Norfolk Partnership Laboratory
Part of the Norse Group

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Site Investigation including Quantitative Risk Assessment
Pine House
Stowlangtoft
Suffolk
104909
December 2023

Client:
HLD Developments Ltd
Old Hall Green Farm Barn
Old Hall Lane
Cockfield
Bury St Edmunds
Suffolk
IP30 0LQ

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1.0 Introduction

1.1 General

This site investigation was carried out at the former Pine House Company in Stowlangtoft, Bury St Edmunds, Suffolk. (OSGR 595171/267819). The Pine House Company occupied the site from 2001 until recent closure. Previous historical land use includes a petrol station and garage/workshop. Mr L Tombs instructed Norfolk Partnership Laboratory (NPL) on an email dated 15/11/2023 to carry out the work after acceptance of Norfolk Partnership Laboratory's quotation. NPL provides a service within Norse Eastern Ltd.

This report should be read in conjunction with the following report:

1) Desk Study and Risk Assessment Pine House, Stowlangtoft, Bury St Edmunds, Suffolk report reference 104488 dated July 2023 by Norfolk Partnership Laboratory.

This investigation and risk assessment has been carried out to the requirements of The Environmental Protection Act Part IIA. This report also considers the health and safety of construction workers and subsequent residents that may be affected due to any soil contamination.

It is proposed to demolish the former garage building and redevelop the site with two detached residential properties with garages including alterations for vehicular access.

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

Although every effort has been made to give a true assessment of the condition of the site, it is possible that different ground conditions may exist in parts of the site that is neither recorded nor visible.

1.2 Report objectives

The objectives of these works are to assess contamination sources, pathways, and receptors, and to determine whether any contamination may be present either within the site boundaries or just outside the site. The report also assesses the extent to which human health, buildings and services and controlled waters may be affected. If contamination is thought likely to be present, recommendations will be made to ascertain the level of contamination and if these levels are within allowable limits.

1.3 Site location

The site is located in Stowlangtoft, Suffolk (OSGR 595171/267819), which is approximately 10.30 kilometres to the northeast of Bury St Edmunds town centre.

Site location plans are included in Appendix A

1.4 Site layout

The development area is roughly rectangular in shape, relatively level, and approximately 0.15 hectare in area. A spot height of 44.8 metres is shown on the OS maps close to the north eastern corner of the study area.

1.5 Planning application

The site is subject to the planning conditions of Babergh & Mid Suffolk District Council ref : DC/23/04344.

2.0 Review and Summary of Previous Report

2.1 Desk Study and Risk Assessment Pine House, Stowlangtoft, Bury St Edmunds, Suffolk, ref 104488 dated July 2023 by Norfolk Partnership Laboratory

A walkover survey was undertaken by Mr S Berwick of NPL on 28 June 2023.

The site is accessed on to a concrete and asphalt covered forecourt from the A1088 Ixworth Road, which is adjacent to the eastern boundary.

The building is located roughly central to the site and is a steel portal frame with brickwork exterior walls and blockwork internal walls and intact concrete floor. The front of the building has floor to ceiling windows either side of a central sliding double door. Vehicular access can also be gained to the rear of the building via a roller shutter door located roughly centrally. The roof is clad with cement board sheets. Inside is predominantly open plan with a bathroom on the southern side and office and storage rooms on the northern side with a timber staircase to a mezzanine storage area. Two filled vehicle inspection pits are also present inside the building.

Three underground fuel storage tank breather pipes are located externally on the south eastern side of the building with two breather pipes internally on the brick piers either side of the sliding double doors which exit through the roof. The location of the pipes suggests potential UST's on the forecourt area where manhole covers were present and to the south of the building. Anecdotal evidence gathered regarding the former tanks appears to confirm our findings, indicating that there were two original 500-gallon tanks located at the front of the site and a larger three compartment tank installed at a later date to the side of the building. The information obtained inferred that these tanks were still insitu and were filled with leanmix or concrete. This however could not be confirmed.
A blockwork bund is to the rear on the north side, presumably once housing a heating oil tank. An above ground heating oil tank is located in the south west corner.

A small area of intact surfacing is present to the rear adjacent to the roller shutter door with the majority of the surfacing comprising unbound materials covered with grass and weeds.

A pole mounted transformer is located to the rear on the northern site boundary with overhead electricity cables crossing the site in a north south direction.

The northern boundary comprises timber fencing to the front (east side) and a hedge to the west side with residential property adjacent to the north. A conifer hedge forms the boundary on the southern side with residential property adjacent. A hedge is also present along the western boundary with agricultural land beyond.

No obvious signs of contamination were noted during the walkover from the most recent site usage as a retail business, although previous historical use as a garage with fuel delivery is apparent.

2.1.1 Potential sources of contamination

From the walkover survey and studying the historical maps a number of potential sources of contamination were identified.

Onsite Sources

i) Potential underground fuel storage tanks
ii) Spillages of various oils/lubricants associated with previous use as a garage
iii) Two filled inspection pits
iv) On site Made Ground deposits
v) Above ground heating oil tank located in the south west corner
vi) Potential tank located in the bund on the north west side of the building
vii) Cement board roofing to garage

Offsite Sources

i) Historical landfill site approximately 210 metres to the southeast of the site.

2.1.2 Conclusions

Risk discussions for on site sources

Potential underground fuel storage tanks

It is likely underground fuel storage tanks are present on the site beneath the forecourt to the east of the building and possibly to the south. The condition of the tanks is unknown. Anecdotal information suggests that the tanks are insitu and possibly filled with leanmix or concrete however this cannot be confirmed. It is possible residual fuel may have leaked into the surrounding soils. Given the elapsed time since the garage was operational this potential risk has been considered High to Medium – possible but unusual to some of the site receptors via a subsurface soils and airborne linkage.

A GPR survey revealed disturbed ground but not a typical signature reading for cylindrical fuel tanks on both the forecourt and area to the south. This may have been due to interference from reinforced concrete or the subsoils.

Spillages of various oils/lubricants associated with previous use as a garage

It is possible historical spillages have occurred on the site associated with the previous site usage for example storage of waste oils and lubricants or leaks and spills from vehicles. Given the elapsed time since the garage was operational a Medium Risk (considered possible but unusual) can be applied to this potential source predominantly via a surface and subsurface soil linkage.

Two filled internal inspection pits

Two former inspection pits are visible inside the building. The materials used to fill the pits are unknown therefore pose a risk to the site which is thought in this instance to

be a Medium Risk (considered possible but unusual) to the surface and subsurface soils.

On site Made Ground deposits

It is likely there are Made Ground deposits on the site below the building and garage forecourt and to the rear of the workshop in the form of construction materials and unbound surfacing. Until characterised these materials pose a risk to some of the site receptors. A Medium Risk – (considered possible but unusual) can be applied.

Above ground heating oil tank in the south west corner of the site

An above ground heating oil tank is in the south-western corner sited on blockwork piers. The tank was in fair condition with no obvious signs of leaks, although there is a potential for spills to have occurred when refilling affecting the surface soils. The risk in this instance can be assessed as Medium Risk - Considered possible but unusual.

Potential tank located in the bund on the north west side of the building

A blockwork bund with intact concrete slab was located to the rear of the building. Possibly the former location of a heating oil tank or used to store waste oils and lubricants. No staining was observed within the bund. He likelihood of contamination the soils around the bund has been considered Low Risk – conceivable but unlikely.

Cement board sheeting

Cement board sheeting is present as the roofing material. This is likely to contain Asbestos, therefore a potential Very High Risk (considered that it is to be expected to happen) has been assigned to two of the potential receptors via an airborne linkage. Broken and damaged sheets represent a risk due to the release of fibres. In this instance no broken sheets were seen on the site.

It is recommended that all potential asbestos containing material (ACM) should be removed by a suitably licensed contractor and disposed of to a suitably licensed facility. Consignment notes for any removed asbestos and documentation stating that all Asbestos has been disposed of from the site should be submitted to Mid Suffolk Council.

After the removal of all ACM from the site, following the conditions above, the remaining potential risk is very low.

Risk discussions for offsite sources

Historical landfill site approximately 210 metres to the southeast of the site

The Envirocheck Report has highlighted a landfill site which is located approximately 210 metres south of the site. The licence holder was H G Thurston and Company Ltd, the landfill was operational from 08/11/88 to 31/12/89. Deposited waste included inert

waste. Due to the distance from the site and the duration of time the site has been inactive, the risk from ground gas migration is considered Very Low – Very unlikely or impossible.

2.1.3 Recommendations

Based upon the report objectives and the information contained herein it is recommended that an intrusive site investigation for contamination purposes is undertaken at the site.

2.2 Further works undertaken within the site.

No further works have been undertaken within the site.

2.3 Intended future use of the site.

It is proposed to demolish the former garage building and redevelop the site with two detached residential properties with garages including alterations to vehicular access.

2.4 Planning applications or permissions at the site

The site is subject to the planning conditions of Babergh & Mid Suffolk District Council ref : DC/23/04344.

2.5 Geology

The geology of the region may be summarised as follows: -

Recent	: Head deposits
Pleistocene	: Lowestoft Formation : Croxton Sand and Gravel Member
Cretaceous	: Upper Chalk

Upper Chalk is a soft white or off white limestone that contains flints. Chalk was deposited in a warm sea close to a low lying landmass that remained free from the deposition of detritus for a long period of time. The chalk dips at a very shallow angle to the east. The surface of the chalk is thought to be 30 metres above ordnance survey datum in the area of the site.

The **Croxton Sand and Gravel Member** consists of stratified superficial deposits of gravel and sand. The deposit occurs onshore and was formed during the Anglian Stage within the Quaternary Period. This description is currently pending an upgrade on the British Geological Survey website.

The **Lowestoft Formation** forms an extensive sheet of chalky till, together with outwash sands and gravels, silts, and clays. The till is characterised by its chalk and flint content. The deposit overlies a large range of Mesozoic, Palaeogene, Neogene and early Pleistocene bedrock formations, and in eastern East Anglia also overlies the older glacigenic Happisburgh Formation. The tills within the Lowestoft Formation typically contain a significantly higher percentage of chalk than the underlying tills. Thickness of the deposit is extremely variable, thickest in buried valleys where locally up to 60 metres may be present. Thick accumulations are also more generally present beneath much of northern Essex and south Suffolk.

Head comprises poorly sorted and poorly stratified deposits formed by the mass movement of superficial materials on sloping ground. The mass movement processes include hillwash and soil creep as well as solifluction, an important mode of sediment transport in periglacial conditions. Head occurs as a veneer up to a metre or so thick lining the floors and/or lower flanks of the tributary valleys of the district. Head ranges from yellow brown to dark brown to grey-black and comprises mainly sand with varying proportions of clay, silt, gravel of pebble grade (mostly flint) and sporadic larger rock clasts.

2.6 Hydrogeology and Hydrology

According to the Regional Hydrogeology Map of Southern East Anglia, the Chalk is the principal aquifer for the area. The estimated minimum hydrostatic level of the Chalk water table in the vicinity of the site is between 30 and 40 metres above Ordnance Survey Datum.

The site is 45 metres above Ordnance Survey Datum therefore the groundwater is between 5 and 15 metres below the site.

The site falls within the Environment Agency Outer Zone 2 for groundwater source protection.

The site is not within the Environment Agency Flood Zones. Flood Zones 2 and 3 are located 320 metres to the west.

According to the BGS Flood map the site is within an area with limited potential for groundwater flooding to occur.

The bedrock Chalk is designated a principal aquifer.

An historical borehole log is available to view on the BGS website id 556305 ref TL96NE13. The borehole was located approximately 95 metres to the south of the site and drilled to a depth of 182 feet (55.47 metres) in 1937 by John J. Gosling & Co Ltd. The investigation was for the row of semi-detached council properties to the south of the study area.

The Upper Chalk was encountered at 4.50 metres below ground level. The borehole was drilled at a location 42 metres above datum. The rest water level recorded was 36.80 metres above datum therefore the hydrostatic level of the groundwater was 5.20 metres below the site.

3.0 Risk Assessment

3.1 Conceptual Model

The known or perceived sources of contamination and pollution linkages are assessed in this section. The conceptual model is realised here in tabulated form.

3.2 Sources of contamination

Historical land use indicates that the site has had a potentially contaminative past use. Development occurred in the 1950's with the site annotated as a "Garage" on the 1973 OS Map. The Pine House Company occupied the site from 2001 to 2021. A number of potential pollutants are identified in the Department of the Environment Industry profiles. The profile for road vehicle fuelling service and repair, garages and filling stations was considered relevant to the site. After visual examination of the site and reviewing information from the desk study the following have been identified as potential pollution sources.

a) Potential underground fuel storage tanks

b) Spillages of various oils/lubricants associated with previous use as a garage

c) Two filled inspection pits

d) On site Made Ground deposits

e) Above ground heating oil tank located in the south west corner

f) Potential tank located in the bund on the north west side of the building

g) Cement board roofing to garage

h) Historical landfill site approximately 210 metres to the southeast of the site

3.3 Pollution Linkages

Each of the potential contaminants may have a number of pollution linkages. Each of these linkage types has a number of potential pathways.

i) Surface soil linkages
   a) Direct contact ingestion or absorption
   b) Indirect contact ingestion or absorption
   c) Leaching to groundwater

ii) Subsurface soil linkages
   a) Direct contact ingestion or absorption
   b) Indirect contact ingestion or absorption
   c) Leaching to groundwater

iii) Surface water linkages
   a) Direct contact ingestion or absorption
   b) Indirect contact ingestion or absorption
   c) Percolation to groundwater

iv) Groundwater linkages
   a) Direct contact ingestion or absorption
   b) Indirect contact ingestion or absorption

v) Airborne linkages
   a) Vapour intrusion into confined / indoor spaces
   b) Inhalation or absorption of particulates
   c) Inhalation or absorption of volatile compounds

3.4 Receptors

A number of potential receptors exist. These can be broadly grouped as:

i) Construction Worker
ii) Future Resident
iii) Trespasser
iv) Local population
v) Flora and fauna
vi) Buildings
vii) Surface Water
viii) Groundwater

For each source, the linkage type, pathway and potential receptors can be identified. A level of risk if no action is taken can then be assigned to each of these linkages. The level of risk has been divided into six categories as follows.

Very Low Risk – Considered very unlikely or impossible.
Low Risk – Considered conceivable but unlikely.
Medium Risk – Considered possible but unusual.
High Risk – Considered probable i.e. about 50% chance
Very High Risk – Considered that it is to be expected to happen.
Certainty – Considered that it will happen.

Note: These risks are related to the probability of an event happening. They do not relate to the severity of the effects on human health or flora and fauna nor the financial consequences if the event should happen.

3.4.1 Potential underground fuel storage tanks

Linkage type	Pathway	Receptor	Risk
Surface soil linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
	Direct contact	Surface water	Low
	Indirect contact ingestion or absorption	Resident	Low
Subsurface soil linkage	Direct contact ingestion or absorption	Construction Worker	High
		Resident	Medium
		Flora and fauna	Medium
	Direct contact	Buildings and services	Medium
	Indirect contact ingestion or absorption	Resident	Medium
	Leaching to groundwater	Local population	Low
		Flora and fauna	Low
		Construction Worker	Low
		Groundwater	Low
Surface water linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
		Surface water	Low
	Percolation to groundwater	Local population	Low
		Flora and fauna	Low
		Groundwater	Low
Groundwater linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Local population	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
		Groundwater	Low
	Indirect contact ingestion or absorption	Local population	Low
		Flora and fauna	Low
Airborne linkage	Inhalation of particulates	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
		Local population	Low
	Inhalation of volatile compounds	Construction Worker	Medium
		Resident	Low
		Trespasser	Medium
		Flora and fauna	Low
		Local population	Low
	Vapour intrusion into indoor spaces	Resident	Medium
		Local population	Low

3.4.2 Spillages of various oils/lubricants associated with previous use as a garage

Linkage type	Pathway	Receptor	Risk
Surface soil linkage	Direct contact ingestion or absorption	Construction Worker	Medium
		Resident	Low
		Trespasser	Medium
		Flora and fauna	Medium
	Direct contact	Surface water	Low
	Indirect contact ingestion or absorption	Resident	Low
Subsurface soil linkage	Direct contact ingestion or absorption	Construction Worker	Medium
		Resident	Medium
		Flora and fauna	Medium
	Direct contact	Buildings and services	Medium
	Indirect contact ingestion or absorption	Resident	Low
	Leaching to groundwater	Local population	Low
		Flora and fauna	Low
		Construction Worker	Low
		Groundwater	Low
Surface water linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
		Surface water	Low
	Percolation to groundwater	Local population	Low
		Flora and fauna	Low
		Groundwater	Low
Groundwater linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Local population	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
		Groundwater	Low
	Indirect contact ingestion or absorption	Local population	Low
		Flora and fauna	Low
Airborne linkage	Inhalation of particulates	Construction Worker	Medium
		Resident	Medium
		Trespasser	Medium
		Flora and fauna	Low
		Local population	Low
	Inhalation of volatile compounds	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
		Local population	Low
	Vapour intrusion into indoor spaces	Resident	Low
		Local population	Low

3.4.3 Two filled inspection pits

Linkage type	Pathway	Receptor	Risk
Surface soil linkage	Direct contact ingestion or absorption	Construction Worker	Medium
		Resident	Medium
		Trespasser	Medium
		Flora and fauna	Low
	Direct contact	Surface water	Low
	Indirect contact ingestion or absorption	Resident	Low
Subsurface soil linkage	Direct contact ingestion or absorption	Construction Worker	Medium
		Resident	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Medium
	Indirect contact ingestion or absorption	Resident	Low
	Leaching to groundwater	Local population	Low
		Flora and fauna	Low
		Construction Worker	Low
		Groundwater	Low
Surface water linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
		Surface water	Low
	Percolation to groundwater	Local population	Low
		Flora and fauna	Low
		Groundwater	Low
Groundwater linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Local population	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
		Groundwater	Low
	Indirect contact ingestion or absorption	Local population	Low
		Flora and fauna	Low
Airborne linkage	Inhalation of particulates	Construction Worker	Medium
		Resident	Low
		Trespasser	Medium
		Flora and fauna	Low
		Local population	Low
	Inhalation of volatile compounds	Construction Worker	Medium
		Resident	Low
		Trespasser	Medium
		Flora and fauna	Low
		Local population	Low
	Vapour intrusion into indoor spaces	Resident	Low
		Local population	Low

3.4.4 On site Made Ground deposits

Linkage type	Pathway	Receptor	Risk
Surface soil linkage	Direct contact ingestion or absorption	Construction Worker	Medium
		Resident	Medium
		Trespasser	Medium
		Flora and fauna	Medium
	Direct contact	Surface water	Low
	Indirect contact ingestion or absorption	Resident	Low
Subsurface soil linkage	Direct contact ingestion or absorption	Construction Worker	Medium
		Resident	Medium
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
	Indirect contact ingestion or absorption	Resident	Low
	Leaching to groundwater	Local population	Low
		Flora and fauna	Low
		Construction Worker	Low
		Groundwater	Low
Surface water linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
		Surface water	Low
	Percolation to groundwater	Local population	Low
		Flora and fauna	Low
		Groundwater	Low
Groundwater linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Local population	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
		Groundwater	Low
	Indirect contact ingestion or absorption	Local population	Low
		Flora and fauna	Low
Airborne linkage	Inhalation of particulates	Construction Worker	Medium
		Resident	Medium
		Trespasser	Medium
		Flora and fauna	Low
		Local population	Low
	Inhalation of volatile compounds	Construction Worker	Medium
		Resident	Medium
		Trespasser	Medium
		Flora and fauna	Low
		Local population	Low
	Vapour intrusion into indoor spaces	Resident	Medium
		Local population	Low

3.4.5 Above ground heating oil tank in the south west corner of the site.

Linkage type	Pathway	Receptor	Risk
Surface soil linkage	Direct contact ingestion or absorption	Construction Worker	Medium
		Resident	Medium
		Trespasser	Medium
		Flora and fauna	Medium
	Direct contact	Surface water	Medium
	Indirect contact ingestion or absorption	Resident	Low
Subsurface soil linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Resident	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
	Indirect contact ingestion or absorption	Resident	Low
	Leaching to groundwater	Local population	Low
		Flora and fauna	Low
		Construction Worker	Low
		Groundwater	Low
Surface water linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
		Surface water	Low
	Percolation to groundwater	Local population	Low
		Flora and fauna	Low
		Groundwater	Low
Groundwater linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Local population	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
		Groundwater	Low
	Indirect contact ingestion or absorption	Local population	Low
		Flora and fauna	Low
Airborne linkage	Inhalation of particulates	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
		Local population	Low
	Inhalation of volatile compounds	Construction Worker	Medium
		Resident	Medium
		Trespasser	Medium
		Flora and fauna	Low
		Local population	Low
	Vapour intrusion into indoor spaces	Resident	Low
		Local population	Low

3.4.6 Potential tank located in bund on the north west side of the building

Linkage type	Pathway	Receptor	Risk
Surface soil linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
	Direct contact	Surface water	Low
	Indirect contact ingestion or absorption	Resident	Low
Subsurface soil linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Resident	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
	Indirect contact ingestion or absorption	Resident	Low
	Leaching to groundwater	Local population	Low
		Flora and fauna	Low
		Construction Worker	Low
		Groundwater	Low
Surface water linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
		Surface water	Low
	Percolation to groundwater	Local population	Low
		Flora and fauna	Low
		Groundwater	Low
Groundwater linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Local population	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
		Groundwater	Low
	Indirect contact ingestion or absorption	Local population	Low
		Flora and fauna	Low
Airborne linkage	Inhalation of particulates	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
		Local population	Low
	Inhalation of volatile compounds	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
		Local population	Low
	Vapour intrusion into indoor spaces	Resident	Low
		Local population	Low

3.4.7 Cement board sheeting to roof

Linkage type	Pathway	Receptor	Risk
Surface soil linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
	Direct contact	Surface water	Low
	Indirect contact ingestion or absorption	Resident	Low
Subsurface soil linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Resident	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
	Indirect contact ingestion or absorption	Resident	Low
	Leaching to groundwater	Local population	Low
		Flora and fauna	Low
		Construction Worker	Low
		Groundwater	Low
Surface water linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
		Surface water	Low
	Percolation to groundwater	Local population	Low
		Flora and fauna	Low
		Groundwater	Low
Groundwater linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Local population	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
		Groundwater	Low
	Indirect contact ingestion or absorption	Local population	Low
		Flora and fauna	Low
Airborne linkage	Inhalation of particulates	Construction Worker	Very high
		Resident	High
		Trespasser	Very high
		Flora and fauna	Low
		Local population	Low
	Inhalation of volatile compounds	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
		Local population	Low
	Vapour intrusion into indoor spaces	Resident	Low
		Local population	Low

3.4.8 Historical landfill site approximately 210 metres to the southeast of the site.

Linkage type	Pathway	Receptor	Risk
Surface soil linkage	Direct contact ingestion or absorption	Construction Worker	Very Low
		Resident	Very Low
		Trespasser	Very Low
		Flora and fauna	Very Low
	Direct contact	Surface water	Very Low
	Indirect contact ingestion or absorption	Resident	Very Low
Subsurface soil linkage	Direct contact ingestion or absorption	Construction Worker	Very Low
		Resident	Very Low
		Flora and fauna	Very Low
	Direct contact	Buildings and services	Very Low
	Indirect contact ingestion or absorption	Resident	Very Low
	Leaching to groundwater	Local population	Very Low
		Flora and fauna	Very Low
		Construction Worker	Very Low
		Groundwater	Very Low
Surface water linkage	Direct contact ingestion or absorption	Construction Worker	Very Low
		Resident	Very Low
		Trespasser	Very Low
		Flora and fauna	Very Low
	Direct contact	Buildings and services	Very Low
		Surface water	Very Low
	Percolation to groundwater	Local population	Very Low
		Flora and fauna	Very Low
		Groundwater	Very Low
Groundwater linkage	Direct contact ingestion or absorption	Construction Worker	Very Low
		Local population	Very Low
		Flora and fauna	Very Low
	Direct contact	Buildings and services	Very Low
		Groundwater	Very Low
	Indirect contact ingestion or absorption	Local population	Very Low
		Flora and fauna	Very Low
Airborne linkage	Inhalation of particulates	Construction Worker	Very Low
		Resident	Very Low
		Trespasser	Very Low
		Flora and fauna	Very Low
		Local population	Very Low
	Inhalation of volatile compounds	Construction Worker	Very Low
		Resident	Very Low
		Trespasser	Very Low
		Flora and fauna	Very Low
		Local population	Very Low
	Vapour intrusion into indoor spaces	Resident	Very Low
		Local population	Very Low

4.0 Recommendations for Site Investigation

Due to potential on site contamination sources, it is recommended that an intrusive investigation is undertaken.

Judgmental sampling in accordance with BS 10175:2011 clause 7.7.2.2 and non-targeted sampling in accordance with BS 10175:2011 clause 7.7.2.3 should be carried out.

NPL recommends that 16 window sample holes are drilled across the site. These investigations should be located in areas that visually appear to have the most potential for contamination ie, underground fuel storage tank locations, above ground heating oil tank location and to characterise onsite made ground deposits. Window sample holes should be drilled to a depth of 3.0 metres or where 1 metre of natural ground is encountered. Four gas monitoring wells should be installed in the site to monitor any potential ground gas or vapours generated from any possibly contaminated soils.

All findings will be documented in a Phase II Site Investigation Report including a Quantitative Risk Assessment. A Remediation Method Statement will be included if required and submitted to Babergh & Mid Suffolk District Council for approval.

5.0 Site Investigation

5.1 Investigation Objectives

The aim of this investigation is to determine whether any contamination exists on the site by targeting the potential sources identified in the Desk Study. In the event of contamination being found then it should be quantified as far as possible.

5.2 Preparatory Enabling Works

A Kite coring rig was used to cut through the intact concrete to allow the window sample holes to be drilled.

5.3 Works undertaken

On 28th and 29th November 2023, eighteen window sample holes were drilled to a maximum depth of 4.00 metres. Two dynamic probes were advanced to a maximum depth of 5.00 metres. Four locations were installed with permanent monitoring wells for potential groundwater and ground gas.

The locations of these excavations are shown on the plan in Appendix B.

5.4 Site Investigation Strategy

The site investigation was to identify any potential contamination and gather geotechnical information.

5.5 Site Sampling Strategy

Disturbed samples were taken from the window sample holes in accordance with BS 5930:2015. The number and depths of these samples encountered are set out in Appendix C of this report.

5.6 In-situ and Geotechnical Testing

Dynamic probing was carried out in two locations to a maximum depth of 5.00 metres.

One determination of Liquid Limit to BS1377-2:1990 Cl 4.3 Cone Penetrometer (Definitive Method) and Determination of Plasticity Index to BS1377-2:1990 Cl 5 was undertaken on a sample from WS07 at 1.00 metre.

5.7 Pollution prevention measures

No pollution prevention measures were required on this site. No material was removed except for samples for testing. Due diligence was employed to prevent any possible cross contamination of material. Window Sample holes were backfilled with bentonite.

6.0 Analytical Strategy

The following samples were tested for the parameters shown. The samples were sent to Envirolab, Cheshire for analysis. Envirolab is a UKAS accredited laboratory, No.1247

6.1 Soil

	Depth (m)	Tests
WS02	0.10	Suite SB, Speciated TPH to WGC UK, Asbestos presence /absence
WS02	2.00	Speciated TPH to WGC UK
WS03	0.65	Speciated TPH to WGC UK
WS04	0.20	Suite SB, Speciated TPH to WGC UK
WS06	2.50	Speciated TPH to WGC UK
WS09	0.10	Suite SB
WS09	1.50	Speciated TPH to WGC UK
WS12	0.40	Asbestos presence /absence
WS13	0.30	Suite SB
WS14	0.30	Suite SB
WS15	0.25	Suite SB
WS16	1.60	Speciated TPH to WGC UK

Suite SB = General contamination suite including testing for: Total Sulphate, Boron, Water Soluble, Arsenic, Cadmium, Chromium III, Chromium VI, Copper, Lead, Mercury, Nickel, Selenium, Zinc, Acid Soluble Sulphide, Phenols (Monohydric), Total Cyanide, Elemental Sulphur, pH Value, PAH Total, Speciated PAH, Soil Organic Matter (SOM).

6.2 Water

No groundwater was encountered so no testing was undertaken as part of this investigation.

7.0 Investigation Results

7.1 Ground conditions

7.1.1 Surface Deposits

Intact concrete

Intact concrete was identified as the surface deposit in WS02, 03, 04, 08, 09, 10, 11, 12, 16, 17 and 18. The thickness of the concrete ranged from 0.05 metre to 0.30 metre.

Asphalt

Asphalt with a thickness of 0.10 metre was recorded in WS07.

Topsoil

Topsoil was identified as the surface deposit in WS01 and WS05. The deposit was dark brown in colour and sandy. The thickness recorded was 0.10 metre.

Made Ground

Made Ground was identified as the surface deposit in WS06, WS13, WS14 and WS15. The deposit comprised gravelly fine medium sand and sandy gravelly Topsoil. The gravel was fine medium flint, concrete, and brick. Colours recorded included black, dark grey and brown. The thickness of the deposit ranged from 0.10 metre in WS06 to 0.50 metre in WS13.

Made Ground was also identified below the intact surfacing in WS02, WS03, WS04, WS07, WS08, WS09, WS10, WS11, WS12, WS16, WS17 and WS18. The deposit comprised gravelly fine medium sand, fine to coarse flint, brick and asphalt gravel, and intact brick. Colours recorded included dark grey, black, and greyish brown. WS16 and WS17 were drilled internally through the vehicle inspection pits which were both 1.50 metres in depth. In WS16 the Made Ground comprised brick, block, flint and slag gravel, concrete cobbles, and gravelly fine medium sand. WS16 had in intact concrete base which was penetrated during the drilling. In WS17 fine to coarse flint, brick, and concrete in a matrix of dark brown fine to coarse sand was recorded. Intact concrete was also noted at 1.50 metres which was unable to be penetrated and prevented further depth from being achieved. No hydrocarbon impacted material was retrieved. Thickness of the Made Ground not including WS16 and WS17 ranged from 0.05 metre in WS18 to 0.40 metre in WS10 and WS12.

More detail can be seen on the window sample logs in Appendix C.

7.1.2 Head

Deposits thought to be Head were recorded below the Topsoil, Made Ground and intact surfacing in WS01, WS02, WS03, WS04, WS05, WS06, WS08, WS10, WS13, WS14, WS15 and WS16.

The deposit comprised, silty fine sand, clayey fine to coarse sand, clayey gravelly fine medium sand, gravelly fine to coarse sand. Colours recorded were brown, and light brown. The gravel was fine to coarse rounded to subangular flint and quartz. The deposit was encountered at depths ranging from 0.10 metre in WS01, WS05 and WS06 to 0.70 metre in WS10. The maximum thickness of the deposit was 1.30 metres in WS06. The Head deposit was proven at a maximum depth of 1.40 metres in WS06.

More detail can be found on the window sample logs in Appendix C.

7.1.3 Lowestoft Till

The Lowestoft Till was identified in WS01, WS07, WS08, WS09, WS10, WS12, WS13, WS14 and WS15. below the Made Ground and Head deposits.

The deposit comprised sandy clay, very sandy clay, gravelly sandy clay, very clayey sand, and silty sand. Colours recorded included orangey brown, brown, and grey. The gravel was fine medium subangular to rounded chalk and flint. The strength of the clay was firm, with soft to firm noted in WS13 only. Where proven the thickness of the deposit varied from 0.40 metre in WS10 to 2.10 metres in WS07. The deposit was proven in all window sample holes except WS13 at a maximum depth of 2.80 metres in WS08. The Lowestoft Till was not proven in WS13 only at a maximum depth of 3.60 metres.

One Atterberg limit test was undertaken on this horizon. The result is tabulated below.

Hole ID	Depth (mbgl)	Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Modified PI (%)
WS07	1.00	15	27	13	14	13

BS1377 classifies the sample as a clay of low plasticity and the NHBC classifies the material as having a low volume change potential.

7.1.4 Croxton Sand and Gravel Formation

Deposits thought to be the Croxton Sand and Gravel Formation were identified in WS01, WS03, WS07, WS10, WS11, WS12, WS16, and WS17 below Made Ground the Lowestoft Till and reworked chalk.

The deposit comprised sand, clayey sand, gravelly sand, and silty gravelly sand. Colours recorded included brown, orangey brown, yellowish brown, yellow, and grey.

Gravel was fine to coarse rounded to subangular flint and quartz. The deposit was encountered at depths ranging from 0.50 metres in WS11 to 2.90 metres in WS07. The Croxton Sand and Gravel Formation was not proven in WS01, WS12 and WS16 at a maximum depth of 3.00 metres. The deposit was proven in WS03, WS07, WS10, WS11 at a maximum depth of 3.80 metres in WS07.

More detail can be seen on the window sample logs in Appendix C.

7.1.5 Reworked Chalk

The Reworked Chalk was encountered below the Head and Lowestoft Till deposits and generally above the Upper Chalk in WS02, WS03, WS04, WS05, WS07, WS08, WS09, WS14, WS15, and WS18. The deposit comprised light brown and beige silty gravelly sand. The gravel was fine to coarse chalk and flint and comminuted silt sized chalk with intact chalk gravel with fine medium sand infilling joints and fissures. The chalk gravel was weak. The deposit was encountered at depths ranging from 0.50 metre in WS05 to 2.80 metres in WS08. Where proven the thickness ranged from 0.40 metre in WS07 to 1.25 metres in WS05. The base of this deposit was proven in all the window sample holes except WS08 at a maximum depth of 3.00 metres.

7.1.6 Upper Chalk

The Upper Chalk was encountered below the Head deposit, Croxton Sand and Gravel Formation and the Reworked Chalk in WS02, WS03, WS04, WS05, WS06, WS07, WS09, WS10, WS11, WS14, WS15, and WS18. The deposit comprised off white silt sized comminuted Chalk with intact weak chalk gravel. The deposit was encountered at depths ranging from 1.40 metres in WS06 to 3.80 metres in WS07. The base of this deposit was not proven in all the window sample holes at a maximum depth of 5.00 metres in WS18.

More detail can be seen on the window sample logs in Appendix C.

7.1.7 Dynamic Probes

In DP19 from ground level to 1.00 metre the equivalent SPT “N” value increases to over 20 before reducing to just below 10 from 1.00 metre to 2.00 metres. From 2.00 metres to 3.60 metres the “N” value remains around 15 before reducing to 10 to an end depth of 5.00 metres.

In DP20 from ground level to 1.00 metre the equivalent SPT “N” value increases to approximately 18 before reducing to just below 10 from 1.40 metres. The density remains consistent with an equivalent SPT “N” value of at around 10 to an end depth of 5.00 metres.

7.2 Groundwater conditions

No groundwater strikes were recorded during the drilling of the window sample holes.

Further groundwater monitoring was undertaken in the window samples with installations. The water levels are tabulated below.

WS No	07/12/2023	13/12/2023	20/12/2023
	Depth (m)		
01	Dry	Dry	Dry
02	Dry	Dry	Dry
03	Dry	Dry	Dry
04	Dry	Dry	Dry
18	Dry	Dry	Dry

7.3 Geoenvironmental test results summary

The samples indicated in Section 6.0 were sent to Envirolab, Cheshire for analysis. Envirolab is a UKAS accredited laboratory, No.1247.

These samples were tested for the contaminants of concern noted in sections 6.1. The test results are included in Appendix D.

7.4 Contamination

7.4.1 Soil

All of the results were found to be below the C4SL's, Atkins ATRISK and LQM/CIEH S4UL's threshold values for residential with the consumption of home grown produce land use, with 1% soil organic matter with the exception of one Lead result which is shown below.

WS No	Depth (m)	Analyte	Threshold value (mg/kg)	Result (mg/kg)
13	0.30	Lead	200	1030

No Asbestos was identified in the soil samples tested.

7.4.2 Generation of ground gases

Gas monitoring was undertaken on the four window sample holes with installations placed in them. The results are tabulated below:

	07/12/2023				13/12/2023			
Test Location	**Pressure (mb)**	**O_2 (%)**	**$C0_2$ (%)**	**CH_4 (%)**	**Pressure (mb)**	**O_2 (%)**	**$C0_2$ (%)**	**CH_4 (%)**
WS01	1003	20.9	0.3	0.0	1003	20.6	0.3	0.0
WS02	1003	20.9	0.3	0.0	1003	20.6	0.3	0.0
WS03	1003	20.4	0.2	0.0	1003	20.2	0.3	0.0
WS04	1003	20.5	0.0	0.0	1003	20.3	0.1	0.0
WS18	1003	20.6	0.0	0.0	1003	20.2	0.0	0.0

	20/12/2023			
Test Location	**Pressure (mb)**	**O_2 (%)**	**$C0_2$ (%)**	**CH_4 (%)**
WS01	1017	20.4	0.2	0.0
WS02	1017	20.5	0.2	0.0
WS03	1017	20.1	0.3	0.0
WS04	1017	20.2	0.0	0.0
WS18	1017	20.2	0.0	0.0

Although tested, no Methane or flow was recorded.

Carbon Dioxide

The maximum recorded Carbon Dioxide reading was 0.3% in WS01 and WS02 on 07/12/2023, 13/12/2023 and in WS03 on 20/12/2023. Following CIRIA report C665; using Table 8.7 and the worst case reading of 0.3% CO_2, the site can be classified as NHBC traffic light situation GREEN. This is indicative of a negligible gas regime and gas protection measures are not considered necessary.

A zero flow was recorded at all times. The limit of detection for flow on the gas detector is 0.1 l/hr and therefore this value is used in the subsequent calculation. In accordance with C665 the Gas Screening Value (GSV) has been calculated by multiplying the maximum recorded gas concentration by the maximum flow recorded.

GSV = 0.003 x 0.1 = 0.0003 l/hr

This result classifies the site as GREEN in accordance with NHBC traffic light system. This is indicative of negligible gas regime and requires no gas protection measures. The gas screening value (GSV) for this site is below the maximum value to classify the site as GREEN. The flow rate was repeatedly measured as zero indicating that there are no driving mechanisms to cause the CO_2 to enter any buildings.

Methane

No Methane was detected.

8.0 Quantitative Risk Assessment

8.1 Risk Assessment Objectives

The objective of the quantitative risk assessment is to revisit the preliminary risk assessment in the light of information obtained during the site investigation and thus reassess the validity of the model.

8.2 Proposed Development

It is proposed to demolish the former garage building and redevelop the site with two detached residential properties with garages including alterations for vehicular access.

8.3 Revised Conceptual Model

Referring back to the original risk assessment in Section 3.0 the following potentially contaminative linkages were present.

a) Potential underground fuel storage tanks

b) Spillages of various oils/lubricant associated with previous use as a garage.

c) Two filled inspection pits

d) On site Made Ground deposits

e) Above ground heating oil tank in the south west corner of the site

f) Potential tank located in bund on north west side of building

g) Cement board sheeting to roof

h) Historical landfill site approximately 210 metres to the south east od the site

8.4 Risk assessment rationale

Where available levels of potential contaminants were compared to C4SL's, Atkins ATRISK and LQM/CIEH S4UL's threshold values to assess human health risk.

To assess the risk to buildings and services the WRAS documentation and BRE Special Digest 1 were used. These are specialist documents that focus on a particular target.

8.5 Exposure scenario

8.4.1 Potential underground fuel storage tanks

Linkage type	Pathway	Receptor	Risk
Surface soil linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
	Direct contact	Surface water	Low
	Indirect contact ingestion or absorption	Resident	Low
Subsurface soil linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Resident	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
	Indirect contact ingestion or absorption	Resident	Low
	Leaching to groundwater	Local population	Low
		Flora and fauna	Low
		Construction Worker	Low
		Groundwater	Low
Surface water linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
		Surface water	Low
	Percolation to groundwater	Local population	Low
		Flora and fauna	Low
		Groundwater	Low
Groundwater linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Local population	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
		Groundwater	Low
	Indirect contact ingestion or absorption	Local population	Low
		Flora and fauna	Low
Airborne linkage	Inhalation of particulates	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
		Local population	Low
	Inhalation of volatile compounds	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
		Local population	Low
	Vapour intrusion into indoor spaces	Resident	Low
		Local population	Low

8.4.2 Spillages of various oils/lubricants associated with previous use as a garage

Linkage type	Pathway	Receptor	Risk
Surface soil linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
	Direct contact	Surface water	Low
	Indirect contact ingestion or absorption	Resident	Low
Subsurface soil linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Resident	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
	Indirect contact ingestion or absorption	Resident	Low
	Leaching to groundwater	Local population	Low
		Flora and fauna	Low
		Construction Worker	Low
		Groundwater	Low
Surface water linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
		Surface water	Low
	Percolation to groundwater	Local population	Low
		Flora and fauna	Low
		Groundwater	Low
Groundwater linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Local population	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
		Groundwater	Low
	Indirect contact ingestion or absorption	Local population	Low
		Flora and fauna	Low
Airborne linkage	Inhalation of particulates	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
		Local population	Low
	Inhalation of volatile compounds	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
		Local population	Low
	Vapour intrusion into indoor spaces	Resident	Low
		Local population	Low

8.4.3 Two filled inspection pits

Linkage type	Pathway	Receptor	Risk
Surface soil linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
	Direct contact	Surface water	Low
	Indirect contact ingestion or absorption	Resident	Low
Subsurface soil linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Resident	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
	Indirect contact ingestion or absorption	Resident	Low
	Leaching to groundwater	Local population	Low
		Flora and fauna	Low
		Construction Worker	Low
		Groundwater	Low
Surface water linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
		Surface water	Low
	Percolation to groundwater	Local population	Low
		Flora and fauna	Low
		Groundwater	Low
Groundwater linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Local population	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
		Groundwater	Low
	Indirect contact ingestion or absorption	Local population	Low
		Flora and fauna	Low
Airborne linkage	Inhalation of particulates	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
		Local population	Low
	Inhalation of volatile compounds	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
		Local population	Low
	Vapour intrusion into indoor spaces	Resident	Low
		Local population	Low

8.4.4 On site Made Ground deposits

Linkage type	Pathway	Receptor	Risk
Surface soil linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
	Direct contact	Surface water	Low
	Indirect contact ingestion or absorption	Resident	Low
Subsurface soil linkage	Direct contact ingestion or absorption	Construction Worker	Medium
		Resident	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
	Indirect contact ingestion or absorption	Resident	Low
	Leaching to groundwater	Local population	Low
		Flora and fauna	Low
		Construction Worker	Low
		Groundwater	Low
Surface water linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
		Surface water	Low
	Percolation to groundwater	Local population	Low
		Flora and fauna	Low
		Groundwater	Low
Groundwater linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Local population	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
		Groundwater	Low
	Indirect contact ingestion or absorption	Local population	Low
		Flora and fauna	Low
Airborne linkage	Inhalation of particulates	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
		Local population	Low
	Inhalation of volatile compounds	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
		Local population	Low
	Vapour intrusion into indoor spaces	Resident	Low
		Local population	Low

8.4.5 Above ground heating oil tank in the south west corner of the site.

Linkage type	Pathway	Receptor	Risk
Surface soil linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
	Direct contact	Surface water	Low
	Indirect contact ingestion or absorption	Resident	Low
Subsurface soil linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Resident	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
	Indirect contact ingestion or absorption	Resident	Low
	Leaching to groundwater	Local population	Low
		Flora and fauna	Low
		Construction Worker	Low
		Groundwater	Low
Surface water linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
		Surface water	Low
	Percolation to groundwater	Local population	Low
		Flora and fauna	Low
		Groundwater	Low
Groundwater linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Local population	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
		Groundwater	Low
	Indirect contact ingestion or absorption	Local population	Low
		Flora and fauna	Low
Airborne linkage	Inhalation of particulates	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
		Local population	Low
	Inhalation of volatile compounds	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
		Local population	Low
	Vapour intrusion into indoor spaces	Resident	Low
		Local population	Low

8.4.6 Potential tank located in bund on the north west side of the building

Linkage type	Pathway	Receptor	Risk
Surface soil linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
	Direct contact	Surface water	Low
	Indirect contact ingestion or absorption	Resident	Low
Subsurface soil linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Resident	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
	Indirect contact ingestion or absorption	Resident	Low
	Leaching to groundwater	Local population	Low
		Flora and fauna	Low
		Construction Worker	Low
		Groundwater	Low
Surface water linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
		Surface water	Low
	Percolation to groundwater	Local population	Low
		Flora and fauna	Low
		Groundwater	Low
Groundwater linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Local population	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
		Groundwater	Low
	Indirect contact ingestion or absorption	Local population	Low
		Flora and fauna	Low
Airborne linkage	Inhalation of particulates	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
		Local population	Low
	Inhalation of volatile compounds	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
		Local population	Low
	Vapour intrusion into indoor spaces	Resident	Low
		Local population	Low

8.4.7 Cement board sheeting to roof

Linkage type	Pathway	Receptor	Risk
Surface soil linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
	Direct contact	Surface water	Low
	Indirect contact ingestion or absorption	Resident	Low
Subsurface soil linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Resident	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
	Indirect contact ingestion or absorption	Resident	Low
	Leaching to groundwater	Local population	Low
		Flora and fauna	Low
		Construction Worker	Low
		Groundwater	Low
Surface water linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
		Surface water	Low
	Percolation to groundwater	Local population	Low
		Flora and fauna	Low
		Groundwater	Low
Groundwater linkage	Direct contact ingestion or absorption	Construction Worker	Low
		Local population	Low
		Flora and fauna	Low
	Direct contact	Buildings and services	Low
		Groundwater	Low
	Indirect contact ingestion or absorption	Local population	Low
		Flora and fauna	Low
Airborne linkage	Inhalation of particulates	Construction Worker	Very high
		Resident	High
		Trespasser	Very high
		Flora and fauna	Low
		Local population	Low
	Inhalation of volatile compounds	Construction Worker	Low
		Resident	Low
		Trespasser	Low
		Flora and fauna	Low
		Local population	Low
	Vapour intrusion into indoor spaces	Resident	Low
		Local population	Low

8.4.8 Historical landfill site approximately 210 metres to the southeast of the site.

Linkage type	Pathway	Receptor	Risk
Surface soil linkage	Direct contact ingestion or absorption	Construction Worker	Very Low
		Resident	Very Low
		Trespasser	Very Low
		Flora and fauna	Very Low
	Direct contact	Surface water	Very Low
	Indirect contact ingestion or absorption	Resident	Very Low
Subsurface soil linkage	Direct contact ingestion or absorption	Construction Worker	Very Low
		Resident	Very Low
		Flora and fauna	Very Low
	Direct contact	Buildings and services	Very Low
	Indirect contact ingestion or absorption	Resident	Very Low
	Leaching to groundwater	Local population	Very Low
		Flora and fauna	Very Low
		Construction Worker	Very Low
		Groundwater	Very Low
Surface water linkage	Direct contact ingestion or absorption	Construction Worker	Very Low
		Resident	Very Low
		Trespasser	Very Low
		Flora and fauna	Very Low
	Direct contact	Buildings and services	Very Low
		Surface water	Very Low
	Percolation to groundwater	Local population	Very Low
		Flora and fauna	Very Low
		Groundwater	Very Low
Groundwater linkage	Direct contact ingestion or absorption	Construction Worker	Very Low
		Local population	Very Low
		Flora and fauna	Very Low
	Direct contact	Buildings and services	Very Low
		Groundwater	Very Low
	Indirect contact ingestion or absorption	Local population	Very Low
		Flora and fauna	Very Low
Airborne linkage	Inhalation of particulates	Construction Worker	Very Low
		Resident	Very Low
		Trespasser	Very Low
		Flora and fauna	Very Low
		Local population	Very Low
	Inhalation of volatile compounds	Construction Worker	Very Low
		Resident	Very Low
		Trespasser	Very Low
		Flora and fauna	Very Low
		Local population	Very Low
	Vapour intrusion into indoor spaces	Resident	Very Low
		Local population	Very Low

8.6 Assessment criteria

The assessment criterion used is for residential with the consumption of home grown produce land use with 1% soil organic matter.

CLEA v1.06, C4SL's, Atkins ATRISK and LQM/CIEH S4ULs models were used to assess human health risk and determine allowable values for any contaminants present.

To assess the risk to buildings and services the WRAS documentation and BRE Special Digest 1 were used. These are specialist documents that focus on a particular target.

8.7 Constraints and limitations

The CLEA model is limited to published data. These assessing criteria only apply to human health and do not assess risk to groundwater.

Atkins AT**RISK**^{soil} SSV data was derived to use where CLEA guidance was not available. AT**RISK**^{soil} SSV was derived using toxicological data inputted into BP RISC 4.0.

The WRAS, CIRIA and BRE documents are specific to the target receptor.

8.8 Risk to controlled waters

According to the Regional Hydrogeology Map of Southern East Anglia, the Chalk is the principal aquifer for the area. The estimated minimum hydrostatic level of the Chalk water table in the vicinity of the site is between 30 and 40 metres above Ordnance Survey Datum.

The site is 45 metres above Ordnance Survey Datum therefore the groundwater is between 5 and 15 metres below the site.

The site represents a Low Risk (considered conceivable but unlikely) to groundwater due to no significant contamination recorded present within the site.

8.9 Effects on Human Health

The testing undertaken during this investigation has indicated that the Lead present in the Made Ground deposit at 0.30 metre in WS13 poses a risk to the construction worker and also exceeds the allowable threshold value for the residential end user.

8.10 Effects on buildings and services

The site generally poses a low risk to buildings and services.

The Sulphate (water sol 2:1) results from the samples taken in the Made Ground ranged from <10mg/l to 110mg/l.

The values of pH recorded from the soil testing ranged from 7.79 to 9.90.

8.11 Uncertainties

There is a risk that contamination may exist in areas not investigated.

8.12 Risk Evaluation

With current knowledge this site generally represents a low risk to human health, buildings and services and controlled waters.

The elevated Lead result from WS13 represents a high risk to the construction worker.

WS13 is located in the proposed patio area of Plot 1 and therefore will be removed during the demolition phase.

9.0 Remediation Method Statement

It is thought that UST's are present on the site in the forecourt and possibly to the south of the building. It is not known if the tanks have been decommissioned. It is known however that the site was occupied by the Pine House Company from 2001, therefore no recent history of fuel delivery has occurred in the intervening years.

Sampling and testing from the assumed tank locations targeted by the GPR survey from the subsoils and Upper Chalk deposit has indicated that the site has not been impacted by hydrocarbons.

The following procedures should be adhered to during the removal of any below ground infrastructure.

The UST's, pipes and associated fittings should be removed by a suitably licensed contractor and disposed of to a suitably licensed facility. Care should be taken with regard to the fuel lines during removal of the tanks, ensuring that any fuel remaining within the supply lines is harvested.

Following the removal of the tanks and any visually or olfactorily impacted surrounding material, validation sampling should be undertaken from the sides and base of the excavation in accordance with BS:10175:2011+A2:2017 to ensure that all contaminated material has been removed. The quantity of testing may be reduced pending the findings upon excavation. This should confirm that no risk would then be present that would impact on controlled waters.

a. The UST's will be excavated using a mechanical excavator. Inspection of the contents of the UST's will be undertaken, if possible, in-situ or when the tanks are removed and made safe. The client will then arrange for the removal of these tanks to a suitable licensed facility.

b. The ground surrounding the UST's will then be assessed for visual and olfactory evidence of contamination. Any obviously contaminated material will then be excavated.

c. The excavation will then be surveyed using a PID. If necessary, further material will be excavated to an extent where no contaminated soil remains. The client will remove this soil to a suitable licensed facility.

d. The remaining excavation will then be sampled. Two samples will be taken from the base of this excavation and one from each side wall using the sampling pattern described in BS10175 Annex D. This sampling frequency may be reduced at the discretion of the Geoenvironmental Engineer when PID, olfactory and visible findings are all considered. Analytical testing will be undertaken on these samples.

e. Testing will comprise, Speciated TPH CWG UK. The results will be assessed against Atkins Atrisk threshold values.

f. Delivery tickets shall be provided for all potentially contaminated material leaving site and also for any inert material brought into the site for backfill purposes. These are to be included in the validation report.

If groundwater is encountered during these works, samples should be taken and analysed for Speciated TPH and VOC's.

Elevated Lead in WS13

The testing has revealed an elevated Lead in TP13 at 0.30 metre within the Made Ground. It is therefore recommended that an area 3.0 x 3.0 metres is removed to a depth of 0.50 metre. (OSGR 595137/267832). Samples should be taken from the sidewalls and base and analysed for Lead to confirm that all the contaminated material has been removed. The excavated material should be disposed of to a suitably licensed facility. Conveyance notes shall be provided.

Proposed garden areas

There is no significant quantity of re-useable Topsoil present on the site. All Made Ground should be removed in the rear garden areas of the proposed development. The average thickness of the Made Ground at the rear of the site is 0.40 metre. All garden and soft areas should be constructed with a minimum of 600mm of clean imported material. This could comprise of 300mm of certified subsoil followed with 300mm of certified Topsoil or 600mm of certified Topsoil.

Test results accompanying the Topsoil must confirm that the soil is fit for purpose when compared to C4SL's, Atkins ATRISK and LQM/CIEH S4UL's threshold values for residential with home grown land use produce using 1% soil organic matter.

Inspection and validation confirming that the requirements have been carried out will be required. This information should be collected and collated throughout the construction process and submitted in a final validation report.

Water supply pipes

If no hydrocarbons contamination is revealed during the removal of the underground storage tanks then standard PE pipe can be installed throughout the development.

Potential Asbestos Containing Materials

The roof is clad with cement board sheets. It is recommended that all potential Asbestos containing material (ACM) should be removed by a suitably licensed contractor and disposed of to a suitably licensed facility. Consignment notes for any removed Asbestos and documentation stating that all Asbestos has been disposed of from the site should be included in the validation report.

Site Validation

All the works detailed above should be documented and submitted with all conveyance notes and delivery tickets to the local authority in the form of a Validation Report.

It should also be stressed that if any possibly contaminated material is encountered during the site clearance or construction process, work shall cease, and Babergh & Mid-Suffolk Council and Norfolk Partnership Laboratory should be informed immediately.

10.0 References

DEFRA: Contaminated Land exposure assessment “CLEA Version 1.04:2008"

Environment Agency: R&D Publication 20; Methodology for the derivation of remedial targets for soil and groundwater to protect water resources: 1999.

Environment Agency: Technical advice to third parties on the pollution of controlled waters for part IIA: 2002.

Environment Agency: Guidance on Requirements for Land Contamination Reports; July 2005.

Environment Agency website.

RAIS website.

WRAS Information and Guidance Note No 9-04-03, Issue 1: The Selection of Materials for Water Supply Pipes to be Laid in Contaminated Land: October 2002.

CIRIA Report 149: Protecting Development from Methane: 1995.

CIRIA C665 Assessing risks posed by hazardous ground gases to buildings, 2007.

BRE Special Digest 1: Concrete in aggressive ground, 3rd Edition: 2005.

Atkins ATRISK SSV's derived using CLEA Version 1.06.

NHBC Standards January 2019.

BS 1377: 1990; Soils for Civil Engineering Purposes.

BS 5930:2015 incorporating amendment A1:2020; Code of practice for Site Investigations.

BS 10175: 2011; Investigation of potentially contaminated sites – Code of practice.

LQM/CIEH S4ULs for Human Health Risk Assessment.

Land Contamination Risk Management July 2023

Norfolk Partnership Laboratory

Site Investigation Section

This report was prepared under the direction of

Lead Engineer

I D Brown

Author of report

Project Engineer

S P Berwick

Date: 21/12/2023

Appendix A

Norfolk County Council

Tom McCabe
Executive Director of
Community and Environmental Services
Norfolk County Council
County Hall, Martineau Lane
Norwich NR1 2SG

DRAWING TITLE

Site Location Plan

REV.	DESCRIPTION	DRAWN BY	CHECKED	DATE

	INITIALS	DATE
SURVEYED BY		
DESIGNED BY		
DRAWN BY	SPB	12/23
CHECKED BY	IDB	12/23

DRAWING No. 104909 - 001

PROJECT TITLE
Stowlangtoft : Former Pine House Company Site Investigation

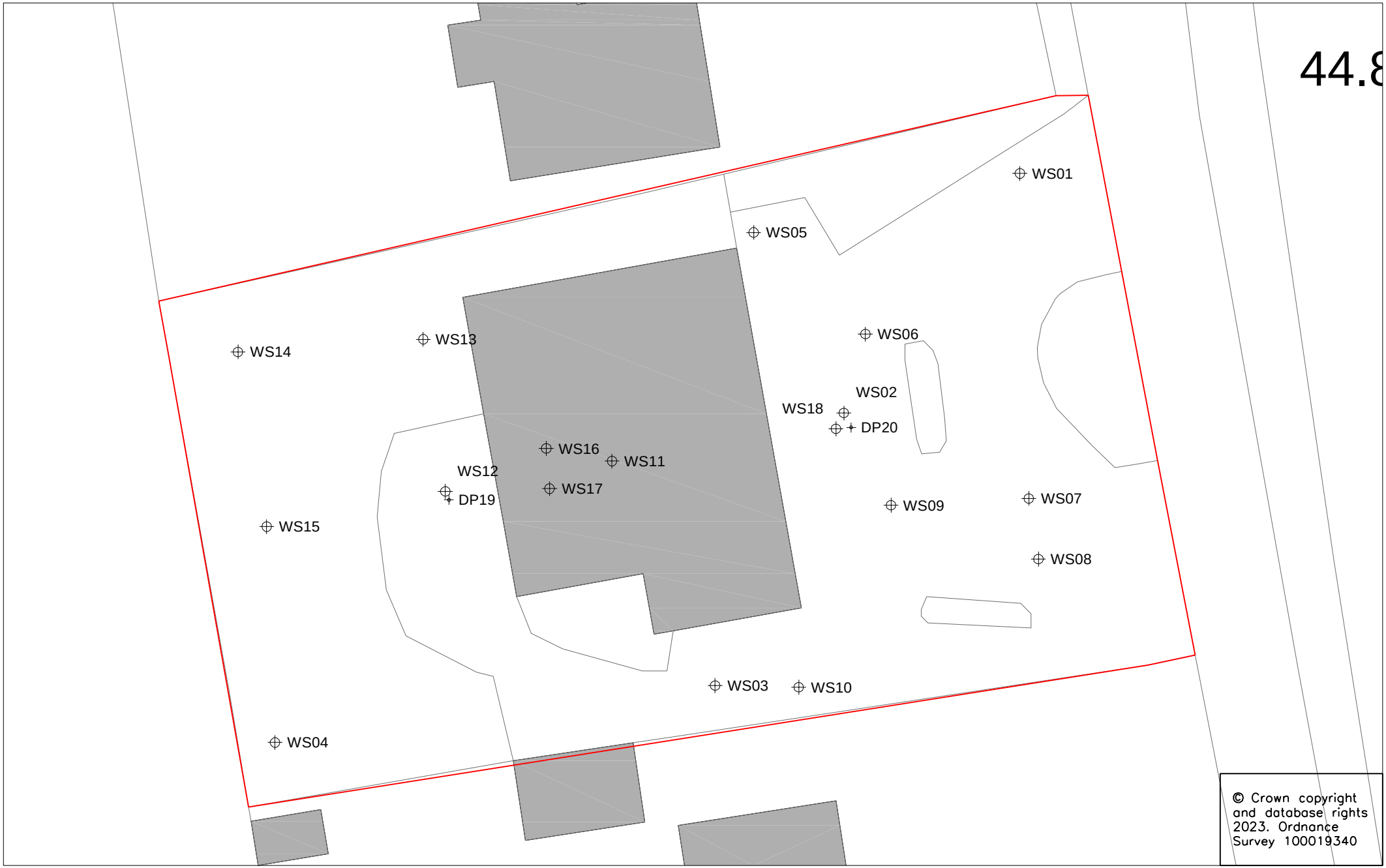
SCALE 1:5000@ A4

FILE No. 104909

ORIGINAL SIZE: A4

IG 12/10/16

Appendix B



Norfolk County Council

Tom McCabe
Executive Director of
Community and Environmental Services
Norfolk County Council
County Hall, Martineau Lane
Norwich NR1 2SG

DRAWING TITLE
Window Sample and Dynamic Probe
Location Plan

REV.	DESCRIPTION	DRAWN BY	CHECKED	DATE

	INITIALS	DATE
SURVEYED BY		
DESIGNED BY		
DRAWN BY	SPB	12/23
CHECKED BY	IDB	12/23

DRAWING No. 104909 - 002
PROJECT TITLE
Stowlangtoft : Former Pine House Company Site Investigation
SCALE 1:300@ A4
FILE No. 104909

ORIGINAL SIZE: A4

IG 12/10/16

Appendix C

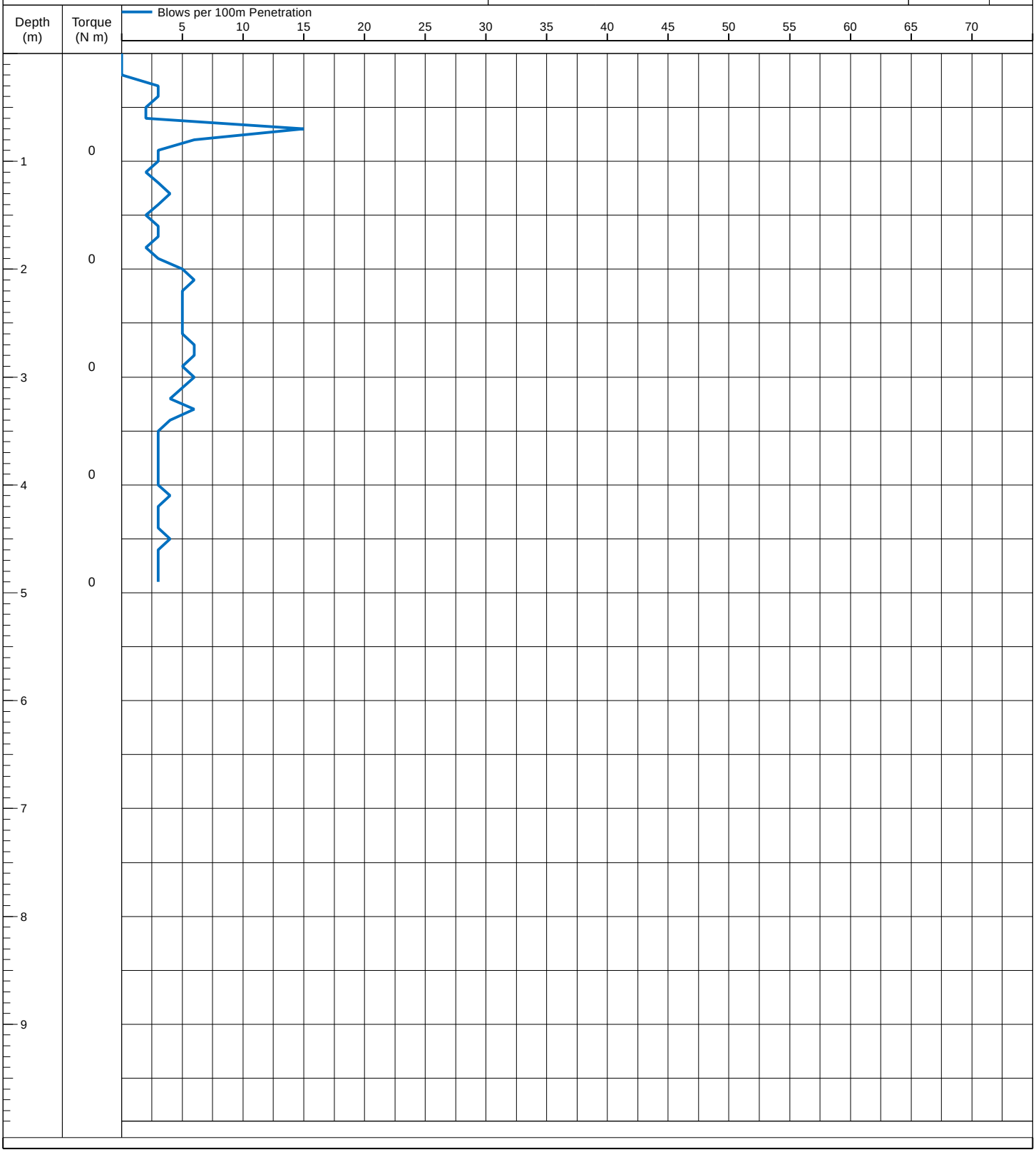
MADE GROUND : comprising black gravelly sandy topsoil. Gravel is fine medium brick and concrete.
MADE GROUND
MADE GROUND : comprising dark brown slightly gravelly fine medium sand. Gravel is fine brick and concrete.
MADE GROUND
MADE GROUND : comprising fine to coarse concrete.
MADE GROUND
Brown fine medium slightly gravelly silty SAND. Gravel is fine medium rounded to subangular flint and quartz.
HEAD
Light brown fine medium silty SAND
HEAD
Firm light brown, brown and grey slightly gravelly sandy CLAY. Gravel is fine medium rounded to subangular flint.
LOWESTOFT TILL
Beige light brown silt sized comminuted CHALK with some fine to coarse intact chalk gravel. Weak. Brown fine medium sand infilling joints and fissures.
REWORKED CHALK
Off white silt sized comminuted CHALK with some intact chalk gravel . Weak.
UPPER CHALK

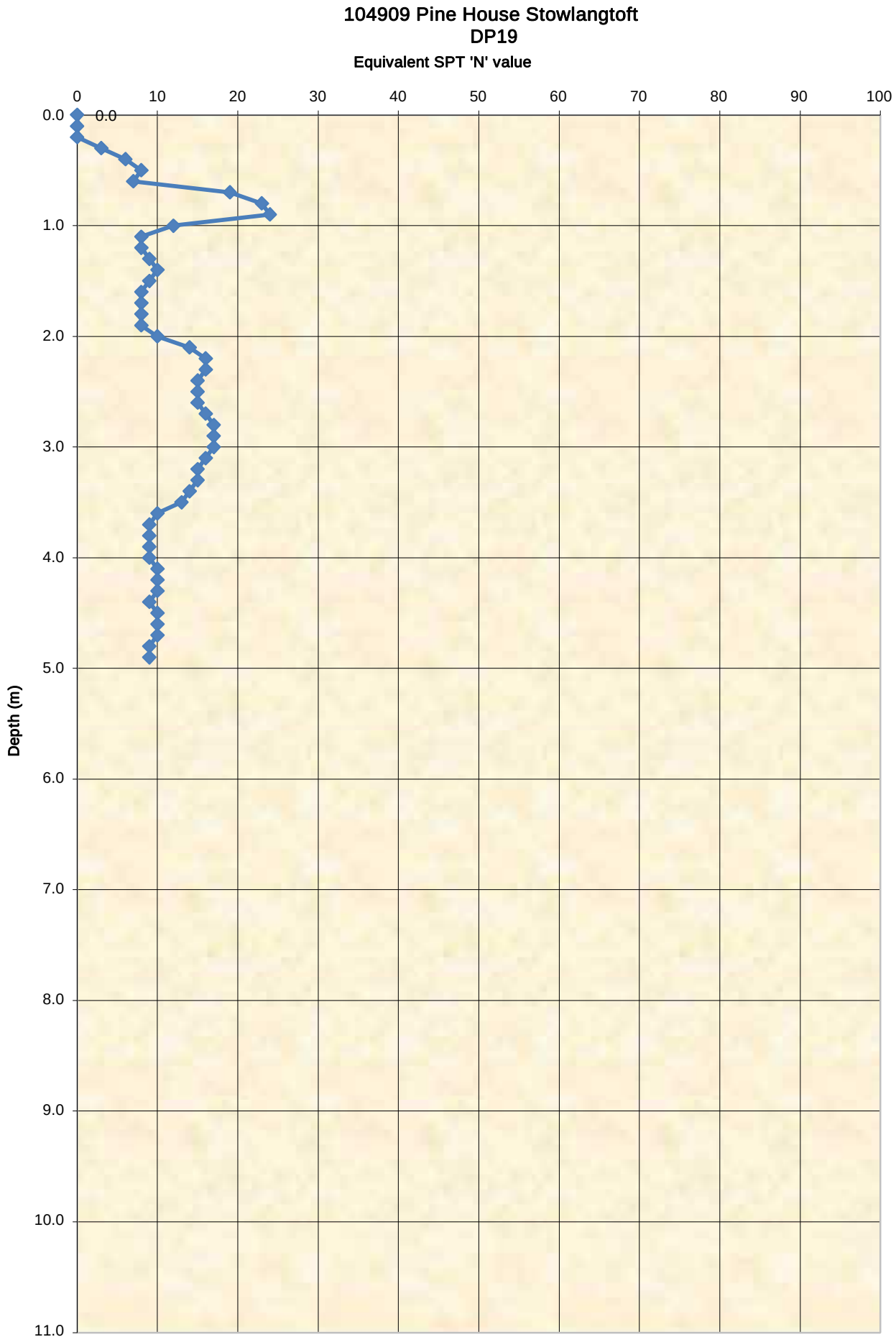
NORFOLK PARTNERSHIP LABORATORY

DYNAMIC PROBE LOG

Sheet 1 of 1

Scheme	Pine House Stowlangtoft Site Investigation	Job No. 104909		Probe No. 19	
Carried out for	Lewis Tombs	Date Started 29/11/2023		Date Finished 29/11/2023	
Dimension (mm) 50	Probe Type DPSH-B	Type of Rig Premier 110		Logged by	DJ
Remarks:		Depth (m) 4.90	Ground Level (m AOD) 0.00	Drawn by	SPB
		Co-ords 595139 - 267824		Checked by	IDB



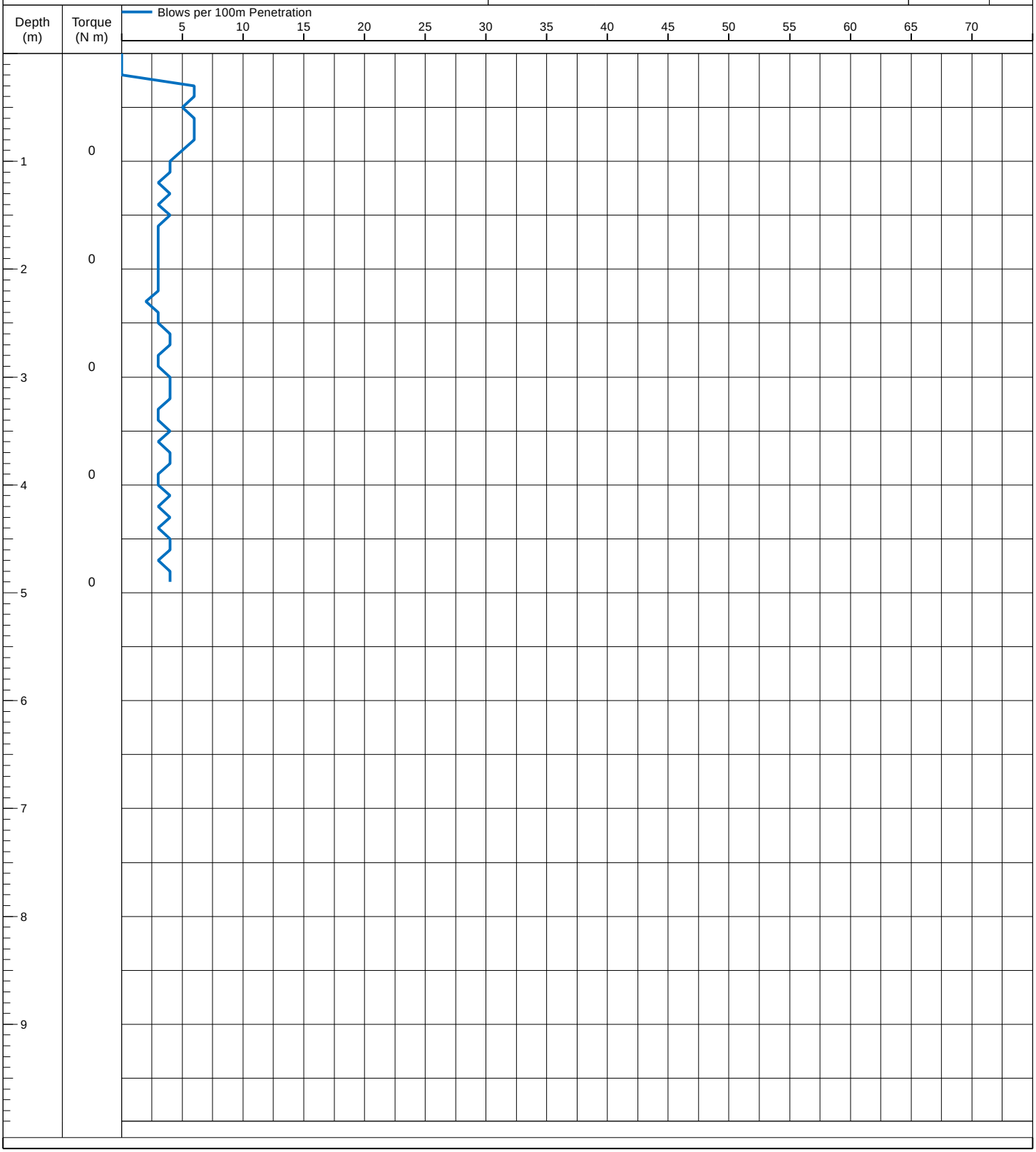

104909 Pine House Stowlangtoft
DP19
Equivalent SPT 'N' value
0
10
20
30
40
50
60
70
80
90
100
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
Depth (m)

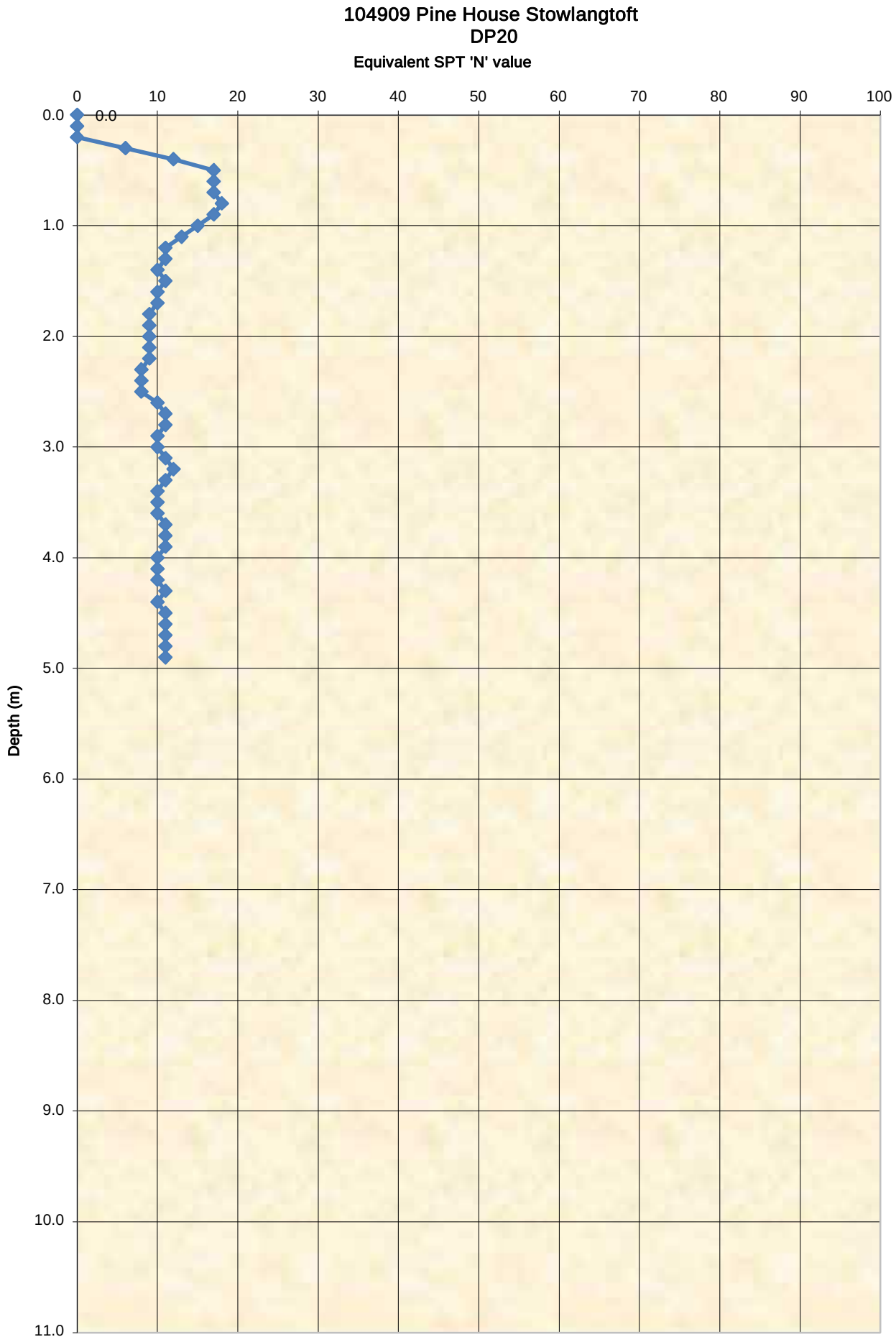
NORFOLK PARTNERSHIP LABORATORY

DYNAMIC PROBE LOG

Sheet 1 of 1

Scheme	Pine House Stowlangtoft Site Investigation	Job No. 104909		Probe No. 20	
Carried out for	Lewis Tombs	Date Started 29/11/2023		Date Finished 29/11/2023	
Dimension (mm) 50	Probe Type DPSH-B	Type of Rig Premier 110		Logged by	DJ
Remarks:		Depth (m) 4.90	Ground Level (m AOD) 0.00	Drawn by	SPB
		Co-ords 595163 - 267829		Checked by	IDB




104909 Pine House Stowlangtoft
DP20
Equivalent SPT 'N' value
0
10
20
30
40
50
60
70
80
90
100
0.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
11.0
Depth (m)

Appendix D

envirolab
Hattersley Science & Technology Park
Stockport Road, Hattersley, SK14 3QU

FINAL ANALYTICAL TEST REPORT

Envirolab Job Number: 23/12069
Issue Number: 1 **Date:** 19 December, 2023

Client: Norse Eastern Ltd t/a Norse Highways
280 Fifers Lane
Norwich
Norfolk
NR6 6EQ

Project Manager: * Civil lab/* Sharon Woods; Simon Holden, Josh Tho
Project Name: Pine House Stowlangtoft Site Investigation
Project Ref: 104909
Order No: PN05072815
Date Samples Received: 06/12/23
Date Instructions Received: 06/12/23
Date Analysis Completed: 19/12/23

Approved by:

[redacted]

Richard Wong
Client Manager

mCERTS THE ENVIRONMENT AGENCY'S MONITORING CERTIFICATION SCHEME
UKAS TESTING 1247

Envirolab Job Number: 23/12069

Client Project Name: Pine House Stowlangtoft Site Investigation

Client Project Ref: 104909

Lab Sample ID	23/12069/1	23/12069/2	23/12069/3	23/12069/4	23/12069/5	23/12069/6	23/12069/7			
Client Sample No	0511	0512	0513	1514	0515	0516	0517			
Client Sample ID	WS02	WS02	WS03	WS04	WS06	WS09	WS09			
Depth to Top	0.1	2	0.65	0.2	2.5	0.1	1.5			
Depth To Bottom										
Date Sampled	28-Nov-23	28-Nov-23	29-Nov-23	28-Nov-23	29-Nov-23	28-Nov-23	28-Nov-23			
Sample Type	SOIL - D	SOIL - D	SOIL - D	SOIL - D	SOIL - D	SOIL - D	SOIL - D			
Sample Matrix Code	5	3	5	4AB	3	3A	3A			
% Stones >10mm$_A$	<0.1	<0.1	<0.1	14.4	0.6	13.6	<0.1	% w/w	0.1	A-T-044
pH$_D$$^{M\#}$	7.89	-	-	9.90	-	8.51	-	pH	0.01	A-T-031s
Sulphate (water sol 2:1)$_D$$^{M\#}$	0.02	-	-	0.03	-	0.03	-	g/l	0.01	A-T-026s
Sulphate (acid soluble)$_D$$^{M\#}$	380	-	-	880	-	360	-	mg/kg	200	A-T-028s
Cyanide (total)$_A$$^{M\#}$	<1	-	-	<1	-	<1	-	mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC$_A$	<0.2	-	-	<0.2	-	<0.2	-	mg/kg	0.2	A-T-050s
Sulphide$_A$	<5	-	-	<5	-	<5	-	mg/kg	5	A-T-043-s
Sulphur (elemental)$_D$$^{M\#}$	450	-	-	11	-	<5	-	mg/kg	5	A-T-029s
Organic Matter$_D$$^{M\#}$	1.3	-	-	0.7	-	1.3	-	% w/w	0.1	A-T-032s
Arsenic$_D$$^{M\#}$	4	-	-	6	-	5	-	mg/kg	1	A-T-024s
Boron (water soluble)$_D$$^{M\#}$	2.2	-	-	<1.0	-	<1.0	-	mg/kg	1	A-T-027s
Cadmium$_D$$^{M\#}$	<0.5	-	-	<0.5	-	<0.5	-	mg/kg	0.5	A-T-024s
Copper$_D$$^{M\#}$	8	-	-	10	-	29	-	mg/kg	1	A-T-024s
Chromium$_D$$^{M\#}$	14	-	-	22	-	29	-	mg/kg	1	A-T-024s
Chromium (hexavalent)$_D$	<1	-	-	<1	-	<1	-	mg/kg	1	A-T-040s
Lead$_D$$^{M\#}$	14	-	-	29	-	22	-	mg/kg	1	A-T-024s
Mercury$_D$	<0.17	-	-	0.66	-	<0.17	-	mg/kg	0.17	A-T-024s
Nickel$_D$$^{M\#}$	10	-	-	16	-	24	-	mg/kg	1	A-T-024s
Selenium$_D$$^{M\#}$	<1	-	-	<1	-	<1	-	mg/kg	1	A-T-024s
Zinc$_D$$^{M\#}$	34	-	-	42	-	42	-	mg/kg	5	A-T-024s

Envirolab Job Number: 23/12069

Client Project Name: Pine House Stowlangtoft Site Investigation

Client Project Ref: 104909

Lab Sample ID	23/12069/1	23/12069/2	23/12069/3	23/12069/4	23/12069/5	23/12069/6	23/12069/7			
Client Sample No	0511	0512	0513	1514	0515	0516	0517			
Client Sample ID	WS02	WS02	WS03	WS04	WS06	WS09	WS09			
Depth to Top	0.1	2	0.65	0.2	2.5	0.1	1.5			
Depth To Bottom										
Date Sampled	28-Nov-23	28-Nov-23	29-Nov-23	28-Nov-23	29-Nov-23	28-Nov-23	28-Nov-23			
Sample Type	SOIL - D	SOIL - D	SOIL - D	SOIL - D	SOIL - D	SOIL - D	SOIL - D			
Sample Matrix Code	5	3	5	4AB	3	3A	3A			
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_{D}^{\#}$	NAD	-	-	-	-	-	-			A-T-045
Asbestos Matrix (visual)$_{D}$	-	-	-	-	-	-	-			A-T-045
Asbestos Matrix (microscope)$_{D}$	-	-	-	-	-	-	-			A-T-045
Asbestos ACM - Suitable for Water Absorption Test?$_{D}$	N/A	-	-	-	-	-	-			A-T-045

Envirolab Job Number: 23/12069

Client Project Name: Pine House Stowlangtoft Site Investigation

Client Project Ref: 104909

Lab Sample ID	23/12069/1	23/12069/2	23/12069/3	23/12069/4	23/12069/5	23/12069/6	23/12069/7			
Client Sample No	0511	0512	0513	1514	0515	0516	0517			
Client Sample ID	WS02	WS02	WS03	WS04	WS06	WS09	WS09			
Depth to Top	0.1	2	0.65	0.2	2.5	0.1	1.5			
Depth To Bottom										
Date Sampled	28-Nov-23	28-Nov-23	29-Nov-23	28-Nov-23	29-Nov-23	28-Nov-23	28-Nov-23			
Sample Type	SOIL - D	SOIL - D	SOIL - D	SOIL - D	SOIL - D	SOIL - D	SOIL - D			
Sample Matrix Code	5	3	5	4AB	3	3A	3A			
PAH-16MS										
Acenaphthene$_A^{M\#}$	<0.01	-	-	<0.01	-	<0.01	-	mg/kg	0.01	A-T-019s
Acenaphthylene$_A^{M\#}$	<0.01	-	-	0.02	-	<0.01	-	mg/kg	0.01	A-T-019s
Anthracene$_A^{M\#}$	<0.02	-	-	0.07	-	<0.02	-	mg/kg	0.02	A-T-019s
Benzo(a)anthracene$_A^{M\#}$	<0.04	-	-	0.38	-	0.07	-	mg/kg	0.04	A-T-019s
Benzo(a)pyrene$_A^{M\#}$	0.06	-	-	0.41	-	0.10	-	mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene$_A^{M\#}$	0.07	-	-	0.47	-	0.12	-	mg/kg	0.05	A-T-019s
Benzo(ghi)perylene$_A^{M\#}$	<0.05	-	-	0.26	-	0.06	-	mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene$_A^{M\#}$	<0.07	-	-	0.19	-	<0.07	-	mg/kg	0.07	A-T-019s
Chrysene$_A^{M\#}$	0.07	-	-	0.40	-	0.10	-	mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene$_A$	<0.04	-	-	0.05	-	<0.04	-	mg/kg	0.04	A-T-019s
Fluoranthene$_A^{M\#}$	0.11	-	-	0.60	-	0.12	-	mg/kg	0.08	A-T-019s
Fluorene$_A^{M\#}$	<0.01	-	-	<0.01	-	<0.01	-	mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene$_A^{M\#}$	0.05	-	-	0.31	-	0.08	-	mg/kg	0.03	A-T-019s
Naphthalene $_A^{M\#}$	<0.03	-	-	<0.03	-	0.15	-	mg/kg	0.03	A-T-019s
Phenanthrene$_A^{M\#}$	<0.03	-	-	0.24	-	<0.03	-	mg/kg	0.03	A-T-019s
Pyrene$_A^{M\#}$	0.08	-	-	0.52	-	0.11	-	mg/kg	0.07	A-T-019s
Total PAH-16MS$_A$	0.44	-	-	3.92	-	0.91	-	mg/kg	0.01	A-T-019s

Envirolab Job Number: 23/12069

Client Project Name: Pine House Stowlangtoft Site Investigation

Client Project Ref: 104909

Lab Sample ID	23/12069/1	23/12069/2	23/12069/3	23/12069/4	23/12069/5	23/12069/6	23/12069/7			
Client Sample No	0511	0512	0513	1514	0515	0516	0517			
Client Sample ID	WS02	WS02	WS03	WS04	WS06	WS09	WS09			
Depth to Top	0.1	2	0.65	0.2	2.5	0.1	1.5			
Depth To Bottom										
Date Sampled	28-Nov-23	28-Nov-23	29-Nov-23	28-Nov-23	29-Nov-23	28-Nov-23	28-Nov-23			
Sample Type	SOIL - D	SOIL - D	SOIL - D	SOIL - D	SOIL - D	SOIL - D	SOIL - D			
Sample Matrix Code	5	3	5	4AB	3	3A	3A			
TPH UKCWG with Clean Up										
Ali >C5-C6$_A$	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	mg/kg	0.01	A-T-022s
Ali >C6-C8$_A$	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	mg/kg	0.01	A-T-022s
Ali >C8-C10$_A$	<1	<1	<1	<1	<1	-	<1	mg/kg	1	A-T-055s
Ali >C10-C12$_A^{M\#}$	<1	<1	<1	<1	<1	-	<1	mg/kg	1	A-T-055s
Ali >C12-C16$_A^{M\#}$	<1	<1	<1	<1	<1	-	<1	mg/kg	1	A-T-055s
Ali >C16-C21$_A^{M\#}$	<1	<1	<1	<1	<1	-	<1	mg/kg	1	A-T-055s
Ali >C21-C35$_A^{M\#}$	6	<1	1	15	<1	-	<1	mg/kg	1	A-T-055s
Ali >C35-C44$_A$	2	<1	<1	11	<1	-	<1	mg/kg	1	A-T-055s
Total Aliphatics$_A$	8	<1	1	26	<1	-	<1	mg/kg	1	Calc-As Recd
Aro >C5-C7$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	mg/kg	0.01	A-T-022s
Aro >C7-C8$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	mg/kg	0.01	A-T-022s
Aro >C8-C10$_A$	<1	<1	<1	<1	<1	-	<1	mg/kg	1	A-T-055s
Aro >C10-C12$_A$	<1	<1	<1	<1	<1	-	<1	mg/kg	1	A-T-055s
Aro >C12-C16$_A$	<1	<1	<1	2	<1	-	<1	mg/kg	1	A-T-055s
Aro >C16-C21$_A^{M\#}$	1	<1	<1	4	<1	-	<1	mg/kg	1	A-T-055s
Aro >C21-C35$_A^{M\#}$	5	<1	<1	14	<1	-	<1	mg/kg	1	A-T-055s
Aro >C35-C44$_A$	<1	<1	<1	9	<1	-	<1	mg/kg	1	A-T-055s
Total Aromatics$_A$	6	<1	<1	30	<1	-	<1	mg/kg	1	Calc-As Recd
TPH (Ali & Aro >C5-C44)$_A$	14	<1	1	56	<1	-	<1	mg/kg	1	Calc-As Recd
BTEX - Benzene$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	mg/kg	0.01	A-T-022s
BTEX - Toluene$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	mg/kg	0.01	A-T-022s
BTEX - m & p Xylene$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	mg/kg	0.01	A-T-022s
BTEX - o Xylene$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	mg/kg	0.01	A-T-022s
MTBE$_A^{\#}$	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	mg/kg	0.01	A-T-022s

Envirolab Job Number: 23/12069

Client Project Name: Pine House Stowlangtoft Site Investigation

Client Project Ref: 104909

Lab Sample ID	23/12069/8	23/12069/9	23/12069/10	23/12069/11	23/12069/12					
Client Sample No	0518	0519	0520	0521	0522					
Client Sample ID	WS12	WS13	WS14	WS15	WS16					
Depth to Top	0.4	0.3	0.3	0.25	1.6					
Depth To Bottom										
Date Sampled	28-Nov-23	29-Nov-23	29-Nov-23	29-Nov-23	29-Nov-23					
Sample Type	SOIL - D	SOIL - D	SOIL - D	SOIL - D	SOIL - D					
Sample Matrix Code	4A	5	5	5	3					
% Stones >10mm$_A$	-	15.1	8.5	6.2	16.8			% w/w	0.1	A-T-044
pH$_D$$^{M\#}$	-	8.04	7.79	8.21	-			pH	0.01	A-T-031s
Sulphate (water sol 2:1)$_D$$^{M\#}$	-	0.11	<0.01	0.02	-			g/l	0.01	A-T-026s
Sulphate (acid soluble)$_D$$^{M\#}$	-	1200	200	270	-			mg/kg	200	A-T-028s
Cyanide (total)$_A$$^{M\#}$	-	<1	<1	<1	-			mg/kg	1	A-T-042sTCN
Phenols - Total by HPLC$_A$	-	<0.2	<0.2	<0.2	-			mg/kg	0.2	A-T-050s
Sulphide$_A$	-	<5	<5	<5	-			mg/kg	5	A-T-043-s
Sulphur (elemental)$_D$$^{M\#}$	-	<5	<5	<5	-			mg/kg	5	A-T-029s
Organic Matter$_D$$^{M\#}$	-	1.4	0.9	0.9	-			% w/w	0.1	A-T-032s
Arsenic$_D$$^{M\#}$	-	14	5	6	-			mg/kg	1	A-T-024s
Boron (water soluble)$_D$$^{M\#}$	-	<1.0	<1.0	<1.0	-			mg/kg	1	A-T-027s
Cadmium$_D$$^{M\#}$	-	5.5	<0.5	0.8	-			mg/kg	0.5	A-T-024s
Copper$_D$$^{M\#}$	-	709	23	15	-			mg/kg	1	A-T-024s
Chromium$_D$$^{M\#}$	-	49	14	20	-			mg/kg	1	A-T-024s
Chromium (hexavalent)$_D$	-	<1	<1	<1	-			mg/kg	1	A-T-040s
Lead$_D$$^{M\#}$	-	1030	38	39	-			mg/kg	1	A-T-024s
Mercury$_D$	-	<0.17	<0.17	<0.17	-			mg/kg	0.17	A-T-024s
Nickel$_D$$^{M\#}$	-	42	13	15	-			mg/kg	1	A-T-024s
Selenium$_D$$^{M\#}$	-	<1	<1	<1	-			mg/kg	1	A-T-024s
Zinc$_D$$^{M\#}$	-	2890	143	122	-			mg/kg	5	A-T-024s

Envirolab Job Number: 23/12069

Client Project Name: Pine House Stowlangtoft Site Investigation

Client Project Ref: 104909

Lab Sample ID	23/12069/8	23/12069/9	23/12069/10	23/12069/11	23/12069/12					
Client Sample No	0518	0519	0520	0521	0522					
Client Sample ID	WS12	WS13	WS14	WS15	WS16					
Depth to Top	0.4	0.3	0.3	0.25	1.6					
Depth To Bottom										
Date Sampled	28-Nov-23	29-Nov-23	29-Nov-23	29-Nov-23	29-Nov-23					
Sample Type	SOIL - D	SOIL - D	SOIL - D	SOIL - D	SOIL - D					
Sample Matrix Code	4A	5	5	5	3					
Asbestos in Soil (inc. matrix)										
Asbestos in soil$_D^{\#}$	NAD	-	-	-	-					A-T-045
Asbestos Matrix (visual)$_D$	-	-	-	-	-					A-T-045
Asbestos Matrix (microscope)$_D$	-	-	-	-	-					A-T-045
Asbestos ACM - Suitable for Water Absorption Test?$_D$	N/A	-	-	-	-					A-T-045

Envirolab Job Number: 23/12069

Client Project Name: Pine House Stowlangtoft Site Investigation

Client Project Ref: 104909

Lab Sample ID	23/12069/8	23/12069/9	23/12069/10	23/12069/11	23/12069/12					
Client Sample No	0518	0519	0520	0521	0522					
Client Sample ID	WS12	WS13	WS14	WS15	WS16					
Depth to Top	0.4	0.3	0.3	0.25	1.6					
Depth To Bottom										
Date Sampled	28-Nov-23	29-Nov-23	29-Nov-23	29-Nov-23	29-Nov-23					
Sample Type	SOIL - D	SOIL - D	SOIL - D	SOIL - D	SOIL - D					
Sample Matrix Code	4A	5	5	5	3					
PAH-16MS										
Acenaphthene$_{A}^{M\#}$	-	<0.01	<0.01	<0.01	-			mg/kg	0.01	A-T-019s
Acenaphthylene$_{A}^{M\#}$	-	<0.01	<0.01	<0.01	-			mg/kg	0.01	A-T-019s
Anthracene$_{A}^{M\#}$	-	<0.02	<0.02	<0.02	-			mg/kg	0.02	A-T-019s
Benzo(a)anthracene$_{A}^{M\#}$	-	0.10	<0.04	<0.04	-			mg/kg	0.04	A-T-019s
Benzo(a)pyrene$_{A}^{M\#}$	-	0.13	0.05	0.05	-			mg/kg	0.04	A-T-019s
Benzo(b)fluoranthene$_{A}^{M\#}$	-	0.18	0.06	0.05	-			mg/kg	0.05	A-T-019s
Benzo(ghi)perylene$_{A}^{M\#}$	-	0.10	<0.05	<0.05	-			mg/kg	0.05	A-T-019s
Benzo(k)fluoranthene$_{A}^{M\#}$	-	<0.07	<0.07	<0.07	-			mg/kg	0.07	A-T-019s
Chrysene$_{A}^{M\#}$	-	0.18	0.07	<0.06	-			mg/kg	0.06	A-T-019s
Dibenzo(ah)anthracene$_{A}$	-	<0.04	<0.04	<0.04	-			mg/kg	0.04	A-T-019s
Fluoranthene$_{A}^{M\#}$	-	0.25	<0.08	0.09	-			mg/kg	0.08	A-T-019s
Fluorene$_{A}^{M\#}$	-	<0.01	<0.01	<0.01	-			mg/kg	0.01	A-T-019s
Indeno(123-cd)pyrene$_{A}^{M\#}$	-	0.12	0.04	0.03	-			mg/kg	0.03	A-T-019s
Naphthalene $_{A}^{M\#}$	-	<0.03	<0.03	<0.03	-			mg/kg	0.03	A-T-019s
Phenanthrene$_{A}^{M\#}$	-	0.10	<0.03	<0.03	-			mg/kg	0.03	A-T-019s
Pyrene$_{A}^{M\#}$	-	0.20	<0.07	<0.07	-			mg/kg	0.07	A-T-019s
Total PAH-16MS$_{A}$	-	1.36	0.22	0.22	-			mg/kg	0.01	A-T-019s

Envirolab Job Number: 23/12069

Client Project Name: Pine House Stowlangtoft Site Investigation

Client Project Ref: 104909

Lab Sample ID	23/12069/8	23/12069/9	23/12069/10	23/12069/11	23/12069/12					
Client Sample No	0518	0519	0520	0521	0522					
Client Sample ID	WS12	WS13	WS14	WS15	WS16					
Depth to Top	0.4	0.3	0.3	0.25	1.6					
Depth To Bottom										
Date Sampled	28-Nov-23	29-Nov-23	29-Nov-23	29-Nov-23	29-Nov-23					
Sample Type	SOIL - D	SOIL - D	SOIL - D	SOIL - D	SOIL - D					
Sample Matrix Code	4A	5	5	5	3					
TPH UKCWG with Clean Up										
Ali >C5-C6$_A$	-	-	-	-	<0.01			mg/kg	0.01	A-T-022s
Ali >C6-C8$_A$	-	-	-	-	<0.01			mg/kg	0.01	A-T-022s
Ali >C8-C10$_A$	-	-	-	-	<1			mg/kg	1	A-T-055s
Ali >C10-C12$_A^{M\#}$	-	-	-	-	<1			mg/kg	1	A-T-055s
Ali >C12-C16$_A^{M\#}$	-	-	-	-	<1			mg/kg	1	A-T-055s
Ali >C16-C21$_A^{M\#}$	-	-	-	-	<1			mg/kg	1	A-T-055s
Ali >C21-C35$_A^{M\#}$	-	-	-	-	17			mg/kg	1	A-T-055s
Ali >C35-C44$_A$	-	-	-	-	5			mg/kg	1	A-T-055s
Total Aliphatics$_A$	-	-	-	-	22			mg/kg	1	Calc-As Recd
Aro >C5-C7$_A^{\#}$	-	-	-	-	<0.01			mg/kg	0.01	A-T-022s
Aro >C7-C8$_A^{\#}$	-	-	-	-	<0.01			mg/kg	0.01	A-T-022s
Aro >C8-C10$_A$	-	-	-	-	<1			mg/kg	1	A-T-055s
Aro >C10-C12$_A$	-	-	-	-	<1			mg/kg	1	A-T-055s
Aro >C12-C16$_A$	-	-	-	-	<1			mg/kg	1	A-T-055s
Aro >C16-C21$_A^{M\#}$	-	-	-	-	<1			mg/kg	1	A-T-055s
Aro >C21-C35$_A^{M\#}$	-	-	-	-	4			mg/kg	1	A-T-055s
Aro >C35-C44$_A$	-	-	-	-	2			mg/kg	1	A-T-055s
Total Aromatics$_A$	-	-	-	-	7			mg/kg	1	Calc-As Recd
TPH (Ali & Aro >C5-C44)$_A$	-	-	-	-	29			mg/kg	1	Calc-As Recd
BTEX - Benzene$_A^{\#}$	-	-	-	-	<0.01			mg/kg	0.01	A-T-022s
BTEX - Toluene$_A^{\#}$	-	-	-	-	<0.01			mg/kg	0.01	A-T-022s
BTEX - Ethyl Benzene$_A^{\#}$	-	-	-	-	<0.01			mg/kg	0.01	A-T-022s
BTEX - m & p Xylene$_A^{\#}$	-	-	-	-	<0.01			mg/kg	0.01	A-T-022s
BTEX - o Xylene$_A^{\#}$	-	-	-	-	<0.01			mg/kg	0.01	A-T-022s
MTBE$_A^{\#}$	-	-	-	-	<0.01			mg/kg	0.01	A-T-022s

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 within the same delivery, will be disposed of **six weeks** after the 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 our scope of accreditation.
The client Sample No, Client Sample ID, Depth to top, Depth to Bottom and Date Sampled are all provided by the client.
A deviating sample 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.

Key

Superscript "#"	Accredited to ISO 17025
Superscript "M"	Accredited to MCertS
Superscript "U"	Individual result not accredited
None of the above symbols	Analysis unaccredited
Subscript "A"	Analysis performed on as-received Sample
Subscript "D"	Analysis performed on the dried sample, crushed to pass 2mm sieve.
Subscript "^"	Analysis has dependant options against results. Details appear in the comments of your Sample receipt
IS	Insufficient Sample for analysis
US	Unsuitable Sample for analysis
NDP	No Determination Possible
NAD	No Asbestos Detected
N/A	Not applicable

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.

Assigned Matrix Codes

1	SAND	6	CLAY/LOAM	A	Contains Stones
2	LOAM	7	OTHER	B	Contains Construction Rubble
3	CLAY	8	Asbestos Bulk (Only Asbestos ID accredited)	C	Contains visible hydrocarbons
4	LOAM/SAND	9	Incinerator Ash (some Metals accredited)	D	Contains glass / metal
5	SAND/CLAY			E	Contains roots / twigs
Note: 7,8,9 matrices are not covered by our ISO 17025 or MCertS accreditation, unless stated above.					

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 by method A-T-007:
For waters, free and visible oils are excluded from the sample used for analysis, so the reported result represents the dissolved phase only.
Results "with Clean up" indicates samples cleaned up with Silica during extraction.

EPH CWG (method A-T-055) from TPH CWG:
EPH CWG results have humics mathematically subtracted through instrument calculation.
Where these humic substances have been identified in any IDs from "TPH CWG with clean up" please note that the concentration is **NOT** included in the quantified results but present in the ID for information.

Electrical Conductivity of water by method A-T-037:
Results greater than 12900µS/cm @ 25^{o}C / 11550µS/cm @ 20^{o}C fall outside the accreditation range and as such are unaccredited.

Please contact your client manager if you require any further information.

Envirolab Analysis Dates

Lab Sample ID	23/12069/1	23/12069/2	23/12069/3	23/12069/4	23/12069/5	23/12069/6	23/12069/7	23/12069/8	23/12069/9	23/12069/10	23/12069/11	23/12069/12
Client Sample No	0511	0512	0513	1514	0515	0516	0517	0518	0519	0520	0521	0522
Client Sample ID/Depth	WS02 0.1m	WS02 2m	WS03 0.65m	WS04 0.2m	WS06 2.5m	WS09 0.1m	WS09 1.5m	WS12 0.4m	WS13 0.3m	WS14 0.3m	WS15 0.25m	WS16 1.6m
Date Sampled	28/11/23	28/11/23	29/11/23	28/11/23	29/11/23	28/11/23	28/11/23	28/11/23	29/11/23	29/11/23	29/11/23	29/11/23
A-T-019s												
A-T-022s												
A-T-024s												
A-T-026s												
A-T-027s												
A-T-028s												
A-T-029s												
A-T-031s												
A-T-032s												
A-T-040s												
A-T-042sTCN												
A-T-043-s												
A-T-044	12/12/2023	12/12/2023	12/12/2023	12/12/2023	12/12/2023	12/12/2023	12/12/2023		12/12/2023	12/12/2023	12/12/2023	12/12/2023
A-T-045								08/12/2023				
A-T-050s												
A-T-055s												
Calc-As Recd												

The above dates are the analysis completion dates, please note that these are not necessarily the date that the analysis was weighed/extracted.

End of Report

Appendix E

Norfolk Partnership Laboratory
Part of the Norse Group

County Hall, Martineau Lane
NORWICH, Norfolk NR1 2SG
Tel: 01603 578389

HLD Developments Ltd
FAO L Tombs
Old Hall Green Farm Barn
Old Hall Lane
Cockfield
Bury St Edmunds
Suffolk
IP30 0LQ

[redacted]

Our Reference No.	NNPL2023120523
Our Project No	104909
Your Sample Ref	D523
Your Project or Order No.	
Date Report Issued	21 Dec 2023

Determination of Liquid Limit to BS 1377-2 : 2022 Penetrometer (Definitive Method) Cl 5.2 and Determination of Plasticity Index to BS 1377-2:2022 Cl 6

Scheme	Pine House Stowlangtoft Site Investigation		
Location	WS07	**Depth**	1 m
Date sampled	28 Nov 2023	**Date received**	28 Nov 2023
Sampled by	D Joyce (NPL Staff)	**Date tested**	18 Dec 2023
Sample type	Small disturbed sample	**Sample Mass (g)**	610

If a sample certificate was provided, it is available for inspection. The accuracy of any information provided by third parties cannot be guaranteed. These results only relate to the sample tested.

Material	Soil		
Description	Stiff light orangish brown gravelly very sandy CLAY. Gravel is angular to subrounded fine and medium flint.		
Supplier	Not applicable	**Source**	Ex site

Test Specimen

Location	Not applicable
Orientation	Not applicable

Preparation Details

Method of Division		Quartering
Preparation Method		Wet sieving
Retained 425µm	%	12.2

Results

Natural Water Content	%	15		
Drying Temperature	°C	105-110		
Liquid Limit	%	27	**Cone Used**	30°, 80 g
Plastic Limit	%	13	**Water Content Direction**	Increasing
Plasticity Index	%	14		
Modified PI *	%	13		

*BRE Digest 240:1993.

This calculation is outside the scope of UKAS accreditation.

BS Soil Classification **CL**

Remarks NHBC Volume change potential classification is low.

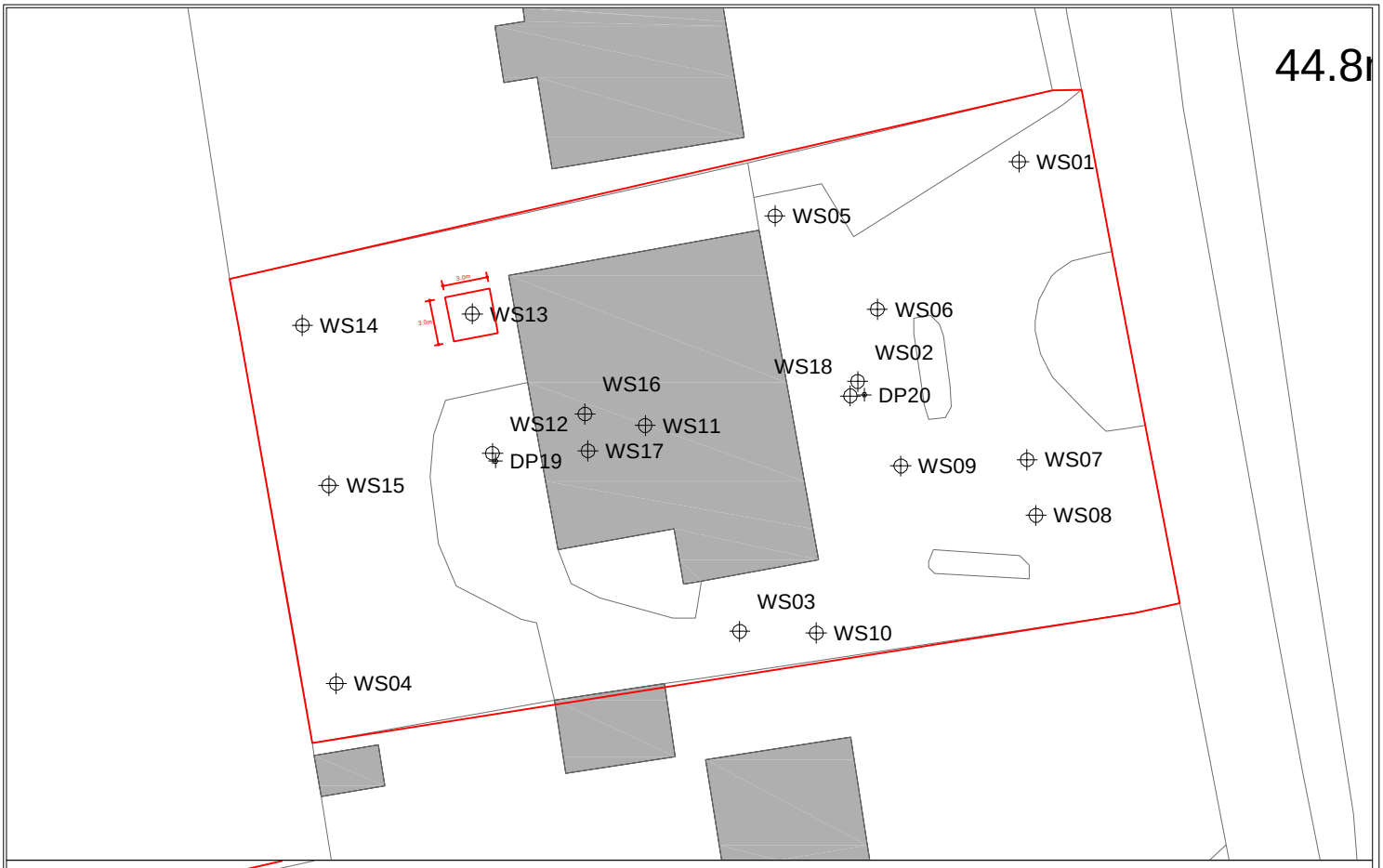
Please be aware that we only report compliance with specifications using 'simple acceptance' as a guide as the specifications for the material as well as the methodology for testing are well established and take into account uncertainty in their formulation.

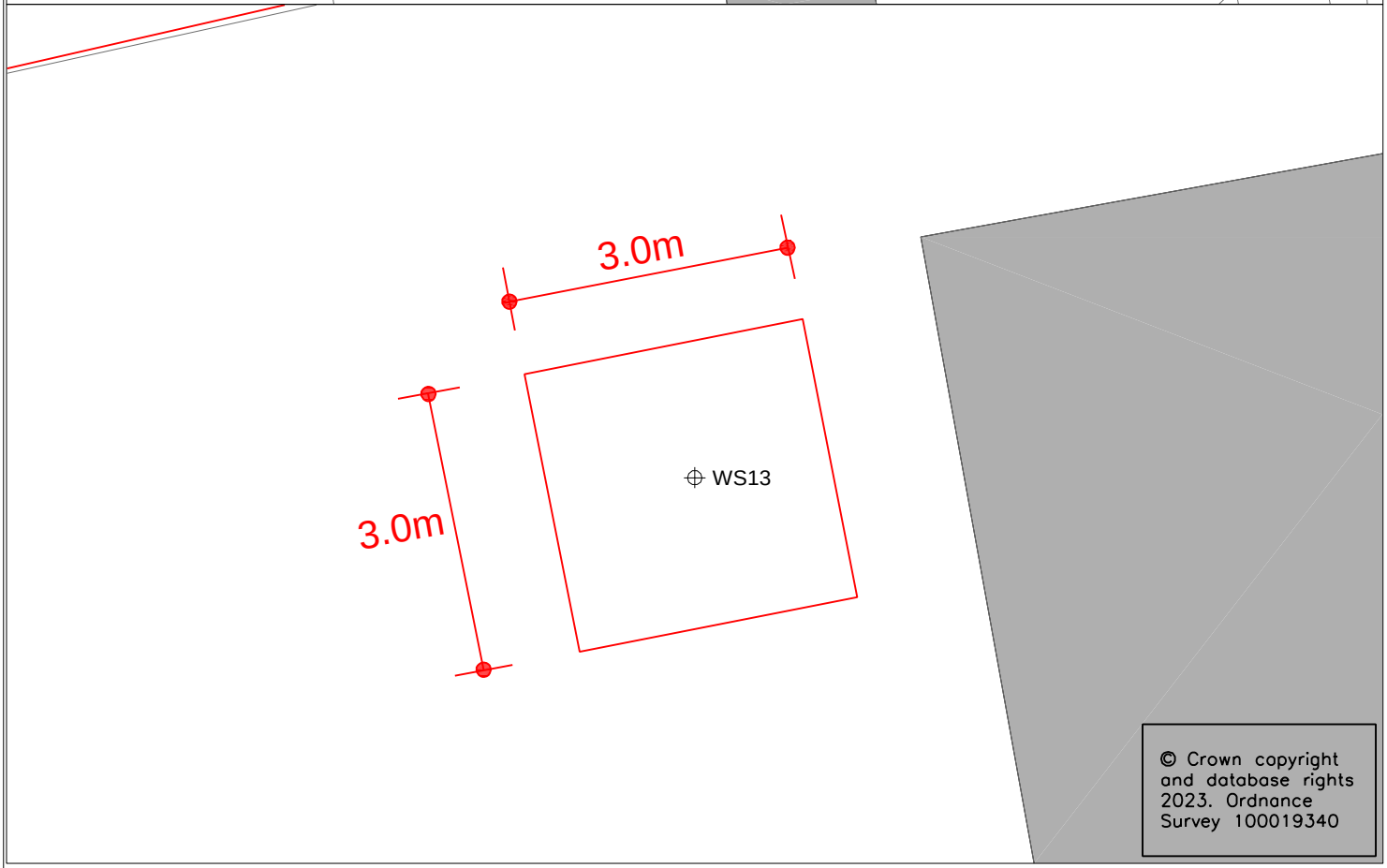
Test Code =604

UKAS TESTING 0920

Jim Elliott (Lead Technical Support Tech.)

Appendix F





Norfolk County Council

DRAWING TITLE

Area requiring remediation

Tom McCabe
Executive Director of
Community and Environmental Services
Norfolk County Council
County Hall
Martineau Lane
Norwich NR1 2SG

REV.	DESCRIPTION	DRAWN	CHECKED	DATE

	INIT.	DATE
SURVEYED BY		
DESIGNED BY		
DRAWN BY	SPB	12/23
CHECKED BY	IDB	12/23

DRAWING No. 104909- 003

PROJECT TITLE
Stowlangtoft : Former Pine House Company

SCALE No scale

FILE No. 104909

IG 12/10/16