	54
435	-435	58	5	54
439	-439	59	4	72



Comments: Test complete to 532mm depth.

Job Number: 33893

Figure: A18

STATS *Specialist Engineering, Materials and Environmental Consultants*

IN-SITU DCP TEST

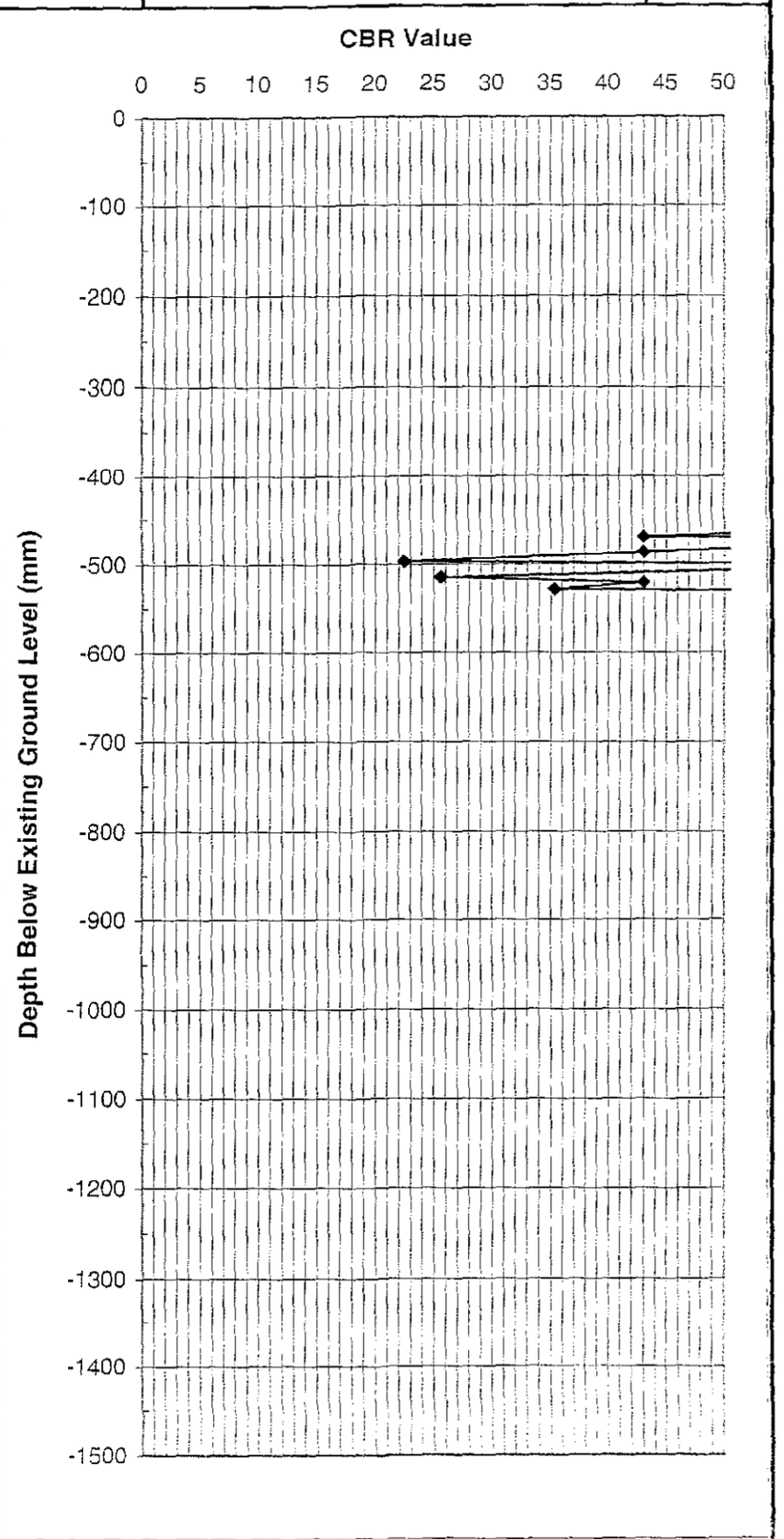
5 Ctnd

Site: Langstone Techology Park, Langstone Road, Havant

Client: Glanville Consultants

Depth (mm): -442

Reading (mm)	Depth (mm)	Number of Blows (mm)	Penetration (mm)	CBR Value
442	-442	60	3	104.4
444	-444	61	2	175
449	-449	62	5	54
454	-454	63	5	54
459	-459	64	5	54
464	-464	65	5	54
470	-470	66	6	43
472	-472	67	2	175
476	-476	68	4	72
481	-481	69	5	54
487	-487	70	6	43
497	-497	71	10	22
501	-501	72	4	72
506	-506	73	5	54
515	-515	74	9	26
521	-521	75	6	43
528	-528	76	7	35
532	-532	77	4	72



Comments:

Job Number: 33893

Figure: A18

STATS *Specialist Engineering, Materials and Environmental Consultants*

IN-SITU DCP TEST

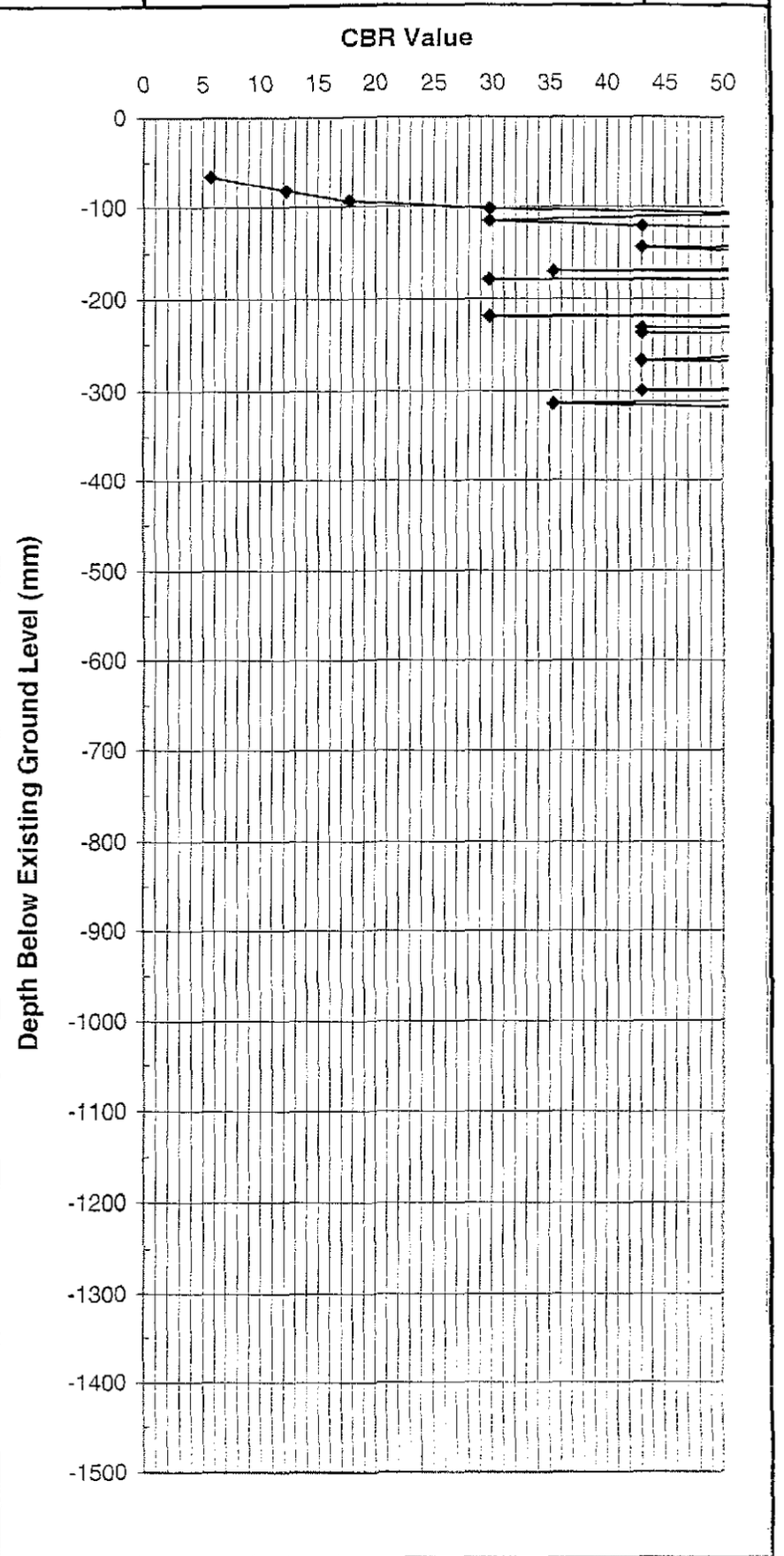
6

Site: Langstone Techology Park, Langstone Road, Havant

Client: Glanville Consultants

Depth (mm): -37

Reading (mm)	Depth (mm)	Number of Blows (mm)	Penetration (mm)	CBR Value
37	-37	0		
66	-66	1	29	6
82	-82	2	16	12
94	-94	3	12	18
102	-102	4	8	30
107	-107	5	5	54
115	-115	6	8	30
121	-121	7	6	43
125	-125	8	4	72
130	-130	9	5	54
135	-135	10	5	54
138	-138	11	3	104
144	-144	12	6	43
149	-149	13	5	54
151	-151	14	2	175
156	-156	15	5	54
160	-160	16	4	72
163	-163	17	3	104
170	-170	18	7	35
171	-171	19	1	426
171	-171	20	0	426
179	-179	21	8	30
181	-181	22	2	175
186	-186	23	5	54
188	-188	24	2	175
192	-192	25	4	72
195	-195	26	3	104
198	-198	27	3	104
202	-202	28	4	72
205	-205	29	3	104
209	-209	30	4	72
211	-211	31	2	175
219	-219	32	8	30
220	-220	33	1	426
222	-222	34	2	175
225	-225	35	3	104
231	-231	36	6	43
231	-231	37	0	426
232	-232	38	1	426
238	-238	39	6	43
240	-240	40	2	175
244	-244	41	4	72
247	-247	42	3	104
252	-252	43	5	54
257	-257	44	5	54
262	-262	45	5	54
268	-268	46	6	43
271	-271	47	3	104
275	-275	48	4	72
280	-280	49	5	54
285	-285	50	5	54
290	-290	51	5	54
294	-294	52	4	72
300	-300	53	6	43
303	-303	54	3	104
307	-307	55	4	72
314	-314	56	7	35
319	-319	57	5	54
323	-323	58	4	72
327	-327	59	4	72



Comments: Test refusal at 331mm depth due to flint fragments.

Job Number: 33893

Figure: A19

STATS *Specialist Engineering, Materials and Environmental Consultants*

IN-SITU DCP TEST

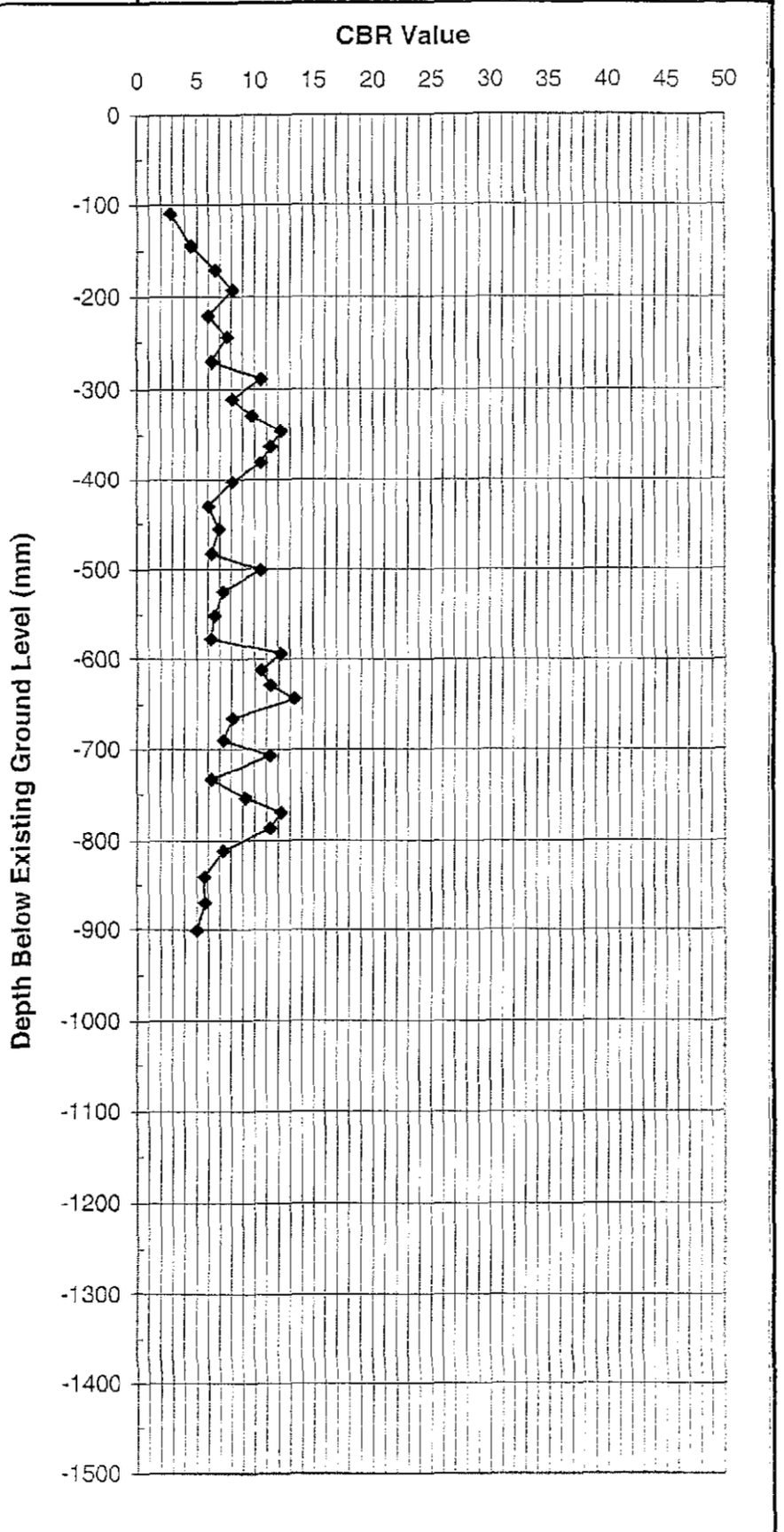
7

Site: Langstone Techology Park, Langstone Road, Havant

Client: Glanville Consultants

Depth (mm): -59

Reading (mm)	Depth (mm)	Number of Blows (mm)	Penetration (mm)	CBR Value
59	-59	0		
110	-110	1	51	3
145	-145	2	35	5
171	-171	3	26	7
193	-193	4	22	8
221	-221	5	28	6
244	-244	6	23	8
271	-271	7	27	6
289	-289	8	18	11
311	-311	9	22	8
330	-330	10	19	10
346	-346	11	16	12
363	-363	12	17	11
381	-381	13	18	11
403	-403	14	22	8
431	-431	15	28	6
456	-456	16	25	7
483	-483	17	27	6
501	-501	18	18	11
525	-525	19	24	7
551	-551	20	26	7
578	-578	21	27	6
594	-594	22	16	12
612	-612	23	18	11
629	-629	24	17	11
644	-644	25	15	13
666	-666	26	22	8
690	-690	27	24	7
707	-707	28	17	11
734	-734	29	27	6
754	-754	30	20	9
770	-770	31	16	12
787	-787	32	17	11
811	-811	33	24	7
840	-840	34	29	6
869	-869	35	29	6
901	-901	36	32	5



Comments: Test complete to 901mm depth.

Job Number: 33893

Figure: A20

STATS *Specialist Engineering, Materials and Environmental Consultants*

IN-SITU DCP TEST

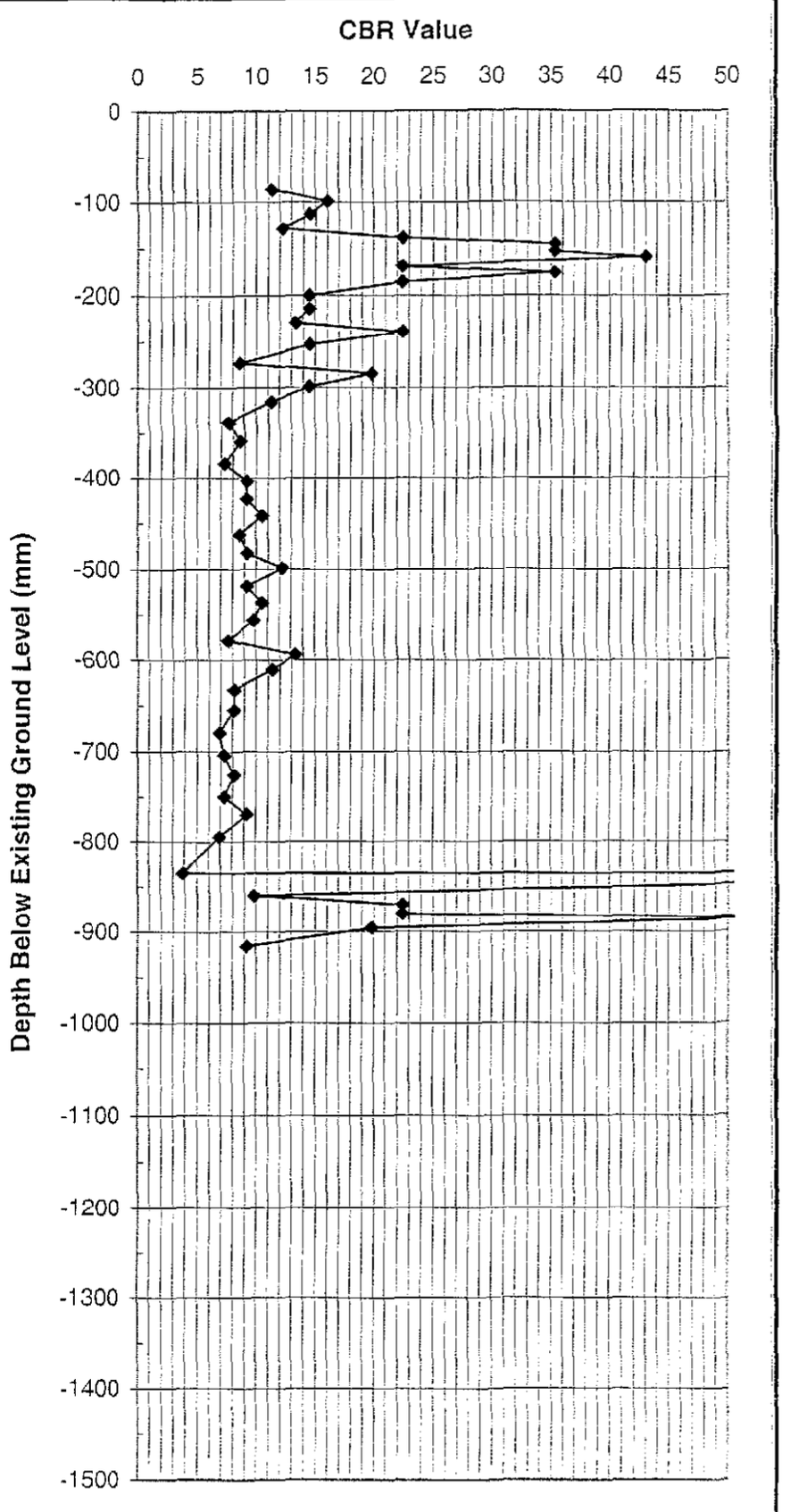
8

Site: Langstone Techology Park, Langstone Road, Havant

Client: Glanville Consultants

Depth (mm): -69

Reading (mm)	Depth (mm)	Number of Blows (mm)	Penetration (mm)	CBR Value
89	-69	0		
106	-86	1	17	11
119	-99	2	13	16
133	-113	3	14	15
149	-129	4	16	12
159	-139	5	10	22
166	-146	6	7	35
173	-153	7	7	35
179	-159	8	6	43
189	-169	9	10	22
196	-176	10	7	35
206	-186	11	10	22
220	-200	12	14	15
234	-214	13	14	15
249	-229	14	15	13
259	-239	15	10	22
273	-253	16	14	15
294	-274	17	21	9
305	-285	18	11	20
319	-299	19	14	15
336	-316	20	17	11
359	-339	21	23	8
380	-360	22	21	9
404	-384	23	24	7
424	-404	24	20	9
444	-424	25	20	9
462	-442	26	18	11
483	-463	27	21	9
503	-483	28	20	9
519	-499	29	16	12
539	-519	30	20	9
557	-537	31	18	11
576	-556	32	19	10
599	-579	33	23	8
614	-594	34	15	13
631	-611	35	17	11
653	-633	36	22	8
675	-655	37	22	8
700	-680	38	25	7
724	-704	39	24	7
746	-726	40	22	8
770	-750	41	24	7
790	-770	42	20	9
815	-795	43	25	7
855	-835	44	40	4
857	-837	45	2	175
861	-841	46	4	72
880	-860	47	19	10
890	-870	48	10	22
900	-880	49	10	22
905	-885	50	5	54
916	-896	51	11	20
936	-916	52	20	9



Comments: Test complete to 936mm depth .

Job Number: 33893

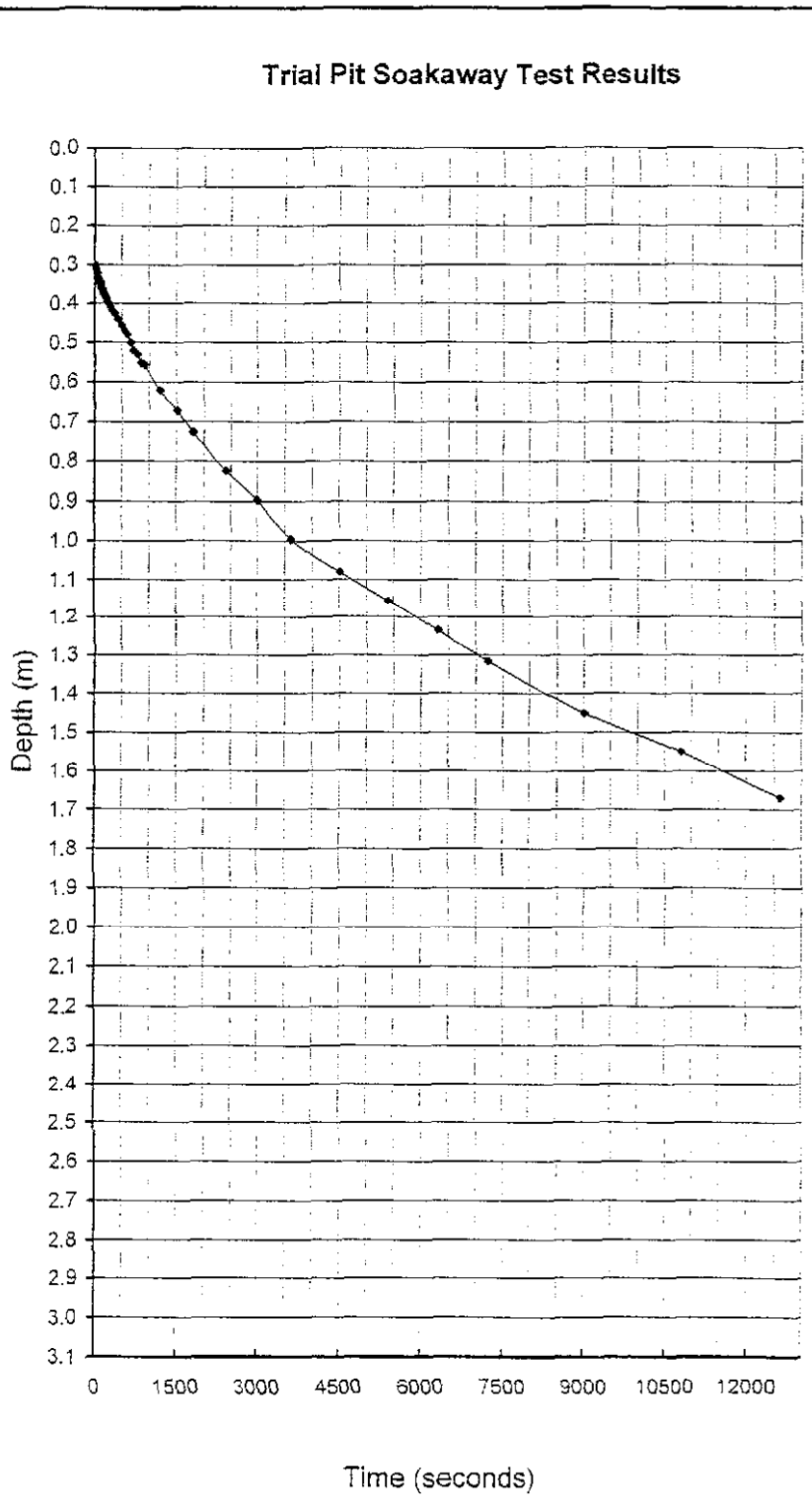
Figure: A21

STATS

Trial Pit Soakaway Test

Location	Langstone Technology Park, Havant	Test No	TP9, Test 1
Client	Havant International Limited	Length of Trial Pit (m)	2.6
Job Number	33893/01	Width of Trial Pit (m)	0.7
Date	19-Sep-03	Water level at start (mbgl)	0.3
Operator	Neil Whittlev	Depth to Base of Trial Pit (m)	3.1

Time (Secs)	Water level (mbgl)
15	0.300
30	0.310
45	0.320
60	0.330
75	0.335
90	0.345
105	0.350
120	0.360
135	0.365
150	0.370
165	0.375
180	0.380
195	0.385
210	0.390
225	0.395
240	0.400
255	0.400
270	0.405
285	0.410
300	0.415
360	0.425
420	0.440
480	0.455
540	0.470
600	0.480
660	0.500
720	0.520
780	0.530
840	0.550
900	0.555
1200	0.620
1500	0.670
1800	0.725
2400	0.825
3000	0.895
3600	0.995
4500	1.080
5400	1.155
6300	1.235
7200	1.315
9000	1.450
10800	1.550
12600	1.670



Results

Vp (m3)	2.49
ap Gravel (m2)	7.43
tp (s)	12600.00
Infiltration Rate (m/s)	2.66E-05

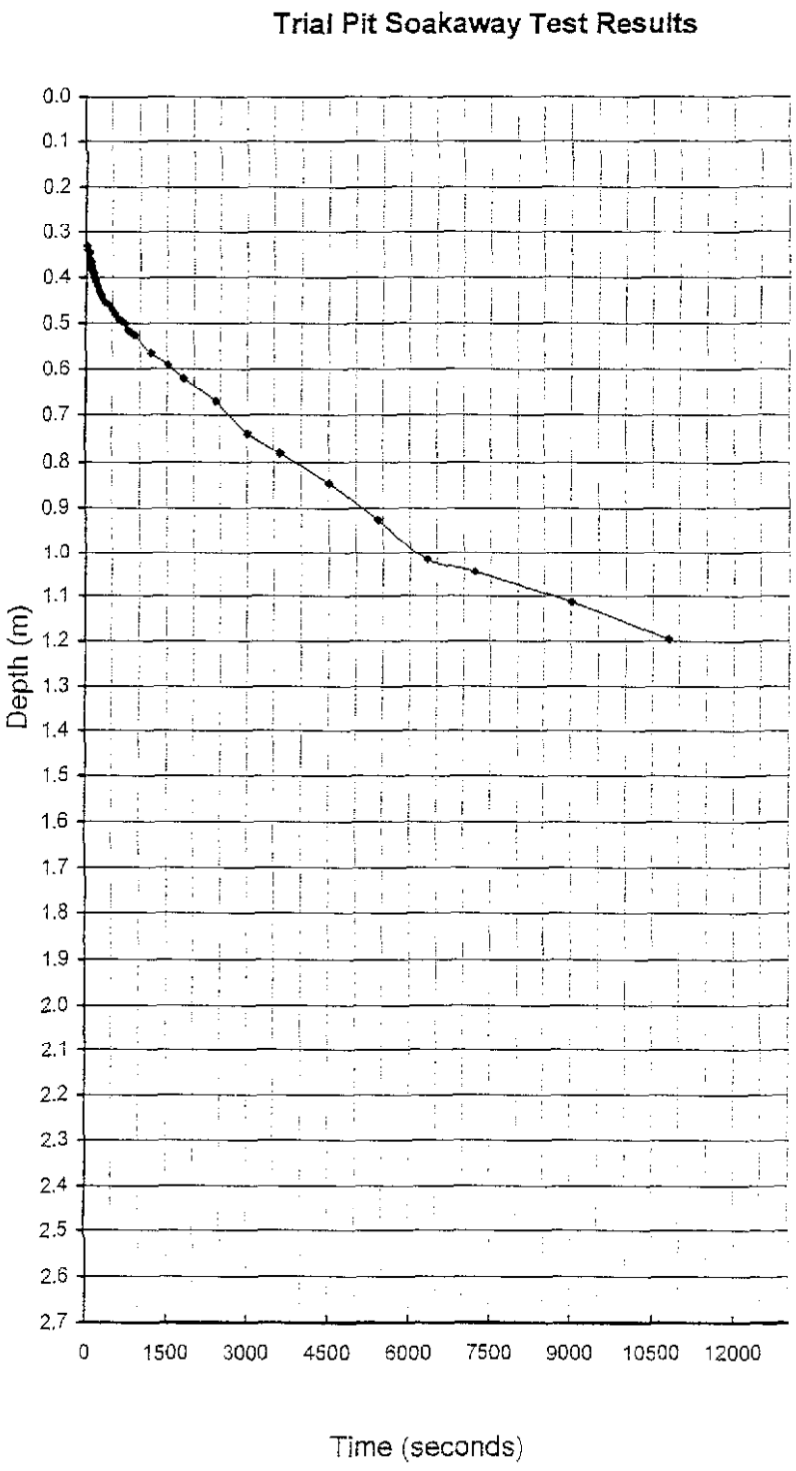
Value to be determined from graph

STATS

Trial Pit Soakaway Test

Location	Langstone Technology Park, Havant	Test No	TP10, Test1
Client	Havant International Limited	Length of Trial Pit (m)	2.9
Job Number	33893/01	Width of Trial Pit (m)	0.75
Date	19-Sep-03	Water level at start (mbgl)	0.33
Operator	Neil Whittley	Depth to Base of Trial Pit (m)	2.7

Time (Secs)	Water level (mbgl)
15	0.330
30	0.340
45	0.345
60	0.360
75	0.365
90	0.375
105	0.385
120	0.390
135	0.390
150	0.400
165	0.405
180	0.410
195	0.415
210	0.420
225	0.425
240	0.430
255	0.435
270	0.435
285	0.440
300	0.445
360	0.455
420	0.460
480	0.470
540	0.480
600	0.490
660	0.495
720	0.500
780	0.515
840	0.520
900	0.525
1200	0.565
1500	0.590
1800	0.620
2400	0.670
3000	0.740
3600	0.780
4500	0.845
5400	0.925
6300	1.015
7200	1.045
9000	1.113
10800	1.195



Results

Vp (m3)	1.88
ap Gravel (m2)	8.75
tp (s)	10800.00
Infiltration Rate (m/s)	1.99E-05

Value to be determined from graph

APPENDIX B

GEOTECHNICAL LABORATORY TEST RECORDS

STATS

UKAS TESTING 0278

STATS Laboratories
Tel: +44 (0) 1727 833261
Fax: +44 (0) 1727 835682
Email: info@stats.co.uk
Website: www.stats.co.uk

Porterswood House
Porters Wood
St Albans
Herts AL3 6PQ
United Kingdom

CERTIFICATE OF TEST

MOISTURE CONTENT AND PLASTICITY INDEX OF SOIL

Your Ref: NAW/33893
Certificate: 82995/13398
Sheet 1 of 1
Site : **Langstone Technology Park**
Client : Glanville Consultants Limited
Corinthian Court
80 Milton Park
Abingdon
Oxon
OX14 4RY

Sampled by STATS Ltd
Date of:-
Receipt : 24/9/03
Test: 25-26/9/03
Tested by: DBG/MGC

METHOD

Moisture content was determined in accordance with BS 1377: Part 2:1990 Clause 3.2.
Plasticity Index was determined in accordance with BS 1377:Part 2:1990 Clause 4.2,4.4,5.2,5.3 & 5.4.

RESULTS

Batch No.	BH/TP No.	Depth (m)	Moisture Content %	Plasticity Index			% Retained 425Micron
				LL (%)	PL(%)	PI	
2059	TP4	1.20	12				
	TP6	1.30	13				
	TP9	0.80	13	46	26	20	0 N
	TP9	1.80	48	71	34	37	0 N
	TP10	0.70	21	46	23	23	0 N

REMARKS

N-Natural State
No soil description required

WS – Wet Sieve Preparation

For STATS

Jonathan Bailey
Senior Geotechnical Engineer

Date of issue: 16 October, 2003

STATS

UKAS TESTING 0278

STATS Laboratories
Tel: +44 (0) 1727 833261
Fax: +44 (0) 1727 835682
Email: info@stats.co.uk
Website: www.stats.co.uk

Porterswood House
Porters Wood
St Albans
Herts AL3 6PQ
United Kingdom

CERTIFICATE OF TEST
PARTICLE SIZE DISTRIBUTION OF SOIL

Your Ref :- NAW/33893
Certificate No :- 82995/13399
Sheet 1 of 4
Site :- **Langstone Technology Park**
Client :- Glanville Consultants Limited
Corinthian Court
80 Milton Park
Abingdon
Oxon
OX14 4RY

Sampled by STATS Ltd
Date of Receipt :- 24/9/03
Test :- 1/10/03
Tested by :- MGC/MWC
Batch No :- 2059

METHOD

The particle size distribution test was carried out in accordance with BS1377: Part 2: 1990: Clause 9.2.

RESULTS

The particle size distribution curves are presented on sheets 2-4.

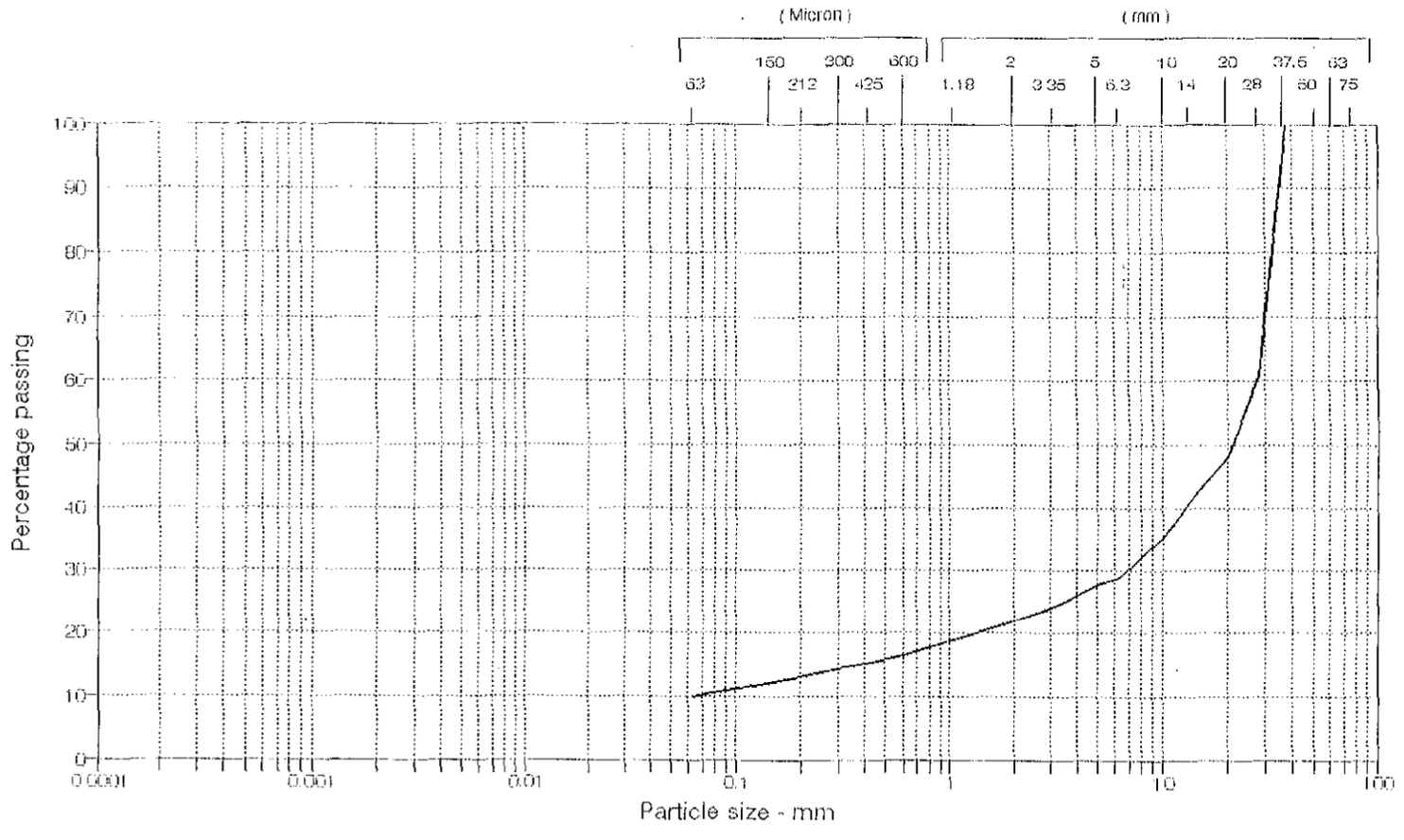
The mass of the test samples submitted for testing was less than the minimum mass specified in the test method.

No soil description required.

For STATS

Jonathan Bailey
Senior Geotechnical Engineer

Date of issue: 16 October, 2003

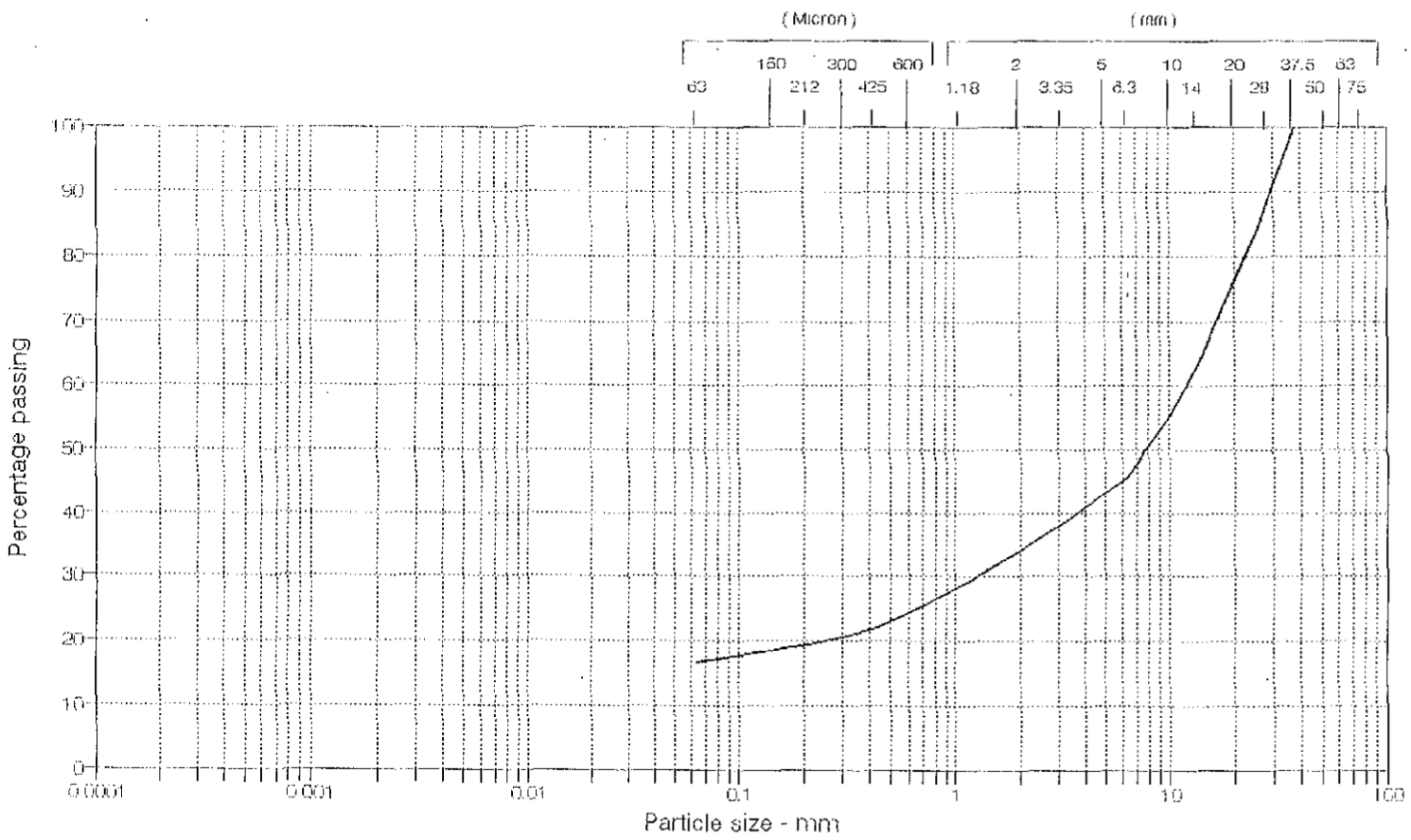


CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE
	SILT			SAND			GRAVEL		

PARTICLE SIZE DISTRIBUTION

Your Ref: NAW/33893
Client: Glanville Consultants Ltd
Site: Langstone Park
Certificate no: 82995/13399

TP no: 10
Batch no: 2059
Depth - m: 2.5
Sheet 3 of 4



CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE
	SILT			SAND			GRAVEL		

PARTICLE SIZE DISTRIBUTION

Your Ref: NAW/33893
Client: Glanville Consultants Ltd
Site: Langstone Park
Certificate no: 82995/13399

TP no: 11
Batch no: 2059
Depth - m: 2.2
Sheet 4 of 4

STATS

STATS Laboratories
Tel: +44 (0) 1727 833261
Fax: +44 (0) 1727 835682
Email: info@stats.co.uk
Website: www.stats.co.uk

Porterswood House
Porters Wood
St Albans
Herts AL3 6PQ
United Kingdom

Water-Soluble Sulfate Content and pH of Soil

BS 1377: Part 3: 1990

33893 Langstone Technical Park

Client Details			
Glanville Consultants Limited Corinthian Court 80 Milton Park Abingdon Oxon OX14 4RY			
Contact Name	Jay Chandarana		
Order Reference	NAW/33893	Order Date	24/9/03

Sample Details			
Sample Type	Soils		
Sampled By	STATS Ltd.	Sampling Date	19/9/03
STATS Batch No	2059	No of Samples	3
Receipt Date	24/9/03	Test Date/Period	30/9-3/10/03

Methods	
Test	1. pH was determined in accordance with BS 1377:Part 3:1990:Clause 9. 2. Water soluble sulfate content of soil was determined in accordance with BS 1377:Part 3:1990:Clause 5.5. The test results are reported to the nearest 0.1g/l with the calculated value shown in parentheses.
Deviations	Test 2: The samples were initially dried at 45°C followed by 75-80°C. Clause 5.3.3.6 – a 25 ml aliquot of filtered extract was used for sample 2059/TP4 and a 50 ml aliquot of filtered extract was used for samples 2059/TP6 and 2059/TP10.

Results

Sample Reference	Depth [m]	% mass passing 2 mm	Sulfate as SO_3 [g/l]	pH
2059/TP4	1.2	28	0.1 (0.06)	7.2
2059/TP6	1.3	97	<0.1 (0.01)	7.6
2059/TP10	0.7	100	<0.1 (0.01)	7.6

Certification

Certificate prepared by		Certificate reviewed by	
Philippe Mueller Construction Materials Scientist		Fergus A Collie Director	
Testing by	BJS/DGG/PM	Certificate Issue Date	7/10/03

The results given in this certificate relate only to those samples submitted and specimens tested and to any materials properly represented by those samples and specimens. Any opinions and interpretations expressed herein are outside the scope of our UKAS accreditation.

End of Certificate

APPENDIX C

CHEMICAL LABORATORY TEST RECORDS

STATS

[ ] Preliminary

[✓] Validated

ALcontrol Geochem Analytical Services

Table Of Results

Job Number: 03/12470/02/01 **Sample Type:** SOIL

Client: Stats Limited Location: Langstone Technology Park

Date of Receipt: 26/09/03 (of first sample) Client Contact: James Dennis

Client Ref. No.: 33893

	UKAS Accredited		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
	Units		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	pH Units	g/l
	Detection Method		ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	ICP	Soxtec	Spectro	HPLC	IRIS	Meter	Spectro1
	Method Detection Limit		<1	<1	<1	<1	<1	<1	<1	<1	<50	<1	<10	<5	<0.01	<0.3	<1.00	<0.003
Sample Number	**Sample Identity**	**Depth (m)**	**Arsenic**	**Boron (Water Soluble)**	**Cadmium**	**Chromium**	**Copper**	**Nickel**	**Lead**	**Selenium**	**Total Sulphate by ICP**	**Zinc**	**Solvent Extractable Matter**	**Acid Soluble Sulphide**	**Total Phenols HPLC**	**Mercury by IRIS**	**pH Value In Soil**	**Soluble Sulphate as SO4 in 2:1 Extract**
1	TP 2	0.00-0.10	6	1	<1	30	30	17	89	<1	851	133	357	<5	<0.01	<0.3	7.55	-
2	TP 5	0.00-0.10	<1	2	1	25	16	14	55	<1	1046	102	305	42	<0.01	<0.3	7.83	-
3	TP 6	0.40	10	<1	3	48	22	38	33	<1	746	104	180	<5	<0.01	<0.3	8.11	-
4	TP 7	0.25	13	2	1	35	63	21	281	<1	1128	267	614	<5	<0.01	<0.3	7.40	-
5	TP 8	0.00-0.10	5	2	<1	25	22	16	57	<1	1251	92	398	<5	<0.01	<0.3	7.62	-
6	TP 9	0.10-0.30	<1	<1	<1	22	14	12	33	<1	714	57	340	<5	<0.01	<0.3	7.92	-
7	TP 11	0.30-0.35	8	<1	2	42	15	23	14	<1	542	60	106	<5	0.01	<0.3	8.10	-
8	TP 12	0.30-0.35	2	<1	<1	20	11	11	17	2	700	48	153	<5	<0.01	<0.3	7.89	-
9	TP 13	0.50-0.75	2	<1	<1	16	34	9	387	<1	2822	155	289	<5	<0.01	0.3	8.08	0.101

Note: METHOD DETECTION LIMITS ARE NOT ALWAYS ACHIEVABLE DUE TO VARIOUS CIRCUMSTANCES BEYOND OUR CONTROL.

NDP = NO DETERMINATION POSSIBLE

NFP = NO FIBRES PRESENT

Checked By _____ William Williams

[ ] Preliminary

[✓] Validated

ALcontrol Geochem Analytical Services

Table Of Results

Job Number: 03/12470/02/01 **Sample Type:** SOIL

Client: Stats Limited Location: Langstone Technology Park

Date of Receipt: (of first sample) 26/09/03 Client Contact: James Dennis

Client Ref. No.: 33893

	UKAS Accredited		✓															
	Units		mg/kg															
	Detection Method		Spectro2															
	Method Detection Limit		<1															
Sample Number	**Sample Identity**	**Depth (m)**	**Total Cyanide Soil**															
1	TP 2	0.00-0.10	<1															
2	TP 5	0.00-0.10	<1															
3	TP 6	0.40	<1															
4	TP 7	0.25	<1															
5	TP 8	0.00-0.10	<1															
6	TP 9	0.10-0.30	<1															
7	TP 11	0.30-0.35	<1															
8	TP 12	0.30-0.35	<1															
9	TP 13	0.50-0.75	<1															

Note: METHOD DETECTION LIMITS ARE NOT ALWAYS ACHIEVABLE DUE TO VARIOUS CIRCUMSTANCES BEYOND OUR CONTROL.

NDP = NO DETERMINATION POSSIBLE

NFP = NO FIBRES PRESENT

Checked By _____ William Williams

APPENDIX D

STANDARD GROUND INVESTIGATION INFORMATION

General

The techniques STATS uses to investigate the geotechnical properties of the ground are generally in accordance with the Site Investigation Steering Group's Specification for Ground Investigations Part 3 and the British Standard Code of Practice for Site Investigations, BS5930: 1999. The descriptions of soils and rocks used in the report are generally in accordance with Section Eight of BS5930: 1999.

The techniques STATS uses to investigate the contamination of ground are generally in accordance with the British Standard Code of Practice for the Identification and Investigation of Potentially Contaminated Land, BS10175: 2001.

Exploratory Hole Records

The depths of the exploratory holes, descriptions of strata encountered, record of samples taken and comments on the groundwater conditions are given in the exploratory hole records in Appendix B.

The borehole records show at what depths disturbed and undisturbed samples (U100's) samples were taken. Taking undisturbed samples involves driving an open-tube sampler (with a nominal diameter of 100mm) into the ground by a drop weight or sliding hammer. The number of blows taken to drive the tube into the ground is recorded on the borehole logs. The quality of undisturbed samples can be reduced when the U100 blow counts are high; in this situation, U100 sampling is replaced by Standard Penetration Testing which is described below.

The borehole records show the 'N' values of any penetration resistance tests undertaken. These are the results of Standard Penetration Tests (SPT's) which are carried out in accordance with BS1377: Part 9: 1990, Clause 3.3, and similar penetration tests using a solid 60° cone point, SPT(C). These tests are carried out in strata to assess the density/consistency of the materials.

The exploratory hole records show the results of any hard shear vane tests and pocket penetrometer tests carried out with the results stated as equivalent undrained shear strength in kPa. The results of the hand vane tests carried out on soft, normally consolidated, clays have been corrected in relation to plasticity, after the recommendation of Bjerrum.

Details of groundwater strikes, seepage and any water level readings made during exploration are given in the exploratory hole records. Groundwater encountered in boreholes during the course of boring was allowed to approach an equilibrium level for a period of time. These observations may not give an accurate indication of the actual groundwater conditions obtaining within the ground. The reasons for this include that boreholes are rarely left standing at the relevant depth for a sufficient time for the water level to reach true equilibrium; that a permeable stratum may have been sealed off by the borehole casing; and that water may have been added to the borehole to facilitate progress. It should also be noted that groundwater levels fluctuate due to seasonal variations in rainfall.

Standpipe/Piezometer/Monitoring Well Installation and Monitoring

Details including the depth of installation of any piezometers or dual purpose soil-gas/water monitoring wells comprising 50mm ID casing and screen are given in the borehole records. Recorded water level readings obtained using an electronic dipmeter are included in the records where applicable.

Other Field Tests

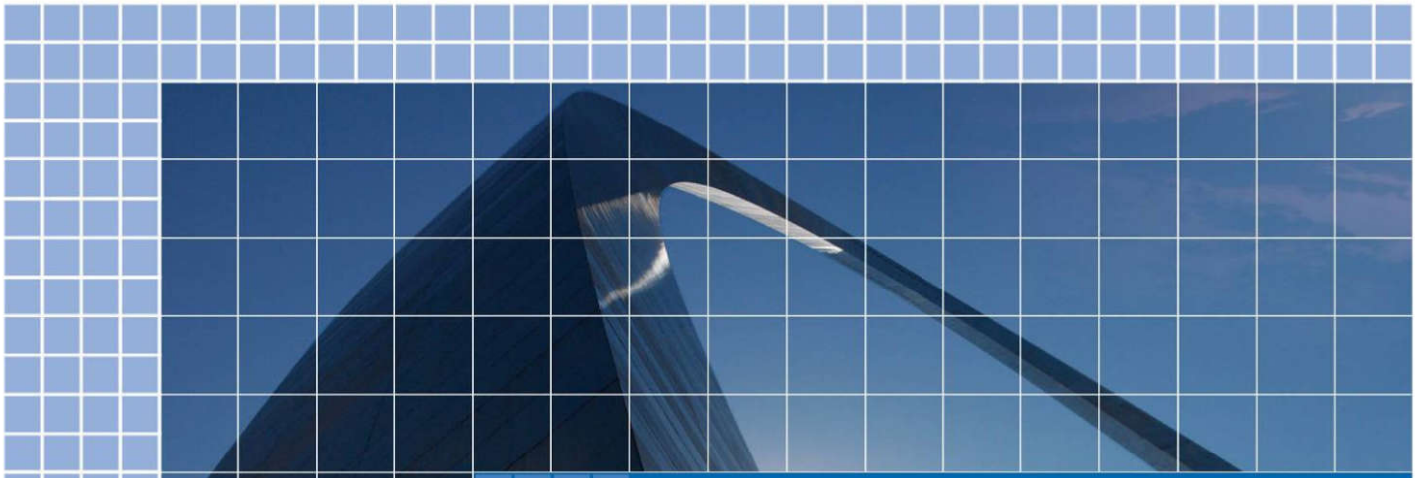
In situ Dynamic Probing tests are carried out with equipment conforming to the SRS 15 apparatus given in the German Standard DIN4094 and in all major aspects with the DPH apparatus given in BS1377 Part 9 1990. The results of the tests are presented as the blow count for every 100mm of penetration (N_{100}) against depth.

In situ Dynamic Cone Penetrometer tests are carried out to assess the in situ California Bearing Ratio (CBR) strength of the soils pertaining at the time of investigation. The tests were carried out in accordance with the method described by Kleyn et al, 1982, Proc. 2nd Euro Symp. Penetration Testing, pp 277-282, using a 60° test cone. The results of these tests are presented with the correlation between DCP and CBR.

Tests on Soils and Groundwaters for Civil Engineering Purposes

The test procedures used by STATS are generally in accordance with the methods described in BS1377: 1990. Details of the specific test methods are generally given on the test certificates.

Reports issued by STATS do not necessarily report the full comprehensive laboratory results required by BS1377: 1990 and the NAMAS Accreditation Standard, M10. However, they do report all the results necessary for design purposes, to the generally accepted industry format. The full laboratory results complying with BS1377: 1990 and the NAMAS Accreditation Standard, M10, are kept, and can be supplied upon request.



Phase I Environmental Assessment Langstone Technology Park, Havant, Hampshire, UK

Jones Lang LaSalle

09/12/2005

WSP

QM

Issue/revision	Issue 1	Revision 1	Revision 2	Revision 3
Remarks				
Date				
Prepared by	R Bilton			
Signature				
Checked by	S Dennis			
Signature				
Authorised by	P Dowley			
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Project number				
File reference				

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Executive Summary

WSP Environmental Ltd was instructed by Jones Lang LaSalle to undertake a Phase I Environmental Assessment of Langstone Technology Park, Havant, Hampshire, PO9 1SA, UK. The report highlights environmental considerations, predominantly with respect to ground conditions, and is required as part of the proposed purchase of the freehold interest in the site. Please refer to Appendix F for WSP's Methodology and Limitations.

Key Findings

The subject site comprises seven Buildings (No. 1000 to 7000) of differing sizes, arranged over varying floor heights to a maximum of four floors The Buildings are located in the north of the site and a large car park is located to the south. Further car parking is located along the northern boundary and the north eastern section of the site.

Potentially contaminative activities on site are limited to the storage of diesel fuel in 2000 and 1000 litre above ground storage tank (AST), and the storage of waste materials. However, no significant environmental issues have been identified associated with the current use of the site.

The site has historically been used as a electronic component manufacturing site, which represents a potential source of contamination. The Local Authority is aware of this previous land use and has commented that the site will be subject to further investigation should the site be redeveloped. A ground investigation report dated 2004 identified slightly elevated concentrations of ground gas within the made ground, but groundwater has reportedly not been impacted.

The site setting is of moderate environmental sensitivity due to an unprotected underlying Minor Aquifer and the proximity of residential properties.

Environmental Liability

The site was historically used as an electronics components manufacturing site. A number of intrusive investigations have been provided for review and these indicate that no significant contamination issues have been identified for the continued commercial use of the site. However, the presence of residual contamination present on the site, which may require some form of remediation in the event of redevelopment cannot be discounted.

Therefore, based on the information contained in this report and with due regard to the continuation of the current site use, it is the opinion of WSPE that the site represents a **low/medium** environmental risk.

Recommendations

A previous limited site investigation indicated the presence of ground gas at the site, therefore the presence of ground gas cannot be discounted and as such ground gas testing investigation should be undertaken. In addition further contamination assessment works may be required on redevelopment. No significant CAPEX issues have been identified, however a number of environmental management recommendations have been made within the body of the report.

WSP Environmental Ltd

Please Note: This summary forms part of WSP Environmental Ltd Phase I Environmental Assessment (ref.: 12022767). Under no circumstances is it to be used as an independent document.

1 Site Information

1.1 SITE DETAILS

Site Address	Langstone Technology Park, Havant, South Hampshire, PO9 1SA, UK
National Grid Reference	SU 712 058
Size	15 hectares.
Tenure	Freehold
Site Location	The site is located approximately 0.2 kilometers to the south of Havant town centre. Adjacent to the west is an industrial estate and beyond is Budds Farm sewage works. Residential properties are located from 20 metres (m) east and the residential area of Langstone is located from 300m south. Bounding the site to the north is the A27 road. A site location plan is included as Appendix A
Current Site Use	The subject site is a technology park and as such supports a number of different tenants, which undertake a range of activities. The majority of tenants undertake office based activities, although there are a few that undertake light industrial activities such as electrical component assembly, testing and repair and pesticide applications testing.

1.2 SITE RECONNAISSANCE

A walk over survey of the site was carried out on 6th December 2005, including an inspection of the exterior and interior of the site and buildings. The site inspection was guided and areas were assessed on a representative but not exhaustive sampling selection. Access was completely restricted within certain areas for security reasons. The following key observations were made during the site reconnaissance:

Site Description

The subject site comprises seven Buildings (No. 1000 to 7000) of differing sizes, arranged over varying floor heights to a maximum of four floors. Building 1000, and 4000 – 7000 are interconnected, whereas Buildings 2000 and 3000 are detached and used to house plant equipment. The Buildings are located in the north of the site and a large car park is located to the south. Further car parking is located along the northern boundary and the north eastern section of the site. See appendix A, site boundary plan for an overview of Buildings.

Specific on-site activities

Building Number	Company Name	Activities
1000	Aker Kvaerner Business Partner Ltd	Office based activities associated with technical design of oil refineries.

1000	Batelle UK Limited	Office based technical design and bench scale pesticide delivery formulation utilising 1 to 2 kilos of active pesticides within onsite laboratory.
1000	Cimtek UK Ltd	Office based activities associated with technical design of printed circuit boards.
1000	Xyratex Technology Ltd	Office based and a digital storage assembly line as well as a stress and component failure laboratory.
4000	Glasshouse Technologies (UK) Ltd	Office Based activities associated with the management of a computer component company.
4000	Havant Council of Community Services	Office based activities associated with the operation of Meals on Wheels and Dial-a-Ride community services.
5000 & 6000	Teleplan	Office based and component repair centre under licence from Microsoft and Dell for the repair and servicing of electronic equipment.
6000	ARM Ltd	Office based activities associated with a recruitment company.
6000	FAST Training services Ltd	Office based training and recruitment for the Ministry of Defence.
6000	General lift	Office based activities associated with the operations of a lift maintenance company.
6000	Havant International Ltd	Office based, Havant International Ltd also service the site complex.
6000	Hitachi Global Storage Technologies	Office based and product stress testing laboratory
6000	Ordinance Survey	Office based operations; however the site is used as a data back up for offsite operations.
6000 & 1000	AT&T	Office based activities associated with a 24 hour customer support help desk and network infrastructure.
6000 & 1000	Jobsite UK (worldwide) Ltd	Office based activities associated with a recruitment company
7000, 6000 & 1000	Lockhead Martin UK Ltd	Office based and technical design for the Ministry of Defence.

- The site is serviced by mains fed gas, electricity and water.
- Gas fired boilers are located within Building 3000; the chillers associated with the air-conditioning system are also located within Building 2000 and a part disused water treatment facility is located within an unlabelled Building west of Building 2000.
- The site is serviced by five lifts, two hydraulic lifts are located in Building 6000 and one hydraulic lift is located within Building 7000. Two electrical lifts are located within

Building 5000. The hydraulic reservoirs were noted to be bunded and no significant staining was noted on the good quality hardstanding.

- Buildings 41 and 42 are identified within the south western portion of the site, separate from the main complex, currently not in operation and utilised for furniture storage.
- The site supports four cooling towers associated with plant chiller equipment. The cooling towers are registered with the Local Authority and are maintained by an automatic dosing regime

External Areas

- A large car park is located to the south and further car parking along the northern boundary and the north eastern portion of the site. No significant staining was noted in these areas.
- Service and delivery yards are located to the western boundary of Buildings 5000 and 1000.
- Grassed areas are located across the site, in particular to the eastern boundary; all were noted to be well maintained.

Bulk Hazardous Materials Storage

- The site representative stated that there are no below ground storage tanks and no evidence of such tanks was noted during the site reconnaissance.
- An above ground diesel tank was observed to be in use within the essential services back up generator house located between Building 3000 and 4000. The tank capacity was approximately 2000 litres and was noted to be contained within a brick bund in good repair. The onsite representative reported that a previous assessment had confirmed the bund as being greater that 110% of the tanks capacity. The fill point for the tank was observed to the exterior of the Building, no staining was observed upon the good quality hardstanding within the room or around the fill point. See Plate 2 within Appendix B
- A further above ground diesel storage tank associated with the sites sprinkler system was observed to be in use to the west of Building 5000, the tank capacity was approximately 1000 litres and was noted to be raised over a bund in good repair. The fill point for the tank was located within the bund.
- A number of full and part used 250 litre diesel drums were observed on site, however, all were contained within mobile bunds See Plate 3 within Appendix B
- A bunded area was identified between Building 42 and 41, historically used for the storage of two large diesel fuel tanks. Inspection of this area identified that the tanks had been removed and no significant staining was identified on the good quality concrete hardstanding within the bund. The onsite representative stated that the tanks had been connected to the power house (Building 3000) by underground pipework. This pipework has reportedly been decommissioned but the onsite representative could not provide any evidence of this.
- It was reported by the onsite representative that two 50,000 litre solvent tanks used for degreasing processes were formerly located to the west of Building 1000. The reported location was inspected and found to be covered with good quality hardstanding and bunded by a gully system and sump drain. No significant staining was noted.

Other Hazardous Materials

- Hazardous chemicals associated with Batelle UK Limited were observed stored to the exterior of the Building 1000 within a secure flammable storage cabinet and liquid materials were stored within Batelle UK Limited laboratory in appropriate secondary containment.
- The part disused Building 2000 previously supported a de-ionising plant for water treatment. Storage tanks for water treatment had been removed, however, small quantities of acids and alkalis associated with the now obsolete treatment process were stored within areas bunded by gullies and sump drains. No significant quantities of chemicals were identified during the site inspection. A small hazardous chemicals cupboard was identified and this contained small quantities of oils, paints and other chemicals

Polychlorinated Biphenyls (PCBs)

- The onsite representative reported that the site supported approximately 12 to 15 electrical substations and approximately 20 to 24 electrical transformers.
- The onsite representative reported that all electrical substations and transformers had been tested for PCB's by the previous site owner (IBM). A result of this was that all PCB containing electrical transformers and substations had been decontaminated where possible, electrical equipment that was not suitable for decontamination was replaced with non PCB containing alternatives.

Ozone Depleting Substances (ODS)

- The site is serviced by an integrated air conditioning system utilising three chillers, all are charged with the refrigerant gas R134a which is a non-ozone depleting substance.
- A number of split air conditioning units service individual tenants within the Building, The onsite representative reported that he was aware that a small number were charged with the refrigerant R22, which is an ozone depleting substance.
- All of the split air-conditioning units are reportedly the responsibility of the tenants. Depleting Substances (ODSs) in air conditioning units should be replaced by 2015 in line with the Environmental Protection (Controls on Ozone-Depleting Substances) Regulations 2002.

Wastes Management

-Non Hazardous

- Waste produced on site comprises cardboard, packaging, office waste and general wastes. Waste steams are directed to recycling centres and to landfills operated by licensed waste contractors.
- Waste diesel drums are stored within mobile drums and within a secure collection compound. No staining was noticed on the good quality hardstanding surrounding these drums. See Plate 2 within Appendix B.

-Hazardous

- The site has been registered by Havent International Limited as a producer of hazardous waste with the Environment Agency.

- Batelle UK Limited separate all liquid waste generated onsite within their laboratory. All chemical waste is treated as hazardous and disposed of via a specialist hazardous waste company.
- Hazardous waste in the form of circuit boards, IT equipment, batteries, aerosol cans, printer cartridges, fire extinguishers and fluorescent tubes and glass are reportedly collected separately and recycled by licensed waste contractors.

Drainage Issues

A drainage plan was made available for inspection to WSPE during the site visit.

-Surface Water

- Drainage maps for the site indicated that car parks to the north and northeast were serviced by an oil/water interceptor that discharged to the 'Langstone Mill Stream' River Lavant.

Drainage maps for the site indicate that the car park to the south is not serviced by an oil/water interceptor and drain into a partially culvurted ditch offsite.

-Foul Water

- Foul water on site is limited to sewage and domestic waste water, this is handled by Southern Water via a foul sewer from the site that passes to the industrial estate adjacent to the west. The site representative did not report any issues associated with on site foul water, and none were observed.

-Trade Effluent

- A trade effluent discharge licence has been identified for the siteand related to the discharge of cooling water.

Asbestos Containing Materials (ACMs)

- Asbestos issues are not commented upon within the context of this report.

1.3 SURROUNDING LAND USE

The site is located to the south of Havant, in a predominantly industrial and residential area. Residential properties are located from 20m to the east of the site, and the 'Langstone Mill Stream' River Lavant runs through the site and along the eastern boundary. Adjacent to the west of the site is a industrial estate supporting marine based industry and plastics manufacturing.

2 Historical Land Use

2.1 SITE HISTORY

Map Information

A study of historical Ordnance Survey maps has been undertaken to identify any potentially contaminative former land uses. Historical maps indicate that the site primarily comprised open land prior to 1909, with a small aqueduct and sluice. By 1909 a small sewage works and associated engine house are identified within the north eastern corner of the site, the sewage works expanded over the site and by 1969 is identified as disused. Prior to 1974 the site has been redeveloped to incorporate works, including tanks along the south western boundary; the current site layout is present in mapping from 2000.

A selection of historical map extracts is included as Appendix D.

Planning

Havant Borough Council provided the following planning information concerning the subject site.

- September 1967 – Erection of Buildings for electronic component assembly conditionally approved.
- September 1969 – Permission granted for the erection of a power house and assembly Building.
- May 1974 – Permission granted for the erection of a storage building for chemicals.
- April 1978 – Permission granted for a three storey office building, car park and diversion of the site road system.
- February 1989 – Permission granted for the relocation of a safety store for storage drums of freon on a chemical containment concrete slab.

Anecdotal Information

The site was originally occupied by International Business Machines (IBM) for the manufacturing of computer display monitors.

The onsite representative stated that Building 1000 was historically used for wet manufacturing processes. This included activities such as etching and substrate processes. This area has been completely refurbished and no evidence of historic activities remains.

The onsite representative stated that remediation in the form of decontamination of acid, arsenic and copper penetrated concrete was undertaken in 1998/1999 in Building 1000. This involved the removal of concrete until it was proven that the remaining concrete was no longer contaminated. Please see section 4.1

Effluents generated from Building 1000 were transferred to Building 41(southwest corner) for treatment. After treatment processes were undertaken, the effluent was discharged from the site via foul sewer. This discharge was reportedly regulated by a trade effluent discharge consent. The effluent treatment facilities are no longer operational and have been partially decommissioned; the Building is now used for furniture storage.

It was also reported that Building 41 was historically used as a de-ionising water treatment plant.

Building 42 was reportedly formerly used for the storage of petroleum mixtures. Complete access to this Building was not possible due to degradation of the Building structure. Those areas accessed did not identify any significant chemical storage.

It is understood that Batelle UK Limited and Havent International Limited have a current outstanding intrusive investigation report for the northwest area of the site. Intrusive boreholes have been placed west of Building 1000 to assess ground water and other ground environmental factors. The results of this report will further characterise the the ground conditions beneath the site.

2.2 SURROUNDING AREA

A study of historical Ordnance Survey maps has been undertaken to identify any potentially contaminative former land uses. A selection of relevant historical map extracts is included as Appendix D The following represents a summary of the available map information:

Surrounding Features	Dates	Distance (m)	Direction
Havant Bypass (A27) road	Pre 1969 – Present	Adjacent	North
Industrial and electronics factories	Pre 1969 – Present	100m	North
Havant Mill *Then* disused mill	Pre 1867 – Pre 1953 Pre 1953 – Present	70m	Northeast
Pumping station and tank	Pre 1969 – Present	From 20m	East
Sewage works	Pre 1963 – Present	From 280m	West
Boat building works, marine works and plastics factories	Pre 1973 – Present	Adjacent	West

3 Regulatory Information & Consultations

3.1 REGULATORY DATABASE

The following environmental data has been obtained from a summary of information databases.

	0-250m	250-500m	Details
Registered landfills		1	A landfill is located 450m to the northwest of the site. Recorded as accepting inert waste from pipework excavation.
Closed landfill facilities	1	0	A landfill is recorded 200m to the southwest of the site, registered as closing in 1965, having accepted household, acid and commercial waste.
Registered transfer stations/ treatment facilities	0	5	The closest registered waste transfer site is operated by A & J Bull (Solent) Ltd 290m west, the site is authorised to accept construction and demolition waste including soil.
Closed transfer stations/ treatment facilities	0	0	Not Applicable N/A
Authorised industrial processes (IPC/IPPC)	0	1	The IPPC registration is for Portsmouth Water Ltd 480m northwest of the site and relates to landfilling.
Fuel Stations Entries	1	1	The closest fuel station entry is to Tesco Havant located 160m northeast of the site.
Licensed radioactive substances	2	0	Both registrations for radioactive substances are held by Apollo Fire Detectors Ltd located 100m to the northwest of the site and relate to the keeping and use of radioactive materials under S7 RSA as well as for the disposal of radioactive waste under S13 RSA.
Enforcements, prohibitions or prosecutions	1	1	The closest prosecution relating to an unauthorised process was for tipping brick and rubble onto land without a waste management licence at 130m from the site.
Discharge Consents	7	10	Four discharge consents are held on site, operated by Havany international Ltd and Xyratex for the discharge of surface water to a fresh water stream.
Pollution Incidents	4	5	The nearest pollution incident occurred in 1995, 90m to the east of the site. The incident comprised the release of oil to a stream and was classified as minor. This incident may have impacted the subject site.
Consents issued under the Planning (Hazardous Substances) Act 1990	0	0	N/A

3.2 CONSULTEES

Local Authority Building Control

The Building Control Officer at Havant Borough Council was contacted with regard to ground conditions beneath the subject site. The Officer stated that the site was raised above ground level thereby reducing the possibility for flooding; the Officer further commented that he was unaware of any significant ground stability issues within the area. However, he was aware that part of the subject site had been built with pilled foundations. The Officer was unaware of any ground gas problems in relation to the historic use of the site or from current neighbouring site activities. Additionally, the Officer was not aware of any flooding issues in the immediate area of the site, although the Officer did confirm that the 'Langstone Mill Stream' River Lavent within the site boundary was known to be susceptible to partial flooding further inland.

Local Authority Contaminated Land Office

The Contaminated Land Officer at Havant Borough Council was contacted for environmentally pertinent information relating to the site. The Officer stated that historically the site was known to support a sewage works and a number of diesel and chemical tanks. Given the historical and neighbouring land uses and the use of good quality hardstanding across the site, the Officer did not consider the site to pose a concern with regards to human health and continued site use. The Officer further added that in the case of redevelopment further intrusive investigations would be required. The Officer also commented upon the groundwater within the area, stating that the complex hydrogeology of the area would give incorrect point sources of water abstraction and that the nearest physical abstraction point to the site was 200m to the north.

Petroleum Officer

No issues have been identified which warrant further consultation with the Petroleum Officer.

Environment Agency

Consultations were made with the Environment Agency regarding pertinent environmental information relating to the site. The Officer was unable to comment on the specific subject site however, did confirm that the 'Langstone Mill Stream' river Lavant to the north of the site was known for its highly variable flow rate primarily due to the size of the rivers catchment area and bottle necks created by culvurted sections of the river.

Environment Agency Flooding Data

Southern portions of the site are located within an EA indicated floodplain, where the chance of flooding is greater than 1 in 200 years (0.5% per annum). Read together with Building Control section above.

Health Protection Agency

The site is located within an area where less then 1% of homes are above the Action level for radon gas. Therefore, no radon protection measures are considered necessary.

British Geological Survey

The site is located within an area where there is a **moderate** risk of collapsible ground stability hazards; **low** risk of running sand ground stability hazards; **very low** risk of

landslide ground stability hazards; and **low** risk of shrinking or swelling clay subsidence hazards. Read together with Building Control section above.

Coal Authority Report

The site is not located within an area affected by Coal Mining

4 Other Relevant Information

4.1 PREVIOUS REPORTS

The following information has been provided for review by the client, it should be noted however that WSP Environmental UK Limited cannot warrant the work of others:

- A 1999 Environmental Monitoring Program undertaken by CASELLA Ltd has been provided by the client for review. This report details results of effluent monitoring, Industrial emissions monitoring, ground water monitoring, surface water monitoring and Building fabric monitoring. The reports detailed a number of investigations including intrusive and non-intrusive techniques.

  The following potential issues were identified:

  – Low concentrations of toluene and purgeable hydrocarbons were identified in effluent monitoring for Building 2000.

  – Groundwater contamination by chlorinated solvents was identified.

  – Copper contamination is identified within a concrete slabs.

- It has subsequently been identified that the effluent treatment facility at Building 2000 has been decommissioned due to a change in site operations, groundwater contamination is identified within an area located outside the current site boundary and the concrete slab contamination is commented within report as having been remediate.

- A 1999 Phase I Environmental Audit undertaken by WSP Environmental has been provided by the client for review. Any pertinent information has been incorporated into this report.

- A 1999 Initial ground investigation undertaken by Soil Consultants Ltd has been provided by the client for review. This report details an intrusive investigation involving the northern area of the site:

  The following potential issues were identified:

  – Elevated levels of Cadmium were recorded in two boreholes, although measured levels were not hazardous.

  – Elevated levels of Arsenic, Lead, Nickel, Copper, Zinc and Mercury were measured in a single borehole.

- The above report comments upon results using Dutch Intervention Values for comparison, such values have been superseded by CLEA Soil Guideline Values and as such the report is considered to be outdated, it is therefore not possible to comment upon the results within the context of current contaminated land assessment.

- A 2003 and 2004 addendum, site investigation report undertaken by STATS has been provided by the client for review. This report details an intrusive investigation involving

  The following potential issues were identified:

  – The site is built upon made ground and elevated levels of land gas were identified.

The results in the report above are based on a single set of readings and omit an important factor (flow rate), making an interpretation based upon this would be unwise. Nevertheless it does highlight elevated levels of methane.

In WSP's opinion based on the information provided for review that the posability for ground gas at the subject site cannot be discounted. However no environmental conclusions can be made regarding potentially contaminated land.

4.2 SALES PARTICULARS

Sales particulars provided for the subject site indicate that the area is zoned for continued site use.

5 Environmental Setting

5.1 GEOLOGY AND HYDRGEOLOGY

Geological Map Sheet no.316, Fareham, scale 1:63,360, Drift edition, shows the following geological sequence (refer to Appendix E for Environment Agency (EA) aquifer classification system):

Geological Unit	Aquifer Status
Alluvium (western portion of the site)	Minor Aquifer
Brickearth (eastern portion of the site)	Minor Aquifer
Reading Beds	Minor Aquifer
Chalk	Major Aquifer

The following current licensed groundwater abstractions have been identified within a 1km radius of the site:

Source	Use	Distance (m)	Direction
Groundwater/Spring*	Public water supply: Potable	200m*	North
Groundwater	Public water supply: Potable	720m	Northwest
Groundwater	Public water supply: Potable	750m	Northwest

*Data provided by Havant Borough Council's Contaminated Land Officer.

The site is not located within an EA designated Groundwater Source Protection Zone.

5.2 HYDROLOGY

Surface water features in the vicinity of the subject site are as follows:

Surface Water Feature	Quality*	Distance (m)	Direction
Pond	unclassified	On site	N/A
Mill Stream / Lavant Stream	A – Very Good	On site	East
Warblington Stream	A – Very Good	590m	East
Hermintage Stream	C – Fairly Good	660m	Northwest

*Chemical water quality as classified under the EA's General Quality Assessment (GQA) Scheme.

No surface water abstractions have been identified within a 1km radius of the subject site.

5.3 SURROUNDING FEATURES

Sensitive surrounding land uses in the immediate vicinity of the subject site are as follows:

Sensitive Land Use	Approx. Distance	Direction
Mill Stream / Lavant Stream	On Site	East
Residential properties	20m	East
Chichester Harbour (SSSI)	750m	Southeast
Chichester and Langstone Harbours Ramsar sites	310m	South
Solent Maritime (Special Area of Conservation)	550m	Southwest

5.4 ENVIRONMENTAL SENSITIVITY

Overall, the site setting is considered to be of **Moderate** sensitivity, due to the following reasons:

- The presence of unprotected minor aquifers underlying the site.
- The presence of on-site surface water features (Pond);
- The presence of on site surface water channels ('Langstone Mill Stream' River Lavant);
- The residential land uses within 20m of the site boundary;
- The presence of groundwater / spring water abstractions from 200m of the site;
- The ecological sensitive nature of the surrounding area (including Chichester Harbour (SSSI) and Chichester and Langstone Harbours (Ramsar sites)

6 Risk Assessment

6.1 OUTLINE CONCEPTUAL MODEL

The methods used within this risk assessment follow a risk-based approach, with the potential environmental risk assessed qualitatively using the 'source-pathway-target pollutant linkage' concept introduced in the Environmental Protection Act 1990. For a site to be designated as Contaminated Land a plausible linkage between the identified Sources, Pathways and Targets must be demonstrated, this is further discussed within Appendix G.

Potential Contaminant Sources

On-Site Contaminant Sources	■ Bulk fuel storage on site poses a potential source of contamination. However, site practises such as bunds reduce the possibility of contamination to be present and therefore these are not considered to be significant source of contamination. ■ Historically the subject site has been occupied by potentially contaminating activities (sewage works and electronic component manufacturing works) which may have resulted in the presence of contaminants such as solvents, hydrocarbons and heavy metals.
Off-Site Contaminant Sources	■ Neighbouring sites and land have had a significant industrial history and include engineering works, plastics factories and sewage treatment facilities. ■ Neighbouring sites have historically been used for engineering works, factories and sewage treatment works. These activities could have resulted in hydrocarbon and heavy metal contamination.

Potential Contaminant Pathways

- Variable permeability soils in the underlying superficial geology have the potential to permit the transport of pollutants to the underlying Minor and Minor Aquifers.
- The 'Langstone Mill Stream' River Lavant running through the eastern boundary of the site would facilitate the transport of pollution and contamination down the watercourse gradient.
- Direct contact with contaminated soils (ingestion, inhalation and dermal contact), is minimised by the presence of hardcover across much of the site, effectively acting as a barrier to subsurface contamination.

Pollutant Linkages

- Migration of contamination through underlying geology causing impact on the underlying Minor and Major Aquifers and migrating towards surface water receptors.
- Migration of contamination through underlying geology causing impact on the 'Langstone Mill Stream' River Lavant and migrating towards Lavant harbour (Ramsar site).
- Direct contact with contaminated soils (ingestion, inhalation and dermal contact).

Potential Receptors

Controlled Waters	■ Underlying Minor Aquifer. ■ The Langstone Mill Stream' river Lavant (onsite).
Human Health Risks	■ Current site conditions comprise concrete and tarmac

	hardstanding and as such, provide a barrier to any subsurface contamination. ■ Third Party neighbours to the west comprise industrial properties and as such hardstanding is likely to be present. ■ Third Party neighbours to the east comprise residential properties with associated gardens and as such represent an unprotected receptor to subsurface contamination.
Other	■ SSSI and Ramsar sites relating to Chichester harbour and Langstone harbour.

6.2 ENVIRONMENTAL RISK ASSESSMENT MATRIX

Having evaluated the information gathered during this study and described in the previous sections, WSP Environmental Ltd has produced the following assessment of risk primarily focused on contaminated land issues:

	ISSUE	RISK CATEGORY	REASON
Contamination Potential:	Potential for significant on-site contamination	Low/Medium	No significant current on-site sources of contamination have been identified. However, the potential for residual contamination to be present on the site from the former uses cannot be discounted.
	Potential for contaminants migrating off the site	Medium	The perceived permeability of the underlying geology (Alluvium and Brickearth) would not restrict the migration of any residual mobile contamination, if present, off the site.
	Potential for contaminants migrating onto the site	Medium	The perceived permeability of the underlying geology (Alluvium and Brickearth) would not restrict the migration of any residual mobile contamination, if present, onto the site. The industrial estate adjacent to the site represents a potential source of contamination.
Other Liability Issues:	Potential for 'other' environmental issues to give rise to liabilities	Low/Medium	The southern area of the site is located within an EA flood plain, where the flood risk is recorded as 1 in 200 years
Environmental Consequences	Risk of Pollution of Controlled Waters	Low/Medium	No significant current sources of contamination have been identified which may have led to the pollution of Controlled Waters. However, potentially contaminative historic site activities may still impact underlying controlled waters.
	Risk of Damage to Property	Low/Medium	The site is located within a floodplain where the chance of flooding is considered to be 1 in 200 years.
	Risk of Harm to Human Health	Low	Given the hardstanding present across the site, users are considered unlikely to come into contact with any contaminants if present in the underlying ground.
Business Consequences:	Likelihood of designation as Contaminated Land under EPA 1990	Low/Medium	Consultations with the relevant Contaminated Land Officer have identified that the site is not considered to pose a concern given the current site use.
	Risk of Site Value and/or Saleability being affected.	Low/Medium	The site is located within a flood plain, whilst this is considered to be infrequent risk, certain investors are currently seeking to undertake further flood risk assessment on such sites and this could potentially arise as an issue in the future saleability of the properties
	Likelihood of a Future Purchaser requesting further investigations.	Low/Medium	The potential for ground gas to be present at the site cannot be discounted and it is considered likely that any purchaser of the site would require a ground gas investigation.
	Risk of Liability for Owner	Low/Medium	Ground gas and flooding issues cannot be discounted and in the event of site redevelopment further investigation would be required
	OVERALL RISK		**LOW/MEDIUM**

7 Summary, Conclusions & Recommendations

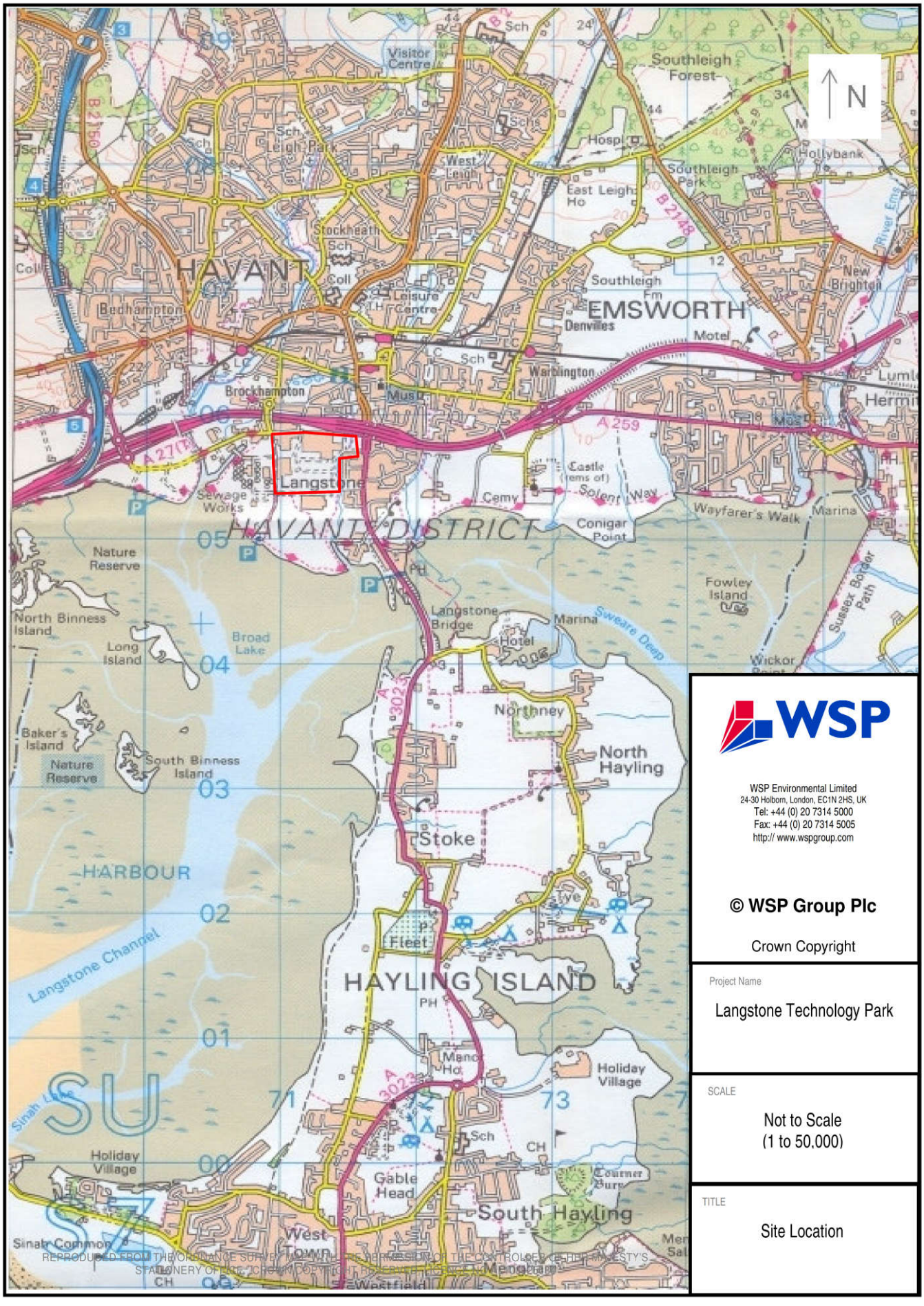
Site Address	Langstone Technology Park, Havant, South Hampshire, PO9 1SA, UK
Tenure	Freehold
Current Land Use	The subject site comprises seven Buildings (No. 1000 to 7000) of differing sizes, arranged over varying floor heights to a maximum of four floors. Buildings 1000, and 4000 – 7000 are interconnected, whereas Buildings 2000 and 3000 are detached and used to house plant equipment. The Buildings are located in the north of the site and a large car park is located to the south. Further car parking is located along the northern boundary and the north eastern section of the site. The site is located to the south of Havant, in a predominantly industrial and residential area. Residential properties are located from 20m to the east of the site, and the 'Langstone Mill Stream' River Lavant runs through the site and along the eastern boundary. Adjacent to the west of the site is a industrial estate supporting marine based industry and plastics manufacturing.
Historical Land Use	Historical maps indicate that the site primarily comprised open land prior to 1909, with a small aqueduct and sluice. By 1909 a small sewage works and associated engine house are identified within the north eastern corner of the site, the sewage works expanded over the site and by 1969 is identified as disused. Prior to 1974 large site redevelopment is identified as works including tanks along the south western boundary; the current site layout is present in mapping from 2000
Regulatory Enquiries	No significant issues have been identified.
Other Information	No significant issues have been identified.
Environmental Setting	The site setting is considered to be of moderate sensitivity, due to the underlying Minor and Major Aquifer, the onsite surface water feature, the onsite surface water channel, the proximity of residential properties in the area and the ecologically sensitive nature of the greater area SSSI and Ramsar sites.
Conclusions	The site has historically been used as an electronics components manufacturing site. A number of intrusive investigations have been provided for review and these indicate that no significant contamination issues have been identified for the continued commercial use of the site. However, the presence of residual contamination present on the site, which may require some form of remediation in the event of redevelopment cannot be discounted. A ground investigation is currently outstanding that will provide further characterisation of the site. Based on the information contained within this report and with due regard to the continued commercial land use, it is the opinion of WSP Environmental Ltd that the site represents a **low/medium** risk with respect to environmental considerations.
Recommendations	The following environmental assessment work is considered necessary for the ongoing commercial use of the site. However, the following environmental management recommendations should be considered: ■ Further flood risk assessment should be considered; ■ It is recommended that ground gas testing should be undertaken at the site.

Please Note: This summary forms part of WSP Environmental Ltd Phase I Environmental Assessment (ref.: 12022767). Under no circumstances is it to be used as an independent document.

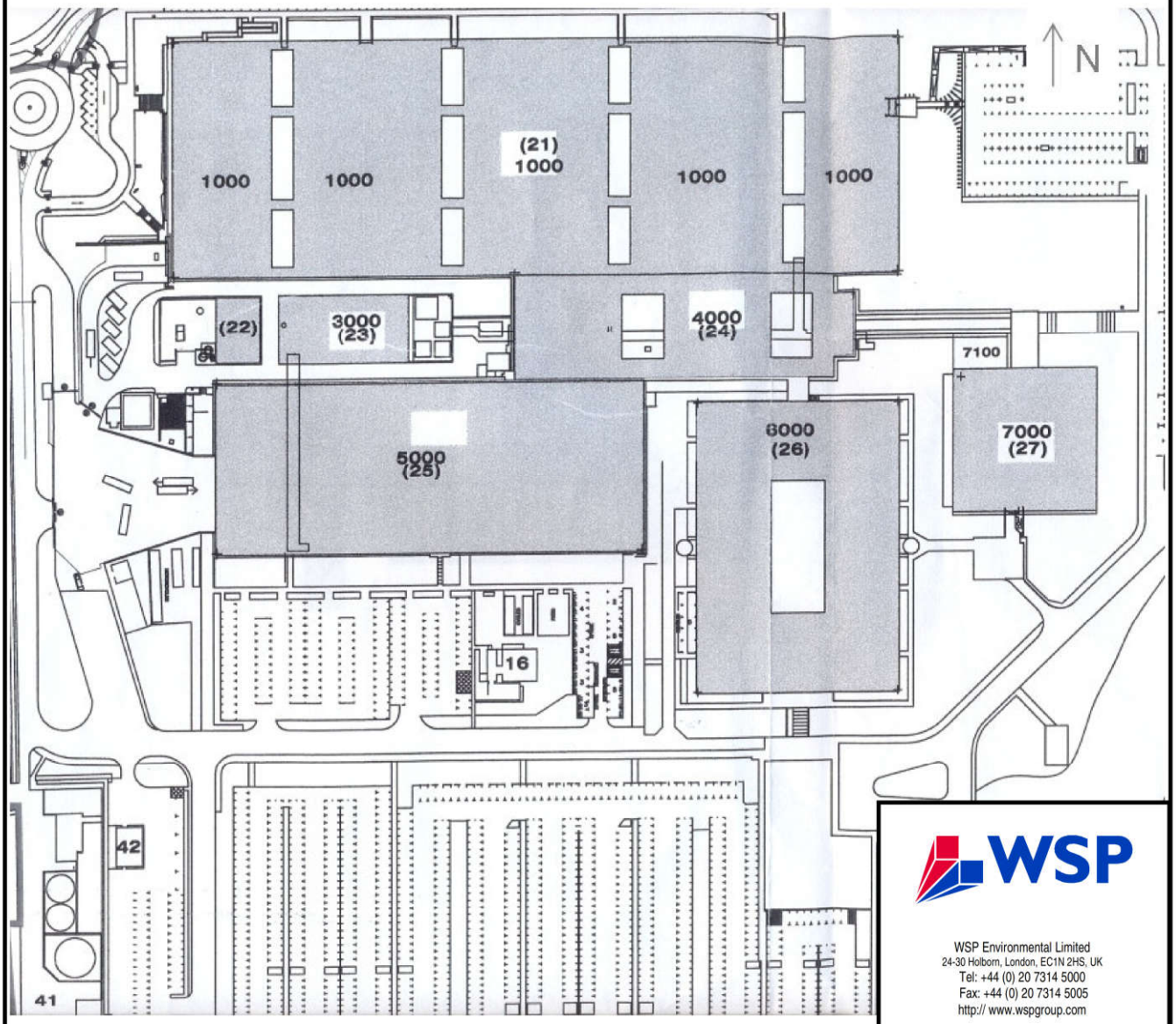
Appendix A Plan

Site Location & Site Boundary

SITE LOCATION PLAN



SITE BUILDING PLAN



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Project Name

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SCALE

No Scale Supplied

TITLE

Site building Plan

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Appendix B Photographic Record

PLATE 1:



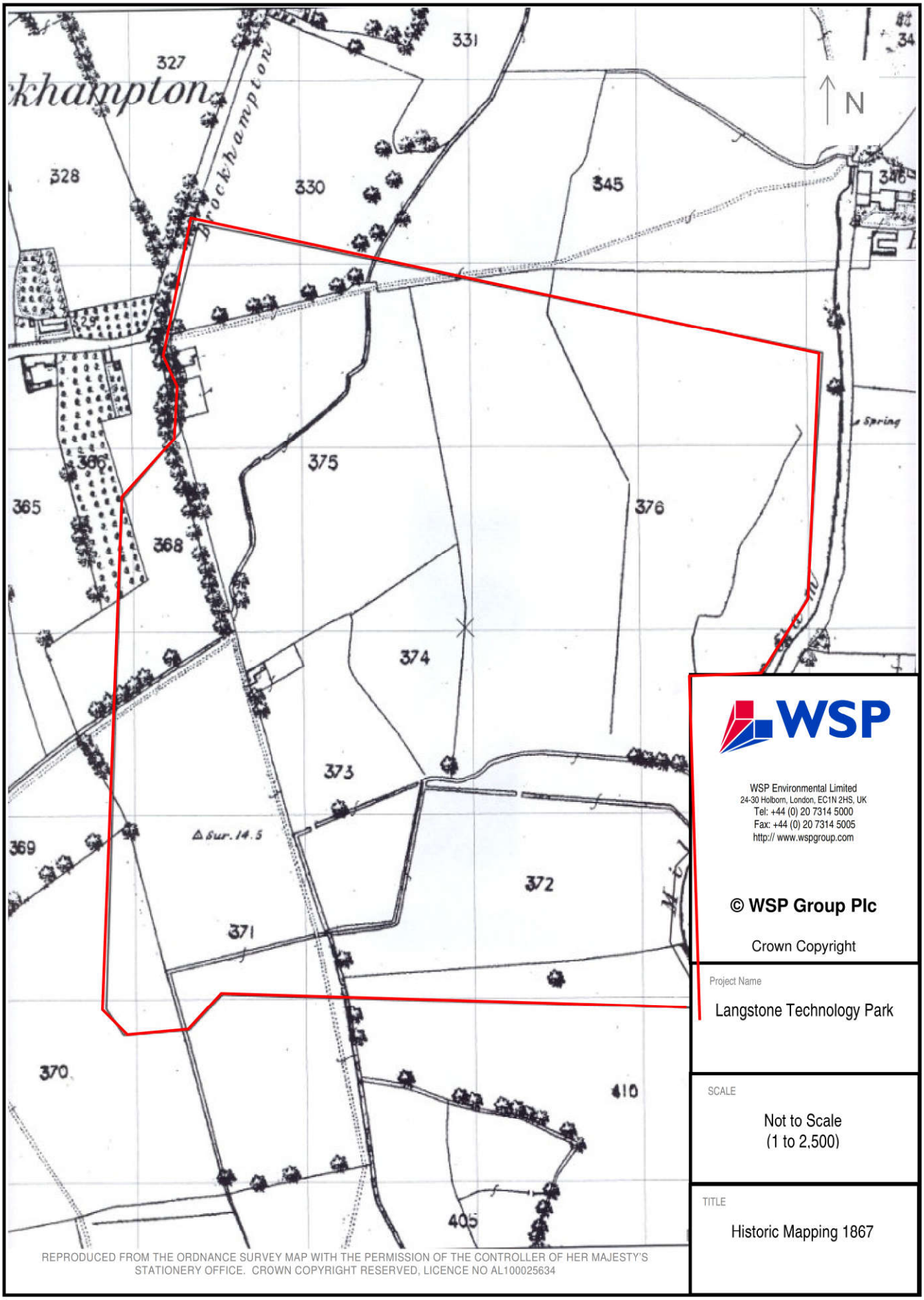
PLATE 2:



PLATE 3:



Appendix C Selection of Historical Map Extracts



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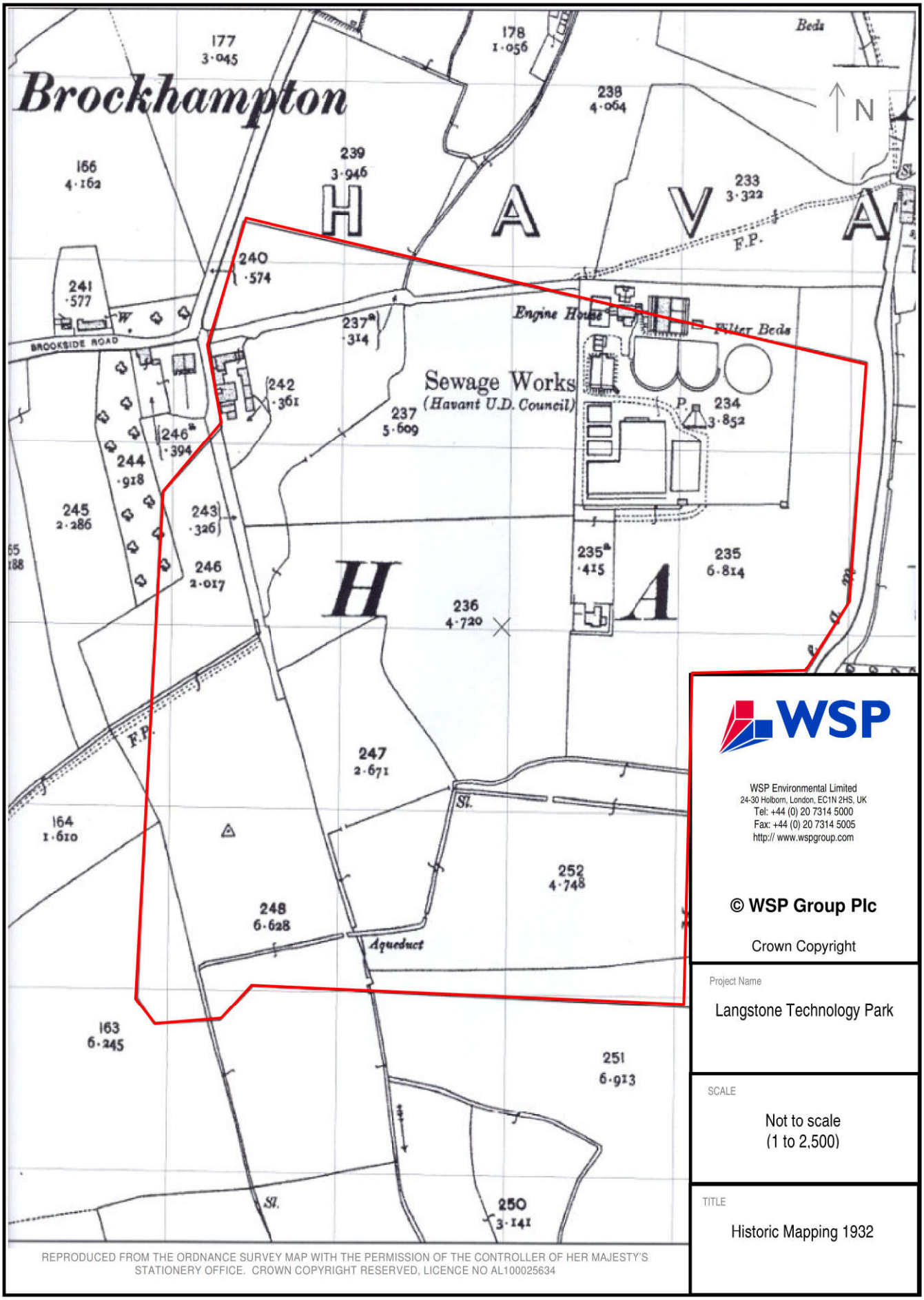
Langstone Technology Park

SCALE

Not to Scale
(1 to 2,500)

TITLE

Historic Mapping 1867



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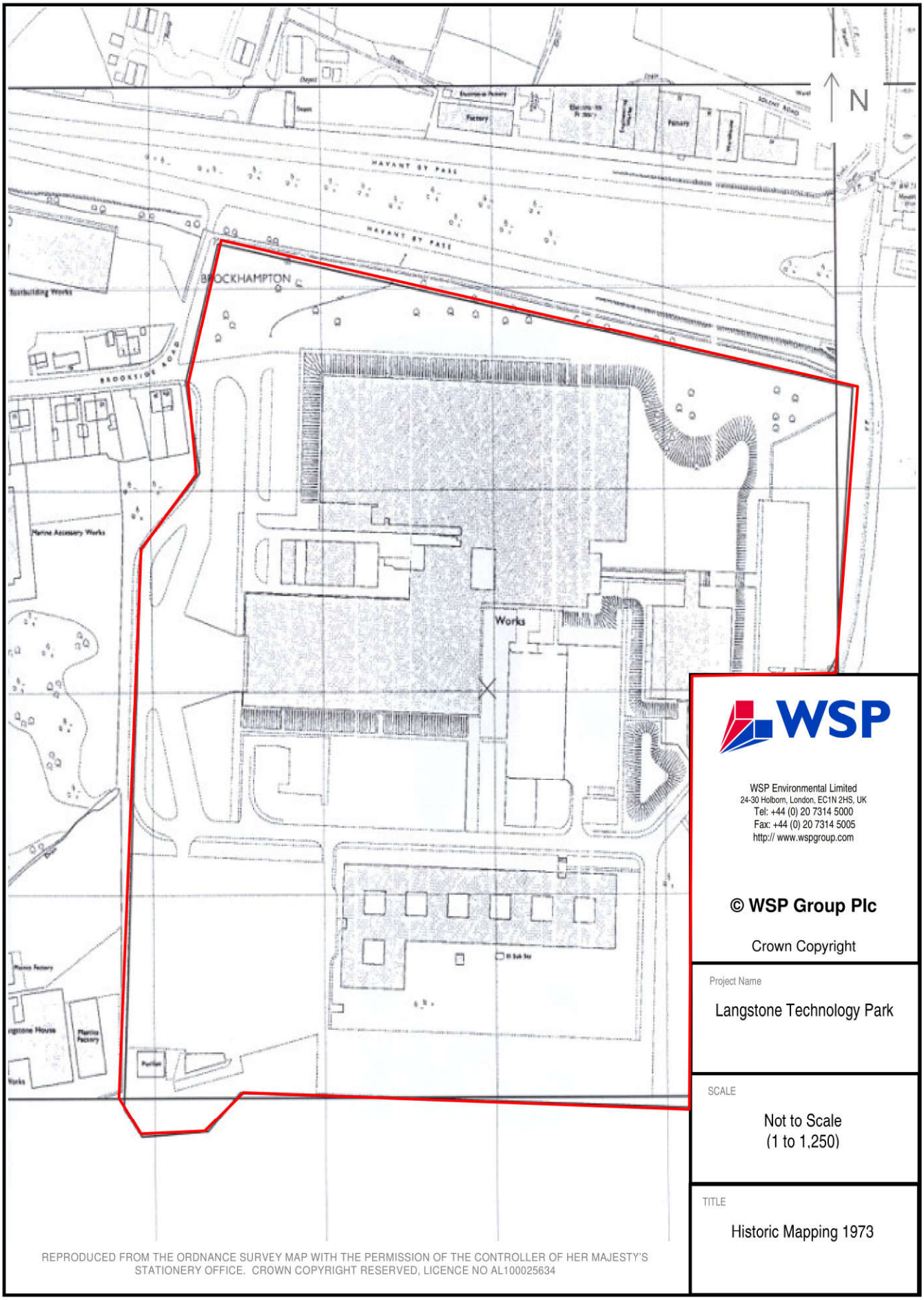
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TITLE

Historic Mapping 1932



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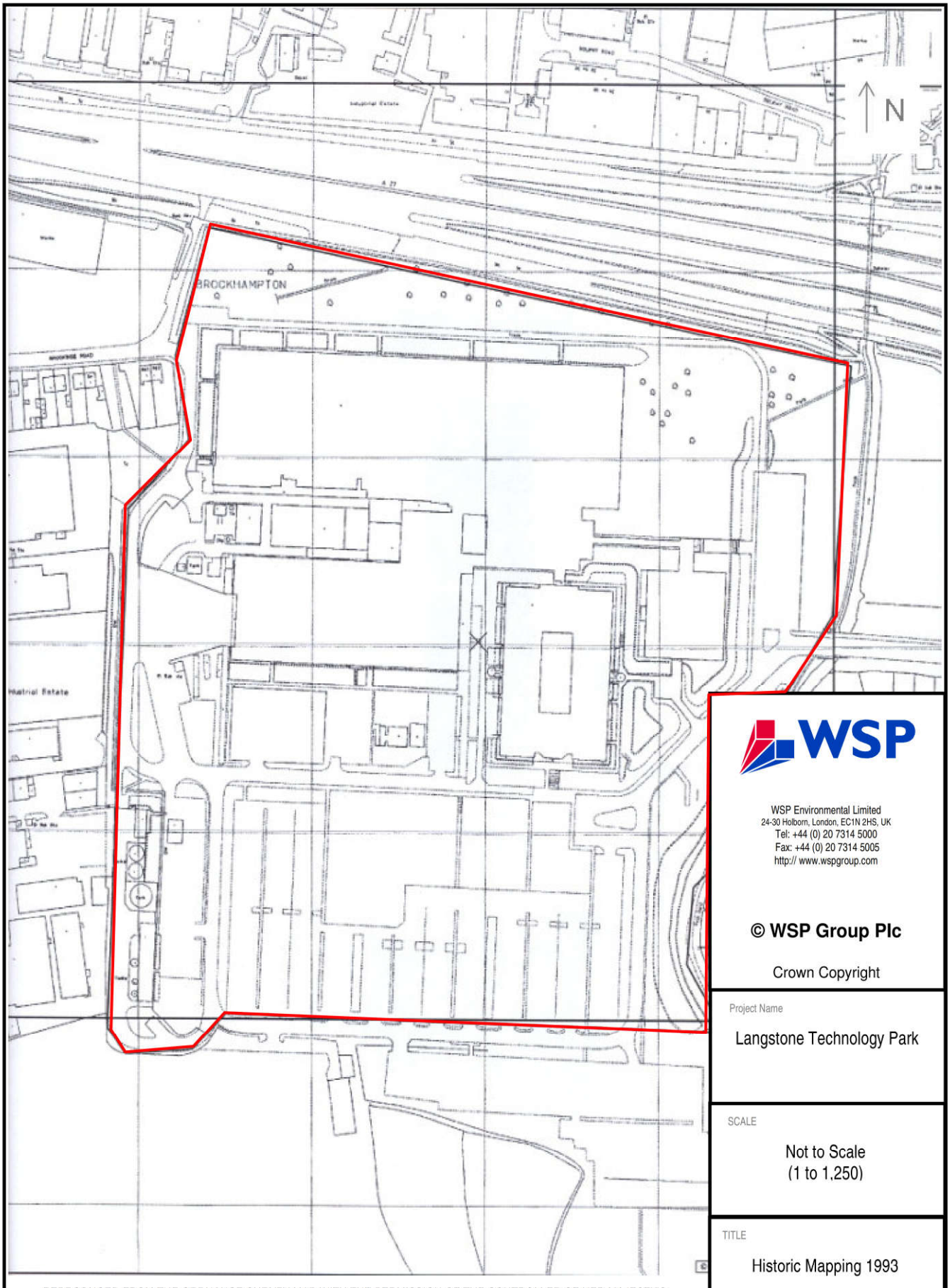
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SCALE

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TITLE

Historic Mapping 1973



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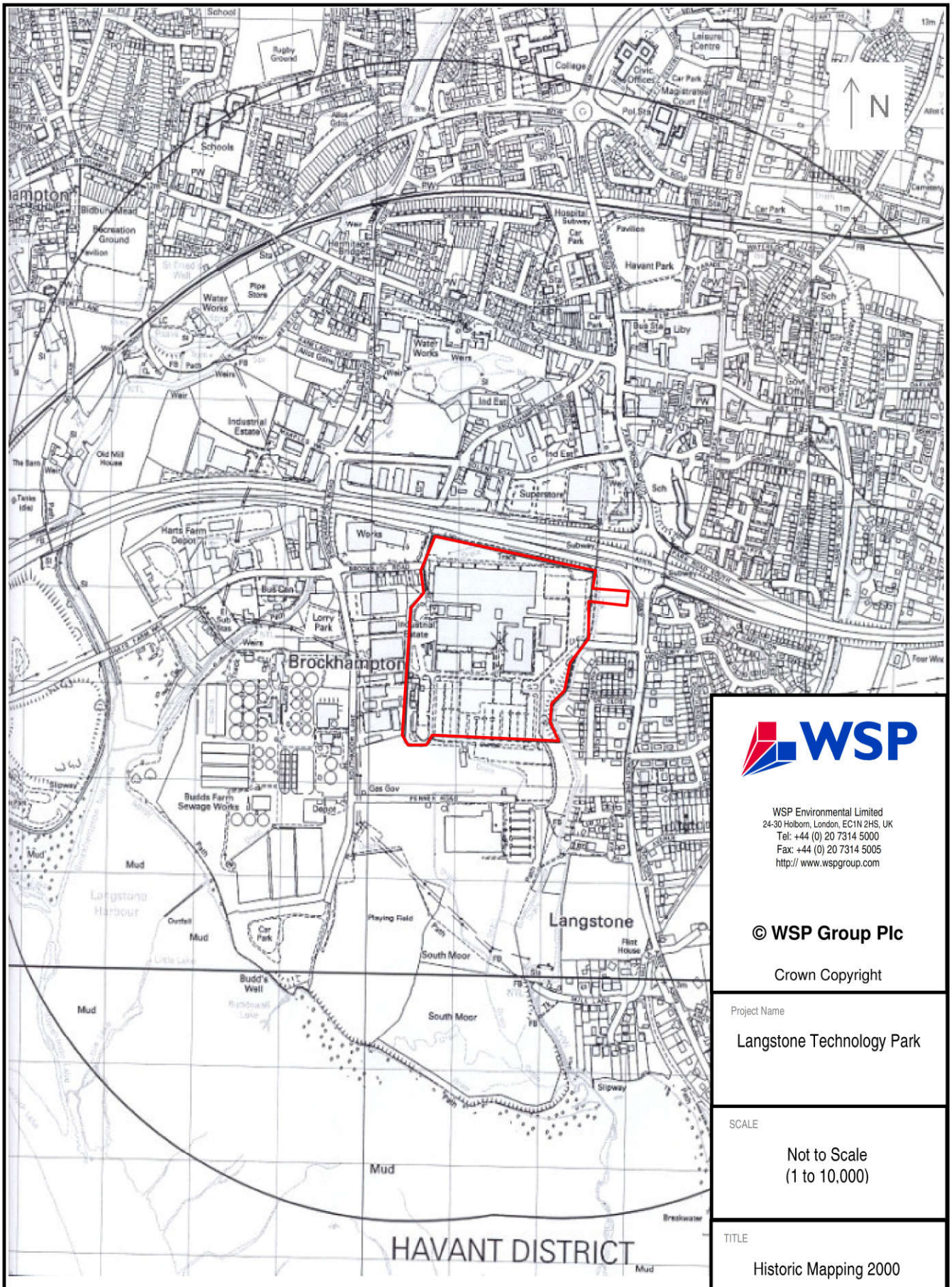
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SCALE

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TITLE

Historic Mapping 1993



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SCALE

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TITLE

Historic Mapping 2000

Appendix D Methodology & Limitations

Methodology

This Environmental Assessment has been designed to provide information relating to:

- the current and former land uses on and surrounding the site;
- the environmental sensitivity of the site location as determined by factors including geology, hydrogeology, surface watercourses and neighbouring land uses; and,
- relevant records held by the environmental regulators.

Any relevant information provided by the client has been reviewed, with appropriate action taken to ensure this information is taken into account and/or verified where necessary. All information is then assessed to define the potential for the site to give rise to environmental liabilities for the freehold/leasehold owner (as appropriate). Recommendations are made for additional work where this is necessary to fully define the site's environmental liabilities, and cost estimates of the financial implications of the findings can be provided under separate cover, where appropriate.

Risk Classification

This assessment has been undertaken with due regard to Contaminated Land Guidance documents issued by the Department for Environment, Food and Rural Affairs (and its Predecessors), the British Standards Institute (the BSi), the Royal Institution of Chartered Surveyors (RICS) and the American Society for Testing and Materials (ASTM) Standard E 1527-00. The methods used follow a risk-based approach, with the potential environmental risk assessed qualitatively using the 'source-pathway-target pollutant linkage' concept introduced in the Environmental Protection Act 1990.

Specific comment is made regarding the site's status under the Contaminated Land Regime implemented on the 1st April 2000 as Part IIA of the Environmental Protection Act 1990, and the actual or potential designation of the site as 'Contaminated Land' as defined in Section 78A(2). Unless specifically stated as relating to this definition, references to 'contamination' and 'contaminants' relate in general terms to the Presence of potentially hazardous substances in, on or under the site.

In addition, consideration has been given to a wide range of related topics including (where appropriate): environmental processes; current and foreseeable environmental legislation; the practices and duties of environmental regulators; the health and safety of occupiers and neighbours as affected by contamination; effects on the structure of buildings; and financial implications. References to risk classifications are made according to the following definitions:

Low Risk

It is unlikely that the issue will arise as a liability/cost for the freehold/leasehold owner (as appropriate) of the site.

Medium Risk

It is possible that the issue could arise as a liability/cost for the freehold/leasehold owner (as appropriate) of the site. Further work is usually required to clarify the risk.

High Risk

It is likely that the issue will arise as a liability/cost for the site freehold/leasehold (as appropriate) owner of the site.

Environmental Risk Assessment

The presence of contaminated materials on a site is generally only of concern if an actual or potentially unacceptable risk exists. Within the context of current UK Legislation (i.e. Section 57 of the Environment Act 1995), the interpretation of a "significant risk" is termed to be one where:

- Significant harm is being caused or there is a significant possibility of such harm being caused, (where harm is defined as harm to health of living organisms or other interference with the ecological systems of which they form a part and, in the case of man, includes harm to his property); and / or, pollution of Controlled Waters is being caused.

The potential for harm to occur requires three conditions to be satisfied:

- Presence of substances (potential contaminants/pollutants) that may cause harm (Source of Pollution).
- The presence of a receptor which may be harmed, e.g. the water environment or humans, buildings, fauna and flora (The Receptor).
- The existence of a linkage between the source and the receptor (The Migration Pathway).

Therefore, the presence of measurable concentrations of contaminants within the ground and subsurface environment does not automatically imply that a contamination problem exists, since contamination must be defined in terms of pollutant linkages and unacceptable risk of harm.

The nature and importance of both pathways and receptors, which are relevant to a particular site, will vary according to the intended use of the site, its characteristics and its surroundings.

In order to assess the contamination risk at the subject site the above rational has been applied and is discussed within section 6 in the context of Contamination Sources and Potential Pollutant Linkages.

Limitations

WSP Environmental Limited has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from WSP Environmental Limited; a charge may be levied against such approval.

WSP Environmental Limited accepts no responsibility or liability for:

a) the consequences of this document being used for any purpose or project other than for which it was commissioned, and

b) this document to any third party with whom an agreement has not been executed.

The work undertaken to provide the basis of this report comprised a study of available documented information from a variety of sources (including the Client) and discussions with relevant authorities and other interested parties. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only to the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, WSP Environmental Limited reserves the right to review such information and, if warranted, to modify the opinions accordingly.

Where no site inspection is undertaken (for example a Desk Study Assessment or due to restricted site access), WSPE cannot comment on the potential for environmental concerns associated with the current use or structure including the Presence of asbestos.

It should be noted that any risks identified in this report are perceived risks based on the information reviewed; actual risks can only be assessed following a physical investigation of the site.

Appendix E Report References

Environment Agency Aquifer Classifications

The Environment Agency (EA) Groundwater Vulnerability Map and Regional Appendices, which make up part of the published Policy and Practice for the Protection of Groundwater, divide the underlying strata in England and Wales into major, minor and non aquifers dependent upon their potential for potable water supply. The following table is derived from the main policy document. The division of the rock formations into major, minor and non aquifer reflects the Regional importance and vulnerability of the formation.

Major Aquifer

Highly permeable formations usually with the known or probable Presence of significant fracturing. Highly productive strata of Regional importance. Often used for large potable abstractions. E.g. Upper Chalk, Permo-Triassic Sandstones

Minor Aquifer

Fractured or potentially fractured but without high intergranular permeability. Generally only support locally important abstractions E.g. Coal Measures

Variable porosity and permeability but without significant fracturing. Generally only support locally important abstractions. E.g. River Terrace Gravels

Non Aquifer

Formations with negligible permeability. Only support very minor abstractions if any. E.g. Mercia Mudstones, igneous rocks

Regulatory Information Sources

Reference has been made to the Landmark Information Group data provision service. This includes information and data collated from several organisations, including the Environment Agency (EA), Department for Environment, Food & Rural Affairs (DEFRA), Health & Safety Executive (HSE), the Health Protection Agency (HPA), and the Coal Authority

GEO-ENVIRONMENTAL APPRAISAL REPORT

Langstone Technology Park,
Havant,
Portsmouth
PO9 1SA

October 2019
Report Ref: 10/1425/001

Prepared on Behalf of:

AG Langstone B.V.

By:

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GEO-ENVIRONMENTAL APPRAISAL REPORT
LANGSTONE TECHNOLOGY PARK, HAVANT, PORTSMOUTH

Report Reference: 10/1425/001

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EXECUTIVE SUMMARY

Client	AG Langstone B.V.
Location	The site comprises an approximately rectangular section of land occupying an area of 16Ha. The site is located toward the southern periphery of Havant, approximately 600m south of the Town Centre, and 1.5km south-east of Junction 5 of the A3(M). Vehicular access onto the site is obtained from the west via Brookside Road, and from the east via a dedicated access road (LTP Site Eastern Access Road). The approximate National Grid Reference for the centre of the site is 471300, 105700.
Development	The site is proposed to be partially re-developed comprising the partial demolition and reconfiguration of an existing laboratory and manufacturing unit located toward the north of the site in order to extend parking provision with associated landscaping and the construction of four (4No.) light industrial / commercial units with associated parking across the south of the site with associated car parking.
Site History	Historical OS maps of the area indicate the site was undeveloped until the early 1900s when a large sewage works and engine house occupied the north-eastern section of the site. During the subsequent decades this facility underwent significant expansion. In the mid 1950s, an allotment garden occupied the centre of the site. In the early to mid 1970s, the site had undergone large-scale redevelopment, resulting in the construction of many of the existing commercial / industrial units. In addition, by this time a large building and an electrical sub-station occupied the southern section of the site, within the existing car-parking area. By the early 1990s the building / electricity substation across the south of the site had been replaced by the existing car park and the site is understood to have been in its current configuration. The surrounding area has been a mix of undeveloped, and industrial land uses with mills, sewage works, works and industrial units along with a retail park with associated infrastructure all located / historically located within close proximity to the site.
Unexploded Ordnance	It is considered that there is an overall Medium Risk from German and anti-aircraft UXO at the site. It was also considered that the risk from Allied Ordnance was Low-Medium. It was recommended that a site-specific plan for the management of UXO risk be written for the site, that briefings be given to operatives prior to commencement of intrusive investigation works, and that these briefings be supplemented with UXO specialist engineer attendance during the works, and magnetometer survey of excavation positions.
Geology	The majority of the site is indicated to be underlain by superficial Alluvium Deposits. The western periphery of the site was recorded to be underlain by River Terrace Deposits. A thin, linear band of superficial Head deposits is indicated to be present across the central and southern sections of the site. Bedrock underlying the site is recorded to comprise chalk.
Mining	The site is not located within an area which may be affected by coal mining activity and no BGS recorded mineral sites are within 500m. There is 'very low' or 'no' hazard potential with regard to ground stability issues including, ground dissolution and landslides hazards. The potential hazard associated with collapsible ground, shrinking or swelling clay and running sand was considered 'low'. The potential hazard associated with compressible ground was considered 'moderate'.
Environmental Setting	The nearest identified environmental receptors are the underlying superficial strata which is classified as a Secondary A Aquifer, solid strata classified as a Principle Aquifer and water course immediately to the east of the site though the site is not situated within a Source Protection Zone and no groundwater or surface water abstractions have been identified within 250m of the site.

	The closest identified formal surface water feature is Langstone Mill Channel, which flows north to south past the site immediately beyond the eastern boundary.
Flooding	The site is not within an area susceptible to flooding from rivers or sea without defences however due to the size of the proposed development, a formal Flood Risk Assessment is likely to be required for the site.
Ground Conditions	Made Ground was identified during the intrusive investigation works to depths of up to 3.1m bgl. and generally comprised a variable sequence of either predominantly granular or cohesive materials of various subtypes. Sub-surface hardstanding was encountered in several locations across the site, generally corresponding with the locations of historic / demolished buildings. There remains the possibility that buried structures may be present elsewhere on site which have not been identified during this investigation. The Made Ground was underlain by a sequence of interbedded granular and cohesive strata interpreted to predominantly comprising river terrace deposits and or a highly weathered material derived from the underlying bedrock. These superficial deposits were proven to a maximum depth of between 5.1m and 6.0m bgl. Solid chalk bedrock was encountered below the superficial deposits across the site, proven to a maximum of 24.85m bgl. Groundwater was generally encountered across the site during the fieldwork at depths of between approximately 2.0m to 3.0m.
Soil Contamination	Visual and olfactory evidence of hydrocarbon contamination was recorded in WS2 and WS5 between though chemical testing did not identify any contaminants which exceeded relevant SSVs for commercial / industrial end use in terms of human health and no asbestos fibres or ACMs were encountered during the investigation. Whilst no elevated concentrations of the determinands tested have been recorded in terms of human health, localised concentrations of contaminants not identified / investigated during this investigation may be present in quantities considered harmful in terms of human health. Should during any future investigation / remediation / construction works identify visual or olfactory evidence of contamination, a suitably qualified environmental consultant should be contacted to further assess any potential issues. Additional works may be required to suitably quantify the risk to potential and identified receptors. In respect to controlled waters, chemical testing has identified elevated concentrations of organic contaminants when compared to SSVs for commercial / industrial end use in the locations of WS2 and WS5. Given the presence of controlled waters beneath the site and groundwater identified at approximately 2.0m to 3.0m bgl, it is recommended that further works be undertaken in these areas with the retrieval of soil and groundwater samples to suitably delineate the identified contamination and further assess the risk these contaminants pose.
Concrete Classification	Laboratory testing indicates that sub-surface concrete should be prepared as Design Sulphate Class DS-1 with an ACEC classification of AC-1.
Foundation Recommendations	It is considered that a shallow foundation solution may prove problematic given the very variable nature of the shallow natural strata. If a shallow foundation solution is utilised, excavations may need to over-deepened in areas of deeper Made Ground or very loose / very soft natural strata. Any shallow foundations may span strata of varying characteristics and may be at risk of differential settlement. We would therefore recommend that foundations are reinforced to protect against differential settlement. Given the above, a piled foundation may prove more suitable. Additional advice should be sought from a specialist piling contractor regarding the pile design (i.e. type, length and diameter). If a piled foundation solution is to be utilised, there may be differential settlement between piled structures and the surrounding ground level.

Hazardous Ground Gas	Ground gas monitoring was undertaken on 4 occasions and has recorded 7.2% carbon dioxide. No methane has been identified and gas flow rates were typically absent. Based on the gas screening values available, the site can be classified as Characteristic Situation 1 (CS1). According to the current guidance and best practice however, where carbon dioxide concentrations are recorded in excess of 5%, consideration should be given to increasing the classification to CS2. In this instance, given the relatively short monitoring period, the presence of elevated carbon dioxide, depleted oxygen levels, the depth and nature of the filled ground and presence of peat in the local area, we would recommend that the characteristic situation be increased to CS2 and that gas protective measures are installed in all new structures in accordance with guidance provided in BS 8485: 2015 "Code of Practice for the Design of Protective Measures for Methane & Carbon Dioxide Ground Gases for New Buildings".
Soakaway Testing	As part of the investigation, soakaway testing was undertaken in general accordance with the guidance provided in BRE digest 365 'Soakaway Design' in two locations with falling head tests also undertaken in two locations in order to supplement the soakaway data. Recorded infiltration rates suggest that the superficial deposits exhibit marginal to good drainage characteristics, and that soakaway drainage / permeable paving may be suitable subject to design parameters. Infiltration rates within the granular Made Ground also show good drainage characteristics however it should be noted that soakaway drainage in Made Ground is generally not considered acceptable by regulators. Whilst no visual or olfactory evidence of contamination was observed and laboratory test results within this area have not highlighted any elevated concentrations of the determinands tested, further thought should be given to the suitability of this location for the installation of soakaways. Due to the presence of chalk there is a risk of ground dissolution features caused by traditional soakaway structures that concentrate infiltration to a localised area. In low to medium density chalk traditional soakaways must have a minimum of 5-10m separation from buildings and structures to avoid the generation of dissolution features that may impact on building foundations (CIRIA C574 'Engineering in Chalk'). Distributive soakaways such as permeable paving and sub-base infiltration that do not concentrate infiltration avoid the risk of generating groundwater dissolution features.
Further Works	Based on the information available to date we would recommend the following further works are required: • Additional investigations to be carried out in the location of WS2 and WS5 to delineate identified organic contamination with regards to controlled waters. Soil and water samples to be recovered for laboratory testing. • Preparation of a Remediation Strategy following delineation of the organic contamination for approval with the Local Authority. • Gas protective measures to be installed in all new structures in accordance with CS2 conditions. The installation of the protective measures should be independently verified to ensure they are fit for purpose and to assist with planning discharge. • The continued risk of unexploded ordinance should be considered during any future excavations and an EOD engineer may be required on site to brief and support site personnel.

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1.0 INTRODUCTION

1.1 Background

Clancy Consulting Limited has been instructed by AG Langstone B.V to carry out a Geo-Environmental Appraisal for Langstone Technology Park, Havant, Portsmouth. Current redevelopment proposals include the partial demolition and reconfiguration of an existing building (Building 1000) located towards the north of the site in order to extend parking provision with associated landscaping, the construction of two new entrance / lobby areas to the existing Building 6000 and the demolition of the existing buildings in the south west of the site to facilitate the construction of four new light industrial buildings comprising twelve units with associated car parking. The newly constructed units will occupy a total area of approximately 12,500m^2 (use classes B1C, B2 and B8). Additional areas of proposed car parking are also planned in the south east and west of the site.

A Phase 1 Desk Study has been carried out for the site by Delta Simons Environmental Consultants Ltd which should be read in conjunction with this current, site investigation report. Clancy Consulting Ltd have also been provided with a copy of a Detailed UXO Risk Assessment for the site. Both of these documents are referenced below.

- Delta Simons Environmental Consultants Ltd. (May 2019) *'Preliminary Geo-Environmental Risk Assessment'*

- *1st Line Defence Ltd. (May 2019) 'Detailed Unexploded Ordnance (UXO) Risk Assessment'*

The Delta Simons report references two other phases of investigation, the reports of which are referenced below. Clancy Consulting Ltd have not however been in receipt of a copy of these reports.

- *WSP (December 2005) 'Phase I Environmental Assessment'*

- *Delta-Simons Environmental Consultants Ltd. (September 2018) 'Phase I Environmental Assessment'*

A site location plan and proposed site layout plan are presented in Appendix I.

1.2 Objectives

The objectives of this investigation are summarised below:

- Review and provide a summary of data obtained during a previous Phase 1 geo-environmental site investigation carried out by a third party, inclusive of land use history, environmental setting, geology, hydrology, hydrogeology, mining and potential geotechnical hazards at the site and surrounding area.

- Undertake a ground investigation comprising the excavation of trial pits, window sample and cable percussive boreholes in order to examine the ground conditions present at the site, and the characteristics of existing building foundations.

- Carry out chemical testing of the soils to assess whether any contamination risk exists with regard to the environment and / or human health.

- Undertake testing for the presence of asbestos fibres in soils and any fragments of asbestos containing materials (ACMs) encountered during the site investigation to assess whether any risk exists with regard to human health.

- Carry out a gas risk assessment to investigate the potential risk to end users of the site from hazardous ground gas.

- Refine the Preliminary Risk Assessment and Conceptual Site Model with regard to potential contamination sources, pathways and receptors.

- Carry out geotechnical testing of the soils to further assess their physical characteristics and provide indicative recommendations for foundations.

- Provide recommendations regarding the requirement for further investigations, if required, to satisfy the Local Planning Authority.

1.3 Limitations of the Study

Clancy Consulting Limited cannot be held responsible for any omissions, misrepresentation, errors or inaccuracies with the supplied third-party reporting / information. The report is written in the context of an agreed scope of work and budget and should not be used in a different context. New information or improved practices and changes in legislation may require a reinterpretation of the report in whole or in part.

Clancy Consulting Limited reserves the right to amend either conclusions or recommendations in light of any further information that may become available. The report is provided for the sole use of AG Langstone B.V. for the objectives discussed previously only and is confidential to them.

The report may not be relied upon by any other party without prior written consent of Clancy Consulting Limited. Those using this information in subsequent assessments or evaluations do so at their own risk.

There is a possibility that buried structures may be present beneath the site associated with potential historic buildings which have not been identified during this investigation.

2.0 DESK STUDY

2.1 Sources of Information

The following sections summarise the data presented in the documents referenced above, supplemented by data obtained from statutory and online data sources including those provided by the British Geological Survey (BGS), the Environment Agency, and DEFRA.

2.2 Site Setting and Description

Langstone Technology Park, hereafter referred to as ‘the site’, comprises an approximately rectangular section of land occupying an area of 16Ha. The site is located toward the southern periphery of Havant, approximately 600m south of the Town Centre, and 1.5km south-east of Junction 5 of the A3(M). Vehicular access onto the site is obtained from the west via Brookside Road and from the east via a dedicated access road (LTP Site Eastern Access Road). The approximate National Grid Reference for the centre of the site is 471300, 105700.

Langstone Technology Park comprises a series of large buildings subdivided into leased units of varying purposes. The largest of the buildings located toward the north of the site and referred to

as 'Building 1000' is a single-storey structure built atop of a man made embankment and understood to contain a number of office, manufacturing and laboratory units with access tunnels running from the car park to the north to beneath the building.

Occupying the centre of the site are a series of buildings including two plant buildings ('Building 2000 and 3000'), offices and amenity complex with associated courtyards ('Building 4000'), a large data and distribution centre ('Building 5000') with waste storage area to the west, and three-storey office buildings ('Building 6000 and 7000'). A small on-site nursery is present to the south of Building 5000.

Toward the south-western corner of the site is a small gymnasium, vehicle washing area (with associated subsurface drainage) storage area and a number of circular historic tank bases. A site walkover undertaken by a third party (Delta Simons) in July 2015 recorded this area to have previously been used as a deionised water production facility, a caustic and buffer chemical storage area, and an effluent treatment plant. Additional information is provided in Section 2.17 below.

Access infrastructure and open landscaping is covering the rest of the site, with engineered slopes within the landscaping areas across the site, suggesting that significant earthworks have previously taken place. The remainder of the site is currently occupied by car parking areas.

The site is bound to the west and south by a series of commercial / light industrial units fronting onto Southmoor Road and Penner Road which run parallel to the site approximately 100m from the respective boundaries. These units are separated from the site by thin, linear sections of heavily vegetated landscaping. Immediately beyond the eastern boundary of the site is a vegetated river corridor associated with Langstone Mill Channel, which runs north to south past the site, eventually flowing into Bridge Lake approximately 500m to the south. Beyond this corridor to the east is a large residential estate.

North of the site, beyond the landscaping areas is the main carriageway of the A27. The associated verges are wooded with a public footpath with forms a site access in the north east of the site. Beyond the A27, approximately 100m to the north is a retail park which includes a Petrol Filling Station.

Open space belonging to Southmoor Nature Reserve is present approximately 250m to the south separating the tidal lakes (Bridge Lake and Storehouse Lake) from the various industrial / commercial concerns located on and in the vicinity of the site.

2.3 Phase 1 Desk Study Findings

2.3.1 Site History

As part of the Phase 1 Desk study undertaken by Delta Simons Environmental Consultants Ltd. available historical Ordnance Survey (OS) maps, and aerial photography were examined in order to assess the development history and previous land uses at the site and in the surrounding area. The findings of this assessment are summarised below.

The first available OS map dated 1867 records the site and immediate surrounds to have been under predominantly agricultural use with several small, unspecified buildings recorded toward the north-western and western peripheries of the site. Havant Corn Mill was recorded approximately 90m north-east of the site. A watercourse was shown flowing north-east to south-west across the northern section, and a series of artificial drainage channels ran west to east across the southern section of the site, associated with the Mill Stream / Channel which was located off-site to the east. By 1897, an aqueduct and sluice were shown in the south-western corner of the site associated with the southern drainage channel.

The OS map dated 1909 showed a large sewage works and engine house occupying the north-eastern corner of the site. During the subsequent decades this facility underwent significant expansion. The OS Map dated 1932 showed several large filter beds within the treatment complex.

By 1954 a number of tanks and sludge beds were identified within the sewage works complex and an allotment garden occupied the centre of the site. OS Maps dated 1962 and 1963 record the sewage works simply as 'works', however the orientation of infrastructure within the complex suggests ongoing operation of the facility. By this time, small scale residential development had occurred to the west, and to a greater extent to the east beyond Langstone Mill Channel, and a larger sewage works complex had been constructed approximately 200m to the south-west.

The A27 Havant bypass had been constructed to the north of the site by 1966 resulting in the demolition and removal of Havant Corn Mill. Industrial premises were recorded approximately 50m north-west of the site at this time.

OS maps dated 1972-1975 show the large-scale redevelopment of the site, resulting in the construction of commercial / industrial units occupying the approximate footprints of existing Buildings 1000, 3000, 5000, 4000, 6000 and 7000. In addition, by this time a large building and an electrical sub-station occupied the southern section of the site, within the existing car-parking area. The entire complex was referred to as 'works'. Additional works / industrial units were recorded immediately west of the site, and the retail park located north of the A27 had also been constructed by this time. The sewage works to the south-west had undergone expansion.

By 1990 the building / electricity sub-station across the south of the site had been replaced by a car-park. A number of tanks and an electricity sub-station were recorded across the southwest of the site. Additional industrial units had been constructed immediately west of the site.

By 1993 the site is understood to have been in its current configuration, and by 2000 the industrial units currently located immediately beyond the southern site boundary had been constructed.

A number of potential sources of contamination were identified by Delta Simons within 150m of the site, including:

- The sewage works present on-site between 1909 until circa 1972, and later industrial / commercial activity undertaken at the site following redevelopment including tanks and sub-stations, and prior to the current site use.
- Havant Mill, located approximately 90m north-east of the site between 1867 and ca. 1966.
- The sewage treatment facility shown approximately 200m southwest of the site between 1962 and the present day.
- An unspecified works unit shown approximately 50m north-west of the site between 1966 to present day.
- Unspecified works shown immediately west of the site between 1972 and present day.
- Other various works including a depot and tanks which were recorded at or in excess of 150m from the site to the north-west and north, but which were not specifically described by Delta Simons within the summary text.

2.3.2 Unexploded Ordnance (UXO) Risk Assessment

The review of historical mapping for the area does not show any significant building damage or demolition which would likely be associated with bomb damage. However, a site-specific assessment of risk with regard to Unexploded Ordnance (UXO) was undertaken by 1st Line Defence in May 2019 on behalf of Delta Simons in support of the Phase 1 Desk Study produced for the site.

The 1st Line Defence UXO assessment considered that there is an overall **Medium Risk** from German and anti-aircraft UXO at the site. It was also considered that the risk from Allied Ordnance was **Low-Medium.**

It was recommended that a site-specific plan for the management of UXO risk be written and briefings be given to operatives prior to commencement of intrusive investigation works. These briefings should be supplemented with UXO specialist engineer attendance during any intrusive works to undertake a magnetometer survey of excavation positions.

2.3.3 Geology

The 1:50,000 British Geological Survey (BGS) scale map for the area (Sheet No. 316, Fareham) indicates that the majority of the site is underlain by superficial Alluvium deposits, with River Terrace deposits underlying the western periphery of the site.

A thin, linear band of superficial Head deposits (clay, sand and gravel) is indicated to be present across the central and southern sections of the site.

Bedrock underlying the site is recorded to comprise chalk of the Lewes Nodular Chalk Formation, Seaford Chalk Formation, Newhaven Chalk Formation, Culver Chalk Formation and Portsdown Chalk Formation (undifferentiated) of Cretaceous age. These materials are biogenic and detrital, generally formed by shallow marine processes involving the deposition of carbonate material (coccoliths) forming distinctive beds of chalk.

The BGS do not record the site to be underlain by artificial ground, however given the setting and development history which includes possible large-scale earthworks and reconciliation of former sludge beds, some Made Ground would be expected. Artificial ground associated with the construction of the A27 is identified by the BGS immediately north-east of the site.

The environmental search undertaken as part of the Delta Simons report identified eight records of potentially infilled land (water) located on-site, which were presumed to be associated with the drainage channels/aqueduct shown on historical maps. An additional seven areas of infilled land (water) were recorded off-site, within 250m.

Twelve historical British Geological Survey (BGS) boreholes were recorded within the site boundaries, excavated in 1966 as part of a ‘proposed development at Brookside Road’. Recorded ground conditions generally comprised topsoil to a depth of approximately 0.8m bgl overlying superficial deposits consisting of clay, silt, gravel and occasional peat layers. Chalk bedrock comprising cobbles in a matrix of ‘firm putty chalk’ with flints was encountered below the superficial deposits and recorded to a maximum depth of approximately 5.60 m bgl.

2.3.4 Mining & Ground Stability

According to Coal Authority records, the site is not located within an area which may be affected by coal mining activity. The BGS consider that ‘no hazard’ is present at the site with regard to ‘non-coal’ mining (underground) and there are no recorded mineral sites within 500m.

There is a 'very low' or 'no' hazard potential at the site with regard to ground stability issues including, ground dissolution and landslides hazards. The potential hazard associated with collapsible ground, shrinking or swelling clay and running sand was considered 'low'. The potential hazard associated with compressible ground was considered 'moderate'.

'Moderate' hazard with regard to ground dissolution was recorded approximately 97m north of the site.

2.3.5 Hydrogeology

According to Environment Agency groundwater vulnerability maps, the various superficial deposits recorded across the site have been classified as a Secondary (A) Aquifer, whilst the underlying chalk bedrock is classified as a Principal Aquifer.

The site is not located within a groundwater Source Protection Zone (SPZ), however an SPZ Zone 1 (inner protection zone) is located 173m north-east of the site.

There are three groundwater abstraction licences recorded within 500m of the site, all of which relate to the abstraction of water for potable use from a borehole located approximately 461m north of the site.

No groundwater discharge consents have been recorded within 500m of the site.

2.3.6 Hydrology

The nearest identified formal surface water feature is Langstone Mill Channel, which flows north to south past the site immediately beyond the eastern boundary. Historical mapping has identified additional drainage channels which were previously present across the north-eastern and southern sections of the site. The current status of these former channels is unknown.

A series of tidal waterways, referred to as Bridge Lake, Storehouse Lake, Chalkdock Lake, North Lake and South Lake, which collectively make up a saline estuary are located approximately 500m south of the site.

No surface water abstraction points have been recorded within 500m of the site.

Sixty-six surface water discharge consents have been recorded within 500m. Two of these entries were recorded as being on site and were related to the to the discharge of 'other matter-surface water' resulting from the manufacture of computers / electronics / optical products. The receiving water was not supplied, however, based on the location of the site and adjacent watercourses is anticipated to be Langstone Mill Channel. The consent was originally issued in April 1978 to Xyratex Ltd. and superseded in March 1995 with a similar authorisation issued to Fasset Ltd. The latest iteration of the consent is understood to be active.

Four pollution incidents to controlled waters were recorded within 250m. The closest recorded incident occurred on March 1995 approximately 82m east of the site, involving the release of 'unknown oils / related products' into an undisclosed watercourse. This was considered to be a Category 3 (minor) incident. An additional Category 2 (significant) incident occurred on January 1997 approximately 94m north-east of the site, involving the release of 'diesel oil' into an undisclosed watercourse.

A prosecution relating to controlled waters has been recorded within 250m. This incident involved 'tipping brick rubble onto land without a waste management license' in February 2005.

2.3.7 Flood Risk

According to Environment Agency records, the majority of the site is located in Flood Zone 1 and is therefore not within an area susceptible to flooding from rivers or sea without defences. The eastern periphery of the site, immediately adjacent Langstone Mill Channel is located within Flood Zone 2 (Fluvial Models). With the exception of a small section of the LTP Site Eastern Access Road, no on-site infrastructure is impacted by this designation. Zone 3 (Fluvial Models) is located immediately east of the site.

Due to the size of the proposed development (>1Ha), a formal Flood Risk Assessment is likely to be required.

An area benefitting from flood defences is recorded approximately 70m west of the site. No flood storage areas have been recorded within 250m.

The site is located within a BGS Groundwater Flooding Susceptibility Area where there is potential for groundwater flooding to occur at surface.

2.3.8 Radon Risk Potential

The Radon Guidance on protective measures for new dwellings indicates that the site is located within an area where between 3% and 5% of homes are above the National Radiological Protection Board (NRPB) recommended action level.

As a result, basic radon gas protective measures are likely to be required in new buildings at the site.

It is recommended that a site-specific radon risk assessment be obtained.

2.3.9 Landfill and Waste Management Sites

A historic landfill facility has been recorded within 500m of the site, which was used to dispose of household waste and was located approximately 191m south-west. The rate of input, date of operation / closure, and the size of the facility have not been recorded.

One landfill site has been recorded by the Local Authority within 500m, located 201m to the south-west, off Southmoor Lane and was operated by Havant Borough Council. The facility was authorised to accept household, commercial and acidic waste. No further information was available regarding maximum input rate, size, or last date of input, however, the site is understood to have closed.

Seven historic waste treatment, transfer and disposal facilities were recorded within 500m of the site with one of these entries located on-site. Teleplan Ltd are authorised to operate an electronics (WEEE) treatment facility within the current site boundary; no further detail have been provided, however the authorisation is understood to be active. The closest off-site entry relates to a household, commercial and industrial transfer station which was located 302m west of the site. Authorisation to operate was issued in September 1997 and was surrendered in October 2010.

Two additional registered (EA) waste transfer facilities have been recorded within 500m and the closest is located 281m west of the site and is authorised to accept concrete and brick rubble, construction and demolition wastes and soils. The remaining facility is located approximately 369m west, and is authorised to accept batteries, degradable commercial and household waste, inert materials, metal waste and special waste. Both facilities are understood to be active.

Three registered waste treatment / disposal sites have been identified within 500m. The closest entry relates to a scrapyard located approximately 248m north of the site and the accepted waste was restricted to scrap metal, and associated vehicle wastes. The license lapsed or was cancelled in August 1990. The remaining treatment facilities were located in excess of 350m from the site.

2.3.10 Industrial Land Uses

Seventy-six contemporary trade directory entries have been recorded within 250m of the site, of which eighteen are currently active. Three entries (all inactive) have been recorded on site.

The inactive on-site entries relate to printing activities undertaken by Diamond Print and Mail Centre Ltd., computer manufacture (Xyratex Ltd.) and general engineering (Saacke Combustion Services Ltd.).

Active off-site trade directory entries include; tool design and manufacturers, blind awning and canopy manufacture, domestic appliance servicing and repair, domestic cleaning services, air conditioning and refrigeration contractors, spray painting/coating, precision engineering, marine electrical services, petrol filling stations, garage services, electrical engineers, metal finishing services and pallet manufacture.

Potentially contaminative inactive entries included; fireplace and mantelpiece manufacture, air conditioning and refrigeration contractors, domestic cleaning services, general engineering, commercial vehicle repair, car body repairs, precision engineering, aviation engineering, crane hire, printers, electronic component manufacture and distribution, pest and vermin control, marine engineering, case manufacturers, hospital, road haulage services, packaging manufacturers, waste disposal services, tyre dealers, distribution services, plastic injection moulding, sheet metal work, screen printing, car component manufacture, garage services, dry cleaners, boatbuilding, metal finishing, builders merchants, plastic product manufacture and lighting manufacture.

Two petrol filling stations (PFS) are recorded within 250m. The closest (Havant Lorry Park) is located approximately 137m north of the site. This facility is recorded to be obsolete. An additional active PFS (Tesco Havant Extra) is recorded approximately 141m north.

Twelve industrial manufacturing points of interest were recorded on-site. These records include manufacturing businesses (Fasset Ltd, Havant International Ltd.) and nine unspecified tanks. An additional fourteen manufacturing points of interest (predominantly 'works' facilities) are recorded off-site within 250m.

2.3.11 Environmental Permits, Incidents and Registers

Two Integrated Pollution Control (IPC) consents and three Integrated Pollution Prevention and Control (IPPC) authorisations have been issued within 500m of the site according to the database search undertaken as part of the Delta Simons Phase I Desk Study. Two of these entries (both IPC) were recorded on-site, authorising 'processes involving halogens within the chemical industry' by Adflex Solutions Ltd. The initial authorisation was issued in March 1995 and varied (non-substantially) in January 1997. Authorisation was subsequently revoked, however no associated date has been supplied. The remaining recorded IPPC authorisations were located in excess of 350m from the site, and related to the combustion of waste derived fuel, and landfilling activities.

Fifteen Local Authority Pollution Prevention and Control permits are recorded within 500m, one of which is located on-site. The on-site authorisation is held by Teleplan and White Electronics Ltd. and relates to 'unspecified' Part B activities. Additional authorised processes within 150m of

the site include 'coating of metal and plastic' at a site located 29m to the south-west, and 'respraying of motor vehicles' at facilities located 45m, 76m, 78m, and 119m south-west, and 121m west. The majority of these authorisations remain active.

Six authorisations under the Radioactive Substances Act for the keeping, use and disposal of radioactive substances have been issued within 500m. These authorisations are all held by Apollo Fire Detectors Ltd. at premises located between 44m and 126m north-west of the site.

2.3.12 Sensitive Land Uses

The site is situated within a Nitrate Vulnerable Zone for surface waters.

An area of outstanding natural beauty (Chichester Harbour) has been designated by Natural England approximately 406m to the south-east. In addition, Chichester and Langstone Harbours, recorded approximately 306m to the south have been designated a RAMSAR site.

A Site of Special Scientific Interest (Langstone Harbour) has been designated by Natural England approximately 306m south of the site.

According to historicengland.org.uk there is one area of heritage interest located within 100m. This feature is a Grade II Listed Building known as Langstone Hotel.

2.3.13 Planning

A search of the Havant Borough Council Planning Portal was undertaken by Delta Simons on 13th May 2019 in order to identify any applications on, or in the vicinity of the site pertinent to the proposed development.

Several applications were identified, the majority of which are understood to relate to minor external changes or changes in use of on-site buildings.
The following specific applications were identified:

- Demolition of existing steel-clad building and two portacabins to make way for a single storey timber framed building to house a nursery school with capacity for 52 pupils (ref. APP/10/00272, dated August 2010)

- Construction of Waste Compactor Housing and Consumables store (ref. APP/11/00168, dated February 2011)

- Installation of 2 no. roof mounted condenser units and associated chiller pipework to support 2 no. additional internal computer room air conditioning units (ref. APP/15/01225, dated October 2015)

Delta Simons state that no additional potentially contaminative activities or other information pertinent to the assessment was identified from the historical planning records.

2.4 Summary of Other Previous Investigations

As part of the Preliminary Geo-Environmental Risk Assessment Report, Delta Simons provided a summary of previous investigation works undertaken at the site. An overview of these investigations is provided below.

2.4.1 WSP Phase I Environmental Assessment December 2005

Investigations were undertaken in December 2005 by WSP Ltd ('Phase I Environmental Assessment – Langstone Technology Park') though we have not been in receipt of a copy of this report.

Potentially contaminative activities identified during a site walkover undertaken as part of the investigation were limited to the storage of diesel fuel in two above ground storage tanks and the storage of waste materials.

During the investigation the Contaminated Land Officer at Havant Borough Council was contacted. According to WSP, the Officer stated that based on the historical and neighbouring land uses, and the use of good quality hardstanding, the site was not considered to pose a concern with regard to human health given its continued use as a technology park. It was noted that in the case of redevelopment, further intrusive investigations would be required.

The following third-party reports were also reviewed as part of WSP's assessment, however, were not provided to Delta Simons:

- A 1999 Environmental Monitoring Program undertaken by Casella Ltd. The report is understood to have detailed results of effluent monitoring, industrial emissions monitoring, ground water monitoring, surface water monitoring and building fabric monitoring. WSP indicated that the Casella Ltd. report reviewed a number of intrusive and non-intrusive investigations previously undertaken at the site, and identified potential issues associated with; elevated, but relatively low concentrations of toluene and hydrocarbons recorded during effluent monitoring for Building 2000, groundwater contamination associated with chlorinated solvents; and copper contamination 'within a concrete slab'. It was noted by WSP that the effluent treatment facility had subsequently been decommissioned, that the identified groundwater contamination was outside the current Site boundary and that the concrete slab had since been remediated.

- A 1999 Phase I Environmental Audit undertaken by WSP Environmental.

- A 1999 Initial Ground Investigation by Soil Consultants Limited, which was understood to have identified potential issues associated with elevated concentrations of cadmium in soil samples taken from two boreholes excavated at the site, and elevated levels of arsenic, lead, copper, zinc and mercury within samples taken from a single borehole. It was noted by WSP that the soil guidance values used for comparison at that time were no longer applicable.

- A 2003 and 2004 'Addendum Site Investigation Report' undertaken by STATS Ltd. WSP indicated that the report identified potential issues associated with elevated concentrations of ground gases within Made Ground at the site. This report was, however based on a single monitoring visit and did not record flow rate.

WSP stated within the report that based upon the information obtained the contamination issues identified did not represent a significant risk with regard to the continued commercial use of the site. It was noted, however that the potential presence of residual contamination, which may require remediation in the event of redevelopment, could not be discounted.

Given the ground gas concentrations identified in a previous investigation at the site, it was considered that the presence of ground gas could not be discounted, as such, further ground gas testing was recommended.

2.4.2 Delta-Simons Phase I Environmental Assessment September 2015

Delta Simons produced a Phase I Environmental Assessment, dated September 2015 though we have not been in receipt of a copy of this report. The report was undertaken as an appraisal of 'inground' environmental risks and liabilities, as part of a pre-divestment assessment of the site. It was undertaken in the context of the site remaining under commercial/ industrial use.

As part of the investigation a site walkover was undertaken. At the time of the investigation, the site was occupied by offices, laboratories, light manufacturing/ engineering, a gym, and a nursery.

The following potential sources of contamination were identified during the Site Walkover carried out on 29th July 2015:

- Waste storage areas were identified toward the east and west of the site. The Site Facilities Manager stated that the western waste storage area had been used by the former tenant (IBM) for chemical storage and processing. Associated plant remained present, including two above ground storage tanks. The plant was understood to include air and chemical extraction systems, solvent recovery equipment, carbon absorption tanks, and chemical storage which included hydrochloric acid, sodium hypochlorite, xylene, nitrogen and cyanide.

- Further general waste storage areas were observed to the west and south-west of Building 5000 (comprising vegetation, metal cardboard, domestic waste, vehicle tyres and drums)

- Beneath Building 1000 in north-western corner of the site, was a chemical drum store. The drums were located within an area of secondary containment;

- Electricity sub-stations were identified in the south-western corner and the centre of the site

- A back-up generator was located between Building 3000 and Building 4000 (central section of the site)

- In the south-west corner of the site, a deionised water production plant and caustic storage area were recorded, in addition to an effluent treatment plant and buffer holding tanks. It was understood that this area had undergone previous intrusive investigation works, however, no further information was available. Used engines/ motors were noted to be stored on pallets externally in this area.

- It was noted that Asbestos Containing Materials were present within the fabric of the buildings on-site, managed via an Asbestos Register. No evidence of leakages/ spillages was observed during the walkover and no significant issues of potential environmental concern (aside from the potential sources listed above) were identified.

The following additional anecdotal information was obtained during the walkover:

- It was understood that surface water pooling occurs in car park areas during periods of increased precipitation.

- Delta Simons was informed by the Facilities Manager that a pollution incident which required remediation works had taken place in 1984, however, no further details were available. Delta Simons did not consider this to represent a significant cause for concern in the context of the current commercial / industrial use of the site.

- Two oil interceptors were recorded within the eastern car parking area.
- Two tunnel entries (into an embankment) were present within the northern elevation of Building 1000 toward the north-western corner of the site.
- A surface water pump house was observed to the east of Building 6000.

2.5 Desk Study Conclusions / Recommendations

Based on the data presented above, Delta Simons Environmental Consultants Ltd. carried out a Preliminary Risk Assessment in accordance with the guidance established in Environment Agency document CLR 11 'Model Procedures for the Management of Land Contamination'. identifying and evaluating potential sources of contamination, possible receptors following redevelopment, and potential contaminant linkages.

The site was considered by Delta Simons to represent 'moderate' environmental sensitivity based on the presence of the underlying superficial Secondary A Aquifer, the Principal bedrock aquifer, and the commercial / industrial use of the site and surrounding area.

The following potential contaminant sources were considered significant:

On-site:

- Potential sources of contamination at the site are considered to include; limited quantities of fuel and chemical storage associated with the current site use(s), chemical storage and activities associated with the site's former uses (electronics manufacture), and historical use of the north-eastern section of the site as a sewage works between 1909 and ca.1972.

Off-site:

- Delta Simons considered significant potential historical off-site sources of contamination (within 150m) to include; a mill, a sewage works, factories, an engineering works, a warehouse, a boatbuilding works / works, a plastics factory and a pumping station with a tank.
- Current potential off-site sources of contamination were considered to include; vehicle respraying processes, metal coating processes, a landfill, a fuel station and facilities for tool design, precision engineering, aviation engineering and engineering services.

Given that the proposed redevelopment requires the partial demolition of existing on-site buildings in the northeast of the site and the construction of new buildings in the south-west, it was recommended that an intrusive site investigation be undertaken to assess uncertainties / data gaps identified in the preliminary Conceptual Site Model.

3.0 SITE INVESTIGATION

3.1 Investigation Design & Objectives

Based on the findings and recommendations presented in the Delta Simons Environmental Consultants Ltd. Preliminary Geo-Environmental Risk Assessment, an intrusive investigation was designed and undertaken by Clancy Consulting Ltd. The design was provided by the appointed Clancy Consulting Ltd Structural Engineer and approach based on guidance provided in BS 10175 Code of Practice for Investigation of Potentially Contaminated Land (2011).

The aim of the investigation was to provide initial characterisation of ground conditions at the site, in order to produce and refine a representative Conceptual Site Model, to carry out contamination and geotechnical assessments to inform civil and structural design and to ensure that the site is suitable for the proposed end-use.

An additional objective of the investigation was to examine the geotechnical competence of materials at the site, including an examination of the existing structure's foundations, in order to provide indicative foundation solutions and to support future detailed geotechnical design.

3.2 Exploratory Fieldwork

The ground investigation works were carried out between 17th and 25th July 2019 and comprised the following works:

- Excavation of 8 No. window sample boreholes (WS1 to WS8) to a maximum depth of 5.45m bgl.
- Hand excavation of 4 No. trial pits (HTP1 to HTP4) to a maximum depth of 1.4m bgl.
- Excavation of 4 No. cable percussive boreholes to a maximum depth of 24.85m bgl.
- Excavation of 2 No. trial pits using a mechanical excavator to depths of between 2.05m and 2.10m bgl to enable soakaway testing in accordance with BRE 365.
- Indicative infiltration testing (falling head) within selected window sample boreholes (WS2 and WS6).

Soil samples for chemical and geotechnical laboratory testing were collected at regular intervals from each exploratory hole location and sealed in appropriate plastic and glass containers provided by the laboratory.

The exploratory locations were positioned within areas proposed for redevelopment with a targeted approach towards locations of potential contamination, proposed structures and infrastructure.

WS1 and BH1/1A were located to the south of Building 6000. These excavations were positioned so as to identify ground conditions in this area to aid in structural design. In addition, HTP1 and HTP2 were excavated immediately adjacent to Building 6000 in order to examine the construction characteristics of the existing building foundations.

WS3, WS4 and BH2 were positioned to the north and south of the existing main car park, within the footprints of two of the proposed new buildings. The purpose of excavations was to examine the ground conditions, geotechnical competence and contaminative status of the ground in this area. HTP3 was excavated within the existing car park between these buildings in order to provide general coverage of the site with regard to soil sampling / chemical testing and to assess the build-up of the existing car park.

WS5 and BH3 were excavated within the footprint of the westernmost of the proposed new buildings in order to provide geotechnical data to enable foundation design. These locations examine the potential for contamination to be present as a result of the previous operation of a deionised water plant, caustic tanks, effluent treatment plant and vehicle wash identified in this area during the Delta Simons Report.

WS2 was located toward the centre / west of the site within a proposed car park area, adjacent to an existing electricity sub-station on site. In addition to establishing geotechnical characteristics

the objective of this excavation was to determine the chemical quality of soils in this area, which has previously also been established as historically being used for the temporary storage of waste.

WS6, WS7, WS8, BH4, HTP4 were excavated toward the north-east of the site, within the area that was historically occupied by a sewage treatment works, and which is to be redeveloped (partial demolition of Building 1000 and the construction of a new vehicle parking area). HTP4 was excavated adjacent to the existing building in order to examine the existing building foundations and assist with future design work.

SA1 and SA2 were excavations undertaken to enable soakaway testing and were positioned toward the south and north of the site to examine the permeability of the subsurface within areas where the installation of drainage is currently under consideration. Falling head tests were also undertaken in WS2 and WS6 for this purpose.

An exploratory hole location plan is provided in Appendix I as Drawing No. 10/1425/002.

3.3 Ground Conditions

Details of the ground conditions encountered, along with records of the soil samples taken are presented on the exploratory hole records in Appendix II with a summary of the ground conditions provided below.

3.3.1 Made Ground

Made Ground was encountered in all exploratory hole locations to depths of between 0.65m and 3.1m bgl. However, HTP1 to HTP4, SA2, WS7 and WS8 were terminated within Made Ground and therefore did not prove the base of the material.

Tarmac hardstanding was encountered at surface in nine of the excavations with thicknesses of between 0.1m and 0.25m. The tarmac hardstanding was commonly underlain by sub-base type materials of sandy gravel of limestone to a maximum depth of 0.65m or sandy gravel of flint to a maximum depth of 0.35m bgl. In WS5, HTP1 and HTP2, this was directly underlain by concrete with a thickness of between 0.05m (WS5) and 0.19m (HTP1 and HTP2). In HTP1 and HTP2 the concrete was steel reinforced with 8mm rebar.

In the locations of BH1, BH1A, WS2, WS6 to WS8 and SA1 to SA2, the Made Ground was found to be topped by grass and occasionally topsoil type materials.

The composition of the underlying Made Ground was highly variable, reflecting the variability of infrastructure and land use across the site.

In the locations of BH1, BH1A, WS7, WS8, SA1 and SA2 (where historic structures were found to be present), the Made Ground was found to comprise a mix of granular deposits with gravel and cobbles of brick and concrete and (in the location of SA2) occasionally fragments of pottery and slate to a maximum depth of 2.45m bgl. These deposits are consistent with soils derived from the demolition process and reworking of demolition type materials.

Elsewhere on site, the Made Ground comprised a mix of granular and cohesive deposits with gravels often including flint, concrete and occasionally brick and chalk proven to a maximum depth of 1.6m bgl.

Fragments of organic material including decaying wood, rootlets and grass were noted between 1.0m and 1.25m in WS2, in WS6 between 1.5m and 3.1m bgl and in HTP1 between 0.24m and 1.4m,

Visual and olfactory evidence of hydrocarbon contamination was identified in WS2 and WS5 between the depths of 0.95m to 1.6m and 2.5m to 3.45m respectively, spanning both Made Ground and natural stratas.

Subsurface Structures / Obstructions

Subsurface hardstanding / obstructions were encountered in WS3, WS5, BH1, BH1A, HTP1 and HTP2 and SA2.

In WS3 a layer of 0.1m thick tarmac was encountered at a depth of 0.35m bgl, underlain by layer of concrete, recorded to a depth of 0.65m bgl. This represented the base of the Made Ground in this excavation.

A thin layer of tarmac was also recorded toward the middle of the Made Ground profile in WS5 between 0.35m and 0.40m bgl.

A layer of in-situ concrete was encountered in BH1 and BH1A at a depth of 1.0m and recorded to 1.15m bgl. A small void was recorded immediately below the concrete between 1.15m and 1.30m bgl. This concrete may represent the floor / hardstanding associated with the historic buildings in this location.

Buried structures were encountered in SA2 in the form of a historic building foundation and drainage, proven to the depth of 2.1m bgl.

It is noteworthy that it is possible that buried structures / basements may present in other areas of the site which have not been identified during this investigation.

3.3.2 Superficial Strata

River Terrace Deposits/Brickearth

A variable, alternating sequence of predominantly granular and cohesive strata potentially consistent with materials described by the BGS as River Terrace Deposits or Brickearth (depending on the publication) was encountered below the Made Ground, or topsoil in each of the excavations.

The BGS indicate that these deposits are likely to be restricted to the western periphery of the site, however intrusive investigation works suggest that the deposits extend across much of the, as far east as SA1.

In general, where encountered, these materials comprised one of three different types.

- A cohesive material typically described as very soft to soft light brown / brownish white / grey occasionally silty, slightly sandy to sandy, slightly gravelly to very gravelly clay. The gravel component was described as rounded to sub-angular, fine to coarse of flint.

- Predominantly granular material described as very loose to medium dense brown / light brown clayey, sandy gravel. The gravel was described as angular to rounded, fine to coarse of flint.

- Firm brown very sandy slightly gravelly clay. Gravel was described as sub-rounded, fine to coarse of flint. This material was characterised by the presence of frequent wood fragments.

In addition to the above, in WS4 a band of greenish grey silt underlain by greenish grey clay with sand lenses was encountered from 2.5m to the base of the borehole at 5.45m bgl.

Underlying the Made Ground in BH4 was a layer of very soft plastic brown amorphous very silty peat, which was recorded between 1.0m and 1.6m bgl. This was the only significant organic deposit recorded during this investigation.

Weathered Chalk Bedrock

Materials consistent with weathered bedrock were encountered across the site underlying the superficial horizons described above and located above intact chalk rock (where encountered).

The degree of weathering varied substantially across the site, and at various locations this material was described as an extremely weathered predominantly cohesive material (very soft to firm occasionally sandy gravelly clay), or a de-structured predominantly granular material described as medium dense clayey, sandy gravel. In both cases the gravel component was described as angular to rounded, fine to coarse of chalk and flint.

The cohesive strata was recorded in WS1, BH1A and BH2 between a minimum of 2.6m and proven to a maximum of 5.45m. The granular material was encountered in WS2, BH1A, BH3, BH4 between a minimum of 2.5m proven to a maximum of 6.0m. Where both types were encountered within the same excavation, the cohesive material was located above the granular.

3.3.3 Chalk Bedrock (Undifferentiated)

Chalk was recorded in BH1A to BH4 below the superficial and weathered materials described above. The chalk was encountered at depths of between 5.1m and 6.0m bgl and recorded to a maximum depth of 24.85m bgl.

In general, where encountered, this material was described as structureless chalk (Grade Dm) composed of uncompacted brownish/light brownish / yellowish / greyish cream slightly sandy slightly gravelly occasionally cobbly silt. The gravel / cobble component was described as sub-angular to sub-rounded very weak chalk and black flint.

An exception was encountered in BH4 between 15.0m and 16.50m bgl where a slightly less weathered horizon was recorded. This material was described as structureless chalk (Grade Dc) composed of uncompacted light greyish cream sandy, silty sub-angular to sub-rounded medium to coarse gravel. This material was underlain by the Grade Dm chalk described above.

3.4 Groundwater

Groundwater was encountered across the site during the fieldwork at depths of between 1.9m and 6.0m rising to between 1.8m and 3.7m. Groundwater was not recorded in WS2 or WS6 due to the undertaking of falling head tests in these locations. The soils were however noted to be ‘wet’ from 3.5m and 4.8m respectively.

Groundwater was not encountered with any of the trial pits or within WS7 and WS8.

Subsequent monitoring visits are to be undertaken on four occasions over the coming months in the locations of BH1A, BH3, WS3 and WS4. The results will be reported upon completion of the monitoring works.

3.5 Laboratory Chemical Testing

Selected soil samples were recovered at regular intervals and submitted to a UKAS / MCerts accredited laboratory for a general and targeted suite of analysis.

Nine samples of Made Ground and six samples of underlying natural soils were submitted for chemical testing.

Testing included analysis of some or all of the following determinands: *arsenic, beryllium, cadmium, chromium (VI), copper, lead, mercury, nickel, selenium, vanadium, zinc.*

Selected soil samples were also tested for *speciated PAH, speciated TPH, asbestos identification, speciated PCBs, Total Organic Carbon, pH and water-soluble sulphate.*

Copies of the laboratory test certificates are presented in Appendix III.

4.0 TIER 1 CONTAMINATION ANALYSIS

4.1 Soil Guidelines

At a Tier 1 stage the long-term human health toxicity of the soil has been assessed with reference to the LQM / CIEH S4ULs for Human Health Risk Assessment and CL:AIRE Category 4 Screening Levels (C4SLs). The proposed development will comprise the partial demolition of an existing laboratory and manufacturing unit located toward the north of the site in order to extend parking provision, the construction of four (4No.) light industrial / commercial units with associated adjacent parking provision across the southern section and additional parking in the east and west of the site. The newly constructed parking area toward the north of the site will include provision for peripheral ornamental landscaping, however following redevelopment, the majority of the site will remain under hardstanding.

On this basis, chemical test results have been compared against Site Screening Values (SSVs) for a commercial / industrial end use.

Where appropriate the statistical significance of the chemical test results has been assessed by reference to the CIEH & CL:AIRE publication “Guidance on Comparing Soil Contamination Data with a Critical Concentration” (2008).

For the purpose of this report a ‘planning scenario’ has been applied which aims to demonstrate that there is a 95% probability that the true population mean falls below the critical concentration (soil screening value).

4.2 Inorganic Contamination

Nine samples of Made Ground and six samples from the natural strata were submitted for chemical testing for inorganic determinands. Statistical analysis of the test results has been carried out for the Made Ground with individual analysis of the natural soil samples.

The test result and statistical analyses of the Made Ground samples indicate that all 95%^{ile} concentrations for the inorganic determinands tested fell below their respective SSVs when compared to values generated for commercial end use.

Statistical outliers were recorded for beryllium and water soluble boron in WS2 at 1.1m with respective recorded concentrations of 1.1 mg/kg and 2.6 mg/kg compared to the respective SSV

of 12 mg/kg and 240000 mg/kg. As nether of the concentrations recorded exceed the respective SSVs, these records are not considered significant.

A statistical outlier was recorded for cadmium in SA1 at 0.6m with a concentration of 1.8 mg/kg compared to the SSV of 190 mg/kg. As the record does not exceed the SSV, it is not considered significant.

No exceedances were recorded for any of the natural samples tested when compared to values generated for commercial end use.

The results of the chemical analyses of inorganic contaminants indicate that both the Made Ground and underlying natural soils are uncontaminated in regard to human health when compared with the appropriate published Soil Screening Value.

4.3 Organic Contamination

Visual and olfactory evidence of hydrocarbon contamination was recorded in the Made Ground and natural soils in WS2 along within the natural soil in WS5. Potentially impacted samples from both of the excavations were subsequently recovered and scheduled to chemical analysis for organic determinands. Additional samples were recovered from across the site for laboratory testing to determine background concentrations.

Nine samples of Made Ground and six samples of the underlying natural soils were scheduled for speciated PAH analysis. One sample of Made Ground, and three samples of natural materials were also scheduled for speciated TPH analysis with one sample of the Made Ground tested for PCB analysis.

No elevated concentrations of the 16 PAH compounds or TPH fractions tested were recorded within the Made Ground or natural soils when compared to SSVs generated for a commercial end use.

A statistical outlier was recorded for the PAH compound naphthalene in WS2 at 1.1m with a recorded concentration of 0.29 mg/kg compared to the SSV of 190 mg/kg. As the concentration does not exceed the SSV, the record is not considered significant.

Despite the above, in the location of WS2 at 1.1m and WS5 at 2.6m where visual and olfactory evidence of hydrocarbon contamination was observed during the investigation works, concentrations of TPH fractions Ali C10-C12, Ali C12-C16 and Aro C12-C16 have been recorded in excess of Water Screening Values (WSVs).

The concentration recorded for TPH fraction Ali C10-C12 in WS2 at 1.1m was 242 mg/kg and in WS5 was at 2.6m was 89 mg/kg compared to the WSV of 48 mg/kg. For Ali C12-C16 the concentrations were recorded as 2210 mg/kg and 318 mg/kg respectively compared to the WSV of 24 mg/kg. The concentrations of Aro C12-C16 were recorded as 1830 mg/kg and 218 mg/kg respectively compared to the WSV of 169 mg/kg.

Given the presence of the superficial Secondary A and Principal bedrock Aquifers beneath the site and that groundwater has been identified between approximately 2.0 to 3.0m bgl, it is considered that a viable pathway may exist through which identified contaminants may migrate into the controlled waters. In the location of WS5 at 2.6m bgl, the sample was taken below the ground water level.

It is noteworthy that samples from WS2 at 2.4m and WS5 at 3.9m were retrieved and tested to establish the extent of any vertical migration of these identified contaminants. Both samples did not record any elevated concentrations of the determinands tested.

PCBs

One sample, taken from WS2 at a depth of 1.1m bgl was scheduled for speciated PCB analysis.

Individual PCB species (PCB105, PCB118, PCB156 and PCB167) were recorded above laboratory levels of detection. The sum recorded concentration of these contaminants was 0.148 mg/kg, which whilst elevated did not exceed the adopted SSV of 0.240 mg/kg for the 'sum of dioxin-like PCBs' on commercial/industrial sites taken from Environment Agency Science Report SC050021 'Soil Guideline Values for dioxins, furans and dioxin-like PCBs in soil'

Total Organic Carbon

Seven samples (one from the shallow natural and six from the underlying chalk bedrock) from across the site were retrieved and sent to a UKAS accredited laboratory to be tested for total organic carbon (TOC).

The TOC content of the shallow natural sample was 1.08% with the TOC in the chalk bedrock ranging from 1.69% to 4.67%.

To derive the percentage of soil organic matter (SOM), in accordance with CLEA guidance the TOC must be divided by 0.58.

As such, the shallow natural soil sample has a SOM of 1.86% with the chalk bedrock recording SOMs ranging from 2.91% to 8.05%.

4.4 Asbestos Contamination

Seven soil samples taken from the Made Ground were screened using microscopy for the presence of asbestos fibres.

None of the samples tested proved the presence of asbestos fibres, or asbestos containing materials in excess of qualitative levels of detection.

5.0 CONTAMINATION ASSESSMENT

5.1 General

Based on the information obtained during the preliminary ground investigation and laboratory testing, a 'Conceptual Site Model' (CSM) has been amended accordingly. The conceptual Site Model is used as a basis to identify contamination sources, pathways and receptors and is subject to constant refinement as more information becomes available.

5.2 Environmental Setting & End Use

Made Ground was identified during the intrusive investigation works to depths of up to 3.1m bgl. and generally comprised a variable sequence of either predominantly granular or cohesive materials of various subtypes.

The Made Ground was underlain by a sequence of interbedded granular and cohesive strata and / or a highly weathered material derived from the underlying bedrock. These superficial deposits were proven to a maximum depth of 6.0m bgl.

Solid bedrock was encountered below the superficial deposits across the site and proven to 24.85m bgl.

Visual and olfactory evidence of hydrocarbon contamination was recorded in WS2 between 1.0m and 1.25m and 1.6m spanning Made Ground and natural soils along with the natural strata in WS5 between 2.5m and 4.0m bgl.

Groundwater was encountered at approximately 2.0m to 3.0m across the site.

Whilst a complex distribution of lower and higher permeability horizons has been proven within these units, the overall hydrogeological character of the geology underlying the site is not considered to be substantially different from the preliminary risk assessment; comprising a sequence of moderately permeable (Secondary A Aquifer) superficial strata, underlain by highly permeable (Principal Aquifer) bedrock. As such, the environmental setting remains of 'moderate' sensitivity.

5.3 Revised Conceptual Site Model

In accordance with CLR11 "Model Procedures for the Management of Land Contamination" (2004) and BSI 10175 "Code of Practice for Investigation of Potentially Contaminated Land" (2011), a Preliminary Conceptual Site Model was developed to identify potential contamination sources, migration pathways and receptors within the study area.

Chemical testing undertaken during the site investigation did not identify any contaminants which exceeded relevant SSVs for commercial / industrial end use in terms of human health. No asbestos fibres or ACMs were encountered during the investigation.

Whilst no elevated concentrations of the determinands tested have been recorded in terms of human health, localised concentrations of contaminants not identified / investigated during this investigation may be present in quantities considered harmful in terms of human health.

Site workers involved in excavations for foundations, roads, sewers etc. may come into direct shallow Made Ground soils which have not been identified during this investigation. As any Made Ground does represent a potential risk, we would therefore recommend that simple precautionary measures be adopted during the construction phase i.e. good personal hygiene, provision of welfare facilities and basic personal protective equipment i.e. gloves and safety glasses. Should during any future investigation / remediation / construction works identify visual or olfactory evidence of contamination, a suitably qualified environmental consultant should be contacted to further assess any potential issues. Additional works may be required to suitably quantify the risk to potential and identified receptors.

In respect to controlled waters, chemical testing has identified elevated concentrations of organic contaminants when compared to SSVs for commercial / industrial end use with the following contamination sources have been identified within the Made Ground and natural soils in WS2 and natural soils in WS5.

- Elevated concentrations of TPH fractions Ali C10-C12, Ali C12-C16 and Aro C12-C16 in WS2 at 1.1m and WS5 at 2.6m.

WS2 was positioned in the location of a historic waste storage area and also adjacent to an existing electricity sub-station with WS5 adjacent to the historic tanks in the west of the site which are likely to be the source of contamination in these locations. Given the presence of controlled waters beneath the site and groundwater identified at approximately 2.0m to 3.0m bgl, it is recommended that further works be undertaken in these areas with the retrieval of soil and groundwater samples to suitably delineate the identified contamination and further assess the risk these contaminants pose.

Further thought should be given in these areas to any proposed hardstanding design and the use of permeable surfaces / soakaways as the introduction of water into these soils may increase the risk of the identified contaminants mobilising and migrating into controlled groundwaters.

6.0 HAZARDOUS GAS ASSESSMENT

6.1 General

Made Ground was identified during the intrusive investigation works to depths of up to 3.1m bgl. and generally comprised a variable sequence of either predominantly granular or cohesive materials of various subtypes with fragments of putrescible materials noted in two locations. Visual and olfactory evidence of hydrocarbons was also noted in two locations which can be a source of hazardous ground gasses. A review of historical maps of the area has identified historic sewage works with associated engine house and filter beds on site with industrial buildings historically occupying the south of the site. Within the surrounding area, another sewage works, mills, industrial units and infilled land / landfill have also been identified which could be viewed as sources of filled ground and potentially organic materials with the potential to generate hazardous ground gases.

Natural strata beneath the site and within the surrounding area including alluvium and river terrace deposits are indicated to potentially contain peat and other organic materials with peaty soils and fragments of decaying wood / grass identified within the natural soils on site. The chalk bedrock could also be viewed as being a potential source of ground gasses, with samples retrieved for TOC testing recording organic concentrations up to 8.05%.

6.2 Scope of Works

In view of the above, four gas monitoring wells were installed in BH1, BH3, WS3 and WS4 with response zones set in the Made and natural strata. An initial gas monitoring programme was scheduled to comprise four monitoring visits over a minimum one month period in general accordance with CIRIA Report C665.

6.3 Monitoring Results

Monitoring has been undertaken on four occasions between 12th September and 30th September 2019 with atmospheric pressures recorded ranging between 1009mb and 1027mb. Falling atmospheric pressure was recorded on two occasions.

Copies of the results are presented in Appendix VII and summarised in the table below.

Table 1 – Gas Monitoring Results

Hole ID	Methane (%v/v)	Carbon Dioxide (%v/v)	Flow Rate (l/hr)	Gas Screening Value (l/hr)
BH1A	0.0	4.7	0.7	0.0329
BH3	0.0	4.8	0.1	0.0048
WS3	0.0	7.2	0.1	0.0072
WS4	0.0	0.0	0.1	0.0000

The monitoring results have not recorded any methane concentrations and maximum carbon dioxide concentration of 7.2%. Gas flow rates were found to be generally absent with the maximum flow rate recorded of 0.7 l/hr. Based on the monitoring results, the worst-case Gas Screening Value (i.e. 7.2% carbon dioxide and 0.7 l/h flow) is 0.0504 l/hr.

In addition to the above, depleted oxygen was recorded in WS3 on one occasion with oxygen recorded at 10.9%.

6.4 Discussion

Based on the available results and the worst-case gas screening value of 0.0504 l/hr recorded, the site can be classified as Characteristic Situation 1 (CS1).

According to the current guidance and best practice however, where carbon dioxide concentrations are recorded in excess of 5%, consideration should be given to increasing the classification to CS2. In this instance, given the relatively short monitoring period, the presence of elevated carbon dioxide, depleted oxygen levels, the depth and nature of the filled ground and presence of peat in the local area, we would recommend that the characteristic situation be increased to CS2 and that gas protective measures are installed in all new structures in accordance with guidance provided in BS 8485: 2015 “Code of Practice for the Design of Protective Measures for Methane & Carbon Dioxide Ground Gases for New Buildings”.

There is now a requirement for the installation of gas protective measures to be independently verified in order to achieve discharge of planning conditions relating to contaminated land. Guidance is provided in CIRIA C735 “Good Practice on the Testing and Verification of Protection Systems for Buildings Against Hazardous Ground Gas”.

We can advise on the verification procedures to ensure regulatory approval.

7.0 GEOTECHNICAL ASSESSMENT

7.1 General

It should be noted that this Section does not comprise or represent a Geotechnical Design Report (GDR) but instead provides preliminary information and recommendations based on the findings of the Ground Investigation.

The geotechnical section of the ground investigation was designed in general accordance with guidance presented in BS EN 1997-2:2007. The objective of the investigation was to obtain preliminary information in order to assess the geotechnical properties of the ground and provide recommendations for foundation and infrastructure design.

7.2 In Situ Geotechnical Testing

In-situ standard penetration tests (SPTs) were carried out during window sample and cable percussive drilling at approximately 1.0m to 1.5m intervals in order to allow the assessment of ground conditions by establishing soil strength/density characteristics.

7.2.1 Made Ground

SPT ‘N’ values of between 15 and 40 were recorded within the granular Made Ground. The mean of the recorded ‘N’ values was 22.75. ‘N’ values of between 8 and 45 were recorded within the cohesive component with a mean recorded ‘N’ value of 17.2.

SPT ‘N’ values in excess of 50 were recorded within the Made Ground in BH1, BH1A and WS8 where obstructions were encountered.

7.2.2 Natural Strata

The SPTs carried out within the shallow natural strata up to 3.45m recorded 'N' values ranging from 1 to >50 indicating these soils to be in a very variable condition.

Beneath this, the SPTs recorded 'N' values ranging from 10 to 28 (with the exceptions of WS4 and BH2 at 4.0m with respective 'N' values of 9 and 4) indicating these soils to be in a medium dense, firm and stiff condition.

7.2.3 Solid Strata

Within the chalk bedrock, the SPT 'N' values generally increased in depth with 'N' values from 6.0m to 13.5m bgl ranging from 6 to 21, 'N' values between 15.0m to 18.0m ranging from 15 to 26 (with the exception of BH3 where an 'N' value of >50 was recorded), from 18.0m to 21.0m ranging from 22 to >50 and from 21.0m proven to a maximum to 24.5m, the SPT 'N' values were all recorded as >50.

In accordance with CIRIA C574 'Engineering in Chalk', the SPT 'N' values indicate that the base of weathering within the chalk bedrock is between 15.0m and 18.0m bgl.

7.3 Laboratory Geotechnical Testing

7.3.1 Triaxial Compression Tests

It was initially intended to recover samples of any cohesive soils for triaxial compression testing in order to provide accurate classification of the soil strength. The clay soils were however found to contain a high sand and gravel content rendering them unsuitable for the recovery of undisturbed samples for laboratory analysis.

Undisturbed samples were recovered from within the chalk however only one (BH1 at 6.0 to 6.45m) was found suitable for triaxial compression testing. The test result recorded a Cu value of 38 kPa.

7.3.2 Plasticity Indices

Four soil samples were recovered from the shallow natural clay deposits from WS1 at 2.5m, WS4 at 2.9m BH4 at 2.1m and SA1 at 1.3m. The four samples were submitted to a UKAS accredited laboratory for Determination of Liquid and Plastic Limits in accordance with BS1377: Part 2: 1990: Methods 3.0,4.4 and 5.0.

NHBC Standards Chapter 4.2 (Building Near Trees) states that in order to assess the volume change potential of cohesive soils, the Modified Plasticity Index should be calculated. The Modified Plasticity Index is defined as the Plasticity Index of the soils multiplied by the percentage of particles less than 425µm.

The results recorded Modified Plasticity Indices ranged from 2.7% in WS1 at 2.5m to 11.7% in WS4 at 2.9m (with the exception of SA1 at 1.3m). Therefore, in accordance with Table 1 of NHBC Standards Chapter 4.2, these soils to be of '**low**' volume change potential.

In SA1 at 1.3m, the Modified Plasticity Index was recorded as 55.0%, indicating these soils to be of '**high**' volume change potential.

7.3.3 Particle Size Distribution

Two soil samples were recovered, one from the shallow Made Ground (HTP3 at 0.15m to 0.2m) and one from the natural granular strata (WS3 at 1.5m) and sent to a UKAS accredited laboratory for particle size distribution testing.

The laboratory test results confirm that these soils are predominantly granular in nature.

7.3.4 CBR Tests

Soil samples from depths between 0.6m and 0.8m bgl were collected from three locations (SA1, SA2 and WS2) and tested by a UKAS accredited laboratory for soaked laboratory CBR tests.

The test results recorded minimum CBR values of 2.7% in SA1 at 0.7m, 1.1% in SA2 at 0.6m and 16.8% in WS2 at 0.6m to 0.8m.

7.3.5 Intact Dry Density of Chalk

Across the site, beneath the superficial deposits, structureless chalk was encountered generally comprising slightly sandy slightly gravelly silt. Fourteen samples were retrieved from WS1 at 4.8m, BH1 at 10.5m to 10.95m, BH2 at 5.0m to 5.45m, 5.6m, 7.5m to 7.95m, 8.0m, and 17.00m to 17.95m, BH3 at 9.0m to 9.45m, 19.0m and 21.0 to 21.45m and from BH4 at 6.5m, 9.1m, 11.5m and 18.9m and submitted to a UKAS accredited laboratory for Saturated Moisture Content and Intact Dry Density testing.

In Accordance with Table 3.2 of CIRIA C574 'Engineering in Chalk', the results recorded for the samples tested are generally consistent with chalk of 'medium density' with areas of 'low density' recorded in BH1 at 10.5m to 10.95m and in BH2 at 5.0m to 5.45m and 7.5m to 7.95m. Areas of 'high density' chalk were encountered in BH4 at 9.1m and 18.9m.

The geotechnical laboratory results are presented in Appendix IV.

7.4 Foundations

7.4.1 Existing Foundations

Three hand excavated trial pits (designated HTP1, HTP2 and HTP4) were excavated alongside the perimeter of existing buildings. The overall objective was to extend these excavations to the base of the foundations in order to determine construction characteristics and founding stratum. HTP1 and HTP2 were excavated adjacent the southern elevation of Building 6000, whilst HTP4 was excavated along the eastern building line of Building 1000.

Building 6000

HTP1 and HTP2 were excavated adjacent to Building 6000 in order to investigate the existing building foundations.

HTP1 was excavated adjacent to a concrete column which extended vertically to a depth of 0.6m bgl, before stepping out horizontally from the column line for a distance of approximately 0.85m. The foundation then extended vertically to a depth of 1.2m, before again stepping out horizontally. At 1.2m depth the foundation extended 1.2m out from the column line before again extending vertically, proven to a depth of 1.4m bgl. The excavation was terminated at 1.4m bgl, at which depth neither the foundation base, nor founding stratum could be proven.

HTP2 was undertaken against a non-loadbearing brick wall, which extended to a depth of 0.3m bgl. A concrete foundation was encountered at this depth which stepped out horizontally by 0.05m, before extending vertically to 0.65m bgl in one half of the trial pit and to the full depth of the excavation at 1.2m bgl in the other half of the trial pit. The foundation base and founding stratum were not exposed.

It is understood from anecdotal evidence that building 6000 is constructed on pad foundations, however the investigation could neither prove or disprove this hypothesis.

Building 1000

HTP4 was excavated to investigate the exist foundations of Building 1000.

The foundation extended vertically to 0.15m bgl where it stepped out horizontally to 0.92m from the building (minus the thickness of the cladding). The foundation then extended vertically to 0.35m bgl before stepping out horizontally to 1.27m from the building. The foundation further extended vertically to 0.5m bgl and was found to be seated within the Made Ground. To confirm that this was the foundation base, the excavation undercut the concrete footing, and was extended to 1.2m bgl.

It is considered that given Building 1000 is situated on a raised mound comprising Made Ground, the foundations encountered may not be representative of the whole building. Given that there are tunnels running beneath the site, deeper foundations may be encountered during demolition.

During the excavation, a metal pipe was encountered adjacent to the concrete footing. The nature and rout of this pie is currently unknown.

Copies of the foundation sections are included in Appendix V, and the exploratory hole logs are provided in Appendix II.

7.4.2 Foundation Recommendations

The following foundation recommendations assume that the proposed development will comprise the partial demolition and reconfiguration of an existing laboratory and manufacturing unit (Building 1000) located toward the north of the site in order to extend parking provision, and the construction of four light industrial / commercial units with associated parking provision across the southern section of the site.

The ground investigation has identified Made Ground across the site to depths up to 3.1m underlain by interbedded granular and cohesive strata and or a highly weathered material derived from the underlying bedrock. These superficial deposits were proven to a maximum depth of between 5.1m and 6.0m bgl and found to be in a very variable condition with SPT ‘N’ values ranging from 1 to >50.

Solid chalk bedrock was encountered below the superficial deposits across the site. In general, where encountered, this material was described as structureless chalk (Grade Dm) composed of uncompacted slightly sandy slightly gravelly occasionally cobbly silt.

SPT ‘N’ values obtained from tests conducted within the chalk (Grade Dm) generally increased with depth with un-weathered horizons indicated from between 15.0m to 18.0m bgl. Dry density testing indicates the chalk to generally be of ‘medium density’ with areas of ‘low density’ recorded in two locations up to 10.95m bgl.

Groundwater was encountered across the site during this investigation at depths generally between 2.0m and 3.0m bgl.

It is considered that a shallow foundation solution within the superficial deposits encountered may prove problematic, though an allowable bearing capacity of 40 to 50 kN/m^2 based on a 1m^2 pad foundation could be assumed in such material. If a shallow foundation solution is utilised, excavations may need to over-deepened in areas of deeper Made Ground or very loose / very soft natural strata. Any shallow foundations may span strata of varying characteristics and may be at risk of differential settlement. We would therefore recommend that foundations are reinforced to protect against differential settlement.

Given the above, a piled foundation may prove more suitable. Additional advice should be sought from a specialist piling contractor regarding the pile design (i.e. type, length and diameter).

If a piled foundation solution is to be utilised, there may be differential settlement between piled structures and the surrounding ground level.

7.5 Concrete Classification

In accordance with BRE Special Digest 1, the site has been classified as “brownfield” with a mobile groundwater regime.

The concentrations of sulphate in aqueous extractions were determined using the gravimetric method. The pH value of each sample was determined using the electrometric method.
Four samples taken from the Made Ground, four from the natural superficial deposits and four from the underlying chalk bedrock were tested for water soluble sulphate content. In addition, ten samples of made ground, six soil samples from the natural superficial deposits and four samples of the chalk bedrock were tested for pH.

Sulphate concentrations did not exceed laboratory level of detection (LOD) of 10 mg/l in any of the samples analysed. The characteristic sulphate value has therefore been set at the laboratory LOD of is therefore 10mg/l. The lowest recorded pH was 7.01.

Therefore, in accordance with Table C2 of SD1, sub-surface concrete should be Design Sulphate Class DS-1 with an ACEC classification of AC-1.

7.6 Waste Management

Arisings generated from excavations for foundations and service trenches etc. may be classified as waste and it is the responsibility of the holder of such material to form a view as to whether or not it constitutes waste.

Guidance on how this can be achieved is set out in the Development Industry Code of Practice (CoP) (CL:AIRE, March 2011).

The handling, re-use or disposal of waste materials is regulated by the Environment Agency, who take into account the CoP in determining whether materials are classified as waste. If materials are handled with in accordance with the CoP it is considered unlikely that they will be considered waste at the point when they are used during development. This might be because the materials were never formally discarded or because they have been processed as part of a ‘recovery’ operation and therefore ceased to be waste.

Should site won material be intended for re-use on site a Materials Management Plan will be required from a suitably qualified environmental consultant in order to comply with the CoP.

7.7 Infiltration Tests

7.7.1 Soakaway Testing

Soakaway testing was undertaken in general accordance with the guidance provided in BRE digest 365 'Soakaway Design' in two locations (SA1 and SA2). Mechanically excavated trial pits were undertaking to depths of approximately 2.0m bgl with the vertical sides trimmed and squared before being partially filled with water and the rate of infiltration recorded. Infiltration rates have subsequently been calculated in order to examine soils permeability characteristics and the feasibility of soakaway drainage.

The results of the soakaway tests are presented in Table 2 below. The monitoring certificates are included as Appendix VI.

Table 2 – Soakaway Test Results

Location	Test Depth (m bgl)	Indicative Infiltration Rate (m/s)
SA1 (Test 1)	0.99 – 2.05	4.37×10^{-5}
SA1 (Test 2)	0.95 – 2.05	3.81×10^{-5}
SA1 (Test 3)	0.90 – 2.05	3.95×10^{-5}
SA2 (Test 1)	1.51 – 2.10	6.26×10^{-4}
SA2 (Test 2)	1.50 – 2.10	8.36×10^{-4}
SA2 (Test 3)	1.53 – 2.10	1.04×10^{-3}

Infiltration rates recorded during the tests carried out in SA1 indicate that the natural strata in this location exhibit marginal drainage characteristics and that soakaway drainage / permeable paving may be suitable subject to design parameters.

The infiltration rates recorded within the Made Ground in SA2 indicate good drainage characteristics, however it should be noted that soakaway drainage in Made Ground is generally not considered acceptable by regulators. Whilst no visual or olfactory evidence of contamination was observed and laboratory test results within this area have not highlighted any elevated concentrations of the determinands tested, further thought should be given to the suitability of this location for the installation of soakaways.

Due to the presence of chalk there is a risk of ground dissolution features caused by traditional soakaway structures that concentrate infiltration to a localised area. In low to medium density chalk traditional soakaways must have a minimum of 5-10m separation from buildings and structures to avoid the generation of dissolution features that may impact on building foundations (CIRIA C574 'Engineering in Chalk'). Distributive soakaways such as permeable paving and sub-base infiltration that do not concentrate infiltration avoid the risk of generating groundwater dissolution features.

7.7.2 Preliminary Infiltration Tests

During the intrusive investigation, preliminary infiltration (falling head) tests were carried out in two of the window sample boreholes (WS2 and WS6) in order to examine the feasibility of soakaways as a means of surface water disposal and supplement the above soakaway testing results. The boreholes were excavated to the depth of 2.0m bgl with a response zone set between 1.5m and 2.0m bgl.

An approximate permeability value of 1.80 x10^{-4} was calculated within WS2 indicating these soils to have good drainage characteristics. The water in WS6 failed to infiltrate over the duration of the test, indicating these soils to have very poor drainage characteristics.

8.0 CONCLUSIONS AND RECOMMENDATIONS

It is understood that site is proposed to be partially re-developed comprising the partial demolition and reconfiguration of an existing laboratory and manufacturing unit located toward the north of the site in order to extend parking provision with associated landscaping and the construction of four (4No.) light industrial / commercial units with associated parking across the south of the site with associated car parking.

Historical OS maps of the area indicate the site was undeveloped until the early 1900s when a large sewage works and engine house occupied the north-eastern section of the site. During the subsequent decades this facility underwent significant expansion. In the mid-1950s, an allotment garden occupied the centre of the site. In the early to mid 1970s, the site had undergone large-scale redevelopment, resulting in the construction of many of the existing commercial / industrial units. In addition, by this time a large building and an electrical sub-station occupied the southern section of the site, within the existing car-parking area. By the early 1990s the building / electricity substation across the south of the site had been replaced by the existing car-park and the site is understood to have been in its current configuration. The surrounding area has been a mix of undeveloped, and industrial land uses with mills, sewage works, works and industrial units along with a retail park with associated infrastructure all located / historically located within close proximity to the site.

The nearest identified environmental receptors are the underlying superficial strata which is classified as a Secondary A Aquifer, solid strata classified as a Principle Aquifer and water course immediately to the east of the site though the site is not situated within a Source Protection Zone and no groundwater or surface water abstractions have been identified within 250m of the site.

Intrusive site investigation works were carried out between 17th and 15th July 2019 and comprised the excavation of 8 No. window sample boreholes 4 No. Cable Percussive boreholes, 4 No. hand excavated, and 2 No. mechanically excavated trial pits. In addition, indicative infiltration testing (falling head) was carried out within selected window sample boreholes (WS2 and WS6), and soakaway testing was undertaken in the machine excavated trial pits.

Made Ground was identified during the intrusive investigation works to depths of up to 3.1m bgl. and generally comprised a variable sequence of either predominantly granular or cohesive materials of various subtypes.

Sub-surface hardstanding was encountered in several locations across the site, generally corresponding with the locations of historic / demolished buildings. There remains the possibility that buried structures may be present elsewhere on site which have not been identified during this investigation.

The Made Ground was underlain by a sequence of interbedded granular and cohesive strata interpreted to predominantly comprising river terrace deposits and or a highly weathered material derived from the underlying bedrock. These superficial deposits were proven to a maximum depth of between 5.1m and 6.0m bgl. Solid chalk bedrock was encountered below the superficial deposits across the site, proven to a maximum of 24.85m bgl.

Groundwater was generally encountered across the site during the fieldwork at depths of between approximately 2.0m to 3.0m.

Visual and olfactory evidence of hydrocarbon contamination was recorded in WS2 and WS5 between though chemical testing did not identify any contaminants which exceeded relevant SSVs for commercial / industrial end use in terms of human health and no asbestos fibres or ACMs were encountered during the investigation.

Whilst no elevated concentrations of the determinands tested have been recorded in terms of human health, localised concentrations of contaminants not identified / investigated during this investigation may be present in quantities considered harmful in terms of human health.

Site workers involved in excavations for foundations, roads, sewers etc. may come into direct shallow Made Ground soils which have not been identified during this investigation. As any Made Ground does represent a potential risk, we would therefore recommend that simple precautionary measures be adopted during the construction phase i.e. good personal hygiene, provision of welfare facilities and basic personal protective equipment i.e. gloves and safety glasses. Should during any future investigation / remediation / construction works identify visual or olfactory evidence of contamination, a suitably qualified environmental consultant should be contacted to further assess any potential issues. Additional works may be required to suitably quantify the risk to potential and identified receptors.

In respect to controlled waters, chemical testing has identified elevated concentrations of organic contaminants when compared to SSVs for commercial / industrial end use in the locations of WS2 and WS5. WS2 was positioned in the location of a historic waste storage area and also adjacent to an existing electricity sub-station with WS5 adjacent to the historic tanks in the west of the site which are likely to be the source of contamination in these locations. Given the presence of controlled waters beneath the site and groundwater identified at approximately 2.0m to 3.0m bgl, it is recommended that further works be undertaken in these areas with the retrieval of soil and groundwater samples to suitably delineate the identified contamination and further assess the risk these contaminants pose.

Further thought should be given in these areas to any proposed hardstanding design and the use of permeable surfaces / soakaways as the introduction of water into these soils may increase the risk of the identified contaminants mobilising and migrating into controlled groundwaters.

Geotechnical testing of the shallow natural cohesive deposits indicate these soils to be of ‘low’ volume change potential with the exception of the location of SA1 where a ‘high’ volume change potential was recorded. That should be taken into consideration for the foundation design.

Laboratory CBR tests carried out in three locations recorded vales ranging from 1.1% to 16.8%.

Dry density tests of the chalk bedrock are generally consistent with chalk of ‘medium density’ with areas of ‘low density’ recorded in BH1 at 10.5m to 10.95m and in BH2 at 5.0m to 5.45m and 7.5m to 7.95m. Areas of ‘high density’ chalk were encountered in BH4 at 9.1m and 18.9m.

Ground gas monitoring was undertaken on 4 occasions and has recorded 7.2% carbon dioxide. No methane has been identified and gas flow rates were typically absent. Based on the gas screening values available, the site can be classified as Characteristic Situation 1 (CS1).

According to the current guidance and best practice however, where carbon dioxide concentrations are recorded in excess of 5%, consideration should be given to increasing the classification to CS2. In this instance, given the relatively short monitoring period, the presence of elevated carbon dioxide, depleted oxygen levels, the depth and nature of the filled ground and presence of peat in the local area, we would recommend that the characteristic situation be increased to CS2 and that gas protective measures are installed in all new structures in accordance with guidance provided in BS 8485: 2015 “Code of Practice for the Design of Protective Measures for Methane & Carbon Dioxide Ground Gases for New Buildings”.

It is considered that a shallow foundation solution may prove problematic given the very variable nature of the shallow natural strata. An allowable bearing capacity of 40 to 50 kN/m^2 based on a 1m^2 pad foundation could be assumed in such material though if a shallow foundation solution is utilised, excavations may need to over-deepened in areas of deeper Made Ground or very loose / very soft natural strata. Any shallow foundations may span strata of varying characteristics and may be at risk of differential settlement. We would therefore recommend that foundations are reinforced to protect against differential settlement.

Given the above, a piled foundation may prove more suitable. Additional advice should be sought from a specialist piling contractor regarding the pile design (i.e. type, length and diameter). If a piled foundation solution is to be utilised, there may be differential settlement between piled structures and the surrounding ground level.

Laboratory testing indicates that sub-surface concrete should be prepared as Design Sulphate Class DS-1 with an ACEC classification of AC-1.

As part of the investigation, soakaway testing was undertaken in general accordance with the guidance provided in BRE digest 365 'Soakaway Design' in two locations with falling head tests also undertaken in two locations in order to supplement the soakaway data. Recorded infiltration rates suggest that the superficial deposits exhibit marginal to good drainage characteristics, and that soakaway drainage / permeable paving may be suitable subject to design parameters. Infiltration rates within the granular Made Ground also show good drainage characteristics however it should be noted that soakaway drainage in Made Ground is generally not considered acceptable by regulators. Whilst no visual or olfactory evidence of contamination was observed and laboratory test results within this area have not highlighted any elevated concentrations of the determinands tested, further thought should be given to the suitability of this location for the installation of soakaways.

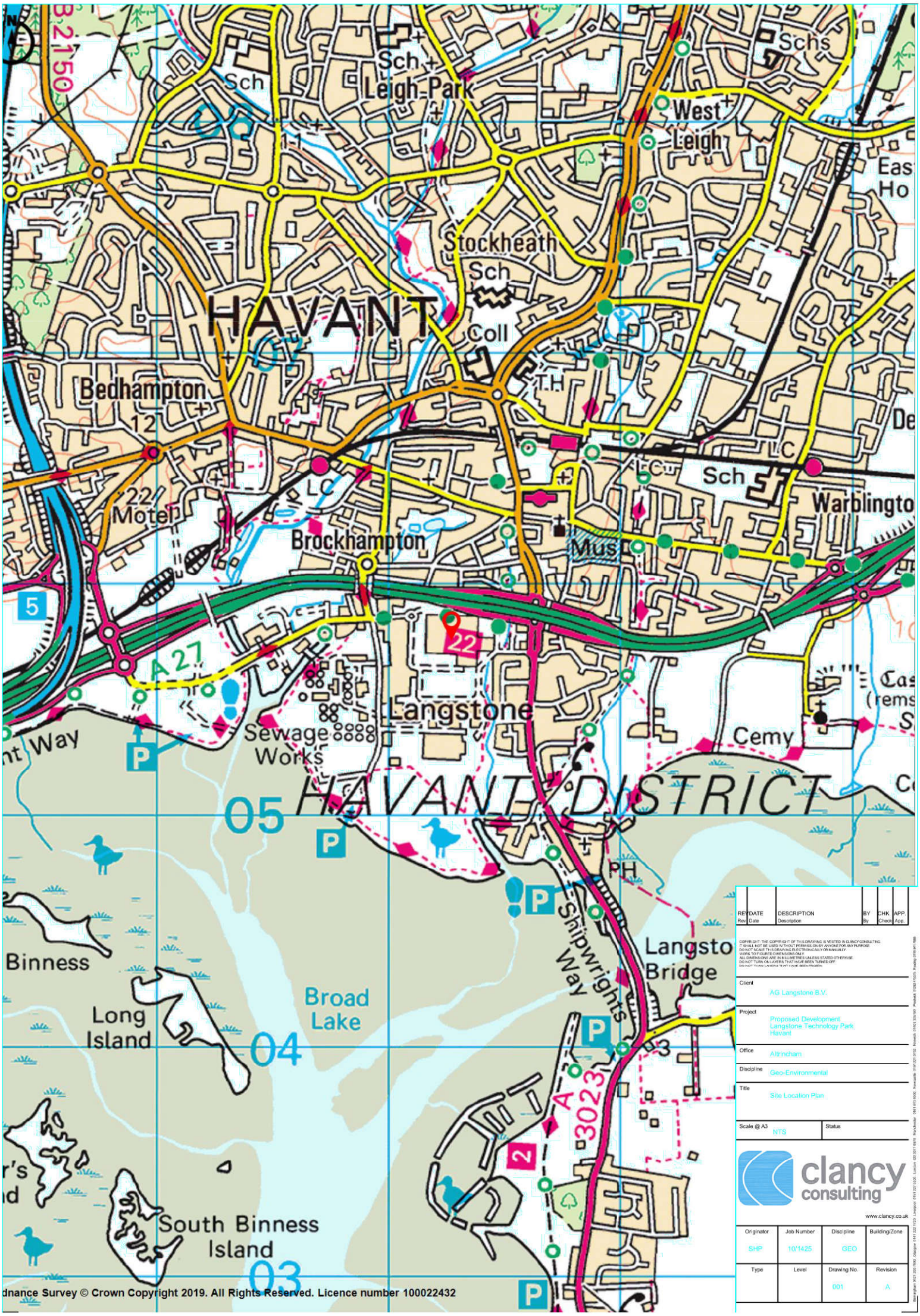
Due to the presence of chalk there is a risk of ground dissolution features caused by traditional soakaway structures that concentrate infiltration to a localised area. In low to medium density chalk traditional soakaways must have a minimum of 5-10m separation from buildings and structures to avoid the generation of dissolution features that may impact on building foundations (CIRIA C574 'Engineering in Chalk'). Distributive soakaways such as permeable paving and sub-base infiltration that do not concentrate infiltration avoid the risk of generating groundwater dissolution features.

Based on the information available to date we would recommend the following further works are required:

- Additional investigations to be carried out in the location of WS2 and WS5 to delineate identified organic contamination with regards to controlled waters. Soil and water samples to be recovered for laboratory testing.
- Preparation of a Remediation Strategy following delineation of the organic contamination for approval with the Local Authority.
- Gas protective measures to be installed in all new structures in accordance with CS2 conditions. The installation of the protective measures should be independently verified to ensure they are fit for purpose and to assist with planning discharge.
- The continued risk of unexploded ordinance should be considered during any future excavations and an EOD engineer may be required on site to brief and support site personnel.

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Appendix I



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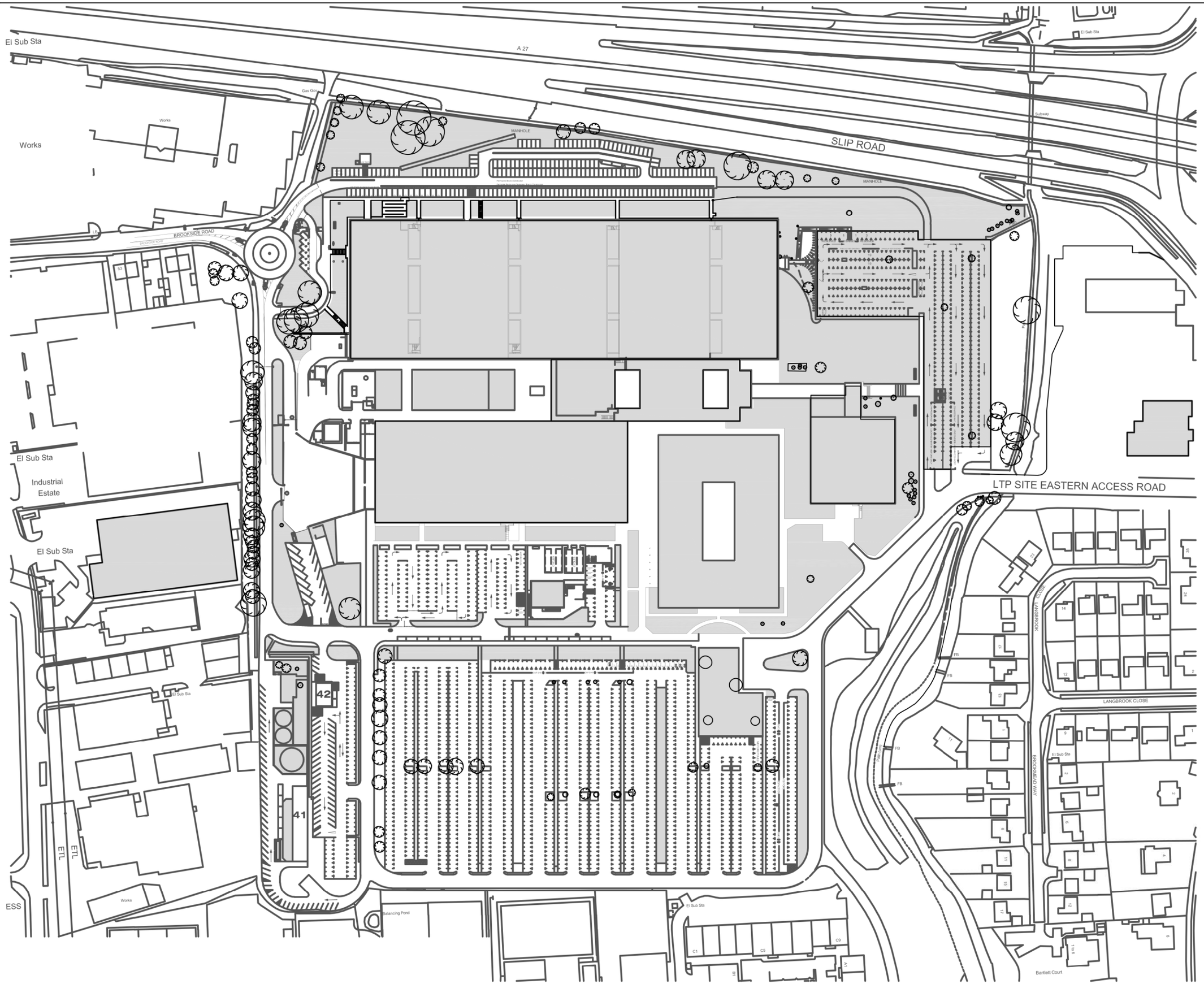
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Project	Proposed Development Langstone Technology Park Havant
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Discipline	Geo-Environmental
Title	Site Location Plan
Scale @ A3	NTS
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Client
AG Langstone B.V.

Project
Proposed Development
Langstone Technology Park
Havant

Office
Altrincham

Discipline
Geo-Environmental

Title
Existing Site
Layout Plan

Scale @ A3
NTS

Status

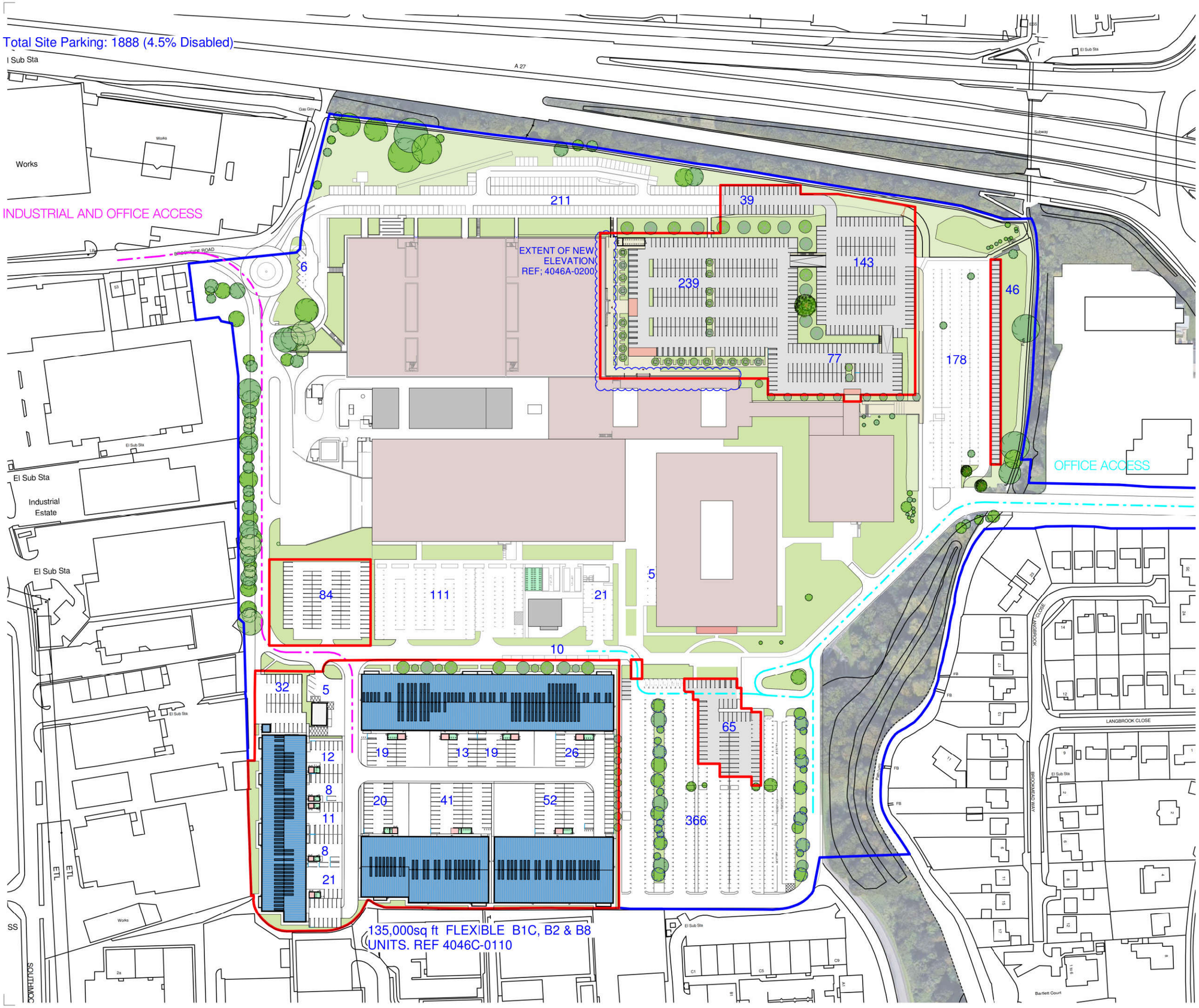
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Originator	Job Number	Discipline	Building/Zone
SHP	10/1425	GEO	

Type	Level	Drawing No.	Revision
		A	A

Birmingham 0121 200 7800 . Glasgow 0141 222 2720 . Liverpool 0151 227 5000 . London 020 3077 6870 .Manchester 0161 613 6000 . Newcastle 0191 221 0702 . Norwich 01603 305 950 . Prestwich 01282 475375 . Reading 0118 941 7888



Notes

This drawing may be scaled for the purposes of Planning Applications, Land Registry and for Legal plans where the scale bar is used, and where it verifies that the drawing is an original or an accurate copy. It may not be scaled for construction purposes.
Always refer to figured dimensions. All dimensions are to be checked on site. Discrepancies and/or ambiguities between this drawing and information given elsewhere must be reported immediately to this office for clarification before proceeding. All drawings are to be read in conjunction with the specification and all works to be carried out in accordance with latest British Standards / Codes of Practice.

Rev	Date	Init	Notes	Chkd
G	26.06.19	CJ	Industrial area and landscape coordinated.	

North

20 0 20 40 60 80 100

SCALE 1:2000 m

Client

Drawing Originator

inspired environments

London - 106 Weston Street London SE1 3QB 020 7160 6000
Bristol - Rivergate House, Bristol, BS1 6LS 0117 923 2535
Plymouth - East Quay House, Plymouth, PL4 0HX 01752 261 282

RIBA Chartered Practice www.aww-uk.com

Project Title

Langstone Technology Park

Drawing Title

Proposed Layout Plan Opt 02

Scale	Sheet	Drawn	Checked	Date
1 : 2000	A3	CJ	IJ	19.03.19

Status	Project No.	
PLANNING	4046	
Drawing Reference	Drawing No.	Revision
	0152	G



Key

- Cable Percussive Borehole
- Window Sample Borehole
- Hand Excavated Trial Pit
- Soakaway Test Trial Pit

REV	DATE	DESCRIPTION	BY	CHK.	APP.
Rev	Date	Description	By	Check	App.

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ALL DIMENSIONS ARE IN MILLIMETRES UNLESS STATED OTHERWISE.
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DO NOT THAW LAYERS THAT HAVE BEEN FROZEN.

Client: Malcolm Hollis

Project: Langstone Technology Park
Havant

Office: Altrincham

Discipline: Geo-environmental

Title: Exploratory Hole
Location Plan

Scale @ A3: NTS

Status:

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Originator	Job Number	Discipline	Building/Zone
SHP	10/1425	GEO	

Type	Level	Drawing No.	Revision
		002	A

Appendix II

clancy consulting	Project Title: Langstone Technology Park, Havant		**BH1**
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 1 Of 1
	GL (mAOD):	N Coord: 50.845214	E Coord: -0.987924
Date: 15/07/2019	Method: Cable Percussion	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
0.20	ES				0.40	MADE GROUND: Grass over brown silty sandy gravelly clay. Gravel is angular to sub-rounded fine to coarse of flint with fragments of slate and brick. Occasional roots and abundant rootlets towards the top of the unit.		
0.60	ES				1.00			
1.00 - 1.10	SPT	sb 50/85mm			1.10	MADE GROUND: Greyish white clayey sandy angular to sub-rounded fine to coarse gravel of chalk and flint with fragments of brick.		
						MADE GROUND: Concrete obstruction.		
					2.00	End Of Borehole At 1.10 m		
					3.00			
					4.00			
					5.00			
					6.00			
					7.00			
					8.00			

KEY

D - Disturbed Sample
B - Bulk Sample
U - Undisturbed
W - Water Sample
S - Standard Penetration Test
C - Cone Penetration Test
N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

No Groundwater Encountered
Borehole terminated due concrete obstruction. Borehole backfilled with arisings.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed

Daily Log Of Depths / Chiselling

Date	Casing	Water	From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		**BH1A**
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 1 Of 4
	GL (mAOD):	N Coord: 50.845214	E Coord: -0.987924
Date: 15/07/2019-17/07/2019	Method: Cable Percussion	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
					0.40	MADE GROUND: Grass over brown silty sandy gravelly clay. Gravel is angular to sub-rounded fine to coarse of flint with fragments of slate and brick. Occasional roots and abundant rootlets towards the top of the unit.		
					1.00			
1.20 - 1.65	SPT	sb 50/85mm			1.15	MADE GROUND: Greyish white clayey sandy angular to sub-rounded fine to coarse gravel of chalk and flint with fragments of brick.		
1.40	ES				1.30	MADE GROUND: Concrete.		
						MADE GROUND: Void.		
2.00 - 2.45	SPT	N=45			2.00	MADE GROUND: Brown sandy gravelly clay. Gravel is sub-rounded to rounded fine to coarse of flint and concrete with a low cobble content of concrete. Becoming increasingly gravelly with fragments of brick and a medium cobble content towards the base of the unit.		
					2.60			
3.00 - 3.45	SPT	pp 50/230mm			3.00	Very dense becoming medium dense light brown sandy very cleyey sub-angular to sub-rounded fine to coarse GRAVEL of flint and chalk.	▼	
3.50	ES							
4.00 - 4.45	SPT	N=10			4.00			
					4.30		▽	
						Firm light brown sandy gravelly CLAY. Gravel is fine to coarse sub-rounded to rounded of flint and chalk.		
5.00 - 5.45	SPT	N=13			5.00			
					5.40			
						Structureless CHALK composed of uncompact light brownish cream sandy gravelly SILT. Gravel is sub-angular to sub-rounded white. (Grade Dm).		
6.00 - 6.45	U				6.00			
					7.00			
7.50 - 7.95	SPT	N=13			7.50			
					8.00	Structureless CHALK composed of uncompact light brownish cream sandy gravelly SILT with low cobble content. Gravel and cobbles are sub-angular to sub-rounded white. Occasional black flecks and flint cobbles. (Grade Dm).		
						Borehole Continues		

KEY

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N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

Groundwater encountered at 4.3m rising to 3.7m. Borehole installed with monitoring well.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
17/07/2019	4.3	3.7			

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		BH1A
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 2 Of 4
	GL (mAOD):	N Coord: 50.845214	E Coord: -0.987924
Date: 15/07/2019-17/07/2019	Method: Cable Percussion	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
9.00 - 9.45	SPT	N=13			9.00	Structureless CHALK composed of uncompact light brownish cream sandy gravelly SILT with low cobble content. Gravel and cobbles are sub-angular to sub-rounded white. Occasional black flecks and flint cobbles. (Grade Dm).		
10.50 - 10.95	U				10.00			
12.00 - 12.45	SPT	N=9			11.00			
13.50 - 13.95	SPT	N=16			12.00			
14.50 - 14.95	U				13.00			
15.00 - 15.45	SPT	N=16			13.50	Structureless CHALK composed of uncompact light brownish cream gravelly sandy SILT. Gravel is sub-angular to sub-rounded light brownish cream with occasional black flecks. (Grade Dm).		
					14.00			
					15.00	Structureless CHALK comprised of uncompact whitish cream slightly sandy slightly gravelly SILT. Gravel is sub-angular to sub-rounded whitish cream with very rare black flecks. (Grade Dm).		
					16.00	Borehole Continues		

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N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

Groundwater encountered at 4.3m rising to 3.7m. Borehole installed with monitoring well.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
17/07/2019	4.3	3.7			

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		**BH1A**
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 3 Of 4
	GL (mAOD):	N Coord: 50.845214	E Coord: -0.987924
Date: 15/07/2019-17/07/2019	Method: Cable Percussion	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
16.50 - 16.95	SPT	N=22				Structureless CHALK comprised of uncompact whitish cream slightly sandy slightly gravelly SILT. Gravel is sub-angular to sub-rounded whitish cream with very rare black flecks. (Grade Dm).		
					17.00			
18.00 - 18.45	SPT	N=26			18.00			
					19.00			
19.50 - 19.95	SPT	N=28				19.50 - 21.00 Gravel of subangular black flint.		
					20.00			
21.00 - 21.45	SPT	pp 50/195mm			21.00	Structureless CHALK comprised of uncompact whitish cream slightly sandy gravelly SILT. Gravel is sub-angular black flint. (Grade Dm).		
22.00 - 22.45	SPT	pp 50/220mm			22.00			
					23.00			
23.50 - 23.95	SPT	pp 50/210mm			23.50			
					24.00	Structureless CHALK comprised of uncompact whitish cream slightly sandy slightly gravelly SILT. Gravel is sub-angular to sub-rounded white with common black flecks. (Grade Dm).		
						Borehole Continues		

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N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

Groundwater encountered at 4.3m rising to 3.7m. Borehole installed with monitoring well.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
17/07/2019	4.3	3.7			

Daily Log Of Depths			Chiselling		
Date	Casing	Water	From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		**BH1A**
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 4 Of 4
	GL (mAOD):	N Coord: 50.845214	E Coord: -0.987924
Date: 15/07/2019-17/07/2019	Method: Cable Percussion	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
24.50 - 24.85	SPT	pp 50/225mm			25.00	Structureless CHALK comprised of uncompact whitish cream slightly sandy slightly gravelly SILT. Gravel is sub-angular to sub-rounded white with common black flecks. (Grade Dm).		
						End Of Borehole At 24.95 m		
					26.00			
					27.00			
					28.00			
					29.00			
					30.00			
					31.00			
					32.00			

KEY

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N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

Groundwater encountered at 4.3m rising to 3.7m. Borehole installed with monitoring well.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
17/07/2019	4.3	3.7			

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

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clancy consulting

Project Title: Langstone Technology Park, Havant		BH2
Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 1 Of 4
GL (mAOD):	N Coord: 50.845665	E Coord: -0.989051
Date: 17/07/2019-18/07/2019	Method: Cable Percussion	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
					0.10	MADE GROUND: Tarmac.		
					0.25	MADE GROUND: Greyish brown sandy angular to sub-angular fine to coarse gravel of limestone.		
					1.00	MADE GROUND: Brown sandy sub-rounded to rounded fine to coarse gravel of flint.		
1.20 - 1.65	C	N=16			1.20	medium dense brown becoming light brown clayey very sandy sub-rounded fine to coarse to rounded GRAVEL of flint with a low cobble content of flint.		
2.00 - 2.45	C	N=10			2.00			
3.00 - 3.45	C	N=2			3.00	Very soft white gravelly CLAY. Gravel is angular to sub-rounded fine to coarse of flint and chalk.		
4.00 - 4.45	C	N=4			4.00			
					4.70			
5.00 - 5.45	U				5.00	Brown sandy gravelly CLAY. Gravel is sub-angular to sub-rounded fine to coarse of flint.		
					5.50			
6.00 - 6.45	SPT	N=17			6.00	Structureless CHALK composed of uncompact yellowish cream gravelly sandy SILT with a low cobble content. Gravel and cobbles are subangular to sub-rounded greyish white chalk and sub-angular black flint. (Grade Dm).		
					7.00			
7.50 - 7.95	U							
					8.00	Borehole Continues		

KEY

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S - Standard Penetration Test
C - Cone Penetration Test
N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

Groundwater encountered at 2.5m rising to 2.3m. Borehole backfilled with arisings.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
29/07/2019	2.5	2.3			

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		**BH2**
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 2 Of 4
	GL (mAOD):	N Coord: 50.845665	E Coord: -0.989051
Date: 17/07/2019-18/07/2019	Method: Cable Percussion	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
9.00 - 9.45	SPT	N=13			9.00	Structureless CHALK composed of uncompact yellowish cream gravelly sandy SILT with a low cobble content. Gravel and cobbles are subangular to sub-rounded greyish white chalk and sub-angular black flint. (Grade Dm).		
10.50 - 10.95	SPT	N=13			10.00			
					11.00	10.50 - 14.00 No cobble content.		
12.50 - 12.95	SPT	N=15			12.00			
					13.00			
14.00 - 14.45	SPT	N=15			14.00	Structureless CHALK composed of uncompact whitish cream gravelly sandy SILT. Gravel is sub-angular to sub-rounded greyish white with occasional black flecks. (Grade Dm).		
					15.00			
15.50 - 15.95	SPT	N=17			15.50	Structureless CHALK composed of uncompact light brownish cream gravelly sandy SILT. Gravel is sub-angular to sub-rounded light brownish cream with occasional black flecks. (Grade Dm).		
					16.00	Borehole Continues		

KEY

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N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

Groundwater encountered at 2.5m rising to 2.3m. Borehole backfilled with arisings.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
29/07/2019	2.5	2.3			

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		**BH2**
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 3 Of 4
	GL (mAOD):	N Coord: 50.845665	E Coord: -0.989051
Date: 17/07/2019-18/07/2019	Method: Cable Percussion	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
17.00 - 17.45	U				17.00	Structureless CHALK composed of uncompact light brownish cream gravelly sandy SILT. Gravel is sub-angular to sub-rounded light brownish cream with occasional black flecks. (Grade Dm).		
18.50 - 18.95	SPT	pp 50/215mm			18.00			
					18.50	Structureless CHALK composed of uncompact light greyish white gravelly sightly sandy SILT. Gravel is sub-angular to sub-rounded light greyish white with occasional black flecks. (Grade Dm).		
20.00 - 20.45	SPT	pp 50/190mm			19.00			
					20.00			
					21.00			
21.50 - 21.95	SPT	pp 50/195mm			21.50	Structureless CHALK composed of uncompact light greyish white gravelly sightly sandy SILT. Gravel is sub-angular to sub-rounded light greyish white chalk and subangular black flint. (Grade Dm).		
					22.00			
23.00 - 23.45	SPT	pp 50/180mm			23.00			
					24.00	Borehole Continues		

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V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

Groundwater encountered at 2.5m rising to 2.3m. Borehole backfilled with arisings.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
29/07/2019	2.5	2.3			

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		BH2
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 4 Of 4
	GL (mAOD):	N Coord: 50.845665	E Coord: -0.989051
Date: 17/07/2019-18/07/2019	Method: Cable Percussion	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
24.50 - 24.70	SPT	pp 50/215mm			24.70	Structureless CHALK composed of uncompact light greyish white gravelly sightly sandy SILT. Gravel is sub-angular to sub-rounded light greyish white chalk and subangular black flint. (Grade Dm).		
					25.00	End Of Borehole At 24.70 m		
					26.00			
					27.00			
					28.00			
					29.00			
					30.00			
					31.00			
					32.00			

KEY

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N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

Groundwater encountered at 2.5m rising to 2.3m. Borehole backfilled with arisings.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
29/07/2019	2.5	2.3			

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		**BH3**
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 1 Of 3
	GL (mAOD):	N Coord: 50.844665	E Coord: -0.991222
Date: 22/07/2019	Method: Cable Percussion	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
					0.15	MADE GROUND: Tarmac.		
0.50	ES				0.60	MADE GROUND: Brown slightly clayey sandy angular to sub-angular fine to coarse gravel of limestone (sandy base).		
1.00	ES				1.00			
1.00 - 1.45	SPT	N=25			1.20	MADE GROUND: Greyish brown gravelly sandy silty clay. Gravel is angular to sub-rounded fine to coarse of flint and brick with fragments of slate.		
2.00 - 2.45	SPT	N=21			2.00	Medium dense brown clayey sandy sub-rounded fine to coarse GRAVEL of flint.	▼	
					2.50			
3.00 - 3.45	SPT	N=20			3.00	Medium dense light brown clayey sandy sub-angular to sub-rounded fine to coarse GRAVEL of flint and chalk.		
4.00 - 4.45	SPT	N=28			4.00			
5.00 - 5.45	SPT	N=17			5.00			
					5.10	Structureless CHALK composed of uncompact greyish white gravelly slightly sandy SILT. Gravel is sub-angular to sub-rounded white with rare black specks. (Grade Dm).		
6.00 - 6.45	SPT	N=13			6.00			
					7.00			
7.50 - 7.95	D	N=12			8.00			
						Borehole Continues		

KEY

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S - Standard Penetration Test
C - Cone Penetration Test
N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

Groundwater encountered at 2.0m. Borehole installed with monitoring well.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
25/07/2019	2				

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		**BH3**
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 2 Of 3
	GL (mAOD):	N Coord: 50.844665	E Coord: -0.991222
Date: 22/07/2019	Method: Cable Percussion	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
					9.00	Structureless CHALK composed of uncompact greyish white gravelly slightly sandy SILT. Gravel is sub-angular to sub-rounded white with rare black specks. (Grade Dm).		
					10.00			
10.50 - 10.95	SPT	N=21			11.00			
12.00 - 12.45	SPT	N=18			12.00			
					13.00	13.00 Flint cobble.		
13.50 - 13.95	SPT	N=18			13.50	Structureless CHALK composed of uncompact greyish white very gravelly slightly sandy SILT. Gravel is sub-angular to sub-rounded white. (Grade Dm).		
					14.00			
15.00 - 15.45	SPT	N=26			15.00	Structureless CHALK composed of uncompact greyish white gravelly sandy SILT. Gravel is sub-angular to sub-rounded white with rare black flecks. (Grade Dm).		
					16.00	Borehole Continues		

KEY

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N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

Groundwater encountered at 2.0m. Borehole installed with monitoring well.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
25/07/2019	2				

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		**BH3**
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 3 Of 3
	GL (mAOD):	N Coord: 50.844665	E Coord: -0.991222
Date: 22/07/2019	Method: Cable Percussion	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
16.50 - 16.93	SPT	pp 50/275mm			17.00	Structureless CHALK composed of uncompact greyish white gravelly sandy SILT. Gravel is sub-angular to sub-rounded white with rare black flecks. (Grade Dm).		
						16.00 Flint cobble.		
18.00 - 18.28	SPT	pp 50/130mm			18.00			
19.00	D				19.00			
19.50 - 19.66	SPT	pp 50/85mm			20.00			
21.00 - 21.22	SPT	pp 50/65mm			21.00			
					22.00			
22.50 - 22.73	SPT	pp 50/75mm			22.73			
					23.00	End Of Borehole At 22.73 m		
					24.00			

KEY

D - Disturbed Sample
B - Bulk Sample
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W - Water Sample
S - Standard Penetration Test
C - Cone Penetration Test
N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

Groundwater encountered at 2.0m. Borehole installed with monitoring well.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
25/07/2019	2				

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		**BH4**
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 1 Of 3
	GL (mAOD):	N Coord: 50.847282	E Coord: -0.98699
Date: 24/07/2019-25/07/2019	Method: Cable Percussion	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
					0.10	MADE GROUND: Tarmac.		
0.40	ES				0.30	MADE GROUND: Brown sandy sub-rounded fine to coarse gravel of flint on a geotextile membrane.		
1.10	ES				1.00	MADE GROUND: Brown very gravelly sandy clay. Gravel is angular to sub-rounded fine to coarse of flint and brick with fragments of wood, slate and metal.		
1.20 - 1.65	SPT	N=2			1.60	Very soft plastic brown amorphous very silty PEAT.		
2.00 - 2.45	SPT	N=50			2.00	Firm becoming very stiff brown very sandy gravelly CLAY. Gravel is sub-rounded to rounded fine to coarse of flint with a low cobble content of flint.		
2.10	ES				2.30		▼	
3.00 - 3.45	SPT	N=33			3.00	Medium dense brown clayey fine to coarse SAND and sub-rounded fine to coarse GRAVEL of flint.		
4.00 - 4.45	SPT	N=28			4.00			
5.00 - 5.45	SPT	N=23			5.00			
					5.80			
6.00 - 6.45	SPT	N=12			6.00	Light brown clayey sandy sub-angular to sub-rounded fine to coarse GRAVEL of chalk and flint.	▽	
6.50	D					Structureless CHALK composed of uncompact brownish cream slightly sandy slightly gravelly SILT. Gravel is sub-angular to sub-rounded white. (Grade Dm).		
					7.00			
7.50 - 7.95	SPT	N=15						
					8.00	Borehole Continues		

KEY

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▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

Groundwater encountered at 6.0m rising to 2.4m. Borehole backfilled with arisings.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
24/07/2019	6	2.4			

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		**BH4**
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 2 Of 3
	GL (mAOD):	N Coord: 50.847282	E Coord: -0.98699
Date: 24/07/2019-25/07/2019	Method: Cable Percussion	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
						Structureless CHALK composed of uncompact brownish cream slightly sandy slightly gravelly SILT. Gravel is sub-angular to sub-rounded white. (Grade Dm).		
9.00 - 9.45 9.10	SPT D	N=8			9.00			
						Structureless CHALK composed of uncompact greyish cream slightly sandy gravelly SILT. Gravel is sub-angular to sub-rounded white. (Grade Dm).		
					10.00			
10.50 - 10.95	SPT	N=6			10.50			
						Structureless CHALK composed of uncompact light greyish white slightly sandy very gravelly SILT. Gravel is sub-angular to sub-rounded white. (Grade Dm).		
11.50	D				11.00			
12.00 - 12.45	SPT	N=7			12.00			
					13.00			
13.50 - 13.95	SPT	N=15						
					14.00			
15.00 - 15.45	SPT	N=22			15.00			
						Structureless CHALK composed of uncompact light greyish cream sandy silty subangular to subrounded medium to coarse GRAVEL. Clasts are white. Matrix is light greyish cream. (Grade Dc).		
					16.00			
						Borehole Continues		

KEY

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N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

Groundwater encountered at 6.0m rising to 2.4m. Borehole backfilled with arisings.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
24/07/2019	6	2.4			

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		**BH4**
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 3 Of 3
	GL (mAOD):	N Coord: 50.847282	E Coord: -0.98699
Date: 24/07/2019-25/07/2019	Method: Cable Percussion	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
16.50 - 16.95	SPT	N=22			16.50	Structureless CHALK composed of uncompact light greyish cream sandy silty subangular to subrounded medium to coarse GRAVEL. Clasts are white. Matrix is light greyish cream. (Grade Dc).		
					17.00	Structureless CHALK composed of uncompact whitish cream gravelly sandy SILT. Gravel is whitish cream sub-rounded to sub-angular fine to coarse. (Grade Dm).		
18.90	D				18.00			
19.00 - 19.45	C	pp 50/265mm			19.00			
					20.00	Structureless CHALK composed of uncompact whitish cream slightly sandy gravelly SILT. Gravel is whitish cream sub-angular to sub-rounded fine to coarse with rare black specks. (Grade Dm).		
20.50 - 20.95	C	N=23			21.00			
22.00 - 22.45	C	pp 50/150mm			22.00			
					23.00			
23.50 - 23.65	C	pp 50/80mm			23.65	End Of Borehole At 23.65 m		
					24.00			

KEY

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N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

Groundwater encountered at 6.0m rising to 2.4m. Borehole backfilled with arisings.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
24/07/2019	6	2.4			

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting

Project Title: Langstone Technology Park, Havant		WS1
Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 1 Of 1
GL (mAOD):	N Coord: 50.845884	E Coord: -0.988569
Date: 16/07/2019	Method: Window Sampler	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
0.30	ES					MADE GROUND: Grass over brown gravelly clayey fine to medium sand. Gravel is sub-angular to rounded fine to coarse of flint with fragments of pottery. Rootlets towards the top of the unit.		
					1.00			
1.20 - 1.65	SPT	N=15			1.30			
1.60	ES					Soft and very soft light brown becoming brownish white slightly sandy very gravelly CLAY. Gravel is sub-angular to rounded fine to coarse of flint and chalk.		
2.00 - 2.45	SPT	N=4			2.00			
2.50	ES							
3.00 - 3.45	SPT	N=3			3.00			
					3.70			
4.00 - 4.45	SPT	N=15			4.00	Firm white gravelly CLAY. Gravel is sub-angular to sub-rounded fine to medium of chalk (weathered bedrock).		
4.80	D							
5.00 - 5.45	SPT	N=13			5.00			
					5.45	End Of Borehole At 5.45 m		
					6.00			
					7.00			
					8.00			

KEY

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▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

Groundwater encountered at 2.0m rising to 1.8m bgl.
Borehole backfilled with arisings.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
17/07/2019	2	1.8			

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting

Project Title: Langstone Technology Park, Havant		**WS2**
Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 1 Of 1
GL (mAOD):	N Coord: 50.846009	E Coord: -0.990914
Date: 17/07/2019	Method: Window Sampler	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
0.50	ES				0.55	MADE GROUND: Grass over brown slightly clayey very sandy angular to sub-rounded fine to coarse gravel of flint and concrete with a low cobble content of concrete. Occasional rootlets towards the top of the unit.		
0.60 - 0.80	B							
1.00 - 1.45	SPT	N=16			1.00	MADE GROUND: Brown slightly clayey very gravelly fine to medium sand. Gravel is angular to sub-rounded fine to coarse of flint.		
1.10	ES				1.25			
					1.60	MADE GROUND: Dark blackish grey becoming brown very sandy slightly gravelly clay with fragments of wood and grass. Gravel is sub-rounded fine to coarse of flint. Strong olfactory evidence of hydrocarbons.		
2.00 - 2.45	SPT	N=2			2.00			
2.40	ES				2.10	Firm brown very sandy slightly gravelly CLAY with fragments of wood and grass. Strong olfactory evidence of hydrocarbons.		
3.00 - 3.45	SPT	N=8			3.00			
					3.50	Brown clayey sandy sub-angular to sub-rounded fine to coarse GRAVEL of flint.		
4.00 - 4.45	SPT	N=12			4.00	Very soft becoming soft grey becoming brown sandy silty CLAY. Slightly gravelly towards the top of the unit. Gravel is sub-rounded fine to coarse of flint.		
						Medium dense light brown clayey sandy angular to sub-rounded fine to coarse GRAVEL of flint and chalk (wet).		
5.00 - 5.45	SPT	N=22			5.00			
					5.45	End Of Borehole At 5.45 m		
					6.00			
					7.00			
					8.00			

KEY

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C - Cone Penetration Test
N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

No Groundwater Encountered
Falling head test was undertaken in the borehole.
Borehole backfilled with arisings.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		**WS3**
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 1 Of 1
	GL (mAOD):	N Coord: 50.845676	E Coord: -0.990613
Date: 16/07/2019	Method: Window Sampler	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
0.25	ES				0.15	MADE GROUND: Tarmac.		
					0.35	MADE GROUND: Orangish brown very sandy sub-rounded fine to coarse gravel of flint with a low cobble content of flint.		
					0.45	MADE GROUND: Tarmac.		
					0.65	MADE GROUND: Concrete.		
1.20 - 1.65	SPT	N=12			1.00	Brown slightly clayey slightly sandy angular to rounded fine to coarse GRAVEL of flint.		
1.50	D				1.45	Medium dense brown clayey very sandy sub-angular to rounded fine to coarse GRAVEL of flint with bands of sandy gravel and gravelly clay.		
2.00 - 2.45	SPT	N=19			2.00			
3.00 - 3.45	SPT	N=13			3.00		▼	
4.00 - 4.45	SPT	N=28			4.00			
5.00 - 5.45	SPT	N=27			5.00			
					5.45	End Of Borehole At 5.45 m		
					6.00			
					7.00			
					8.00			

KEY

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V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

Groundwater encountered at 3.0m bgl. Borehole unstable and collapsed in to 3m bgl. Borehole installed with gas monitoring well.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
25/07/2019	3				

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		**WS4**
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 1 Of 1
	GL (mAOD):	N Coord: 50.844701	E Coord: -0.989103
Date: 16/07/2019	Method: Window Sampler	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
					0.15	MADE GROUND: Tarmac.		
0.40 - 0.65 0.40	B ES				0.65	MADE GROUND: Light orangish brown clayey sandy angular fine to coarse gravel of limestone.		
1.20 - 1.65	SPT	N=15			1.00	Firm to stiff brown sandy very gravelly CLAY.		
1.80	ES				1.70			
2.00 - 2.45	SPT	N=15			2.00	Medium dense greyish brown slightly clayey slightly sandy angular to sub-rounded fine to coarse GRAVEL of flint with a medium cobble content of flint.		
2.90 3.00 - 3.45	D SPT	N=5			2.50 3.00	Soft greenish grey sandy SILT.		
					3.40	Firm greenish grey sandy CLAY with widely spaced coarse sand partings.		
4.00 - 4.45	SPT	N=9			4.00			
5.00 - 5.45	SPT	N=16			5.00			
					5.45	End Of Borehole At 5.45 m		
					6.00			
					7.00			
					8.00			

KEY

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N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

Groundwater encountered at 2.1m bgl. Borehole unstable and collapsed in to 2.0m bgl. Borehole installed with gas monitoring well.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
25/07/2019	2.1				

Daily Log Of Depths			Chiselling		
Date	Casing	Water	From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting

Project Title: Langstone Technology Park, Havant		**WS5**
Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 1 Of 1
GL (mAOD):	N Coord: 50.845351	E Coord: -0.991569
Date: 18/07/2019	Method: Window Sampler	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
					0.10	MADE GROUND: Tarmac.		
					0.15	MADE GROUND: Concrete.		
					0.35	MADE GROUND: Brown sandy gravelly clay. Gravel is sub-angular fine to coarse to sub-rounded of flint, brick, limestone and chalk.		
					0.40	MADE GROUND: Tarmac.		
0.70	ES				1.00	MADE GROUND: Brown sandy gravelly clay with a low cobble content of brick. Gravel is sub-angular to sub-rounded fine to coarse of flint, brick, limestone and chalk.		
1.20 - 1.65	SPT	N=9			1.60	Loose becoming very loose brown clayey sandy angular fine to coarse to sub-rounded GRAVEL of flint.		
2.00 - 2.45	SPT	N=5			2.00	2.50 - 3.45 Stained dark grey.		
2.60	ES					2.50 - 4.00 Visual and olfactory evedence of hydrocarbons.		
3.00 - 3.45	SPT	N=1			3.00	3.45 Becoming white.		
3.90	ES				4.00	End Of Borehole At 4.00 m		
					5.00			
					6.00			
					7.00			
					8.00			

KEY

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N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

Groundwater encountered at 1.9m bgl. Borehole unstable and collapsed in to 1.9m bgl.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed
25/07/2019	1.9				

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		**WS6**
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 1 Of 1
	GL (mAOD):	N Coord: 50.847089	E Coord: -0.986694
Date: 18/07/2019	Method: Window Sampler	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
0.80	ES				1.00	MADE GROUND: Grass over brown very sandy slightly gravelly clay with fragments of brick and clinker. Gravel is angular to sub-rounded fine to coarse of flint, concrete and brick. Occasional rootlets towards the top of the unit.		
1.20 - 1.65	SPT	N=14			1.50			
1.70	ES					MADE GROUND: Dark grey sandy gravelly clay. Gravel is angular to sub-rounded fine to coarse of flint, chalk, clinker, brick, mudstone and coal with fragments of wood and decaying rootlets.		
2.00 - 2.45	SPT	N=8			2.00			
3.00 - 3.45	SPT	N=10			3.00 3.10			
3.90	ES					Medium dense light orangish brown very clayey gravelly fine to coarse SAND. Gravel is sub-rounded to rounded fine to coarse of flint and chalk.		
4.00 - 4.45	SPT	N=11			4.00			
5.00 - 5.45	SPT	N=21			5.00	4.80 - 5.45 Wet.		
					5.45	End Of Borehole At 5.45 m		
					6.00			
					7.00			
					8.00			

KEY

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C - Cone Penetration Test
N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

No Groundwater Encountered
Borehole backfilled with arisings.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting

Project Title: Langstone Technology Park, Havant		WS7
Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 1 Of 1
GL (mAOD):	N Coord: 50.847365	E Coord: -0.987382
Date: 18/07/2019	Method: Window Sampler	Driller: WB Drilling
		Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
0.40	ES				1.00	MADE GROUND: Grass over brown clayey gravelly fine to coarse sand with a low cobble content of flint and brick. Gravel is angular to sub-rounded fine to coarse of flint. Occasional rootlets towards the top of the unit.		
1.20 - 1.65	SPT	N=20			2.00			
1.40	ES				2.45	End Of Borehole At 2.45 m		
2.00 - 2.45	SPT	N=40			3.00			
					4.00			
					5.00			
					6.00			
					7.00			
					8.00			

KEY

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B - Bulk Sample
U - Undisturbed
W - Water Sample
S - Standard Penetration Test
C - Cone Penetration Test
N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

No Groundwater Encountered
Borehole terminated in Made Ground due to cobble construction.Borehole backfilled with arisings.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		WS8
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 1 Of 1
	GL (mAOD):	N Coord: 50.848019	E Coord: -0.987472
Date: 18/07/2019	Method: Window Sampler	Driller: WB Drilling	Logged By: SHP

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water	Standpipe
0.60	ES					MADE GROUND: Brown sandy gravelly slightly silty clay. Gravel is angular to sub-rounded fine to coarse of brick, concrete and flint.		
1.20 - 1.21	SPT	sb 50/5mm			1.00 1.10 1.21	MADE GROUND: Concrete cobbles obstruction.		
						End Of Borehole At 1.21 m		
					2.00			
					3.00			
					4.00			
					5.00			
					6.00			
					7.00			
					8.00			

KEY

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S - Standard Penetration Test
C - Cone Penetration Test
N - Penetration Test 'N' Value
V - Hand Shear Vane kPa
▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

No Groundwater Encountered
Borehole terminated in Made Ground due to concrete obstruction. Borehole backfilled with arisings.

Scale: 1:50

Water Strikes

Date	Strike	Level	Minutes	Casing	Sealed

Daily Log Of Depths

Date	Casing	Water

Chiselling

From	To	Hours

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting

Project Title: Langstone Technology Park, Havant			HTP1
Project Number: 10/1425	Client: AG Langstone B.V.		Sheet 1 Of 1
GL (mAOD):	N Coord: 50.843224		E Coord: -0.988262
Date: 21/07/2019	Method: Hand Excavated	Logged By: SHP	Scale: 1:50

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water
0.50	ES				0.24	MADE GROUND: Red tarmac.	
						MADE GROUND: Black tarmac.	
					1.00	MADE GROUND: Concrete with 8 mm rebar towards top of unit.	
					1.40	MADE GROUND: Orangish brown mottled dark grey in part very sandy slightly gravelly clay with a low cobble content of granite. Gravel is fine to coarse angular to sub-rounded of flint with fragments of metal, polystyrene and wood.	
					2.00	1.00 - 1.40 Becoming increasingly gravelly.	
						End Of Trial Pit At 1.40 m	
					3.00		
					4.00		
					5.00		
					6.00		
					7.00		
					8.00		
					9.00		
					10.00		

KEY

D - Disturbed Sample
B - Bulk Sample
W - Water Sample
V - Hand Shear Vane kPa

▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

No Groundwater Encountered
Trial pit backfilled with arisings.

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting

Project Title: Langstone Technology Park, Havant			HTP2
Project Number: 10/1425	Client: AG Langstone B.V.		Sheet 1 Of 1
GL (mAOD):	N Coord: 50.844518		E Coord: -0.988413
Date: 21/07/2019	Method: Hand Excavated	Logged By: SHP	Scale: 1:50

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water
					0.25	MADE GROUND: Red tarmac.	
					0.35	MADE GROUND: Black tarmac.	
						MADE GROUND: Concrete with 8 mm rebar towards middle of unit.	
					1.00	MADE GROUND: Grey gravelly fine to coarse sand with a low cobble content of brick. Gravel is fine to coarse angular to sub-angular of concrete.	
					1.20	MADE GROUND: Brown very clayey gravelly fine to coarse sand with a low cobble content of concrete and flint. Gravel is fine to coarse sub-angular to rounded of flint.	
					2.00	End Of Trial Pit At 1.20 m	
					3.00		
					4.00		
					5.00		
					6.00		
					7.00		
					8.00		
					9.00		
					10.00		

KEY

D - Disturbed Sample
B - Bulk Sample
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V - Hand Shear Vane kPa

▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

No Groundwater Encountered
Trial pit backfilled with arisings.

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting

Project Title: Langstone Technology Park, Havant			HTP3
Project Number: 10/1425	Client: AG Langstone B.V.		Sheet 1 Of 1
GL (mAOD):	N Coord: 50.845147		E Coord: -0.989939
Date: 21/07/2019	Method: Hand Excavated	Logged By: SHP	Scale: 1:50

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water
0.15 - 0.20	B				0.15	MADE GROUND: Tarmac.	
0.40	ES				0.20	MADE GROUND: Fine to coarse sandy angular gravel of limestone.	
0.60 - 0.75	B				0.75	MADE GROUND: Orangish brown becoming greyish brown sandy gravelly clay with fragments of coal and wood. Gravel is fine to coarse angular to sub-rounded of chalk, flint and brick.	
					0.80	MADE GROUND: Concrete obstruction.	
					1.00	End Of Trial Pit At 0.80 m	
					2.00		
					3.00		
					4.00		
					5.00		
					6.00		
					7.00		
					8.00		
					9.00		
					10.00		

KEY

D - Disturbed Sample
B - Bulk Sample
W - Water Sample
V - Hand Shear Vane kPa

▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

No Groundwater Encountered
Trial pit backfilled with arisings.

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		HTP4
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 1 Of 1
	GL (mAOD):	N Coord: 50.84722	E Coord: -0.98755
Date: 21/07/2019	Method: Hand Excavated	Logged By: SHP	Scale: 1:50

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water
0.20	ES				0.35	MADE GROUND: Grass over gravelly fine to medium sand with fragments of brick and concrete. Gravel is fine to coarse angular to sub-rounded of flint and concrete.	
					1.00	MADE GROUND: Brown sandy gravelly clay with a low cobble content of flint. Gravel is fine to coarse angular to sub-rounded of flint.	
					1.20	End Of Trial Pit At 1.20 m	
					2.00		
					3.00		
					4.00		
					5.00		
					6.00		
					7.00		
					8.00		
					9.00		
					10.00		

KEY

D - Disturbed Sample
B - Bulk Sample
W - Water Sample
V - Hand Shear Vane kPa

▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

No Groundwater Encountered
Trial pit backfilled with arisings.

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting	Project Title: Langstone Technology Park, Havant		SA1
	Project Number: 10/1425	Client: AG Langstone B.V.	Sheet 1 Of 1
	GL (mAOD):	N Coord: 50.848068	E Coord: -0.987702
Date: 19/07/2019	Method: JCB	Logged By: SHP	Scale: 1:50

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water
0.30	ES				0.45	MADE GROUND: Grass over brown very clayey gravelly fine to medium sand. Abundant rootlets towards the top of the unit. Gravel is angular to sub-rounded fine to coarse of flint. Rare fragments of plastic.	
0.60	ES				0.65		
0.70	B				1.00	MADE GROUND: Brownish grey sandy gravelly cobbles of brick and concrete with fragments of tarmac, shells and metal.	
1.30	ES				1.20		
					1.60	Brown clayey very sandy angular to sub-rounded fine to coarse GRAVEL of of flint.	
					2.00	Firm dark brownish grey sandy CLAY with fragments of wood.	
						Firm light grey sandy slightly gravelly CLAY with rare fragments of wood. Gravel is sub-rounded fine to coarse of flint.	
					3.00	End Of Trial Pit At 2.05 m	
					4.00		
					5.00		
					6.00		
					7.00		
					8.00		
					9.00		
					10.00		

KEY

D - Disturbed Sample
B - Bulk Sample
W - Water Sample
V - Hand Shear Vane kPa

▽ - Groundwater Strike
▼ - Groundwater Level

AGS

REMARKS

No Groundwater Encountered
Trial Pit used for soakaway testing. Trial pit backfilled with arisings.

Printed By GeoLogs (www.GeoLogs.com)

clancy consulting

Project Title: Langstone Technology Park, Havant			SA2
Project Number: 10/1425	Client: AG Langstone B.V.		Sheet 1 Of 1
GL (mAOD):	N Coord: 50.845255		E Coord: -0.987848
Date: 19/07/2019	Method: JCB	Logged By: SHP	Scale: 1:50

Depth (m)	Type	Test Result	Level	Legend	Depth (m)	Description	Water
0.60 0.70	B ES				0.10	MADE GROUND: Grass over brown clayey gravelly sand. Gravel is angular to sub-rounded fine to coarse of flint with fragments of brick and cement.	
					1.00	MADE GROUND: Brown slightly clayey gravelly fine to coarse sand with a medium cobble and boulder content of brick, concrete and pottery. Gravel is angular to sub-rounded fine to coarse of brick, flint, concrete, pottery and slate.	
1.80	B				1.50	MADE GROUND: Firm brown sandy slightly gravelly CLAY. Gravel is sub-rounded fine to coarse of flint. Masonry structure in east of the trial pit.	
					2.00 2.10	End Of Trial Pit At 2.10 m	
					3.00		
					4.00		
					5.00		
					6.00		
					7.00		
					8.00		
					9.00		
					10.00		

KEY

D - Disturbed Sample
B - Bulk Sample
W - Water Sample
V - Hand Shear Vane kPa

▽ - Groundwater Strike
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AGS

REMARKS

No Groundwater Encountered
Trial pit used for soakaway testing. Trial pit backfilled with arisings.

Printed By GeoLogs (www.GeoLogs.com)

Appendix III

envirolab
Units 7 & 8 Sandpits Business Park
Mottram Road, Hyde, Cheshire, SK14 3AR

FINAL ANALYTICAL TEST REPORT

SUPPLEMENT TO TEST REPORT 19/07173 and 19/07261/1

Amendments: Request for combined report

Envirolab Job Number: 19/07173 and 19/07261
Issue Number: 2 **Date:** 12 August, 2019

Client:
Clancy Consulting
Dunham Court
2 Dunham Road
Altrincham
Cheshire
UK
WA14 4NX

Project Manager: Desy Korai/Sophie Harper-Pryce
Project Name: Langstone Technology Park, Havant
Project Ref: 10/1425
Order No: 26688 / SHP / PPA /26706
Date Samples Received: 25/07/19
Date Instructions Received: 30/07/19
Date Analysis Completed: 09/08/19

Prepared by:

Richard Wong
Client Manager

Approved by:

Danielle Brierley
Client Manager

Envirolab Job Number: 19/07173 and 19/07261

Client Project Name: Langstone Technology Park, Havant

Client Project Ref: 10/1425

Lab Sample ID	19/07173/1	19/07173/2	19/07173/5	19/07173/8	19/07173/12	19/07173/15	19/07173/16	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	HTP1	HTP3	BH1	SA1	WS1	WS2	WS2			
Depth to Top	0.50	0.40	0.60	0.60	1.60	1.10	2.40			
Depth To Bottom										
Date Sampled	16-Jul-19	17-Jul-19	15-Jul-19	19-Jul-19	16-Jul-19	17-Jul-19	17-Jul-19			
Sample Type	Solid	Soil	Soil	Solid	Soil	Soil	Soil			
Sample Matrix Code	7	5AB	4A	7	5A	5AE	5AE			
% Stones >10mm$_A$	<0.1	27.0	28.3	<0.1	55.9	0.7	<0.1	% w/w	0.1	A-T-044
pH$_D$$^{M\#}$	7.86	8.63	8.21	9.01	9.04	8.73	8.75	pH	0.01	A-T-031s
Sulphate (water sol 2:1)$_D$$^{M\#}$	<0.01	-	<0.01	-	<0.01	-	-	g/l	0.01	A-T-026s
Arsenic$_D$$^{M\#}$	3	<1	-	4	<1	6	5	mg/kg	1	A-T-024s
Beryllium$_D$$^{\#}$	<0.5	<0.5	-	<0.5	<0.5	1.1	1.0	mg/kg	0.5	A-T-024s
Boron (water soluble)$_D$$^{M\#}$	<1.0	<1.0	-	<1.0	<1.0	2.6	2.4	mg/kg	1	A-T-027s
Cadmium$_D$$^{M\#}$	<0.5	<0.5	-	1.8	<0.5	<0.5	<0.5	mg/kg	0.5	A-T-024s
Copper$_D$$^{M\#}$	7	1	-	6	1	10	8	mg/kg	1	A-T-024s
Chromium (hexavalent)$_D$	<1	<1	-	<1	<1	<1	<1	mg/kg	1	A-T-040s
Lead$_D$$^{M\#}$	8	1	-	8	2	13	10	mg/kg	1	A-T-024s
Mercury$_D$	<0.17	<0.17	-	<0.17	<0.17	<0.17	<0.17	mg/kg	0.17	A-T-024s
Nickel$_D$$^{M\#}$	9	2	-	23	15	54	56	mg/kg	1	A-T-024s
Selenium$_D$$^{M\#}$	<1	<1	-	<1	<1	<1	<1	mg/kg	1	A-T-024s
Vanadium$_D$$^{M\#}$	19	4	-	29	18	40	43	mg/kg	1	A-T-024s
Zinc$_D$$^{M\#}$	24	6	-	28	17	69	75	mg/kg	5	A-T-024s

Envirolab Job Number: 19/07173 and 19/07261

Client Project Name: Langstone Technology Park, Havant

Client Project Ref: 10/1425

Lab Sample ID	19/07173/1	19/07173/2	19/07173/5	19/07173/8	19/07173/12	19/07173/15	19/07173/16	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	HTP1	HTP3	BH1	SA1	WS1	WS2	WS2			
Depth to Top	0.50	0.40	0.60	0.60	1.60	1.10	2.40			
Depth To Bottom										
Date Sampled	16-Jul-19	17-Jul-19	15-Jul-19	19-Jul-19	16-Jul-19	17-Jul-19	17-Jul-19			
Sample Type	Solid	Soil	Soil	Solid	Soil	Soil	Soil			
Sample Matrix Code	7	5AB	4A	7	5A	5AE	5AE			
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_D^{\#}$	NAD	-	NAD	NAD	-	-	-			A-T-045
Asbestos ACM - Suitable for Water Absorption Test?	N/A	-	N/A	N/A	-	-	-			

Envirolab Job Number: 19/07173 and 19/07261

Client Project Name: Langstone Technology Park, Havant

Client Project Ref: 10/1425

Lab Sample ID	19/07173/1	19/07173/2	19/07173/5	19/07173/8	19/07173/12	19/07173/15	19/07173/16	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	HTP1	HTP3	BH1	SA1	WS1	WS2	WS2			
Depth to Top	0.50	0.40	0.60	0.60	1.60	1.10	2.40			
Depth To Bottom										
Date Sampled	16-Jul-19	17-Jul-19	15-Jul-19	19-Jul-19	16-Jul-19	17-Jul-19	17-Jul-19			
Sample Type	Solid	Soil	Soil	Solid	Soil	Soil	Soil			
Sample Matrix Code	7	5AB	4A	7	5A	5AE	5AE			
PAH-16MS										
Acenaphthene$_A^{M\#}$	<0.01	<0.01	-	0.01	<0.01	1.64	<0.01	mg/kg	0.01	A-T-019s
Acenaphthylene$_A^{M\#}$	<0.01	<0.01	-	<0.01	<0.01	0.12	<0.01	mg/kg	0.01	A-T-019s
Anthracene$_A^{M\#}$	<0.02	<0.02	-	<0.02	<0.02	1.47	<0.02	mg/kg	0.02	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	0.14	0.05	-	0.15	<0.04	2.48	<0.04	mg/kg	0.04	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	0.32	0.05	-	0.19	<0.04	2.22	<0.04	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	0.36	0.06	-	0.25	<0.05	3.26	<0.05	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	0.59	<0.05	-	0.20	<0.05	1.15	<0.05	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	0.12	<0.07	-	0.08	<0.07	0.97	<0.07	mg/kg	0.07	A-T-019s
Chrysene$_A^{M\#}$	0.19	<0.06	-	0.19	<0.06	2.80	<0.06	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	0.13	<0.04	-	0.05	<0.04	0.47	<0.04	mg/kg	0.04	A-T-019s
Fluoranthene$_A^{M\#}$	<0.08	0.08	-	0.20	<0.08	7.14	<0.08	mg/kg	0.08	A-T-019s
Fluorene$_A^{M\#}$	<0.01	<0.01	-	<0.01	<0.01	1.84	<0.01	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	0.53	0.05	-	0.23	<0.03	1.62	<0.03	mg/kg	0.03	A-T-019s
Naphthalene $_A^{M\#}$	<0.03	<0.03	-	<0.03	<0.03	0.29	<0.03	mg/kg	0.03	A-T-019s
Phenanthrene$_A^{M\#}$	<0.03	0.03	-	0.10	<0.03	6.57	<0.03	mg/kg	0.03	A-T-019s
Pyrene$_A^{M\#}$	0.09	0.08	-	0.17	<0.07	6.03	<0.07	mg/kg	0.07	A-T-019s
Total PAH-16MS$_A^{M\#}$	2.47	0.40	-	1.82	<0.08	40.1	<0.08	mg/kg	0.01	A-T-019s

Lab Sample ID	19/07173/1	19/07173/2	19/07173/5	19/07173/8	19/07173/12	19/07173/15	19/07173/16	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	HTP1	HTP3	BH1	SA1	WS1	WS2	WS2			
Depth to Top	0.50	0.40	0.60	0.60	1.60	1.10	2.40			
Depth To Bottom										
Date Sampled	16-Jul-19	17-Jul-19	15-Jul-19	19-Jul-19	16-Jul-19	17-Jul-19	17-Jul-19			
Sample Type	Solid	Soil	Soil	Solid	Soil	Soil	Soil			
Sample Matrix Code	7	5AB	4A	7	5A	5AE	5AE			
Speciated PCB-WHO12										
PCB BZ 81$_A$	-	-	-	-	-	<0.005	-	mg/kg	0.005	A-T-004s
PCB BZ 105$_A$	-	-	-	-	-	0.036	-	mg/kg	0.005	A-T-004s
PCB BZ 114$_A$	-	-	-	-	-	<0.005	-	mg/kg	0.005	A-T-004s
PCB BZ 118$_A^{M\#}$	-	-	-	-	-	0.084	-	mg/kg	0.007	A-T-004s
PCB BZ 123$_A$	-	-	-	-	-	<0.005	-	mg/kg	0.005	A-T-004s
PCB BZ 126$_A$	-	-	-	-	-	<0.005	-	mg/kg	0.005	A-T-004s
PCB BZ 156$_A$	-	-	-	-	-	0.009	-	mg/kg	0.005	A-T-004s
PCB BZ 157$_A$	-	-	-	-	-	<0.005	-	mg/kg	0.005	A-T-004s
PCB BZ 167$_A$	-	-	-	-	-	0.019	-	mg/kg	0.005	A-T-004s
PCB BZ 169$_A$	-	-	-	-	-	<0.005	-	mg/kg	0.005	A-T-004s
PCB BZ 189$_A$	-	-	-	-	-	<0.005	-	mg/kg	0.005	A-T-004s
PCB BZ 77$_A$	-	-	-	-	-	<0.005	-	mg/kg	0.005	A-T-004s
Total Speciated PCB-WHO12$_A$	-	-	-	-	-	0.148	-	mg/kg	0.005	A-T-004s

Envirolab Job Number: 19/07173 and 19/07261

Client Project Name: Langstone Technology Park, Havant

Client Project Ref: 10/1425

Lab Sample ID	19/07173/1	19/07173/2	19/07173/5	19/07173/8	19/07173/12	19/07173/15	19/07173/16	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	HTP1	HTP3	BH1	SA1	WS1	WS2	WS2			
Depth to Top	0.50	0.40	0.60	0.60	1.60	1.10	2.40			
Depth To Bottom										
Date Sampled	16-Jul-19	17-Jul-19	15-Jul-19	19-Jul-19	16-Jul-19	17-Jul-19	17-Jul-19			
Sample Type	Solid	Soil	Soil	Solid	Soil	Soil	Soil			
Sample Matrix Code	7	5AB	4A	7	5A	5AE	5AE			
TPH CWG										
Ali >C5-C6$_A^{\#}$	-	-	-	-	-	<0.01	<0.01	mg/kg	0.01	A-T-022s
Ali >C6-C8$_A^{\#}$	-	-	-	-	-	0.03	<0.01	mg/kg	0.01	A-T-022s
Ali >C8-C10$_A$	-	-	-	-	-	18	<1	mg/kg	1	A-T-055s
Ali >C10-C12$_A^{M\#}$	-	-	-	-	-	242	<1	mg/kg	1	A-T-055s
Ali >C12-C16$_A^{M\#}$	-	-	-	-	-	2210	<1	mg/kg	1	A-T-055s
Ali >C16-C21$_A^{M\#}$	-	-	-	-	-	2600	<1	mg/kg	1	A-T-055s
Ali >C21-C35$_A$	-	-	-	-	-	433	<1	mg/kg	1	A-T-055s
Total Aliphatics$_A$	-	-	-	-	-	5500	<1	mg/kg	1	A-T-055s
Aro >C5-C7$_A^{\#}$	-	-	-	-	-	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C7-C8$_A^{\#}$	-	-	-	-	-	<0.01	<0.01	mg/kg	0.01	A-T-022s
Aro >C8-C10$_A$	-	-	-	-	-	22	<1	mg/kg	1	A-T-055s
Aro >C10-C12$_A^{M\#}$	-	-	-	-	-	210	<1	mg/kg	1	A-T-055s
Aro >C12-C16$_A$	-	-	-	-	-	1830	<1	mg/kg	1	A-T-055s
Aro >C16-C21$_A^{M\#}$	-	-	-	-	-	1240	<1	mg/kg	1	A-T-055s
Aro >C21-C35$_A^{M\#}$	-	-	-	-	-	396	1	mg/kg	1	A-T-055s
Total Aromatics$_A$	-	-	-	-	-	3700	1	mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35)$_A$	-	-	-	-	-	9200	1	mg/kg	1	A-T-055s
BTEX - Benzene$_A^{\#}$	-	-	-	-	-	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - Toluene$_A^{\#}$	-	-	-	-	-	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene$_A^{\#}$	-	-	-	-	-	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - m & p Xylene$_A^{\#}$	-	-	-	-	-	<0.01	<0.01	mg/kg	0.01	A-T-022s
BTEX - o Xylene$_A^{\#}$	-	-	-	-	-	<0.01	<0.01	mg/kg	0.01	A-T-022s
MTBE$_A^{\#}$	-	-	-	-	-	<0.01	<0.01	mg/kg	0.01	A-T-022s

Lab Sample ID	19/07173/17	19/07173/19	19/07173/21	19/07173/22	19/07173/23	19/07173/27	19/07173/29	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS3	WS4	WS5	WS5	WS6	WS7	SA2			
Depth to Top	0.25	1.80	2.60	3.90	0.80	1.40	0.70			
Depth To Bottom										
Date Sampled	17-Jul-19	17-Jul-19	18-Jul-19	18-Jul-19	18-Jul-19	18-Jul-19	19-Jul-19			
Sample Type	Soil	Solid	Solid	Solid	Soil	Soil	Soil			
Sample Matrix Code	4A	7	7	7	4ABE	5AB	4ABE			
% Stones >10mm$_A$	40.8	<0.1	<0.1	<0.1	37.5	22.9	36.6	% w/w	0.1	A-T-044
pH$_D$$^{M\#}$	9.03	9.04	9.15	9.10	9.20	8.01	8.34	pH	0.01	A-T-031s
Sulphate (water sol 2:1)$_D$$^{M\#}$	<0.01	-	<0.01	<0.01	-	-	-	g/l	0.01	A-T-026s
Arsenic$_D$$^{M\#}$	<1	<1	<1	<1	<1	3	1	mg/kg	1	A-T-024s
Beryllium$_D$$^{\#}$	0.8	0.8	0.6	<0.5	<0.5	0.5	<0.5	mg/kg	0.5	A-T-024s
Boron (water soluble)$_D$$^{M\#}$	1.7	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	mg/kg	1	A-T-027s
Cadmium$_D$$^{M\#}$	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	mg/kg	0.5	A-T-024s
Copper$_D$$^{M\#}$	2	5	3	1	<1	12	7	mg/kg	1	A-T-024s
Chromium (hexavalent)$_D$	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-040s
Lead$_D$$^{M\#}$	7	11	5	2	2	5	1	mg/kg	1	A-T-024s
Mercury$_D$	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	<0.17	mg/kg	0.17	A-T-024s
Nickel$_D$$^{M\#}$	26	40	31	24	14	20	4	mg/kg	1	A-T-024s
Selenium$_D$$^{M\#}$	<1	<1	<1	<1	<1	<1	<1	mg/kg	1	A-T-024s
Vanadium$_D$$^{M\#}$	24	51	41	18	12	22	6	mg/kg	1	A-T-024s
Zinc$_D$$^{M\#}$	38	55	38	26	16	29	8	mg/kg	5	A-T-024s

Envirolab Job Number: 19/07173 and 19/07261

Client Project Name: Langstone Technology Park, Havant

Client Project Ref: 10/1425

Lab Sample ID	19/07173/17	19/07173/19	19/07173/21	19/07173/22	19/07173/23	19/07173/27	19/07173/29	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS3	WS4	WS5	WS5	WS6	WS7	SA2			
Depth to Top	0.25	1.80	2.60	3.90	0.80	1.40	0.70			
Depth To Bottom										
Date Sampled	17-Jul-19	17-Jul-19	18-Jul-19	18-Jul-19	18-Jul-19	18-Jul-19	19-Jul-19			
Sample Type	Soil	Solid	Solid	Solid	Soil	Soil	Soil			
Sample Matrix Code	4A	7	7	7	4ABE	5AB	4ABE			
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_D^{\#}$	-	-	-	-	NAD	NAD	NAD			A-T-045
Asbestos ACM - Suitable for Water Absorption Test?	-	-	-	-	N/A	N/A	N/A			

Envirolab Job Number: 19/07173 and 19/07261

Client Project Name: Langstone Technology Park, Havant

Client Project Ref: 10/1425

Lab Sample ID	19/07173/17	19/07173/19	19/07173/21	19/07173/22	19/07173/23	19/07173/27	19/07173/29	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS3	WS4	WS5	WS5	WS6	WS7	SA2			
Depth to Top	0.25	1.80	2.60	3.90	0.80	1.40	0.70			
Depth To Bottom										
Date Sampled	17-Jul-19	17-Jul-19	18-Jul-19	18-Jul-19	18-Jul-19	18-Jul-19	19-Jul-19			
Sample Type	Soil	Solid	Solid	Solid	Soil	Soil	Soil			
Sample Matrix Code	4A	7	7	7	4ABE	5AB	4ABE			
PAH-16MS										
Acenaphthene$_A^{M\#}$	<0.01	<0.01	0.03	<0.01	<0.01	0.02	0.11	mg/kg	0.01	A-T-019s
Acenaphthylene$_A^{M\#}$	<0.01	<0.01	<0.01	<0.01	0.02	0.02	0.09	mg/kg	0.01	A-T-019s
Anthracene$_A^{M\#}$	<0.02	<0.02	0.06	<0.02	0.05	0.06	0.49	mg/kg	0.02	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	0.04	<0.04	0.07	<0.04	0.29	0.42	2.74	mg/kg	0.04	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	0.06	<0.04	<0.04	<0.04	0.32	0.50	4.17	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	0.09	<0.05	0.06	<0.05	0.36	0.56	4.35	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	0.06	<0.05	<0.05	<0.05	0.28	0.43	3.30	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	<0.07	<0.07	<0.07	<0.07	0.12	0.20	1.61	mg/kg	0.07	A-T-019s
Chrysene$_A^{M\#}$	<0.06	<0.06	0.08	<0.06	0.31	0.46	2.89	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	<0.04	<0.04	<0.04	<0.04	0.07	0.11	0.68	mg/kg	0.04	A-T-019s
Fluoranthene$_A^{M\#}$	<0.08	<0.08	0.27	<0.08	0.52	0.74	5.78	mg/kg	0.08	A-T-019s
Fluorene$_A^{M\#}$	<0.01	<0.01	0.08	<0.01	0.01	0.02	0.08	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	0.08	<0.03	<0.03	<0.03	0.32	0.50	3.48	mg/kg	0.03	A-T-019s
Naphthalene $_A^{M\#}$	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	0.03	A-T-019s
Phenanthrene$_A^{M\#}$	<0.03	<0.03	0.18	<0.03	0.21	0.28	1.64	mg/kg	0.03	A-T-019s
Pyrene$_A^{M\#}$	<0.07	<0.07	0.25	<0.07	0.46	0.68	5.75	mg/kg	0.07	A-T-019s
Total PAH-16MS$_A^{M\#}$	0.33	<0.08	1.08	<0.08	3.34	5.00	37.2	mg/kg	0.01	A-T-019s

Lab Sample ID	19/07173/17	19/07173/19	19/07173/21	19/07173/22	19/07173/23	19/07173/27	19/07173/29	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	WS3	WS4	WS5	WS5	WS6	WS7	SA2			
Depth to Top	0.25	1.80	2.60	3.90	0.80	1.40	0.70			
Depth To Bottom										
Date Sampled	17-Jul-19	17-Jul-19	18-Jul-19	18-Jul-19	18-Jul-19	18-Jul-19	19-Jul-19			
Sample Type	Soil	Solid	Solid	Solid	Soil	Soil	Soil			
Sample Matrix Code	4A	7	7	7	4ABE	5AB	4ABE			
TPH CWG										
Ali >C5-C6$_A^{\#}$	-	-	<0.05	<0.01	-	-	-	mg/kg	0.01	A-T-022s
Ali >C6-C8$_A^{\#}$	-	-	<0.05	<0.01	-	-	-	mg/kg	0.01	A-T-022s
Ali >C8-C10$_A$	-	-	23	<1	-	-	-	mg/kg	1	A-T-055s
Ali >C10-C12$_A^{M\#}$	-	-	89	<1	-	-	-	mg/kg	1	A-T-055s
Ali >C12-C16$_A^{M\#}$	-	-	318	2	-	-	-	mg/kg	1	A-T-055s
Ali >C16-C21$_A^{M\#}$	-	-	279	2	-	-	-	mg/kg	1	A-T-055s
Ali >C21-C35$_A$	-	-	45	1	-	-	-	mg/kg	1	A-T-055s
Total Aliphatics$_A$	-	-	756	7	-	-	-	mg/kg	1	A-T-055s
Aro >C5-C7$_A^{\#}$	-	-	<0.05	<0.01	-	-	-	mg/kg	0.01	A-T-022s
Aro >C7-C8$_A^{\#}$	-	-	<0.05	<0.01	-	-	-	mg/kg	0.01	A-T-022s
Aro >C8-C10$_A$	-	-	19	<1	-	-	-	mg/kg	1	A-T-055s
Aro >C10-C12$_A^{M\#}$	-	-	65	<1	-	-	-	mg/kg	1	A-T-055s
Aro >C12-C16$_A$	-	-	218	2	-	-	-	mg/kg	1	A-T-055s
Aro >C16-C21$_A^{M\#}$	-	-	161	2	-	-	-	mg/kg	1	A-T-055s
Aro >C21-C35$_A^{M\#}$	-	-	31	2	-	-	-	mg/kg	1	A-T-055s
Total Aromatics$_A$	-	-	494	6	-	-	-	mg/kg	1	A-T-055s
TPH (Ali & Aro >C5-C35)$_A$	-	-	1250	13	-	-	-	mg/kg	1	A-T-055s
BTEX - Benzene$_A^{\#}$	-	-	<0.05	<0.01	-	-	-	mg/kg	0.01	A-T-022s
BTEX - Toluene$_A^{\#}$	-	-	<0.05	<0.01	-	-	-	mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene$_A^{\#}$	-	-	<0.05	<0.01	-	-	-	mg/kg	0.01	A-T-022s
BTEX - m & p Xylene$_A^{\#}$	-	-	<0.05	<0.01	-	-	-	mg/kg	0.01	A-T-022s
BTEX - o Xylene$_A^{\#}$	-	-	<0.05	<0.01	-	-	-	mg/kg	0.01	A-T-022s
MTBE$_A^{\#}$	-	-	<0.05	<0.01	-	-	-	mg/kg	0.01	A-T-022s

Envirolab Job Number: 19/07173 and 19/07261

Client Project Name: Langstone Technology Park, Havant

Client Project Ref: 10/1425

Lab Sample ID	19/07173/30	19/07173/31	19/07261/1	19/07261/2	19/07261/3	19/07261/4	19/07261/5	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH3	BH4	BH2	BH2	BH2	BH3	BH3			
Depth to Top	1.00	1.10	6.00	9.00	12.50	5.00	7.50			
Depth To Bottom			6.45	9.45	12.95	5.45	7.95			
Date Sampled	19-Jul-19	24-Jul-19	18-Jul-19	18-Jul-19	18-Jul-19	23-Jul-19	23-Jul-19			
Sample Type	Soil	Soil	Solid	Solid	Solid	Solid	Solid			
Sample Matrix Code	5A	4A	7	7	7	7	7			
% Stones >10mm$_A$	4.1	16.4	<0.1	<0.1	<0.1	<0.1	<0.1	% w/w	0.1	A-T-044
pH$_D$$^{M\#}$	8.01	7.01	9.03	-	9.00	-	8.98	pH	0.01	A-T-031s
Sulphate (water sol 2:1)$_D$$^{M\#}$	<0.01	<0.01	<0.01	-	<0.01	-	<0.01	g/l	0.01	A-T-026s
Total Organic Carbon$_D$$^{M\#}$	-	1.08	1.69	3.00	4.67	3.25	2.31	% w/w	0.03	A-T-032s
Arsenic$_D$$^{M\#}$	<1	<1	-	-	-	-	-	mg/kg	1	A-T-024s
Beryllium$_D$$^{\#}$	<0.5	<0.5	-	-	-	-	-	mg/kg	0.5	A-T-024s
Boron (water soluble)$_D$$^{M\#}$	<1.0	<1.0	-	-	-	-	-	mg/kg	1	A-T-027s
Cadmium$_D$$^{M\#}$	<0.5	<0.5	-	-	-	-	-	mg/kg	0.5	A-T-024s
Copper$_D$$^{M\#}$	4	3	-	-	-	-	-	mg/kg	1	A-T-024s
Chromium (hexavalent)$_D$	<1	<1	-	-	-	-	-	mg/kg	1	A-T-040s
Lead$_D$$^{M\#}$	3	8	-	-	-	-	-	mg/kg	1	A-T-024s
Mercury$_D$	<0.17	<0.17	-	-	-	-	-	mg/kg	0.17	A-T-024s
Nickel$_D$$^{M\#}$	8	8	-	-	-	-	-	mg/kg	1	A-T-024s
Selenium$_D$$^{M\#}$	<1	<1	-	-	-	-	-	mg/kg	1	A-T-024s
Vanadium$_D$$^{M\#}$	12	18	-	-	-	-	-	mg/kg	1	A-T-024s
Zinc$_D$$^{M\#}$	17	18	-	-	-	-	-	mg/kg	5	A-T-024s

Envirolab Job Number: 19/07173 and 19/07261

Client Project Name: Langstone Technology Park, Havant

Client Project Ref: 10/1425

Lab Sample ID	19/07173/30	19/07173/31	19/07261/1	19/07261/2	19/07261/3	19/07261/4	19/07261/5	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH3	BH4	BH2	BH2	BH2	BH3	BH3			
Depth to Top	1.00	1.10	6.00	9.00	12.50	5.00	7.50			
Depth To Bottom			6.45	9.45	12.95	5.45	7.95			
Date Sampled	19-Jul-19	24-Jul-19	18-Jul-19	18-Jul-19	18-Jul-19	23-Jul-19	23-Jul-19			
Sample Type	Soil	Soil	Solid	Solid	Solid	Solid	Solid			
Sample Matrix Code	5A	4A	7	7	7	7	7			
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_D^{\#}$	NAD	-	-	-	-	-	-			A-T-045
Asbestos ACM - Suitable for Water Absorption Test?	N/A	-	-	-	-	-	-			

Lab Sample ID	19/07173/30	19/07173/31	19/07261/1	19/07261/2	19/07261/3	19/07261/4	19/07261/5	Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH3	BH4	BH2	BH2	BH2	BH3	BH3			
Depth to Top	1.00	1.10	6.00	9.00	12.50	5.00	7.50			
Depth To Bottom			6.45	9.45	12.95	5.45	7.95			
Date Sampled	19-Jul-19	24-Jul-19	18-Jul-19	18-Jul-19	18-Jul-19	23-Jul-19	23-Jul-19			
Sample Type	Soil	Soil	Solid	Solid	Solid	Solid	Solid			
Sample Matrix Code	5A	4A	7	7	7	7	7			
PAH-16MS										
Acenaphthene$_A^{M\#}$	<0.01	0.02	-	-	-	-	-	mg/kg	0.01	A-T-019s
Acenaphthylene$_A^{M\#}$	<0.01	0.03	-	-	-	-	-	mg/kg	0.01	A-T-019s
Anthracene$_A^{M\#}$	<0.02	0.06	-	-	-	-	-	mg/kg	0.02	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	<0.04	0.46	-	-	-	-	-	mg/kg	0.04	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	<0.04	0.57	-	-	-	-	-	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	<0.05	0.74	-	-	-	-	-	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	<0.05	0.58	-	-	-	-	-	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	<0.07	0.26	-	-	-	-	-	mg/kg	0.07	A-T-019s
Chrysene$_A^{M\#}$	<0.06	0.58	-	-	-	-	-	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene$_A^{M\#}$	<0.04	0.14	-	-	-	-	-	mg/kg	0.04	A-T-019s
Fluoranthene$_A^{M\#}$	<0.08	0.66	-	-	-	-	-	mg/kg	0.08	A-T-019s
Fluorene$_A^{M\#}$	<0.01	0.02	-	-	-	-	-	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	<0.03	0.63	-	-	-	-	-	mg/kg	0.03	A-T-019s
Naphthalene $_A^{M\#}$	<0.03	<0.03	-	-	-	-	-	mg/kg	0.03	A-T-019s
Phenanthrene$_A^{M\#}$	0.03	0.20	-	-	-	-	-	mg/kg	0.03	A-T-019s
Pyrene$_A^{M\#}$	<0.07	0.65	-	-	-	-	-	mg/kg	0.07	A-T-019s
Total PAH-16MS$_A^{M\#}$	<0.08	5.60	-	-	-	-	-	mg/kg	0.01	A-T-019s

Envirolab Job Number: 19/07173 and 19/07261

Client Project Name: Langstone Technology Park, Havant

Client Project Ref: 10/1425

Lab Sample ID	19/07261/6							Units	Limit of Detection	Method ref
Client Sample No										
Client Sample ID	BH3									
Depth to Top	10.50									
Depth To Bottom	10.95									
Date Sampled	23-Jul-19									
Sample Type	Solid									
Sample Matrix Code	7									
% Stones >10mm$_A$	<0.1							% w/w	0.1	A-T-044
pH$_D$$^{M\#}$	9.09							pH	0.01	A-T-031s
Sulphate (water sol 2:1)$_D$$^{M\#}$	<0.01							g/l	0.01	A-T-026s
Total Organic Carbon$_D$$^{M\#}$	4.63							% w/w	0.03	A-T-032s

REPORT NOTES

General
This report shall not be reproduced, except in full, without written approval from Envirolab.
The results reported herein relate only to the material supplied to the laboratory.
The residue of any samples contained within this report, and any received with the same delivery, will be disposed of six weeks after initial scheduling. For samples tested for Asbestos we will retain a portion of the dried sample for a minimum of six months after the initial Asbestos testing is completed.
Analytical results reflect the quality of the sample at the time of analysis only.
Opinions and interpretations expressed are outside the scope of our accreditation.
If results are in italic font they are associated with an AQC failure, these are not accredited and are unreliable.
A deviating samples report is appended and will indicate if samples or tests have been found to be deviating. Any test results affected may not be an accurate record of the concentration at the time of sampling and, as a result, may be invalid.
The Client Sample No, Client Sample ID, Depth to Top, Depth to Bottom and Date Sampled were all provided by the client.

Soil chemical analysis:
All results are reported as dry weight (<40°C).
For samples with Matrix Codes 1 - 6 natural stones, brick and concrete fragments >10mm and any extraneous material (visible glass, metal or twigs) are removed and excluded from the sample prior to analysis and reported results corrected to a whole sample basis. This is reported as '% stones >10mm'.
For samples with Matrix Code 7 the whole sample is dried and crushed prior to analysis and this supersedes any “A” subscripts
All analysis is performed on the sample as received for soil samples which are positive for asbestos or the client has informed asbestos may be present and/or if they are from outside the European Union and this supersedes any "D" subscripts.

TPH analysis of water by method A-T-007:
Free and visible oils are excluded from the sample used for analysis so that the reported result represents the dissolved phase only.

Electrical Conductivity of water by Method A-T-037:
Results greater than 12900µS/cm @ 25°C / 11550µS/cm @ 20°C fall outside the calibration range and as such are unaccredited.

Asbestos:
Asbestos in soil analysis is performed on a dried aliquot of the submitted sample and cannot guarantee to identify asbestos if only present in small numbers as discrete fibres/fragments in the original sample.
Stones etc. are not removed from the sample prior to analysis.
Quantification of asbestos is a 3 stage process including visual identification, hand picking and weighing and fibre counting by sedimentation/phase contrast optical microscopy if required. If asbestos is identified as being present but is not in a form that is suitable for analysis by hand picking and weighing (normally if the asbestos is present as free fibres) quantification by sedimentation is performed. Where ACMs are found a percentage asbestos is assigned to each with reference to 'HSG264, Asbestos: The survey guide' and the calculated asbestos content is expressed as a percentage of the dried soil sample aliquot used.

Predominant Matrix Codes:
1 = SAND, 2 = LOAM, 3 = CLAY, 4 = LOAM/SAND, 5 = SAND/CLAY, 6 = CLAY/LOAM, 7 = OTHER, 8 = Asbestos bulk ID sample.
Samples with Matrix Code 7 & 8 are not predominantly a SAND/LOAM/CLAY mix and are not covered by our BSEN 17025 or MCERTS accreditations, with the exception of bulk asbestos which are BSEN 17025 accredited.
Secondary Matrix Codes:
A = contains stones, B = contains construction rubble, C = contains visible hydrocarbons, D = contains glass/metal, E = contains roots/twigs.

Key:
IS indicates Insufficient Sample for analysis.
US indicates Unsuitable Sample for analysis.
NDP indicates No Determination Possible.
NAD indicates No Asbestos Detected.
N/A indicates Not Applicable.
Superscript # indicates method accredited to ISO 17025.
Superscript "M" indicates method accredited to MCERTS.
Subscript "A" indicates analysis performed on the sample as received.
Subscript "D" indicates analysis performed on the dried sample, crushed to pass a 2mm sieve

Please contact us if you need any further information.

Envirolab Deviating Samples Report

Units 7&8 Sandpits Business Park, Mottram Road, Hyde, SK14 3AR
Tel. 0161 368 4921 email. ask@envlab.co.uk

Client: Clancy Consulting, Dunham Court, 2 Dunham Road, Altrincham, Cheshire, UK, WA14 4NX

Project: Langstone Technology Park, Havant

Clients Project No: 10/1425

Project No: 19/07173

Date Received: 30/07/2019 (am)

Cool Box Temperatures (°C): 16.7, 17.3, 20.0

Lab Sample ID	19/07173/1	19/07173/12	19/07173/21
Client Sample No			
Client Sample ID/Depth	HTP1 0.50m	WS1 1.60m	WS5 2.60m
Date Sampled	16/07/19	16/07/19	18/07/19
Deviation Code			
F	✓	✓	✓

Key
F *Maximum holding time exceeded between sampling date and analysis for analytes listed below*

HOLDING TIME EXCEEDANCES

Lab Sample ID	19/07173/1	19/07173/12	19/07173/21
Client Sample No			
Client Sample ID/Depth	HTP1 0.50m	WS1 1.60m	WS5 2.60m
Date Sampled	16/07/19	16/07/19	18/07/19
PAH-16MS	✓	✓	
VPHCWG			✓

If, at any point before reaching the laboratory, the temperature of the samples has breached those set in published standards, e.g. BS-EN 5667-3, ISO 18400-102:2017, then the concentration of any affected analytes may differ from that at the time of sampling.

Appendix IV

LABORATORY REPORT

4043

Contract Number: PSL19/4664

Report Date: 14 August 2019

Client's Reference: 10/1425

Client Name: Clancy Consulting
Dunham Court
2 Dunham Road
Altrincham
Cheshire
WA144NX

For the attention of: Sophie Harper-Pryce

Contract Title: Langstone Technology Park, Havant

Date Received: 1/8/2019
Date Commenced: 1/8/2019
Date Completed: 14/8/2019

Notes: Opinions and Interpretations are outside the UKAS Accreditation

A copy of the Laboratory Schedule of accredited tests as issued by UKAS is attached to this report. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced other than in full, without the prior written approval of the laboratory.

Checked and Approved Signatories:

R Gunson (Director)
A Watkins (Director)
R Berriman (Quality Manager)

S Royle (Laboratory Manager)
S Eyre (Senior Technician)
L Knight (Senior Technician)

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SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
WS1		D	4.80		White CHALK.
WS2		B	0.60	0.80	Brown very sandy very clayey GRAVEL of flint and chalk.
HTP3		B	0.15	0.20	MADE GROUND brown sandy slightly silty gravel.
SA1		B	0.70		Brown slightly sandy very clayey GRAVEL of flint and chalk.
SA2		B	0.60		MADE GROUND brown sandy very clayey gravel.
BH4		D	6.50		White CHALK.
BH4		D	9.10		White CHALK.
BH4		D	11.50		White CHALK.
BH4		D	18.90		White CHALK.
BH1		U	6.00	6.45	Soft white structureless CHALK.
BH1		U	10.50	10.95	White stuctureless CHALK.
BH2		U	5.00	5.45	White stuctureless CHALK.
BH2		U	7.50	7.95	White stuctureless CHALK.
BH2		U	17.00	17.45	Brown mottled grey very gravelly sandy CLAY.
BH3		U	9.00	9.45	White stuctureless CHALK.
BH2		D	5.60		White CHALK.
BH2		D	8.00		White CHALK.
BH3		D	19.00		White CHALK.
BH3		D	21.00	21.45	White CHALK.

SUMMARY OF LABORATORY SOIL DESCRIPTIONS

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Description of Sample
WS1		D	2.50		Brown very gravelly CLAY.
WS3		D	1.50		Brown sandy clayey silty GRAVEL.
BH4		D	2.10		Brown very gravelly sandy CLAY.
SA1		D	1.30		Brown CLAY.
WS4		D	2.90		Greyish brown slightly gravelly very silty CLAY.

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SUMMARY OF SOIL CLASSIFICATION TESTS

(BS1377 : PART 2 : 1990)

Hole Number	Sample Number	Sample Type	Top Depth m	Base Depth m	Moisture Content % Clause 3.2	Linear Shrinkage % Clause 6.5	Particle Density Mg/m^3 Clause 8.2	Liquid Limit % Clause 4.3/4	Plastic Limit % Clause 5.3	Plasticity Index % Clause 5.4	Passing .425mm %	Remarks
WS1		D	2.50		13			25	16	9	30	Low plasticity CL.
BH4		D	2.10		14			25	15	10	35	Low plasticity CL.
SA1		D	1.30		42			88	33	55	100	Very high plasticity CV.
WS4		D	2.90		21			31	18	13	90	Low plasticity CL.

SYMBOLS : **NP : Non Plastic** *** : Liquid Limit and Plastic Limit Wet Sieved.**

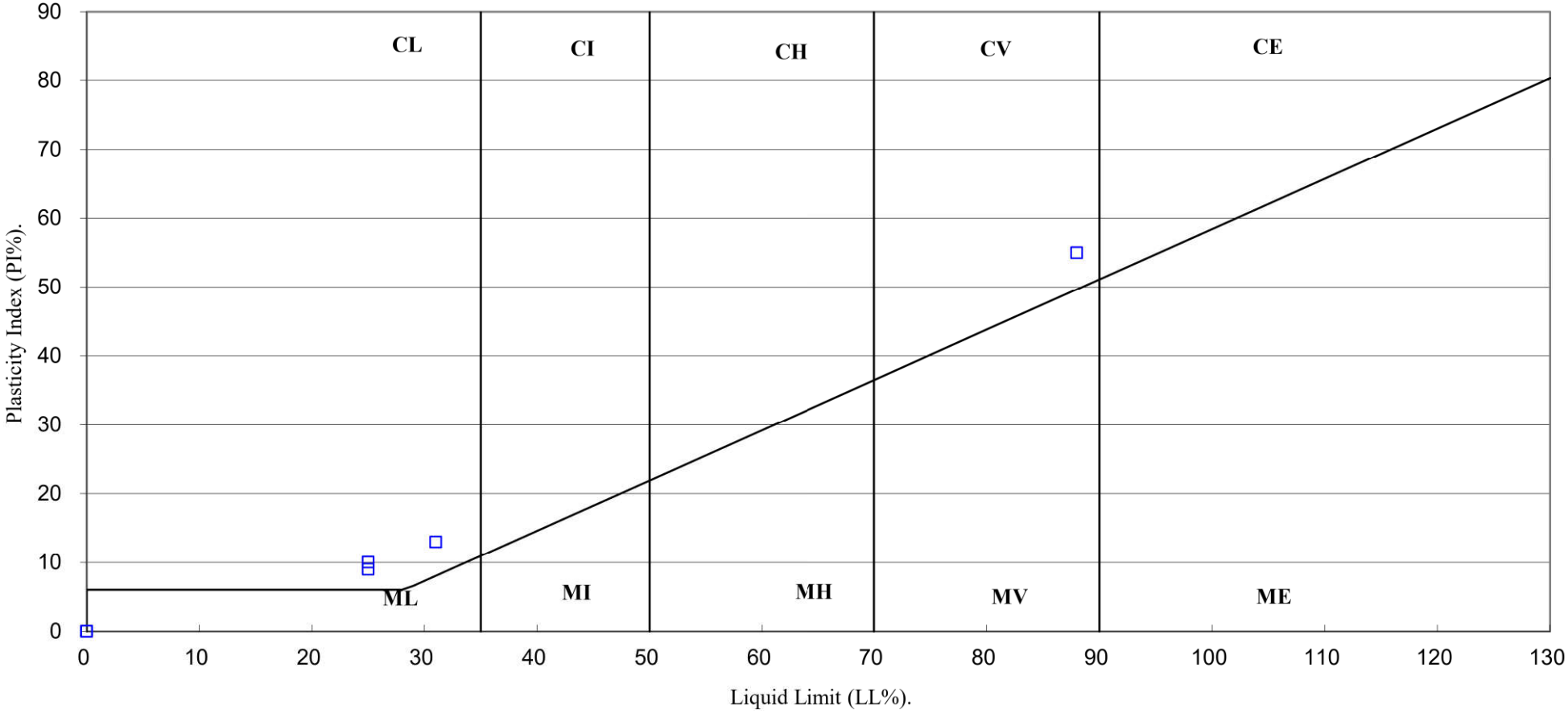
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PLASTICITY CHART FOR CASAGRANDE CLASSIFICATION.



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