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**Report on a
Phase 1 & 2
Geoenvironmental Investigation
For A
Proposed Development
On A Site Off
Main Street
Nailstone**

On Behalf of Michael Beeston

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This report is based upon archival research including the analysis of historical maps, geological and hydrological data and other relevant Third Party environmental information that GeolInvestigations Ltd have taken to be correct, and no liability can be accepted for any inaccuracies contained within the Third Party information referenced.

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1 Introduction

This report presents the findings of a Phase 1 & 2 Geoenvironmental investigation undertaken by GeoInvestigations Ltd at a site off Main Street, Nailstone, Leicestershire, on behalf of the 'Client', Mr Michael Beeston, in relation to a proposed residential development.

Plans showing the current layout and proposed development are appended.

The purpose of the ground investigation is to assist with addressing planning condition 6, relating to the need to assess the risk from potentially contaminated land, as presented below:

6. No development approved by this permission shall be commenced until a scheme for the investigation of any potential land contamination on the site has been submitted in writing to and agreed in writing by the Local Planning Authority which shall include details of how any contamination shall be dealt with. The approved scheme shall be implemented in accordance with the agreed details and any remediation works so approved shall be carried out prior to the site first being occupied.

Reason: To ensure that risks from land contamination to the future users of the land and neighbouring land are minimised in accordance with Policy DM7 of the adopted Site Allocations and Development Management Policies Development Plan Document (2016).

7. If during development, contamination not previously identified is found to be present at the site, no further development shall take place until an addendum to the scheme for the investigation of all potential land contamination is submitted in writing to and approved in writing by the Local Planning Authority which shall include details of how the unsuspected contamination shall be dealt with. Any remediation works so approved shall be carried out prior to the first dwelling being occupied.

Reason: To ensure that risks from land contamination to the future users of the land and neighbouring land are minimised in accordance with Policy DM7 of the adopted Site Allocations and Development Management Policies Development Plan Document (2016).

In addition, in situ and laboratory geotechnical testing is included to assist with foundation design for the new build.

Preliminary soakaway testing was also undertaken.

This report commences with the findings of a Phase 1 desk top study and site walkover survey undertaken to identify potential targets for intrusive investigation.

2 Site Location And Description

The site is located at the western end of Main Street, Nailstone, near Nuneaton in Leicestershire, at approximate post code CV13 0QB. It is a roughly rectangular shaped site measuring around 0.49 hectares in area, located on the northern side of Main Street, north-east of the junction within the main (A447) road.

The application boundary includes a former farmyard forming a quadrangle courtyard bordered by barns, which have been converted to dwellings along the eastern side, and also partway along the southern side of the quadrangle backing onto Main Street.

The buildings along the north and west of the quadrangle comprise the original brick-built barn buildings that have not been converted, and which are currently used for general storage.

There are two more recent timber buildings positioned on a concrete apron to the north of the quadrangle, which are to be removed and replaced with a new two to three storey dwelling with associated garage extending south towards the quadrangle, creating an 'L' shaped development.

The eastern timber building located on the concrete apron is used as a store, whilst the western building is a largely empty former stable block.

The application site boundary includes part of the pasture extending to the north beyond the northern application site boundary.

The site can be accessed from the west off the main A447 via two sets of gates to the north of the quadrangle. The site is also accessed off Main Street, via an unsurfaced gravel track along the eastern boundary of the site, leading around the north-east corner of the quadrangle, linking to the western access.

Photographs taken during a site walkover on 12th & 13th December 2024, showing the key site features, are presented below.



1. View south across the site from near the northern boundary towards the northern elevation of the barn on the northern side of the quadrangle.



2. View south-east across the site towards the western end of the wooden stable block.



3. View looking east across the northern part of the (application) site.



4. View looking north from near the northern (application) site boundary.



5. View looking north-east from near the northern (application) site boundary.



6. Access into site from A447 to the west of the site.



7. View east across the site from near the gated access from the A447 along the western boundary.



8. View east across the site from near the gated access off the A447, showing the timber stable block on the left-hand side.



9. View south towards quadrangle courtyard looking through access from northern side of quadrangle.



10. View towards the southern/south-eastern side of the quadrangle.



11. View across the quadrangle towards the southern side/south-western corner.



12. View towards the dwellings along the eastern side of the quadrangle. Raised soft landscaped garden constructed from imported topsoil taken from the adjacent field.



13. View looking towards south-west corner of the quadrangle from near centre of the quadrangle.



14. View east across the quadrangle from near the western side of the quadrangle.



15. View north from near centre of the quadrangle, towards storage barn along the northern side of the quadrangle.



16. View towards the north-western corner of the quadrangle, towards the empty stable block.



17. Items stored within former stable block in the north-western corner of the quadrangle.



18. As previous photograph, but looking into the adjacent stable unit.



19. Wooden stable block and adjacent wooden storage shed to the north of the quadrangle.



20. General items stored within the rear of the wooden stable block.



21. Western elevation of the wooden storage shed.



22. Pasture to the north of the wooden stable block, looking to the north/north-east.



23. View looking north along track along the eastern site boundary.



24. View towards site access along the eastern site boundary leading to Main Street, and towards the single storey dwelling at north-eastern corner of the quadrangle.



25. Area of infilled former pond located close to the north-eastern corner of the quadrangle.



26. View south towards the north-eastern corner (external) of the quadrangle buildings. Access archway on right hand side to quadrangle courtyard is visible.

The site is bordered to the north by the remainder of the grassed field (pasture) extending north beyond the application site boundary.

The main A447 highway runs north-south along the western boundary, with agricultural fields beyond to the west/north-west of the site.

There are residential properties to the east of the site, including a new residential development to the east/north-east of the application site centre.

The southern site boundary is bordered by Main Street, with residential properties beyond.

The junction of Main Street and the A447 extends around the south-west corner of the site.

The site is located on the western edge of Nailstone in a broadly rural setting. Topographically, the site is located on a broad flat-topped interfluvial area, rising gently to the east of the site.

Further to the north and also to the south of the site, the ground falls towards small brooks flowing west, located within the bottom of the valleys, which trend east-west.

3 Geology, Hydrogeology and Hydrology

3.1 Geology

The combined Enviro & Geo Insight report presented within Appendix 1 includes information provided by the British Geological Survey (BGS), which shows that there are no artificial or made ground deposits beneath the site, or within 250 metres of the site.

The site is shown to be underlain by superficial deposits of glaciofluvial sand and gravel.

The bedrock is shown to comprise mudstone belonging to the Gunthorpe Member (part of the Mercia Mudstone Group).

The site is not shown to be located within a Coal Authority high risk development area. The Coal Authority interactive map shows no recorded historical mineshafts within influencing distance of the site.

No faults are shown to affect the site.

The following table shows the level of risk associated with natural ground subsidence hazards:

Hazard	Negligible	Very Low	Low	Moderate	High
Collapsible Ground		x			
Compressible Ground	x				
Ground Dissolution	x				
Landslides		x			
Running Sand		x			
Shrink-Swell Clay	x				

Mining and Groundworkings

Britpits Records

BritPits (an abbreviation of British Pits) is a database maintained by the British Geological Survey of currently active and closed surface and underground mineral workings. Details of major mineral handling sites, such as wharfs and rail depots are also held in the database.

There are no sites recorded within the Britpits database located within 500m of the site boundary.

Surface Ground Workings Records

These are historical land uses identified from Ordnance Survey mapping, that involved ground excavation at the surface. These features may or may not have been subsequently backfilled.

There are no recorded historical surface ground working identified within 250 metres of the site.

Mining Records

The following table summarises the other records of mining: -

	On site	Within 250m	Within 500m
Underground workings	None	None	None within 1 km
Underground mining extents	None	None	None
Historical mineral planning areas	None	None	None
Non coal-mining areas	None	None	None
JPB records of mining areas	Yes		
Coal Authority non-coal mining areas	None	None	None
Researched mining	None	None	None
Mining Record Office plans	None	None	None
BGS mine plans	None	None	None
Coal	Yes		
Brine	None		
Gypsum	None		
Tin	None		
Clay	None		

The site is located within a coal mining area as defined by the Mining Remediation Authority (MRA) (formerly the 'Coal Authority'). However, according to the MRA interactive mapping the site is not within a Development High Risk Area and there are no recorded mineshafts within the locality or fissures\breaklines.

A record of coal investigation borehole 200 metres east of the site confirms the depth to the base of the Triassic strata of around 70 metres, at which depth the Coal Measures are recorded, with nearly 50 metres of rock above the shallowest coal seam.

It is concluded therefore that the risk of coal mining related subsidence is negligible.

Ground Cavities and Sinkholes

The records of natural cavities are based on an industry recognised national database. Sinkholes and caves are formed by the dissolution of soluble rock, such as chalk and limestone, gulls and fissures by cambering. Ground instability can result from movement of loose material contained within these cavities, often triggered by water.

There are no records of natural ground cavities or sinkholes.

The table below summarises the records of all ground cavities and sinkholes in the area.

	Within 500m	Within 1000m
Natural Cavities	None	
Mining Cavities	None	None
Reported Incidents since 2014	None	
Historical Incidents	None	
National Karst Database	None	

3.2 Hydrogeology and Hydrology

Permeability

A qualitative classification of estimated rates of vertical movement of water from the ground surface through the unsaturated zone of bedrock (the zone between the land surface and the water table) is provided by the BGS.

The superficial deposits maximum and minimum permeability is classified as 'Very High to High'; the flow type is classified as 'Intergranular'.

The bedrock maximum and minimum permeability is classified as 'Low'; the flow type is classified as 'Fracture' flow.

Aquifers

The superficial deposits are classified as a Secondary 'A' aquifer. These are 'permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers'.

The bedrock beneath the site is classified by the Environment Agency as a Secondary 'B' aquifer.

These are 'predominantly lower permeability layers which may store/yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers'.

Groundwater Vulnerability

An assessment of the vulnerability of groundwater to a pollutant discharged at ground level based on the hydrological, geological, hydrogeological and soil properties within a one kilometre square grid. Groundwater vulnerability is described as High, Medium or Low as follows:

- High - Areas able to easily transmit pollution to groundwater. They are likely to be characterised by high leaching soils and the absence of low permeability superficial deposits.
- Medium - Intermediate between high and low vulnerability.
- Low - Areas that provide the greatest protection from pollution. They are likely to be characterised by low leaching soils and/or the presence of superficial deposits characterised by a low permeability.

Both the superficial deposits and the bedrock are assessed as being of 'Medium' vulnerability.

Abstractions and Source Protection Zones

There are no currently active groundwater abstractions, or potable abstractions, within 2 km of the site.

The nearest surface water abstraction is located 1,491 metres to the south-west of the site from a tributary of the Carlton Brook, for trickle irrigation.

The site is not located within a groundwater abstraction Source Protection Zone (SPZ).

Hydrology

There are no surface water features within 250 metres of the site.

Flooding

The site is not located within a Flood Zone 2 or 3. There is a reported negligible risk of surface flooding and negligible risk of groundwater flooding.

3.3 Radon

According to the British Geological Survey, the site is located within an area where less than 1% of properties measured exceed the threshold. Radon protection measures are not required for new residential properties and/or extensions to residential properties.

4 Site History

Copies of the available historical Ordnance Survey mapping are presented in Appendix 2. These have been reviewed to identify potentially contaminative uses of the site and surrounding areas that may have impacted on the ground beneath the site.

The earliest historical mapping of **1886** shows the site included the quadrangle of presumably farm buildings and possibly a farmhouse around the central courtyard, although there were gaps in the quadrangle of buildings at this time, which were later largely infilled with additional structures.

There is a pump 'P' (water well) shown in the east of the quadrangle, and an additional one close by, but off-site to the east.

The land to the north of the buildings at this time is shown to comprise a large field, with a hedgerow or row of separate trees extending from the north-west corner of the quadrangle.

A small roughly circular feature was present close to the north-east corner of the building quadrangle on the outside of the quadrangle. This is considered very likely to have been a pond.

Beyond the site, the only potential contaminative activity at this time identified is a 'Smithy' located around 75m to the south-west of the site.

Within 250 metres of the site, the land use is shown to be largely residential at this time, with properties bordering the road extending along the southern site boundary and east into Nailstone, which appears to comprise essentially residential properties and possible farmsteads.

The **1903** mapping shows little change to the site and surrounding area, other than the water well (or pump) within the quadrangle is no longer shown.

The next available historical Ordnance Survey mapping is dated **1955** (small scale) and **1958** (large scale). These editions no longer show the presence of the pond, and the Smithy is labelled as 'The Smithy Farm', which suggests this site was no longer a Blacksmith.

The field boundary extending from the north-west corner of the quadrangle was no longer shown at this time.

Other than expansion of residential properties associated with Nailstone village, no other changes of significance are noted.

At some point between **1966** and **1978** a small plot of land to the east of the quadrangle on the site had been developed with a residential property.

No other changes of note are apparent in the surrounding area by this time.

Between **1994** to **2003**, the large-scale historical mapping shows that the field to the north of the quadrangle of buildings on the site had been fenced to define the current northern and eastern site boundaries, and a small building had been constructed in the east/north-east of the site, which is likely to be the wooden storage building currently present at that location.

By **2011** a square (probable concrete apron) had appeared to the west/south-west of the wooden storage shed, and by **2019** a building likely to be the current wooden stable is shown.

5 Environmental Data Reports

A GroundSure Enviro-Insight report is also included within the report presented within Appendix 1 and this has been reviewed in order to identify current and historical potential on site and off-site sources of contamination that may have impacted, or currently be impacting, on or beneath the site.

5.1 Sources of Potential Contamination

5.1.1 Historical Industrial land use

The Enviro-Insight report identifies the site to have been formerly part of the 'Smithy' located to the south-west of the site, although this is considered erroneous. There is no reason to suspect the site has been part of the Blacksmiths works.

The nearest historical electricity substation is located 128m east of the site.

There are no historical petrol filling stations or garages within 500m of the site.

5.1.2 Landfill and Other Waste Sites

Landfill & Other Waste Sites

There are no records of currently active/recent, or historical landfill sites located within 500m of the site.

There are no records of historical waste sites or licensed waste sites within 500m of the site.

Licensed Waste Sites

These are records of active or recently closed waste sites under Environment Agency/Natural Resources Wales regulation.

The nearest licensed waste site is recorded at a location 496 metres north of the site. This relates to the Nailstone Depot Transfer Station, taking Non-Biodegradable Wastes. (EPR reference: A/EPR/MP3492FR).

Waste Exemptions

These are activities involving the storage, treatment, use or disposal of waste that are exempt from needing a permit. Exemptions have specific limits and conditions that must be adhered to.

There are 5 locations within 250 metres of the site recorded to have waste exemptions: -

Distance & Direction	Site Name	Exemption Type
24m SW	Elmside Farm	Disposing, treatment, using & storage.
67m SE	Stud Farm	Disposing, treatment, using & storage.
78m SW	Elmside Farm	Disposing, treatment, using.
82m SW	Nailstone Depot	Storage.
97m SW	LCC Nailstone Depot	Using.

5.1.3 Recent Industrial Land Uses

The following table summarises the records of current industrial land use within 250 metres of the site.

Ref.	Activity	Distance & Direction
1	Kirby Proseal. Construction Completion Services.	20m S
2	Electricity Sub-Station.	132m E

A summary of the records relating to other current industrial land uses and processes is presented over-page: -

Record	'Y'=Yes (distance/direction)	'N'=None (within radius)
Current or recent petrol stations		N (500m)
Sites determined as contaminated land		N (500m)
Control of Major Accident Hazards (COMAH)		N (500m)
Regulated Explosives Sites		N (500m)
Hazardous Substances Storage/Usage (NIHHS)		N (500m)
Historical Licensed Industrial Activities (IPPC)		N (500m)
Licensed Industrial Activities (Part A(1))		N (500m)
Licensed Industrial Activities (Part A(2)/B)		N (500m)
Radioactive Substance Authorisations		N (500m)
Licensed Discharges to controlled waters	Y (493m N)	
Pollutant release to surface waters (Red List)		N (500m)
Pollutant release to public sewer		N (500m)
Dangerous Substances (List 1)		N (500m)
List 2 Dangerous Substances		N (500m)
Pollution Incidents (EA/NRW)	Y (297m W)	
Pollution Inventory substances		N (500m)
Pollution inventory waste transfers		N (500m)
Pollution inventory radioactive waste		N (500m)

The Licensed Discharge to controlled waters relates to the discharge of surface water from the 'Nailstone Depot' to a surface water course.

The pollution incident recorded date is 9/5/2002. It was a minor (Category 3 incident) relating to the disposal on land of inert construction material wastes.

5.2 Potential Contamination Receptors and Pathways

Aquifers

The Environment Agency has classified the superficial deposits as a Secondary 'A' aquifer, and the bedrock beneath the site as a Secondary 'B' Aquifer.

Groundwater Vulnerability

The superficial and bedrock aquifers are classified as being of 'Medium' vulnerability.

Abstractions and Source Protection Zones

There are no currently active groundwater abstractions, or potable abstractions, within 2 km of the site.

The nearest surface water abstraction is located 1,491 metres to the south-west of the site from a tributary of the Carlton Brook, for trickle irrigation.

The site is not located within a groundwater abstraction Source Protection Zone (SPZ).

Hydrology

There are no surface water features within 250 metres of the site.

Environmentally Sensitive Sites

The site is not considered to be located within influencing distance of any environmentally sensitive sites with environmental designations.

6 Preliminary Conceptual Site Model

6.1 Introduction

A **Site Conceptual Model** is a simplified representation of the ground conditions beneath the site that enables a qualitative or quantitative risk assessment to be carried out. The Site Conceptual Model identifies the potential sources of contamination, the potential contaminant migration pathways and the potential receptors of contamination (i.e. the 'potential pollutant linkages').

Sources of contamination include contaminating current or historical uses, activities, events or substances at the site or within the surrounding area that may impact on underlying soils or groundwater.

Contaminant Migration Pathways are the routes that contaminants follow from sources to receptors.

Receptors of contamination include human and non-human organisms, controlled waters (groundwater or surface water) and building materials (concrete or plastic) that experience adverse effects on exposure to contaminated materials.

A **Pollutant Linkage** occurs when a contaminant is able to travel from a source, via a pathway, to a receptor. Each element may exist in isolation and pose no environmental risk. It is only when all three elements are linked to each other that a pollutant linkage exists and poses an environmental risk.

The information obtained from the site walkover survey, a review of the historical maps and the GroundSure report information, has been reviewed to identify potential pollutant linkages that may be active, and these are discussed within the following sections of the report.

6.2 Potential Sources of Contamination

Potential contamination sources may present risks to human health, ecological receptors, building materials and controlled waters (groundwater and surface water) at the site, either from on-site sources or through cross boundary migration from off-site contamination sources onto the site.

On-site sources of contamination if present may also impact on off-site receptors through cross boundary migration of contamination.

On-site sources

The infilled pond near the north-eastern external corner of the quadrangle of buildings is considered to present a potential source of contaminated soil and hazardous ground gases, depending on the nature of the infill.

Import of materials to create hardstanding areas, may also have introduced substances harmful to health such as hardcore containing asbestos containing materials, and ash/foundry slag.

There is no evidence of any above ground storage tanks (ASTs) for DERV or heating oil, or any evidence of storage of agrochemicals.

Off-site potential sources

There are no potentially contaminative uses identified off-site considered to be capable of causing an unacceptable risk of contamination on or beneath the site of interest.

6.3 Potential Receptors, Pathways and Preliminary Risk Assessment

The on-site infilled pond may still represent a source of hazardous ground gases along with being a source of contaminated soil, including potentially asbestos containing materials (ACMS), toxic heavy metals, polycyclic aromatic hydrocarbons, petroleum hydrocarbons, depending on the source and nature of the infill materials.

As the pond was infilled by 1955 at the latest, it is considered unlikely that hazardous landfill gas generation will still be active, although residual landfill type gases may remain within the soil atmosphere. Volatile organic compounds if they were present initially are very likely to have largely degraded by now, but heavier hydrocarbons may remain.

Future site occupants of the new dwellings may potentially be exposed to contaminants within the infill materials in the pond, and/or hazardous ground gases in the soil atmosphere if drawn into the proposed residential properties adjacent to the pond.

The soils are reported to comprise sands and gravels which are relatively permeable to gases as the soil pores are larger than within fine grained soils (i.e. clays and silty clays), and with better connectivity.

Advective flow of soil gases may be driven by the difference between the pressure inside a building and the soil (known as the “stack effect”), caused by wind passing over a building. This effect may be significant for volatile organic compounds (and radon transport), but methane migration by this mechanism presents a very low risk.

Barometric lag is also an important factor, along with the permeability of the ground, and rapidly rising groundwater can also cause pressurisation of gas within the soil atmosphere. Slowly rising groundwater is not likely to cause large widespread emissions of gas from the ground. This could cause a localised hazard however, if the soil gases are channelled to a highly permeable pathway.

Materials imported as sub-base to hard surfaced yard areas and beneath floor slabs, may have included local industrial wastes such as foundry slag and ash, along with demolition rubble containing asbestos containing materials, which could present a risk to future occupants of the development if not removed from beneath soft landscaped garden areas.

Table 6.1 over-page summarises the potentially active pollutant linkages identified for the site, and also a qualitative assessment of the risk based on the framework presented within CIRIA C552 ‘Contaminated Land Risk Assessment’ 2001, which provides a risk rating based on the severity of the consequence of an incident and the probability of that incident occurring.

Tables 6.2 and 6.3 that follow Table 6.1 define the risk ratings presented within Table 6.1.

Table 6.1: Summary of Potential Pollutant Linkages

	Source or hazard	Pathways	Receptors	Risk Rating
1	Hazardous ground gases and within the soil atmosphere within and surrounding the infilled pond.	Drawing of hazardous gases in the soil atmosphere into dwellings close to the pond, followed by inhalation, or asphyxiation, or fire/explosion of methane mixtures in air.	Future occupants.	Very low.
2	Contaminants within the pond infill, in material imported as hardcore and sub-base, and localised spillages of agrochemicals and fuels.	i) Soil and dust ingestion ii) Consumption of homegrown fruit and vegetables. iii) Skin contact with dust (indoors). iv) Skin contact with soil (outdoors). v) Inhalation of dust (indoors). vi) Inhalation of dust (outdoors). vii) Inhalation of vapours (indoors). viii) Inhalation of vapours (outdoors).	Future occupants.	Low. Low. Low. Low. Low. Low. Very Low. Very low.

Table 6.1 above does not address the risk to construction workers, which should be assessed by the principal contractor, based on the available ground investigation information.

Table 6.2: Description of the classified risks and likely action required.

Very high risk	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.
High risk	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short term and are likely over the longer term.
Moderate risk	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and

	to determine the potential liability. Some remedial works may be required in the longer term.
Low risk	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
Very low risk	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.

Table 6.3: Comparison of consequence against probability.

		Consequence			
		Severe	Medium	Mild	Minor
Probability	High likelihood	Very high risk	High risk	Moderate risk	Moderate/ low risk
	Likely	High risk	Moderate risk	Moderate/ low risk	Low risk
	Low likelihood	Moderate risk	Moderate/ low risk	Low risk	Very low risk
	Unlikely	Moderate/ low risk	Low risk	Very low risk	Very low risk

7 Intrusive Ground Investigation Works

7.1 Scope of Intrusive Ground Investigation Works

Based on the findings of the desk study, the following intrusive investigation works are proposed, as summarised below: -

Exploratory Hole Ref.	Purpose
WS1	Geotechnical sampling and in situ testing. Standpipe installation for groundwater level and gas monitoring.
WS2/DP2	Geotechnical sampling and in situ testing.
WS3/DP3	Geotechnical sampling and in situ testing. Standpipe installation for groundwater level and gas monitoring.
WS4	Geotechnical sampling and in situ testing. Standpipe installation for groundwater level and gas monitoring.
WS5, WS5A	Sampling for chemical contamination analysis of pond infill. Standpipe installation for groundwater level and gas monitoring.
WS6	Sampling for chemical contamination analysis of pond infill.
HDP1	Sampling of near surface soils within proposed soft landscaped garden area.
HDP2	Sampling of near surface soils within proposed soft landscaped garden area.
HDP3	Sampling of near surface soils within proposed soft landscaped garden area.
TPSA1	Soakaway testing.
TPSA2	Soakaway testing.

WS – Windowless sampler boreholes

DP – Super heavy dynamic probe holes

HDP – Hand dug pits

TPSA – Soakaway Test Pits

An additional borehole was required within the pond (WS5A) as WS5 struck an obstruction at 0.5m and could not be progressed.

The soakaway trial pit excavations and infiltration testing were undertaken on the 12th December 2024.

The hand dug pits were excavated on 12th December 2024.

The boreholes were drilled on 16th December 2024 and 20th December 2024. The boreholes were drilled by dynamic sampling methods using windowless samplers with soils taken into plastic liners.

The geotechnical boreholes (WS1 to WS4) were cased using temporary steel liners to prevent collapse of the water bearing sands encountered. This is slower than drilling without casing, hence a return visit to site was required to complete the boreholes.

The boreholes were topped up with water before undertaking the Standard Penetration Tests to prevent 'blowing sand' conditions and the consequential reduction in SPT 'N' values associated with blowing sands.

The standpipes were installed before pulling the casing to ensure the boreholes sides did not collapse before the standpipes could be installed to the base of the holes.

The standpipes comprise 35mm slotted pipes with 'geosock' filters, and only a 0.5m plain section at the top, with a bentonite seal from ground level to 0.50m below ground level. This was due to the high water-table beneath the site, as a minimum standard (for hazardous ground gas monitoring) 1.0m plain section with 1.0m bentonite seal would result in the standpipe slots being open only below the water table.

The exploratory hole arisings were logged by a Chartered Geologist from GeoInvestigations Ltd, who also took sub-samples for laboratory testing.

The locations of the exploratory holes are shown on appended Drawing 746-D-01, and the logs presented within Appendix 3.

Selected representative samples were taken for laboratory analysis and these were placed in appropriate sample containers provided by the laboratory. The chemical samples were stored in cooler boxes with icepacks to await collection and same day delivery to the accredited laboratory of i2 Analytical, Watford.

7.2 Strata Encountered

Made Ground

Boreholes WS5, WS5A and WS6 were drilled within the infilled pond area, proving a maximum thickness of 1.1 metres of made ground, comprising brown, slightly reddish brown, and dark brown organic silty clay with rootlets, fine to medium gravel of rounded quartzite, flints, and fine brick fragments.

Within borehole WS5A a lower layer of dark grey to black clayey, silty sand was also proven with angular sandstone fragments, rounded quartzite pebbles and a layer of concrete at the base.

Within borehole WS6, a layer of dark brown silty sandy clay with red brick fragments, rounded quartzite gravel, flint and fine brick, was encountered above a soft dark grey clay below 0.75m, containing a little coal ash.

Hand dug pit HDP3 also proved made ground beneath the quadrangle courtyard area, where a proposed soft landscape garden area is proposed. The made ground encountered comprises a thin upper layer of decorative chippings above brick and concrete hardcore with admixed fine to coarse gravel of 'tarmac' (tar/bituminous bound macadam) to 0.45 metres below ground level.

Within borehole WS2, made ground was also proven, comprising 0.45 metres of sandy roadstone rock chippings with occasional fragments of brick, above a soft grey clay with much gravel, and a cobble, of red brick to 0.65 metres below existing ground level (m begl).

Within borehole WS3, a 0.15m thick upper layer of black, sandy gravel of tar/bitumen bound macadam fragments was proven, above a firm dark grey silty clay layer with a little to some gravel of quartzite and flint extending to 0.45m begl.

Borehole WS4 was also drilled through an upper layer of unbound road pavement materials including a 0.20m thick upper layer of black, sandy gravel of tar/bitumen bound macadam with some gravel of concrete, above a layer of firm dark grey silty clay with some gravel of quartzite and an occasional coarse gravel of red brick.

The remaining exploratory holes proved natural soil materials from the ground surface, although locally rare fine red gravel of possible brick fragments was found in near surface ‘topsoil’, suggesting local reworking.

Superficial Geology

The natural soils included an upper layer of ‘topsoil’¹ type material within the field in the northern half of the site, as identified within borehole WS1, hand dug pits HDP1 and HDP2, and the two soakaway test pits, TPSA1 and TPSA2.

The ‘topsoil’ comprises soft dark brown silty, sandy to very sandy organic rich clay with rootlets some gravel of mainly rounded quartzite (‘pebbles’) and lesser other natural lithologies. This upper layer was proven to a depth of between 0.40m to 0.95m begl.

Below the topsoil or made ground, the natural superficial deposits were found to comprise water bearing sandy gravels or gravelly sands with variable percentages of fines, interbedded with soils logged as sandy gravelly clays.

The sands and gravels are generally medium dense within the SPTs at 1.0 metre below ground level, but looser at greater depth.

The soils logged in the field as sandy gravelly clays are variable in strength, but tend to be firm, becoming soft to firm with depth. The generally high percentage of gravel within the clays gives higher SPT ‘N’ values than would be expected if the clay was free of gravel.

The base of the superficial deposits was not proven within the boreholes, which were drilled to a maximum depth of 4.45m begl.

7.3 Groundwater Level Observations

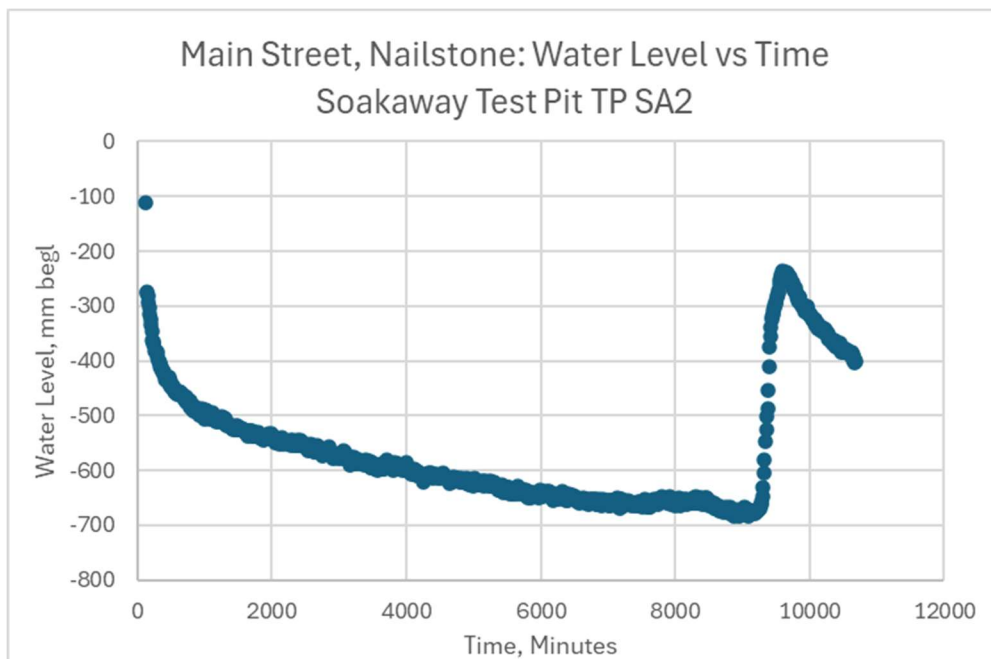
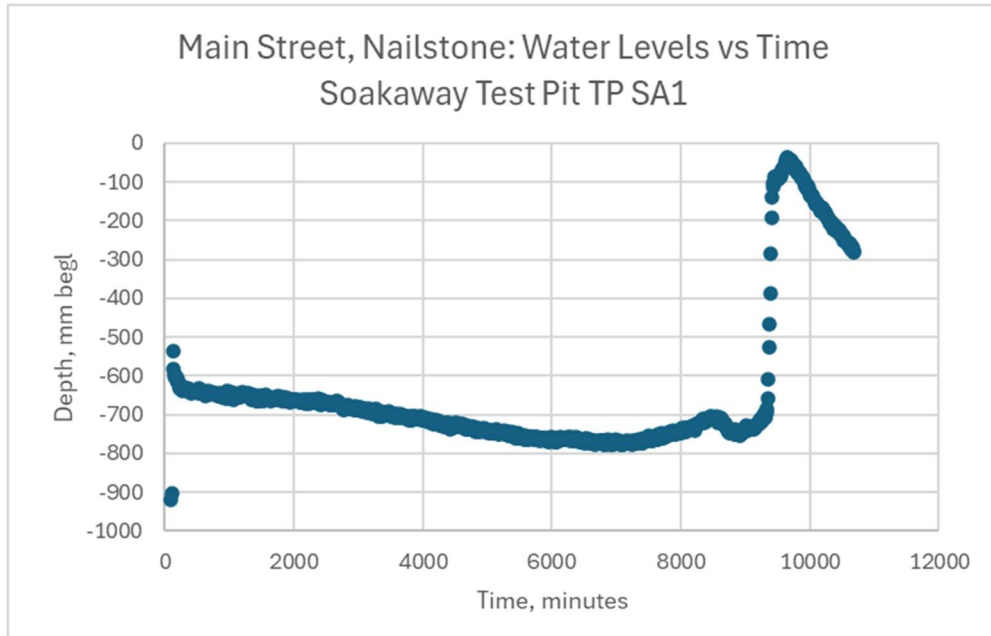
Groundwater seepages were observed in most exploratory holes. Monitoring of the standpipes after allowing time for stabilisation was undertaken on 10th January 2025, and the following levels recorded:

Exploratory Hole Ref.	Depth to water table
WS1	0.55m begl (2.65m to base)
WS3	0.60m begl (2.65m to base)
WS4	1.24m begl (2.78m to base)
WS5	0.57m begl (2.51m to base)
TPSA1	0.62m begl (1.45m to base)
TPSA2	0.53m begl (1.62m to base)

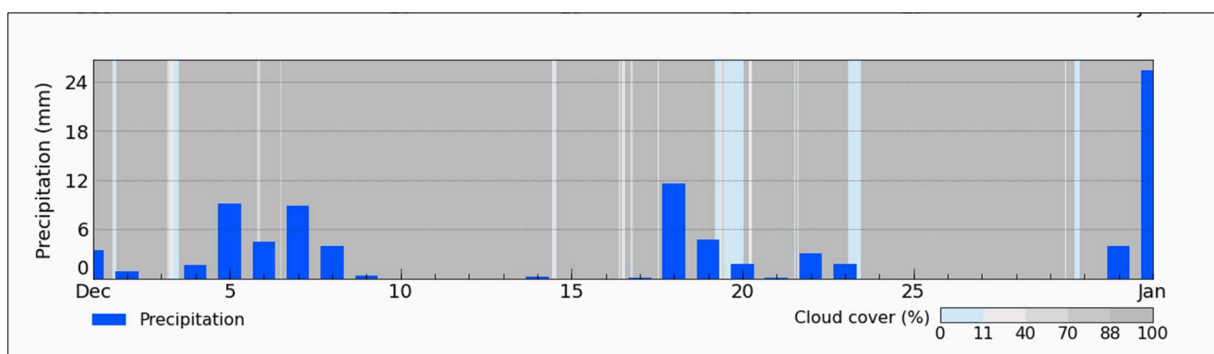
m begl = metres below existing ground level.

The water level data recorders inserted into the monitoring standpipes installed in trial pits TPSA1 and TPSA2 on 12th December 2024 were removed on 19th December 2024 and the water pressure data downloaded. The two graphs over-page present the water level data derived from the water pressure readings recorded from 12th December to the 19th December 2024.

¹ Use of the term ‘topsoil’ does not necessarily infer compliance with the British Standard Specification for topsoil (BS 3882:2015).



Both monitoring devices show a sudden rapid rise in the water levels in both trial pits commencing on 18th December 2024 at around 5 pm, which corresponds to a rainfall event on the 18th December 2024, as recorded at the nearby East Midlands Airport (see over-page).



(Rainfall Data December 2024, East Midlands Airport. Data from meteoblue.com)

The groundwater monitoring data in conjunction with the rainfall data shows a very rapid response of the groundwater table level to rainfall within both trial pits, with a rise of around 0.5m to 0.6m over the course of around eight hours.

Typically, there is a lag between a rise in groundwater level and a period of rainfall, as time for soil infiltration through the surface layers is required. However, such a rise observed beneath this site during a rainfall period indicates the groundwater beneath the site is closely connected to the surface, or a rapid infiltration within higher ground off-site is impacting on levels beneath the site through a pathway such as a buried channel or former stream.

7.4 Laboratory Testing

Representative samples were scheduled for chemical laboratory analysis in accordance with a general contaminative screening suite (i2 Analytical Ltd Standard Spectrum Suite) considered appropriate in relation to the previous use of the site, and site observations during drilling.

The testing of the samples included asbestos screening, determination of pH, concentrations of total cyanide, total sulphate, sulphide, total organic carbon, polycyclic aromatic hydrocarbons (USA EPA 16 priority compounds), toxic metals (suite of 11), and petroleum hydrocarbons (with carbon banding and also aliphatic/aromatic split).

Two samples of the natural topsoil from hand dug pits HDP1 and HDP2 were selected for analysis, along with one sample of the sub-base beneath the proposed garden area within the quadrangle area from HDP3.

Samples taken from the infilled pond from boreholes from boreholes WS5A and WS6 were also subject to chemical laboratory testing.

Geotechnical laboratory analysis of selected samples was also undertaken including predominantly particle size distribution testing (8 No.) to confirm soil classification, particularly of borderline cohesive/granular strata, and plasticity index testing (5 No.) on clay soils to enable confirmation of volume change potential of the shrinkable strata.

Additional samples of the natural soils were also analysed for pH and water-soluble sulphate to establish if protection requirements against acid and sulphate attack are required for buried concrete.

The laboratory test certificates are presented in Appendices 4 and 5 for chemical laboratory test results and geotechnical laboratory test certificates respectively.

8 Contamination Assessment

8.1 Assessment Criteria

The contamination test data for the soils have been compared against published 'Tier 1' generic assessment criteria (GAC), for a 'residential with home grown produce' land-use.

In the first instance, the Tier 1 GAC's adopted comprise the LQM/CIEH S4ULs (Suitable For Use Screening Levels) for Human Health Risk Assessment (Copyright Land Quality Management Limited reproduced with permission; Publication No. S4UL3429. All rights reserved).

The S4ULs currently exclude Lead, hence the Defra approved Category 4 Screening Levels² (C4SLs) have been adopted. For the proposed development, the C4SL for a commercial use is relevant, for which 200 mg/kg is considered acceptable for total Lead in soil.

A peer reviewed in house generic assessment criteria of 40 mg/kg has been adopted for total cyanide for screening purposes.

On the 19th April 2021, the Environment Agency updated their Land Contamination Risk Management (LCRM) guidance, advising that the C4SLs are suitable for the assessment of land contamination under the planning regime, as well as for Part 2A assessments. They also state that where there is a Soil Guideline Value (SGV) and a C4SL value, the C4SL value should be adopted for the assessment.

The S4ULs are more conservative than the C4SLs, and have been adopted in the first instance, as a conservative screening tool to identify potential contaminants of concern. Where a S4UL is exceeded, the C4SL value is consulted to establish if remedial works may be necessary, or further detailed site-specific risk assessment to derive a development specific assessment criterion.

Where a determinand exceeds one or more GAC, further consideration of the risk is required to establish if remedial works are required. This can include statistical analysis of the soils, supported by further sampling and analysis where appropriate.

8.2 Soil Chemical Contamination Test Results

Appended Table A presents all the chemical test results, along with the adopted generic assessment criteria (GAC).

Table 8.1 over-page summarises the results that exceed their adopted GAC.

² CL:AIRE. SP1010. 'Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination.' 20.12.13.

Table 8.1: Summary of Results Exceeding GACs							
				Sample Reference		HDP3	WS6
				Depth (m)		0.08-0.45	0.50
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status	GAC Resi with home-grown produce (SOM 1%)	GAC for new planting		
Speciated PAHs							
Phenanthrene	mg/kg	0.05	MCERTS	95		140	0.33
Benzo(a)anthracene	mg/kg	0.05	MCERTS	7.2		66	0.85
Chrysene	mg/kg	0.05	MCERTS	15		66	0.9
Benzo(a)pyrene	mg/kg	0.05	MCERTS	2.2		67	0.89
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.24		6	0.22
Heavy Metals / Metalloids							
Boron (water soluble)	mg/kg	0.2	MCERTS	290	3	0.8	4
Lead (aqua regia extractable)	mg/kg	1	MCERTS	200		210	91
TPHCWG - Aromatic >EC16 - EC21 EH_CU_1D_AR	mg/kg	10	MCERTS	260		270	-

With reference to appended Table A, and Table 8.1 above, it is apparent that the results for only one of the samples tested were found to exceed their respective adopted generic assessment criteria.

The sample was taken from hand dug HDP3 of the shallow made ground within the proposed private domestic garden area within the quadrangle courtyard.

The contaminants identified predominantly comprise polycyclic aromatic hydrocarbons (PAHs), and these are considered to be associated with the fragments of tar/bituminous macadam (i.e. 'tarmac' road surfacing materials), which typically contain elevated PAHs.

The marginally elevated aromatic petroleum hydrocarbon fraction EC16 to EC21 is also likely to be associated with the tarmac fragments.

The source of the marginally elevated Lead concentrations within this sample of made ground is not obvious from the nature of the material identified.

The sample of made ground from the infilled pond areas from borehole WS6 was found to contain 4 mg/kg of water-soluble boron, which is above the recommended threshold for new planting of 3 mg/kg.

No asbestos was identified in any of the samples tested, and it is noted that no volatile organic compounds, or elevated concentrations of other heavier petroleum hydrocarbons, were identified within the fill material encountered within the pond.

8.3 Risk Assessment & Proposed Remediation Strategy

The only sample showing chemical contamination concentrations above the generic assessment criteria (GACs) in relation to human health and the proposed 'residential with home grown produce' land-use was the sample taken from hand dug pit HDP3 from within the quadrangle courtyard area, where a soft landscaped garden area is proposed.

The 0.45 metres of made ground above the natural soil was found to be impacted by elevated polycyclic aromatic hydrocarbons (PAHs) and marginally impacted by a heavy aromatic petroleum

hydrocarbon fraction, both considered to be related to the 'tarmac' road pavement fragments within the made ground.

As the 'tarmac' is not in the form of a sealed hard standing surface, but as fragments within the soil matrix, the associated contaminants are available and the following pollutant pathways are considered active in absence of remedial action:

- i) Soil and dust ingestion
- ii) Consumption of homegrown fruit and vegetables.
- iii) Skin contact with dust (indoors).
- iv) Skin contact with soil (outdoors).
- v) Inhalation of dust (indoors).
- vi) Inhalation of dust (outdoors).

In the absence of any volatile organic compounds, the vapour inhalation pathway is considered inactive.

The maximum ratio of contaminant concentration to GAC is for benzo(a)pyrene, for which the ratio is 30 (i.e. 67/2.2). On this basis, a simple cover system layer comprising acceptable topsoil and subsoil up to 600mm deep as calculated in accordance with BRE 465 'Cover Systems for Land Regeneration (2004)', is not considered appropriate.

Under these circumstances, either complete removal of the impacted made ground material from beneath the proposed soft landscaped area is required, or placement of a cover system incorporating a basal proprietary high visibility 'no-dig'/warning barrier geotextile at the base of the a cover system.

Above the warning membrane, a combined thickness of 600mm of proven acceptable topsoil and subsoil should be placed.

Some excavation of the contaminated material may be necessary to accommodate the 600mm of the cover system.

However, if all of the contaminated material is excavated and removed to expose the uncontaminated soil beneath, then no remedial capping is required, and the area can be backfilled with proven acceptable sub-soil and topsoil, appropriate to the proposed planting scheme.

Generally a maximum thickness of 300mm of topsoil is appropriate, deepened where advised for planting of trees, in deeper, specially prepared 'tree pits'.

The above remedial cover system will also address the elevated lead and elevated heavy petroleum hydrocarbon fraction identified within the made ground at this location.

Whilst elevated boron presents a threat to new planting, the concentration detected (4 mg/kg) in one of the samples of the made ground used to infill the pond is not considered to present sufficient threat to warrant new planting within this shared area of open space, which had a health cover of lawn at the time of the investigation.

All subsoil, topsoil and granular fill material used to provide the remedial cover system, if adopted, or used to replace the excavated contaminated fill if wholly removed, shall be subject to validation sampling and analysis after placement, and a verification report provided.

Although the roof tiles appear to comprise fired clay, an asbestos survey by a qualified surveyor is advised prior to refurbishment of the structures in accordance with best practice.

8.4 Hazardous Ground Gas Assessment

The detailed radon report within the appended GroundSure report shows that the site is not located within a radon affected area.

There are no records of current or historical landfills within 250 metres of the site.

The Phase 1 assessment concluded that the infilled pond on site presents a 'low' level of risk from hazardous ground gases to the proposed residential properties that will be located immediately adjacent to the pond, after conversion of the barn.

In assessing the risk, reference has been made to NHBC Publication NF94 'Hazardous ground gas - an essential guide for housebuilders', published April 2023, and British Standard BS8485 'Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings'. BSI 2019.

This investigation has shown the former pond to have been infilled to a maximum proven depth near the centre of 1.10 metres below ground level, by the mid 1950's, using essentially a topsoil type material with a little admixed brick and a little ash. By now, any readily biodegradable material deposited, such as materials found in domestic waste, would have decayed long ago, leaving only material less resistant to decay, such as the root matter within the topsoil type backfill.

Whilst there is organic matter within the fill, it is in the form of natural material which does not generate hazardous ground gases rapidly, and as it is within a clay soil matrix, the migration rate is considered very low at source.

However, the pond clayey infill is surrounded by more permeable sand and gravel, which may have allowed migration of hazardous ground gases above the water table with the soil pores by diffusion processes.

As there is to be a residential building immediately adjacent to the pond, with a possible ground bearing slab and no sub-floor ventilation, as is associated with a suspended floor slab, it was considered prudent to determine if there is a source of hazardous ground gas within the pond backfill materials, and also whether there is any evidence of lateral migration.

On this basis, it was proposed that the four standpipe installations be subject to spot gas monitoring using a Gas Data GFM 436 portable gas meter, including one within the pond (WS5A) and three at progressively further distances away from the pond (WS4, WS3 and WS1)

At the time of preparing this report, two visits have been completed and the results presented within Appendix 6.

The first two visits have not identified any detectable methane and no significant/elevated carbon dioxide (2% v/v maximum within WS4 outside the pond), and no detectable hydrogen sulphide or carbon monoxide.

Oxygen depletion was also identified within the standpipe in borehole WS4, with a reduction to 13% v/v.

During the first site visit, when the ground was frozen, a slightly negative gas flow rate (-0.4 l/hr) was detected within borehole WS4, indicating air was flowing through the gas meter into the ground, suggesting that the frozen ground had enabled a differential pressure to develop.

However, during the second visit, a positive flow was measured in both boreholes WS4 and WS5 of 1.8 and 4.3 litres per hour respectively, which indicates a pressure building up locally in the ground, which can be promoted by an impermeable surface soil layer, enabling differential pressures to develop, potentially assisted by a rapid groundwater level rise, causing the soil atmosphere to be compressed slightly, sealed below the surface.

With maximum Gas Screening Values of $1.8 \text{ l/hr} \times (2\%/100\%) = 0.036 \text{ litres per hour (WS4)}$ and $4.3 \text{ l/hr} \times (0.9\%/100\%) = 0.039 \text{ litres per hour (WS5A)}$.

On this basis, the site is considered to fall into Characteristic Situation CS-1.

The 2019 publication entitled 'Risk and reliability in gas protection design – 20 years on' by Geoff Card, (GB Card and Partners), James Lucas (The Environmental Protection Group) and Steve Wilson (EPG), includes a discussion on the risk presented by depleted oxygen.

It is noted in their publication that oxygen depletion is widespread in natural soils and is not known to cause emissions of oxygen deficient air out of the ground. They consider that it is not practical to assess the risk associated with this aspect of ground gas by applying arbitrary limiting gas concentrations to soil gas, based on oxygen depletion limits used inside confined spaces.

In order to pose a risk, the flow of depleted air must displace fresh air in the building such that oxygen concentrations fall below 19.5% (healthy individuals are unable to work strenuously and their coordination may be affected in oxygen environments of 15% to 19%).

They note that where emissions of oxygen depleted air have caused problems in above ground buildings (e.g. in Northumberland) there has been a very fast and large emission of gas in a short space of time via shafts, old wells or heavily fractured and open rock.

In Japan, they note that deoxygenated air caused by groundwater lowering (and methane generation on subsequent groundwater rebound) was emitted into buildings via water wells (Hayashi and Ishi, 1989).

In conclusion, the publication states that an open or very permeable pathway is required for these very high flow rates to occur and cause the 9% nitrogen concentration required to displace fresh air and cause the oxygen to drop to 19.5% (which is the recommended high alarm value in tunnelling work – (HSE, 2013) and limit for an oxygen deficient atmosphere (OSHA, 1993).

The site is not affected by underground coal workings, mineshafts, wells, fractured ground or faults hence the detected oxygen depletion is not considered to present an unacceptable risk to the proposed commercial/retail unit.

On this basis, the localised oxygen depletion measured in WS4 is no considered to present an unacceptable risk and is also typical of natural ground with some organic matter.

However, further visits are to be completed to enable confirmation of the gas regime and whether hazardous ground gas protection is required.

8.5 Remediation Verification

In order to confirm that the remedial cover system across the proposed soft landscaped garden area within the courtyard area (refer to Drawing 746-D-01) has been installed in accordance with the proposed strategy, it is proposed that the following remedial verification works be undertaken: -

- i. Photographic evidence of the excavation to cover system formation and the placement of the proprietary high visibility geotextile warning/barrier layer at the base of the cover system soils.
- ii. Confirmation of the source of any sub-soil and topsoil material placed above the basal warning/barrier layer.
- iii. Cover system soils shall be obtained from greenfield source sites. Topsoil may be manufactured from greenfield sub-soils blended with natural organic material to generate a topsoil.
- iv. Chemical analysis of three samples per source and per material type used as cover system soils shall be undertaken in accordance with the YALPAG Technical Guidance for Developers, Landowners and Consultants publication entitled 'Verification Requirements for Cover Systems' June 2021, Version 4.1.
- v. The chemical testing suite should include standard metals/metalloids (as a minimum As, Cd, Cr, CrVI, Cu, Hg, Ni, Pb, Se, Zn), PAH (16 USEPA speciation), asbestos, pH and soil organic matter (SOM) (or calculated from total organic carbon (TOC)). This is considered appropriate to greenfield/greenfield manufactured soils.
- vi. Excavation through the cover system to confirm the thickness of the cover system at three locations, including photographs showing the verification locations.
- vii. Samples may be taken from the remedial verification excavations or stockpiles of the soil material intended for use after placement on the site.
- viii. A remedial cover system verification report shall be prepared including a plan showing the locations of the cover system thickness verification excavations, photographs of the remedial excavation and high visibility geotextile warning barrier layer, photographs of the remedial cover system verification excavations including a survey staff to confirm the depth to the base, chemical test results for the cover system soils, confirming they meet the appropriate generic assessment criteria for a residential dwelling with home-grown produce' as referenced within Section 8.1 of this document.

If the made ground is completely removed, exposing the natural ground beneath, then there is no requirement for a cover system. However, an inspection of the excavation shall be undertaken by geoenvironmental consultant to confirm the made ground has been completely stripped, and an inspection record maintained with photographs.

In addition, as above chemical analysis of three samples per source and per material type used as cover system soils shall be undertaken in accordance with the YALPAG Technical Guidance for Developers, Landowners and Consultants publication entitled 'Verification Requirements for Cover Systems' June 2021, Version 4.1.

The chemical testing suite should include standard metals/metalloids (as a minimum As, Cd, Cr, CrVI, Cu, Hg, Ni, Pb, Se, Zn), PAH (16 USEPA speciation), asbestos, pH and soil organic matter (SOM) (or calculated from total organic carbon (TOC)). This is considered appropriate to greenfield/greenfield manufactured soils.

However, the actual thickness of the placed soils is not relevant as the soils are not required as a remedial cover under these circumstances.

9 Engineering Assessment

9.1 Soil Engineering Properties

The soils encountered beneath the site comprise a mixture of clay, silt, sand and gravel sized material in various proportions, described in the field as clayey, silty gravelly sand, clayey silty sandy gravels, or very sandy, gravelly silty clays.

In the field, many of the soil strata encountered were considered borderline between clayey sand and gravel, or sandy gravelly clays, hence eight bulk samples were subject to laboratory particle size distribution (PSD) analysis in order to confirm whether the soils should be considered granular or cohesive with respect to foundation bearing capacity assessment.

Samples logged as cohesive in the field (4 No.) as sandy gravelly clays were selected for classification, along with four samples logged as clayey gravelly sand/ sandy gravels.

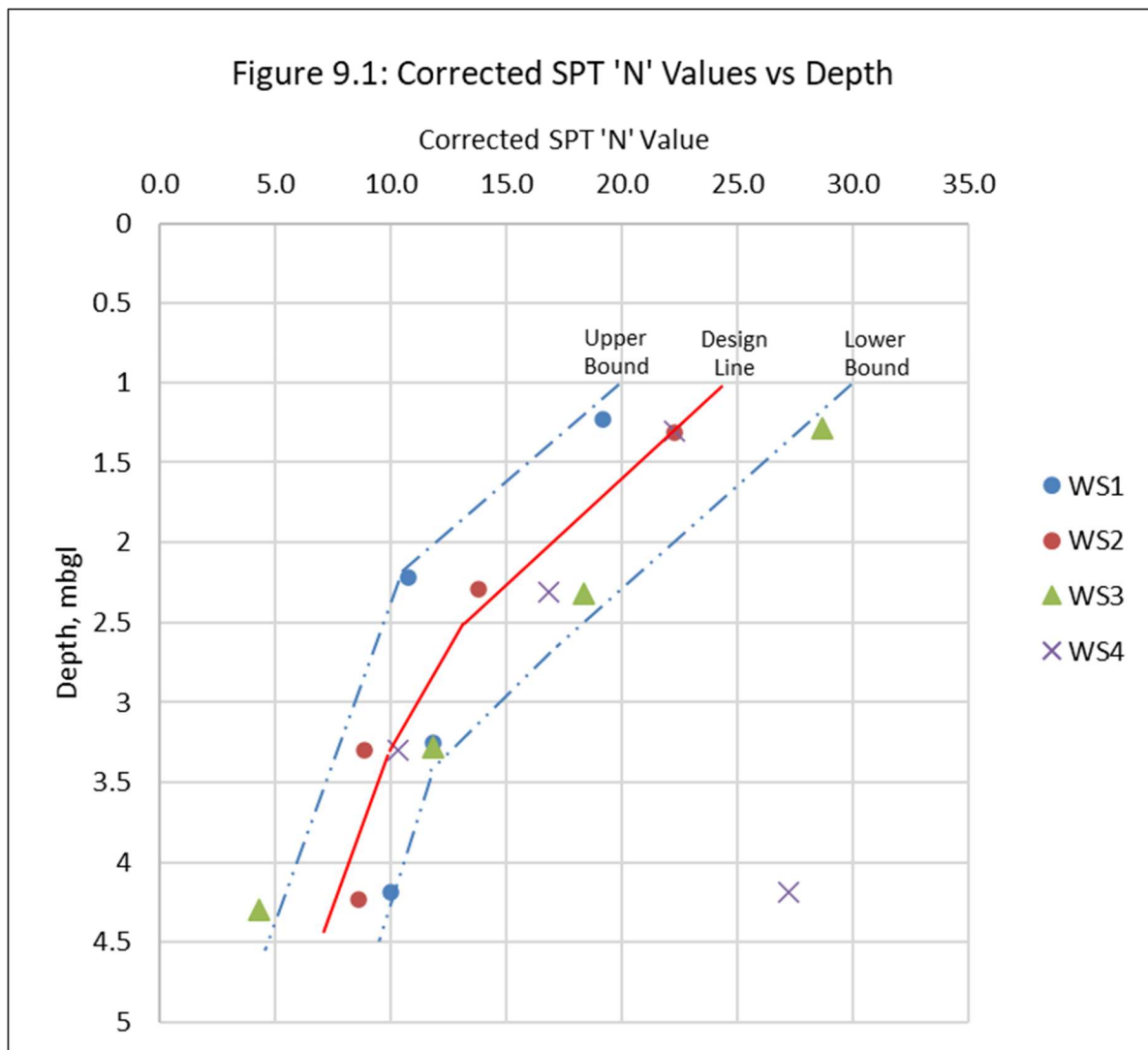
Three of the samples logged as clay soils in the field subject to PSD analysis were also subject to Atterberg Limits determination to confirm soil volume change potential, in case the PSD confirmed the soils are fine soils.

However, all eight samples subject to PSD analysis (including 3 No. sedimentation analyses to confirm silt/clay split of the fine soil fraction) confirmed that all the soils are 'granular', containing less than 35% fine soil and hence greater than 65% coarse soil material.

The sand content ranged from 35% to 39%, gravel from 27% to 49% and fine soils from 13% up to 31% maximum. The fine soils were shown to be predominantly clay with 32% to 39% silt within the fine soil fraction (the remainder comprising clay).

The soil fraction finer than 425 microns was shown to be of non-plastic to 'Low' volume change potential (in accordance to NHBC Guidance Chapter 4.2).

Figure 9.1 below (over-page) presents the Standard Penetration Test results (corrected) for each borehole against depth.



With reference to Figure 9.1, the SPT results show a marked decrease in the 'N' value with depth, with design values of $N=25$ at 1.0m bgl, $N=17.5$ at 2.0m, $N=12$ at 3.0m, reducing to around 8 at 4.0m bgl.

This reduction in SPT 'N' values with depth is also reflected within the two dynamic probe logs, although to a lesser extent in DP2. Both dynamic probe logs show higher readings between 1.0m and around 2.7m bgl, then gradually falling below that depth, which is consistent with the SPT 'N' values.

As discussed previously, the groundwater table lies at shallow depth beneath the site (minimum recorded 0.53m bgl), but is very responsive to rainfall, showing a rapid rise close to ground level in one of the monitoring devices, hence it has been assumed for bearing capacity calculations, that the water table lies at ground level on occasions.

In addition, the rapid rise in groundwater level will create a seepage force on the underside of the foundation, which should also be taken into account within the bearing capacity calculation.

9.2 Foundations and Floor Slabs

Based on the borehole and dynamic probing logs, ground of potentially suitable bearing capacity was not proven until a depth of 0.7m to 0.95m bgl was reached, which is consistent with the depth of the thickened soft organic rich topsoil material, which was proven to 0.95m within borehole WS1.

On this basis, a net allowable bearing capacity has been calculated for a 0.6m wide strip footing, located at a depth of 0.95m bgl, with groundwater at ground level, and an upward seepage force based on a driving head of 0.50m.

For a design SPT 'N' value of 23 at the underside of the foundation, a peak angle of shearing resistance of 34 degrees is derived.

The soil above the foundation is assumed to have a saturated unit weight for a low strength clay soil of 17.5 kN/m³. Below the foundation, a saturated unit weight of 20 kN/m³ has been adopted for the medium dense sand/gravel material present.

Based on the above, a net allowable bearing pressure of 72 kPa is calculated.

Increasing the width of the foundation to 1.0m results in an increase in the net allowable bearing pressure to 100 kPa, and hence a maximum line load of 100 kN/m run.

This is based on a factor of safety of 2.5 against shear failure.

A check for settlement for both foundation widths has been undertaken, and the results show that settlement for the 0.6m wide foundation at 0.95m would be around 3mm, and for the 1.0m wide foundation, around 6mm.

If the proposed loads are too high, then a rigid reinforced raft foundation could be adopted to reduce the foundation bearing pressure.

However, raft foundations are generally suitable for square buildings, or rectangular shaped buildings with a length to width ratio of no greater than 2:1, hence the single storey garage part of the proposed building may require a separate foundation and allowance for potential differential movement.

The dynamic probe hole logs reveal a marked increase in blow counts at depths of between 7.0 metres and 8.2 metres below ground level, which may be the base of the glaciofluvial sand and gravel deposits, resting on either a very stiff glacial Till, or the Mercia mudstone bedrock.

The dynamic probe hole findings indicate that bottom driven steel mini-piles would also offer an alternative foundation solution, if shallow strip foundations are not suitable. The rapid increase in stiffness of the ground below 7.0 metres to 8.20 metres suggests that the mini-piles would reach the required set at somewhere between 9 metres to 10 metres below ground level.

If the piling option is to be pursued, it is recommended that a specialist piling contractor be contacted to establish if additional deep boreholes are required in order to enable detailed piled foundation design.

A 'piling mat' or 'working platform' comprising a suitable thickness of compacted granular fill will be required to ensure a piling rig can be operated safely without sinking into the ground or toppling over.

With respect to floor slab design, a ground bearing floor slab would be acceptable in conjunction with a shallow strip foundation, provided that the upper layers of soft organic rich topsoil and soft subsoil clay soils are removed and replaced with engineered/compacted granular fill, which would result in a relatively deep excavation in places, where the organic rich material reaches 0.95 metres below ground level.

The topsoil and soft clay would also need to be removed from beneath a raft foundation if adopted and be replaced with engineered/compacted granular fill of an appropriate specification.

A suspended floor slab would be required for a piled foundation solution, and also if a ground bearing floor slab is to be avoided due to the depth of topsoil and soft clay that would require excavation and replacement.

9.3 Foundation Construction Considerations

The shallow depth to groundwater beneath the site and the rapid rise during rainfall will present significant difficulties for excavation to the required depth for strip foundations or raft foundation sub-base, resulting in collapse of the sides in the short-term and flooding of the excavations. This instability was observed whilst excavating the soakaway trial pits, which were subject to groundwater inflow and short-term collapse.

There may be a possibility that the groundwater table falls over the summer months, but due to the rapid response of the groundwater table to rainfall, there could be periodic flooding of excavations after rainfall even during the drier months.

If strip foundations or raft foundations are to be adopted, it is advised that a dewatering contractor is employed to ensure the groundwater table is lowered prior to commencement of excavation, and during the construction of the foundations.

Alternatively, adoption of a mini-pile solution would avoid the need for dewatering works associated with foundation construction.

9.4 Soil Infiltration Potential

Trial pits TPSA1 and TPSA2 were installed with 20mm single sized pea gravel from the base to 0.65m and 0.75m below ground level respectively, with a groundwater level monitoring pipe slotted from the base up to a metre from the base.

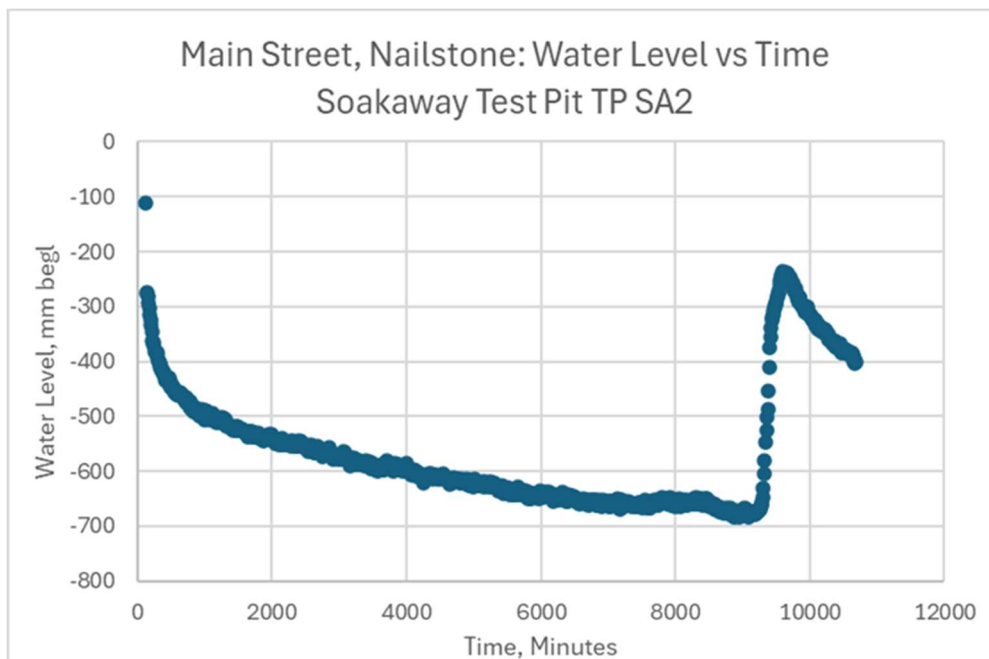
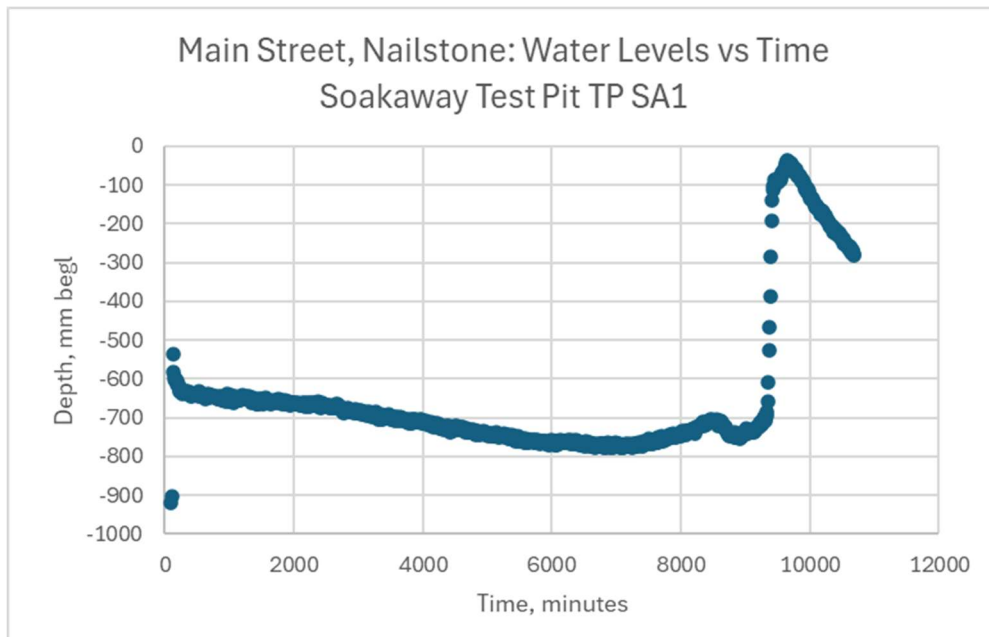
Above the gravel, the trial pits were backfilled to the surface using excavation arisings.

Both pits were installed with water pressure monitoring devices (In-Situ Inc. Rugged TROLL 100) on 12th December 2024 and the pits filled with water pumped from a water bowser at around 11 am.

TPSA1 was filled to 0.37m begl and TPSA2 to 0.25m begl.

The water pressure monitoring devices were recovered on the 19th December 2024. The data downloaded and converted to water levels as millimetres below ground level.

The water levels are presented in Section 7.3 and reproduced below (over-page): -



The water level plots above show that the water levels fell very slowly, taking 5 days to drop from 0.53m to 0.78m begl in TPSA1, and over 6 days for the water levels to fall from 0.28m begl to 0.68m begl in TPSA2.

As discussed within Section 7.3, the water level monitoring devices also show a rapid rise in ground water levels on 18th December 2024, which corresponds to a rainfall event and shows a rapid response to rainfall, with groundwater levels approaching the ground surface.

It is concluded that due to the very slow infiltration rate, and high water table, with a rapid response to rainfall events, the ground conditions beneath the site are not considered suitable for the use of soakaways for surface/stormwater from the development.

9.5 Buried Concrete Protection Requirements

Based on the maximum water-soluble sulphate test result (68.2 mg/l) and minimum pH value determined (6.7 units), for all soils and made ground tested, the site falls into Design Sulphate Class 'DS-1' with a corresponding Aggressive Chemical Environment for Concrete (ACEC) classification of 'AC-1', in accordance with BRE Special Digest 1:2005, 'Concrete in aggressive ground', assuming mobile groundwater.

On this basis, no special protective measures are required for buried concrete against acid or sulphate attack.

9.6 Waste Disposal

All surplus soil/made ground materials are considered wastes, whether contaminated or uncontaminated, natural or man-made, and should be disposed of at a facility licensed or permitted to accept the wastes.

The classification of waste soils is based on the general suite of chemical contamination screening results and should be confirmed in accordance with Environment Agency publication WM3.

It is recommended that the results of this intrusive investigation be forwarded to a local waste disposal contractor or waste disposal facility operator to confirm the waste classification in accordance with WM3 guidance, and for a cost of disposal. The developer is responsible for ensuring the waste is disposed of correctly.

Waste acceptance criteria (WAC) analysis will be required for soils destined for disposal to inert or hazardous landfills.

The re-use of excavation arisings as fill to raise levels or as capping material for example does not require a waste management license/permit provided there is a need for the material and the material was always intended to be used in the planned works.

However, in order to minimise the risk of the Regulators (Environment Agency) considering the operation to be waste disposal operation in the future, it is advised that the re-use of the material is undertaken in accordance with the appropriate Code of Practice as published by 'CL:AIRE' - the 'Definition of Waste: Code of Practice' (DoW CoP) publication.

10 Key Conclusions and Recommendations

This investigation has identified the presence of medium dense clayey to very clayey sand/gravel deposits beneath up to 0.95m of soft organic clay 'topsoil' and subsoil.

The groundwater table lies at shallow depth beneath the site, around 0.5 metres below existing ground level (December/January), and is very responsive to rainfall, rising during rainfall events to near ground level.

The presence of the high-water table presents difficulties for excavation stability, even for shallow excavations, and also results in low net allowable bearing pressures for foundations.

For a 0.6m wide strip foundation at 0.90m below ground level, bearing on the medium dense sand/gravel, a net allowable bearing pressure of 72 kPa has been calculated, allowing for an upward seepage force which would be experienced during rainfall events.

For a 1.0m wide foundation at the same depth, a net allowable bearing pressure of 100 kPa has been calculated.

A ground bearing floor slab may be adopted although the soft clays extend to up to 0.95m below ground level, and hence excavation and replacement of the soft material with compacted granular sub-base would be required.

However, unless the groundwater table falls over the drier summer months, a dewatering scheme will be required to maintain stable dry excavations beneath the site, including in relation to foundation excavation, floor slab construction and services trenches. In addition, groundwater levels are very responsive to rainfall, hence excavations could also flood during the summer months due to rapid rise after rainfall events.

If foundation loads on the soil require further reduction, a reinforced concrete raft foundation may potentially offer a solution, although rafts are suited to buildings with a square or rectangular footprint of maximum 2:1 ratio (length to width), hence the 'L' shaped outline of the proposed structure would require further detailed consideration.

In addition, excavation to accommodate the compacted granular sub-base layer beneath the raft would also be required, and this excavation would be subject to groundwater flooding issues, hence dewatering would also be required for raft foundations.

The dynamic probe holes indicate that hollow steel bottom driven piles would extend to a depth of around 8m to 10m below ground, as a marked increase in soil stiffness was proven at 7.0m to 8.2m below ground level. Adoption of a piled solution would avoid the need for dewatering to enable foundation construction and address the low net allowable bearing pressures.

Based on the desk top study and site walkover survey, it was concluded that the site has historically been used as a farmyard, with no evidence of widespread potential sources of contamination.

The key potential source of contamination identified relates to the infilled former pond which was considered to present a risk from hazardous ground gases, volatile organic compounds and contaminated infill materials.

It was also concluded that there may be potentially unsuitable and/or contamination within materials imported as hardcore/sub-base beneath floor slabs and other hard standing areas/farm track including for example foundry slag, ash and demolition rubble including asbestos.

Based on the findings of this investigation it is concluded that the risk from hazardous ground gases associated with the infilled pond does not warrant the inclusion of any special protective measures for the proposed new dwellings. However, further hazardous ground gas monitoring is currently underway to confirm this conclusion and offer additional comfort.

The made ground beneath the quadrangle courtyard area was found to be contaminated with polycyclic aromatic hydrocarbons (PAHs) and heavy petroleum hydrocarbons considered to be associated with fragments of tarmacadam within the made ground.

Hence, a cover system is proposed for the soft landscaped garden area within the quadrangle, comprising 600mm of proven suitable subsoil and topsoil (combined thickness) above a basal proprietary high visibility geotextile waring/barrier layer, to minimise the risk of unacceptable exposure to the high concentrations of PAHs within the made ground.

The cover system will require inspection, confirmatory sampling and chemical analysis and verification reporting.

Alternatively, all the made ground may be stripped completely from above the made ground within the proposed soft landscaped garden area within the quadrangle courtyard, in which case a remedial cover would not be required, although the soils placed within the garden area would still require verification sampling and analysis.

No special protective measures are required for buried concrete against acid or sulphate attack.

No special protection for standard blue MDPE (alkathene) water supply pipes is considered necessary.

It is recommended that the results of this intrusive investigation be forwarded to a local waste disposal contractor or waste disposal facility operator to confirm the waste classification in accordance with WM3 guidance.

The ground conditions beneath the site are not considered suitable for the use of soakaways.

TABLES

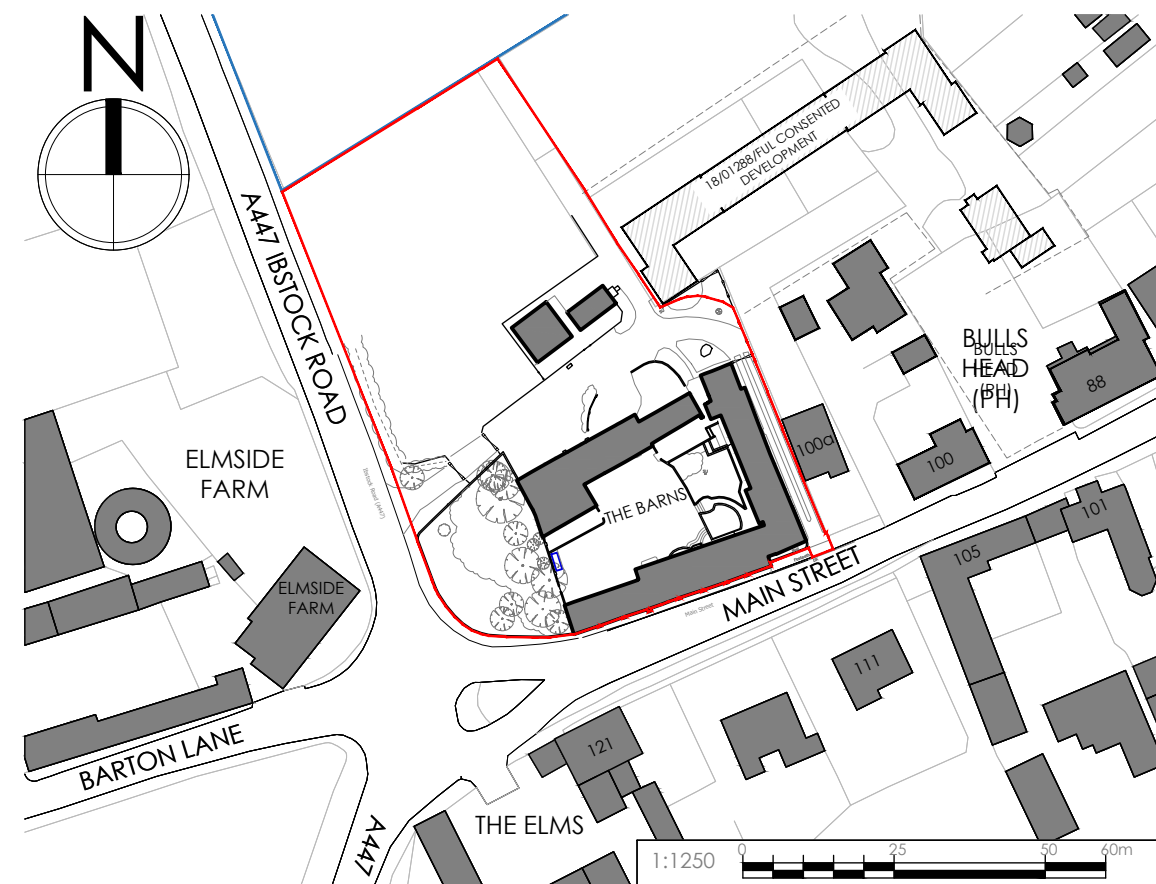
TABLE A: Soil Chemical Test Results with Generic Assessment Criteria
Project / Site name: Main Street, Nailstone (746)

Lab Sample Number						410860	410861	410862	410863	410864	410865	410866	416750	416751	416752
Sample Reference						HDP1	HDP2	HDP3	WS1	WS1	WS2	WS3	WS5A	WS6	WS6
Depth (m)						0.00-0.30	0.00-0.45	0.08-0.45	0.90-1.50	2.15-2.30	1.50-2.30	0.60-1.40	0.30	0.50	0.75-0.85
Date Sampled						12/12/2024	12/12/2024	13/12/2024	16/12/2024	16/12/2024	16/12/2024	16/12/2024	20/12/2024	20/12/2024	20/12/2024
Analytical Parameter (Soil Analysis)					GAC Resid with home-grown produce (SOM 1%)	GAC for new planting									
	Units														
	Limit of detection														
	Accreditation Status														
Stone Content						< 0.1	< 0.1	< 0.1	22.3	< 0.1	53.6	43	35.9	< 0.1	< 0.1
Moisture Content						13	14	10	14	16	13	11	14	16	18
Total mass of sample received						0.3	0.3	0.3	0.5	0.5	0.5	0.5	0.4	0.4	0.4
Asbestos															
Asbestos in Soil Detected/Not Detected						Not-detected	Not-detected	Not-detected	-	-	-	-	Not-detected	Not-detected	-
Asbestos Analyst ID						JSW	JSW	MJN	-	-	-	-	MBI	MBI	-
General Inorganics															
pH (L099)	pH Units	N/A	MCERTS	6-9		6.7	7	8	7.8	7.5	7.8	8	7.5	8	-
Total Cyanide	mg/kg	1	MCERTS	40		< 1.0	< 1.0	< 1.0	-	-	-	-	< 1.0	< 1.0	-
Total Sulphate as SO4	mg/kg	50	MCERTS			530	590	810	-	-	-	-	540	-	-
Water Soluble Sulphate as SO4 16hr extraction (2:1)	mg/kg	2.5	MCERTS			19	25	76	29	35	30	75	140	-	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS			0.00956	0.0126	0.0377	-	-	-	-	0.0682	-	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS			9.56	12.6	37.7	14.6	17.5	15	37.4	68.2	-	-
Sulphide	mg/kg	1	MCERTS			< 1.0	1.4	4.5	-	-	-	-	< 1.0	-	-
Organic Matter	%	0.1	MCERTS										-	4.2	3.4
Total Organic Carbon (TOC) - Automated	%	0.1	MCERTS			1.3	1.5	3.6	-	-	-	-	1.6	2.5	2
Total Phenols															
Total Phenols (monohydric)						< 1.0	< 1.0	< 1.0	-	-	-	-	< 1.0	< 1.0	-
Speciated PAHs															
Naphthalene	mg/kg	0.05	MCERTS	2.3		< 0.05	0.06	2.1	-	-	-	-	< 0.05	0.06	-
Acenaphthylene	mg/kg	0.05	MCERTS	170		< 0.05	< 0.05	0.59	-	-	-	-	< 0.05	< 0.05	-
Acenaphthene	mg/kg	0.05	MCERTS	210		< 0.05	< 0.05	21	-	-	-	-	< 0.05	< 0.05	-
Fluorene	mg/kg	0.05	MCERTS	170		< 0.05	< 0.05	18	-	-	-	-	< 0.05	< 0.05	-
Phenanthrene	mg/kg	0.05	MCERTS	95		0.1	< 0.05	140	-	-	-	-	0.08	0.33	-
Anthracene	mg/kg	0.05	MCERTS	2400		< 0.05	< 0.05	42	-	-	-	-	< 0.05	0.07	-
Fluoranthene	mg/kg	0.05	MCERTS	280		0.21	0.24	180	-	-	-	-	0.19	1.3	-
Pyrene	mg/kg	0.05	MCERTS	620		< 0.05	< 0.05	150	-	-	-	-	0.17	1.1	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	7.2		< 0.05	0.14	66	-	-	-	-	0.09	0.85	-
Chrysene	mg/kg	0.05	MCERTS	15		0.12	0.15	66	-	-	-	-	0.09	0.9	-
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	2.6		< 0.05	< 0.05	76	-	-	-	-	0.13	1.4	-
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	77		< 0.05	< 0.05	28	-	-	-	-	0.06	0.43	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	2.2		< 0.05	< 0.05	67	-	-	-	-	0.06	0.89	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	27		< 0.05	< 0.05	30	-	-	-	-	0.18	0.82	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.24		< 0.05	< 0.05	6	-	-	-	-	< 0.05	0.22	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	320		< 0.05	< 0.05	33	-	-	-	-	0.16	0.78	-
Total PAH															
Speciated Total EPA-16 PAHs						< 0.80	< 0.80	925	-	-	-	-	1.2	9.18	-
Heavy Metals / Metalloids															
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	37		9.8	12	21	-	-	-	-	11	22	-
Boron (water soluble)	mg/kg	0.2	MCERTS	290	3	0.6	0.7	0.8	-	-	-	-	0.9	4	-
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	11		0.4	0.5	0.6	-	-	-	-	0.5	< 0.2	-
Chromium (hexavalent) Low Level	mg/kg	1.2	NONE	6		< 1.2	< 1.2	< 1.2	-	-	-	-	< 1.2	< 1.2	-
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	910		16	16	21	-	-	-	-	25	20	-
Copper (aqua regia extractable)	mg/kg	1	MCERTS	2400	130	29	29	52	-	-	-	-	27	39	-
Lead (aqua regia extractable)	mg/kg	1	MCERTS	200		60	62	210	-	-	-	-	63	91	-
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	40		< 0.3	< 0.3	< 0.3	-	-	-	-	< 0.3	< 0.3	-
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	180		13	14	28	-	-	-	-	14	28	-
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	250		< 1.0	< 1.0	< 1.0	-	-	-	-	< 1.0	< 1.0	-
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	3700	300	86	92	120	-	-	-	-	87	150	-
Magnesium (leachate equivalent)															
Magnesium (water soluble)															
Petroleum Hydrocarbons															
TPHCWG - Aliphatic >C5 - C6 HS_ID_AL	mg/kg	0.02	NONE	42		< 0.010	< 0.010	< 0.010	-	-	-	-	< 0.010	-	-
TPHCWG - Aliphatic >C6 - C8 HS_ID_AL	mg/kg	0.02	NONE	100		< 0.010	< 0.010	< 0.010	-	-	-	-	< 0.010	-	-
TPHCWG - Aliphatic >C8 - C10 HS_ID_AL	mg/kg	0.05	NONE	27		< 0.010	< 0.010	< 0.010	-	-	-	-	< 0.010	-	-
TPHCWG - Aliphatic >C10 - C12 EH_CU_ID_AL	mg/kg	1	MCERTS	130		< 1.0	< 1.0	< 1.0	-	-	-	-	< 1.0	-	-
TPHCWG - Aliphatic >C12 - C16 EH_CU_ID_AL	mg/kg	2	MCERTS	1100		< 2.0	< 2.0	< 2.0	-	-	-	-	< 2.0	-	-
TPHCWG - Aliphatic >C16 - C21 EH_CU_ID_AL	mg/kg	8	MCERTS	65000		< 8.0	< 8.0	< 8.0	-	-	-	-	< 8.0	-	-
TPHCWG - Aliphatic >C21 - C35 EH_CU_ID_AL	mg/kg	8	MCERTS	65000		< 8.0	< 8.0	28	-	-	-	-	12	-	-
TPHCWG - Aliphatic >C5 - C35 EH_CU+HS_ID_AL	mg/kg	10	NONE			< 10	< 10	28	-	-	-	-	12	-	-
TPHCWG - Aromatic >EC5 - EC7 HS_ID_AR															
TPHCWG - Aromatic >EC7 - EC8 HS_ID_AR						< 0.010	< 0.010	< 0.010	-	-	-	-	< 0.010	-	-
TPHCWG - Aromatic >EC8 - EC10 HS_ID_AR						< 0.020	< 0.020	< 0.020	-	-	-	-	< 0.020	-	-
TPHCWG - Aromatic >EC10 - EC12 EH_CU_ID_AR						< 1.0	< 1.0	1.6	-	-	-	-	< 1.0	-	-
TPHCWG - Aromatic >EC12 - EC16 EH_CU_ID_AR						< 2.0	< 2.0	43	-	-	-	-	< 2.0	-	-
TPHCWG - Aromatic >EC16 - EC21 EH_CU_ID_AR						< 10	< 10	270	-	-	-	-	< 10	-	-
TPHCWG - Aromatic >EC21 - EC35 EH_CU_ID_AR						< 10	< 10	440	-	-	-	-	< 10	-	-
TPHCWG - Aromatic >EC5 - EC35 EH_CU+HS_ID_AR						< 10	< 10	760	-	-	-	-	< 10	-	-
TPH (>EC6 - EC8) HS_ID_TOTAL															
TPH (>EC8 - EC10) HS_ID_TOTAL						-	-	-	-	-	-	-	-	< 0.01	-
TPH (>EC10 - EC12) EH_CU_ID_TOTAL						-	-	-	-	-	-	-	-	< 0.02	-
TPH (>EC12 - EC16) EH_CU_ID_TOTAL						-	-	-	-	-	-	-	-	< 2.0	-
TPH (>EC16 - EC21) EH_CU_ID_TOTAL						-	-	-	-	-	-	-	-	< 4.0	-
TPH (>EC21 - EC40) EH_CU_ID_TOTAL						-	-	-	-	-	-	-	-	< 10	-
TPH (>EC21 - EC40) EH_CU_ID_TOTAL															
TPH (C10 - C40) EH_CU_ID_TOTAL						< 10	< 10	870	-	-	-	-	-	36	-
Petroleum Range Organics (EC6 - EC10) HS_ID_TOTAL															
TPH (EC10 - EC40) EH_CU_ID_TOTAL						-	-	-	-	-	-	-	16	36	-
MTBE (Methyl Tertiary Butyl Ether)															
Benzene						< 5.0	< 5.0	< 5.0	-	-	-	-	< 5.0	-	-
Toluene						< 5.0	< 5.0	< 5.0	-	-	-	-	< 5.0	-	-
Ethylbenzene						< 5.0	< 5.0	< 5.0	-	-	-	-	< 5.0	-	-
p & m-Xylene						< 8.0	< 8.0	< 8.0	-	-	-	-	< 8.0	-	-
o-Xylene						< 5.0	< 5.0	< 5.0	-	-	-	-	< 5.0	-	-

DRAWINGS



EXISTING BLOCK PLAN 1:500



EXISTING SITE PLAN 1:1250

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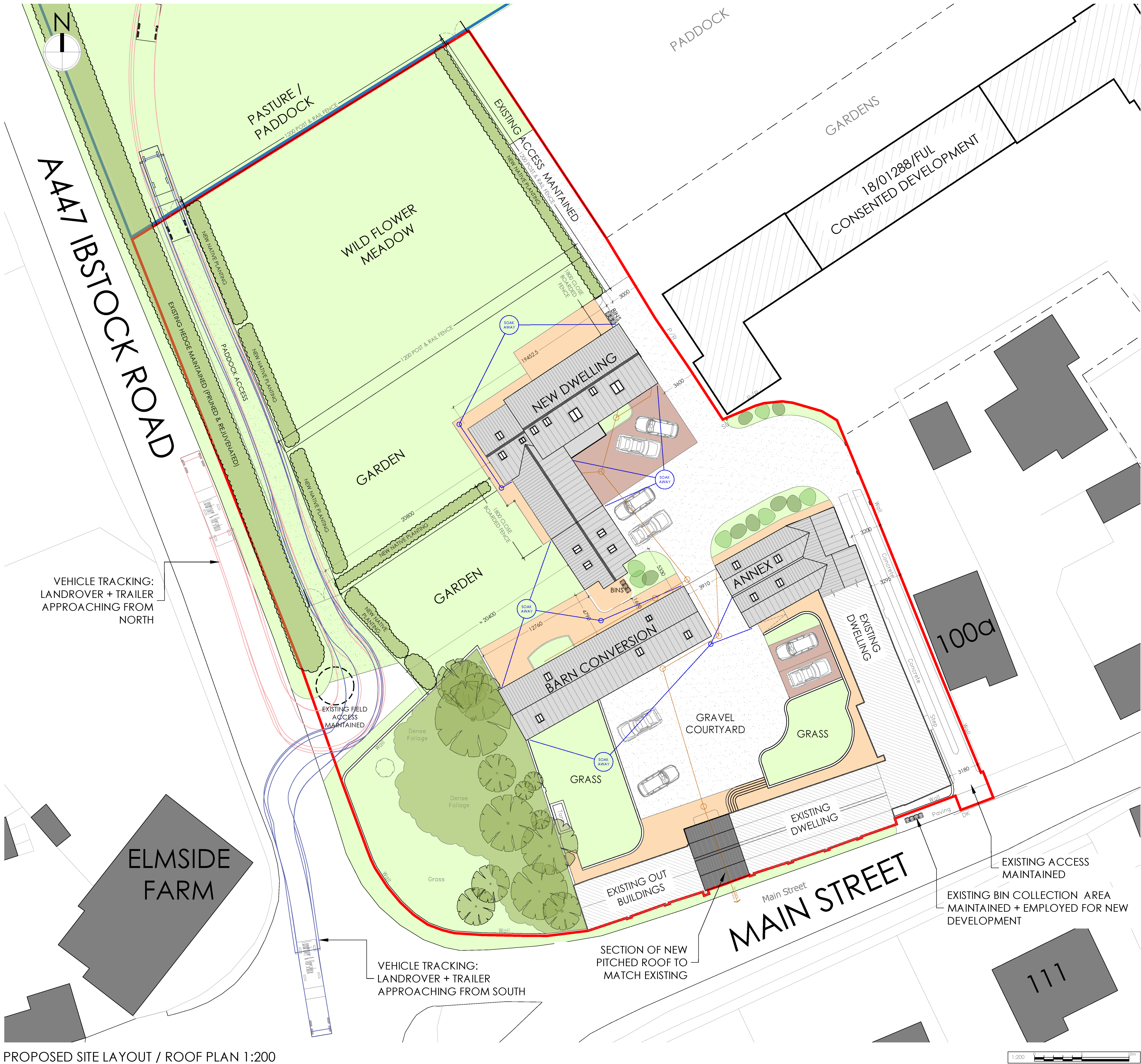
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Project:
Barn Conversion, Annex Extension
& New Dwelling
The Barns, Main St.
Nailstone

Title:
Site Plan & Block Plan

Scale: 1:500 1:1250	Drawn: MFB	Checked: RC	Date: 19.05.23
Drawing No. 8748 03 01	Revision: -		

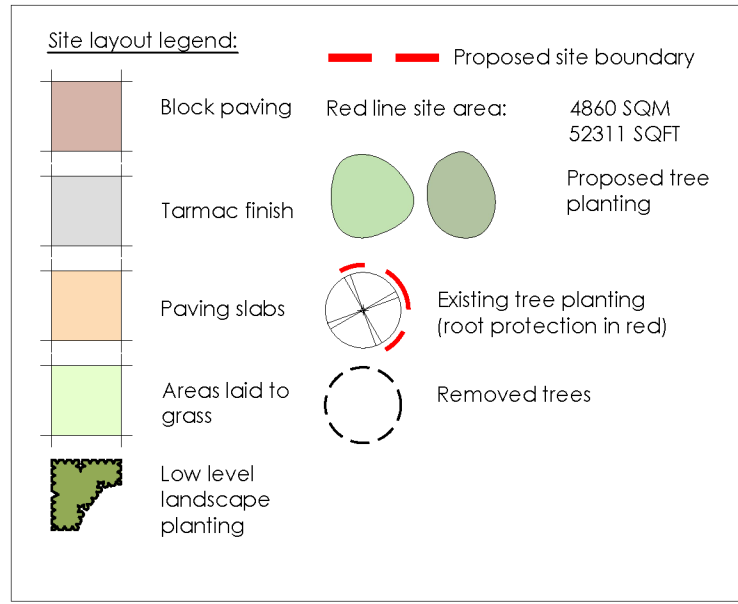
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PROPOSED SITE LAYOUT / ROOF PLAN 1:200



PROPOSED BLOCK PLAN 1:500



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Rev P1 Alterations to field access for field maintenance. Sweep1 path analysis to demonstrate. 27.07.23

Revision Notes:
Drawing Status:

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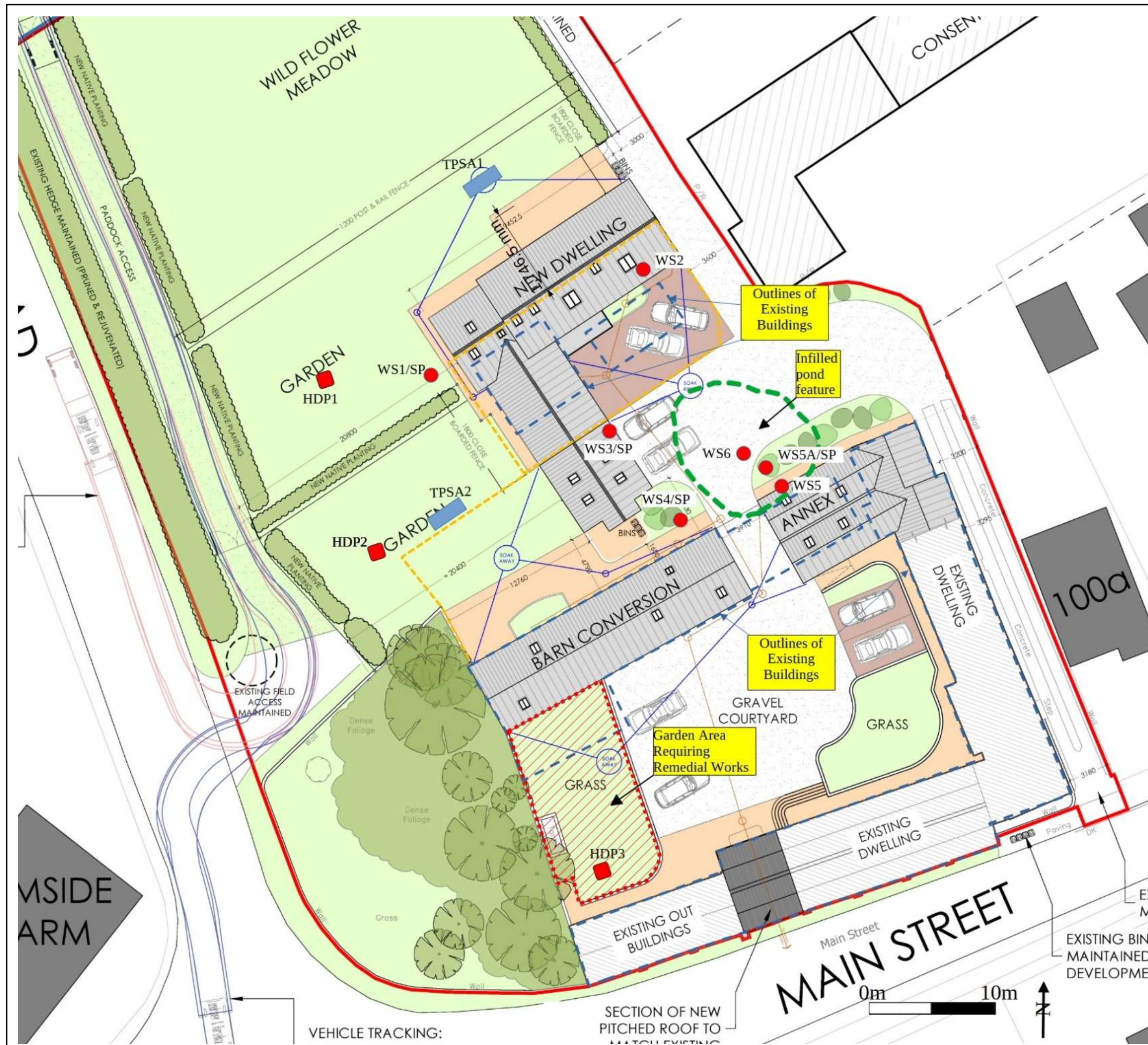
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Project:
Barn Conversion, Annex Extension
& New Dwelling
The Barns, Main St.
Nailstone

Title:
Proposed Block Plan & Roof Plan

Scale: 1:200 1:500	Drawn: MFB	Checked: KC	Date: 19.05.23
Drawing No. 8748 03 05		Revision: P1	

HSSP A1



Notes

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KEY

WS1 to WS6
Windowless Sampler
Boreholes, 30th October
2024.
SP=Standpipe Installation

TP SA1 & TP SA2
Soakaway Test Pits, 12th
December 2024.

Hand dug pits, HDP1 to
HDP3, 12th December 2024

REV	DATE	AMENDMENT	BY

GeoInvestigations Ltd
07419 327 307
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CLIENT

CLIENT

Michael Beeston

PROJECT

Main Street, Nailstone

TITLE

Exploratory Hole Location Plan

Date	Jan 2025	Drawn by:	PJP
Scale	as shown	Size	Checked PJP
			Apprvd PJP

DRAWING No.

746-D-01

Rev