

HB Newport

Remediation Strategy

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FAIRHURST

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CONTENTS

1.0	INTRODUCTION	3
2.0	SITE SETTING	5
3.0	OPTIONS APPRAISAL	10
4.0	REMEDIATION STRATEGY	12
5.0	VERIFICATION PLAN	17
6.0	CONCLUSIONS	22

FIGURES

FIGURE 1	SITE LOCATION PLAN
FIGURE 2	EXISTING SITE LAYOUT PLAN
FIGURE 3	PROPOSED DEVELOPMENT PLAN

APPENDICES

APPENDIX A	FIGURES
APPENDIX B	SITE ACCEPTANCE CRITERIA (SAC)

1.0 INTRODUCTION

1.1 General

Fairhurst have been appointed by TJ Morris Ltd (the Client) to prepare a Remediation Strategy to support the proposed development of a site located at West Retail Park, Docks Way, Newport, NP20 2NS, (herein called the 'site'). The location of the site is shown in **Figure 1, Appendix A**.

The proposed development comprises the demolition of the existing retail park (Class A1) and subsequent erection of 1 No. retail unit (Class A1) with associated access and serving arrangements and car parking. No basements are proposed as part of the development and minimal soft landscaping in the form of soft verges are proposed in the south eastern region of the site. The proposed development plans are shown in **Figure 2, Appendix A**.

This Remediation Strategy has been produced on the basis of the findings of the Fairhurst Preliminary Risk Assessment (PRA) (red. 151157 R1.0, dated November 2022) and the subsequent Fairhurst Ground Investigation Report (GIR) (ref. 151157 R2.0, dated March 2024). This Remediation Strategy will be updated following completion of additional monitoring being carried out as part of the GIR.

1.2 Planning Considerations

The site is currently subject to Newport City Council planning permission reference **23/0091**, which was granted permission on the 4th October 2023. The planning permission includes pre-commencement conditions with relation to contaminated land under **Condition 3**, as outlined below:

- a) *An appropriate Desk-Study of the site has been carried out, to include a conceptual model and a preliminary risk assessment, and the results of that study have been submitted to and approved in writing by the Local Planning Authority.*
- b) *If potential contamination is identified then an appropriate intrusive site investigation shall be undertaken and a Site Investigation Report to (BS10175/2011), containing the results of any intrusive investigation, shall be submitted and approved in writing by the Local Planning Authority.*
- c) *Unless otherwise agreed in writing by the Local Planning Authority as unnecessary, a Remediation Strategy, including Method statement and full Risk Assessment shall be submitted to and approved in writing by the Local Planning Authority.*

No part of the development hereby permitted shall be occupied until:

- d) *Following remediation a Completion/Verification Report, confirming the remediation has being carried out in accordance with the approved details, shall be submitted to, and approved in writing by, the Local Planning Authority.*
- e) *Any additional or unforeseen contamination encountered during the development shall be notified to the Local Planning Authority as soon as is practicable. Suitable revision of the remediation strategy shall be submitted to and approved in writing by the Local Planning Authority and the revised strategy shall be fully implemented prior to further works continuing.*

This Remediation Strategy report has been prepared to facilitate the discharge of **part (c) of Condition 3**.

1.3 Scope and Objectives

Fairhurst's ground investigation report for the site included a geo-environmental quantitative risk assessment, which identified source-pathway-receptor (S-P-R) linkages that require mitigation to render the site 'suitable for use' under the proposed development plans.

This Remediation Strategy and verification plan aim to facilitate remediation of the S-P-R linkages. It requires implementation and verification prior to the occupation of the development. This report provides:

- A brief summary of the site setting and quantitative risk assessment findings;
- A remediation strategy for the identified S-P-R linkages;
- A verification plan; and,
- Confirmation of general requirements and responsibilities with respect to the work, including materials import, waste disposal and unexpected contamination strategies.

This report was prepared utilising the findings of the GIR which should be read in conjunction with this report.

1.4 Previous Reports

The following reports pertaining to the subject site have been previously prepared by Fairhurst and should be read in conjunction with this Remediation Strategy:

- Fairhurst Preliminary Risk Assessment, Ref. 151157/R2.0, dated August 2022; and
- Fairhurst Ground Investigation Report, Ref. 151157/R2.0, dated March 2024.

1.5 Limitations

This Report is for the private and confidential use of the Client for whom the report is undertaken and should not be reproduced in whole or in part, or relied upon by third parties for any use whatsoever. Fairhurst accepts no duty or responsibility (including negligence) to any party other than the stated Client and disclaims all liability of any nature whatsoever to any such party in respect of this Report.

The nature of ground investigation is such that differing ground conditions, whether geotechnical or geo-environmental may be present between sampling positions and exploratory hole locations. As such, there is the potential to encounter unexpected contamination on site, for which a protocol is provided within this report.

1.6 Roles and Responsibilities

The Principal Contractor is responsible for obtaining all necessary licenses, permits and consents to undertake the works.

The Principal Contractor is responsible for preparing all necessary Health and Safety Risk Assessments and Method Statements to conduct the works required. This includes preparation of specific Risk Assessment and Method Statement to assess and manage the risks associated with presence of asbestos containing soils and bulk ACM, consulting with an Asbestos Specialist as required.

The Principal Contractor is responsible for collating all lines of evidence required by the Verification Plan set out within this report. The Principal Contractor should provide these lines of evidence to a suitably qualified Geo-Environmental Engineer to incorporate into a Remediation Validation Report.

The Principal Contractor should ensure all relevant information is collated and obtained for incorporation into the site's Health and Safety Plan.

2.0 SITE SETTING

For full details of the site setting, reference should be made to Fairhurst's Ground Investigation Report (Ref: 151157/R2.0, dated March 2024) and Fairhurst Preliminary Risk Assessment (Ref: 151157/R2.0, dated August 2022), however the following provides a summary of pertinent information for ease of reference.

2.1 Site Description

The site comprises a broadly rectangular plot approximately 1.36 hectares in area, accessed from Docks Way on the north western boundary of the site. Currently the site consists of two rectangular retail units with associated infrastructure including car parking and access roads. Additionally, there is a sewage pumping station located in the northwest corner of the site. The site boundary was formed of a combination of hedges, trees and wire fencing.

The retail units were occupied and active during both during the site walkover and the ground investigation works undertaken as part of the Fairhurst PRA and Fairhurst GIR, respectively.

The surrounding area comprises predominantly residential to the north east with an undeveloped field associated with a leisure centre to the south. The area to the west of the site comprises industrial land use, whilst the area north of the site comprises Mendalglef Retail Park. The Twenty Acres Reen River is located adjacent to the south western boundary.

2.2 Ground Conditions

The British Geological Survey (BGS) 1:50,000, Sheet No. 249, Newport Solid and Drift (dated 1997) and historical borehole records have been reviewed to provide information on the published and proven underlying geology and ground conditions at the site. These indicate that the site is underlain by superficial deposits of the Tidal Flat Deposits and Alluvium, with bedrock comprising the Mercia Mudstone Group. Additionally, localised Made Ground of variable thickness is anticipated to be present beneath the site.

All exploratory positions encountered hardstanding surfacing consisting of asphalt from surface to depths of between 0.08m bgl and 0.40m bgl. Made Ground was identified directly underlying the hardstanding across the entire extent of the site.

Made Ground was recorded to maximum depths ranging from 1.10m bgl to 2.00m bgl and was noted to have a variable thickness across the site ranging from 1.00m to 1.92m. Made Ground was generally described as a sandy GRAVEL with anthropogenic inclusions consisting of sub-base, road stone (occasional cobble and boulder size), asphalt, concrete and brick.

The Made Ground was underlain by superficial geology comprising Tidal Flat Deposits across the site to maximum depths of between 10.50m bgl and 11.20m bgl and noted to be relatively uniform in thickness, ranging from 9.00m to 9.50m, where the base was proven. The Tidal Flat Deposits were predominantly encountered as a cohesive material, described as a very soft to firm grey / greyish brown / blueish grey CLAY and locally sandy. Additionally, 2 No. laterally extensive site wide Peat layers were described as dark brown slightly clayey PEAT within the Tidal Flat Deposits, encountered between 4.30m bgl and 4.90m bgl (Peat Layer 1) and between 9.00m bgl to 9.50m bgl (Peat Layer 2). These were recorded to be up to 0.90m and 1.00m thick, respectively. The soils immediately above and below the Peat layers were described to contain decaying plant materials, peat fragments and an organic odour.

A layer of Sands and Gravels was encountered within all Cable Percussive Borehole underlying the Tidal Flat Deposits extending to depths of between 14.20m bgl and 15.90m bgl, noted to be variable in thickness ranging from 3.00m to 4.90m. Whilst not anticipated to be present on site, it is deemed likely

to be a superficial deposit associated with fluvial processes. This material was described to be variable in composition, including the following:

- Slightly clayey sandy, sub-angular to sub-rounded, medium to coarse sandstone and occasional limestone GRAVEL;
- Clayey gravelly SAND with frequent sub-rounded cobbles;
- Clayey gravelly SAND. Gravels are sub-angular to rounded, fine to coarse sandstone.

The Mercia Mudstone Group was encountered underlying the superficial Sands and Gravels across the site within the Cable Percussive Boreholes. The top of the Mercia Mudstone Group was noted to be weathered in all locations encountered, to maximum depths of between 16.50m bgl and 21.20m bgl, described as firm to stiff, reddish brown / blueish grey CLAY with mudstone inclusions and occasional sub-rounded gravel and rare cobbles and ranging in thickness from 1.80m to 6.00m. The non-weathered component of the Mercia Mudstone Group was encountered in only two of the Cable Percussive Boreholes to a depth of 25.50m bgl, however the base of this strata was not proven. The non-weathered component was described as a very weak to weak MUDSTONE with strength increasing with depth. Fracturing was identified throughout the unit classified as a Fracture Index (FI) between I12 to I30.

Groundwater strikes and seepages were encountered at multiple depths throughout the Made Ground, Tidal Flat Deposits and the Sands and Gravels, within the more granular layers. Post installation monitoring indicated that groundwater within the superficial deposits were potentially tidally influenced, considering the proximity to the Severn Estuary. This is subject to confirmation following completion of the additional monitoring.

No visual or olfactory contamination was encountered within soils during the Fairhurst/LMB intrusive ground investigation.

2.4 Geo-Environmental Findings

As reported within the Fairhurst GIR (ref: 151157/R2.0, dated March 2024) geo-environmental laboratory analysis, including soil and groundwater testing has been conducted, specific to the site Conceptual Site Model (CSM) and contaminants of concern. Six round of gas and groundwater monitoring were undertaken, including volatile vapour monitoring, to ascertain the ground gas scenario on site.

Risks to human health was assessed by comparing chemical soil test results against Generic Assessment Criteria for a 'commercial' end use. No exceedances were reported, as such, it is considered soils encountered across the site represent a low risk to human health in the context of the proposed development.

Bulk asbestos containing materials (ACM) were not encountered during the intrusive investigation, however asbestos screening laboratory testing was carried out and detected asbestos in the form of both fibres and ACM within 1 no. sample from the Made Ground at 0.45m bgl in BH103. The asbestos was identified as chrysotile and amosite with fibres identified at a concentration < 0.001%. The potential risk to construction workers from asbestos containing soils and bulk ACM can be addressed through the preparation and implementation of a site specific Risk Assessment and Method Statement by the Principal Contractor.

The majority of the proposed development is to be laid to hardstanding, which breaks the associated contaminant pathway and mitigates the risk to site end users. However, there are areas of soft landscaping proposed as soft verges in the south eastern section of the site within which there is potential for risk to future site users. Therefore, mitigation measures via the implementation of a clean cover system (CCS) in soft landscaped areas only, are required to break source-pollutant-receptor pathway.

Considering the thickness of Made Ground beneath the site, it is likely that potable water pipes will be laid in Made Ground. Concentrations of total VOCs, total SVOCs, MTBE and Total Phenols were encountered exceeding the thresholds for PE and PVC pipeline. Therefore, mitigation measures may be required, such as upgraded potable water supply pipes which should be agreed with the drinking water supplier in advance of construction.

Groundwater quality was assessed by comparison of groundwater monitoring results against UK Drinking Water Standards and Environmental Quality Standards for Freshwater in that order of preference, considering the sensitivity of both groundwater and surface water receptors. Groundwater levels identified the presence of a groundwater body within the superficial Tidal Flat Deposits, which demonstrated evidence of being tidally influenced. A summary of the identified chemical exceedances are presented in Table 1 below.

Table 1 – Water Environment Exceedances of Determinands

Determinand	Location	Screening Criteria (ug/l)		Concentration of Exceedance (ug/l)	Stratum
		DWS	EQS		
Arsenic	BH104	10	50	10.5	TFD
Copper	BH102(d)	2000	1	1.6	TFD & Sand and Gravel
Fluoranthene	BH101(s)	No Criteria	0.02	0.26	TFD
Ammonia	BH101(s) & BH104	No Criteria	1500	2700 & 3200	TFD
Total Suspended Solids	BH101(s) & BH104	-	-	520mg/l & 4300mg/l	TFD

Concentrations of arsenic were found to marginally exceed the DWS screening criteria, whilst copper, fluoranthene and ammonia were found to exceed their respective EQS screening criteria. The marginal exceedances of arsenic, copper and fluoranthene are not considered to be representative of the wider site conditions as each was identified in a single location only. Additionally, considering the ground conditions present on site with groundwater expected to be limited laterally within more granular lenses, it is unlikely to be in hydraulic continuity with off-site hydrological receptors. Ammonia was identified exceeding EQS criteria and was scheduled to target a specific on-site point source (sewage pumping station), however of the locations sampled, on was in close proximity to the point source and the other was up hydraulic gradient. As a result, the recorded concentrations of ammonia has been attributed to background concentrations, likely associated with the organic matter content present within the Tidal Flat Deposits. As such, the risk to controlled waters was determined as low.

Based on the ground gas data collected and analysed within the Fairhurst GIR (ref: 151157/R3.0, dated March 2024), the site was assessed as Characteristic Situation 4 (CS4) in accordance with CIRIA Report C665 and BS8485:2015. The site classification as CS4 is attributed to the combination of recorded high flow rates and elevated methane and carbon dioxide above advisory thresholds. The identified ground gas regime is attributed to the presence of significant organic matter within the Tidal Flat Deposits as the likely source of ground gas with the recorded high flow rates anticipated to be driven by differential pressures between the surface and underlying soils due to low and falling atmospheric pressures. Low photo-ionisation detector (PID) results were recorded during the ground gas monitoring, as such the risk from volatile vapours is considered to be low.

The assessment confirms that the majority of source-pathway-receptor linkages are low or very low risk and require no further assessment or mitigation. The potentially complete pollutant linkages are provided in **Table 2** below:

Table 2 – Summary of Pollutant Linkages Identified Following Ground Investigation

POLLUTANT LINKAGE NUMBER	DESCRIPTION
1	Potential risks to human health through inhalation of soils with asbestos fibres.
2	Potential risks to human health via permeation of VOCs, SVOCs, MTBE and Total Phenols into potable water pipes. Application of barrier pipes are advised.
3	Potential risks to human health through the inhalation of accumulated ground gases.
4	Potential risks to buried concrete from aggressive ground conditions.

Further information on each pollutant linkage identified above is provided for ease of reference:

2.4.1 Pollutant Linkage 1 – Risks to Construction Workers and Future Commercial End Users

Laboratory analysis undertaken has identified asbestos fibres and bulk ACM in a single sample within Made Ground. Considering Made Ground has been identified across the extent of the site, it is not considered feasible that redevelopment works can occur without disturbance of the Made Ground. Whilst there are no safe limits of asbestos concentrations within soil, the low levels of asbestos fibres and potential ACM present a relatively low risk to construction workers. This can be managed through the preparation of a Risk Assessment and Method Statement, by the Principal Contractor, seeking advice from an asbestos specialist/sub-contractor as required, covering the potential to encounter asbestos fibres in soils and ACM during the construction phase works, and how potential risks to construction workers and offsite receptors will be mitigated.

Considering minimal soft landscaping in the form of soft verges only is included as part of the proposed development, a conservative approach has been taken. Therefore, there is the potential for future site maintenance workers or visitors to come into contact with shallow soils, as such it is considered prudent to deploy remedial measures to mitigate this risk. **Sections 4.2** and **5.0** of this report outline the relevant mitigation and verification procedures.

2.4.2 Pollutant Linkage 2 – Risks to Potable Water Supply Pipes

The laboratory analysis undertaken to date has identified exceedances above the UKWIR PE and PVC thresholds and owing to the presence of VOCs, SVOCs, MTBE and Total Phenols in shallow soil – there could be viable pathways of contact between soil and pipe materials. Considering the exceedances were found site wide, it is considered prudent to make allowance for the use of barrier pipe. **Sections 4.3** and **5.0** of this report outline the relevant mitigation and verification procedures.

2.4.3 Pollutant Linkage 3 – Risk of Ground Gas to Future Commercial End Users

Return ground gas and groundwater monitoring undertaken to date has resulted in the site being classified as CS4, in accordance with CIRIA Report C665 and BS8485:2015, based on worst case GSVs of 13.72l/hr for methane and 1.43l/hr for carbon dioxide. These GSVs have been calculated based on a high recorded flow rate of 25.00l/hr and maximum methane and carbon dioxide concentrations of 54.90% and 5.70%, respectively.

A ground gas regime classification of CS4 requires 3.5 gas protection points for a proposed development which is considered to be a Type D building, with smaller office spaces within the proposed development considered to be Type C, requiring 4.5 gas protection points. **Sections 4.4** and **5.0** of this report outline the relevant mitigation and verification procedures.

2.4.4 Pollutant Linkage 4 – Risks to Buried Concrete from Aggressive Ground Conditions

Based on the soil chemical concentrations reported in the Fairhurst GIR (ref: 151157/R3.0, dated March 2024), depending on founding material, differing Concrete Classifications have been determined on site. **Sections 4.5** and **5.0** of this report outline the relevant mitigation and verification procedures.

3.0 OPTIONS APPRAISAL

With reference to the options appraisal matrix of the LCRM guidance and the relatively localised and low level contamination encountered, the pollutant linkages set out above are remediated most effectively through civil engineering and standard construction practices.

Pollutant Linkage 1 relates to the potential risk to construction workers and future commercial end users via the inhalation of shallow soils. The potential risks to construction workers can be mitigated through the use of good working practices (i.e. dust suppression in dry weather, PPE, good hygiene) and the preparation of a Risk Assessment and Method Statement, by the Principal Contractor, regarding the potential to encounter asbestos fibres in soils and ACM during the construction phase works. This is explained in more detail in **Section 4.1.1**.

With regards to future site end users, the costs of biological, chemical, physical and stabilisation or treatment methods far outweigh the benefits and feasible options are:

- Civil engineering – source excavation and disposal;
- Pathway manipulation – provision of a clean cover system (CCS) comprising a high visibility marker layer and ‘clean’ imported soils.

The options are explained in more detail in **Section 4.2**.

In order to comply with the waste hierarchy and design a sustainable remedial methodology, the pathway manipulation method is the preferred option. This allows for soils to be retained on site where possible and avoids unnecessary removal and import costs.

In the case of **Pollutant Linkage 2 (Potable water supply pipes)**, the costs of biological, chemical, physical and stabilisation or treatment methods far outweigh the benefits and feasible options are:

- Civil engineering – source excavation and disposal;
- Civil engineering – installation of water supply pipe in ‘clean’ upfill to avoid contact with Made Ground; and,
- Pathway manipulation - Use of pipe material able to withstand the contaminant concentrations identified on site, i.e. use of barrier pipes.

The options are explained in more detail in **Section 4.3**.

In order to comply with the waste hierarchy and design a sustainable remedial methodology, the pathway manipulation method is the preferred option. This allows for soils to be retained on site where possible and avoids unnecessary removal and import costs.

Pollutant Linkage 3 relates to the potential risk to future commercial end users via inhalation of accumulated ground gases. The costs of biological, chemical, physical and stabilisation or treatment methods far outweigh the benefits and feasible options are:

- Civil engineering – source excavation and disposal;
- Pathway Manipulation – installation of ground gas protection measures within the building.

The options are explained in more detail in **Section 4.4**.

In order to comply with the waste hierarchy and design a sustainable remedial methodology, the pathway manipulation method is the preferred option. This allows for soils to be retained on site where possible and avoids unnecessary removal and import costs.

Pollutant Linkage 4 relates to aggressive attack on below ground concrete. Removal of soils

containing elevated sulphate concentrations (some of which are naturally derived) would not be sustainable or practical, and thus use of appropriate concrete classification in accordance with BRE SD1 is considered the most appropriate method of mitigation of risk to buried structures from aggressive ground conditions.

The option is explained in more detail in **Section 4.5**.

4.0 REMEDIATION STRATEGY

Please note that where Local Authority is referenced below, this may include the Local Planning Authority and / or Environmental Health under the Planning regime, or Building Control Inspector in relation to the Building Regulation requirements.

4.1 General Requirements

4.1.1 Asbestos Fibres / ACMs / Dust

Asbestos fibres and bulk ACM fragments have been identified via laboratory testing within Made Ground on site. As such, the Principal Contractor is to prepare a Risk Assessment and Method Statement, consulting with an Asbestos Specialist as required to assess and adequately manage the risks associated with the presence of asbestos containing soils and ACM during the construction phase works, detailing how potential risks to construction workers and offsite receptors will be mitigated.

The Principal Contractor should implement a 'watching brief' for ACM. The 'watching brief' should be undertaken by an appropriately trained and experienced operative (such as somebody who is asbestos Category B trained). Visibly identifiable ACMs are not permitted in the permanent works at the site. The ACM site acceptance criteria has therefore been determined as <0.1% w/w.

Where suspected visible bulk ACM is identified in excavated Made Ground and existing stockpiled material during the remediation works, works should cease to allow appropriate risk assessment, agreement on remedial works, and production of appropriate RAMS for the work by the Principal Contractor (or appropriately appointed specialist sub-contractor).

Where bulk ACM is identified this should be removed by an appropriate contractor. Depending on the form, quantity etc., of asbestos, the Contractor should determine if the works are required to be undertaken by a Licensed or Non-Licensed contractor. The Principal Contractor must ensure that all works undertaken are in compliance with CAR 2012 (where appropriate), under appropriate RAMS, and ACM removed from site is disposed of to a suitably licensed facility and via an appropriately licensed waste carrier.

If any ACM contaminated soils are removed from site, or bulk ACM is segregated and removed, then detailed records should be collated by the Principal Contractor, including location/source of ACM materials encountered, delineation sampling and survey results, ACM form and volume of material removed, verification of materials post bulk ACM removal and prior to reuse, and waste transfer notes for any ACM (or ACM contaminated soils) removed from site.

4.1.2 Unexpected Contamination

If any unexpected contamination is encountered which has not been previously identified by intrusive investigations and considered within this Remediation Strategy, works in the specific area / affected works should cease and the client appointed project Geo-Environmental Engineer (and Local Planning Authority, where required) should be consulted.

Site inspections, further testing and risk assessment may be required to determine if the potential risks associated with the unexpected contamination pose an immediate, and / or long term risk, and mitigation measures should be designed accordingly in consultation with the project Geo-Environmental Engineer.

Any deviations from protection measures detailed in this Remediation Strategy should be sent to the Local Planning Authority and / or appropriate regulators, where required, including details of the unexpected contamination encountered, the associated potential risks and the proposed mitigation measures where required, for approval. Any associated remedial actions undertaken should be

recorded and verified by the Principal Contractor, and provided to the appointed Geo-Environmental Engineer for their inclusion within the site Verification Report for planning purposes.

4.1.3 Imported Materials

It is the responsibility of the Principal Contractor to assess the suitability for use of material imported to site to meet engineering levels. Imported materials may fall into the following three categories:

- Primary Aggregate – There is no requirement to chemically validate these materials. However, this is subject to delivery documentation confirming the primary nature and origin of the material;
- Secondary Aggregate – Chemical laboratory testing of aggregate is not practically achievable. However, such materials must be validated to be free of gross contamination and / or deleterious material and include documentation confirming the materials source. Testing suites dependent on the source may be required, for example including asbestos analysis where demolition rubble is to be imported. All materials which are to be imported to site must be confirmed as suitable by a Geo-environmental Engineer prior to placement; and,
- Imported Soils – Any imported materials for use in areas of soft landscaping, should meet the Site Acceptance Criteria detailed in **Appendix B** (including sampling the material at a frequency of 1 no. sample per 250 m³ - with a minimum of 3 no. tests for any single source of material). Any soft landscaping materials must also meet any relevant landscape architect specification for the site and any other MMP requirements. Consideration can be given to importation of materials which exceed these criteria in areas outside of the proposed soft landscaping, if required to achieve engineering levels, provided they demonstrably do not present an unacceptable risk to environmental receptors, including controlled waters, and subject to agreement with a Geo-Environmental Engineer.

All materials imported for use on-site, including areas of soft and hard landscaping, should be free from visual / olfactory evidence of contamination (including presence of ACMs). Delivery notes for all materials imported should be collated detailing the source, volume and carrier of materials, and provided for inclusion within the site Verification Report. It is recommended that all materials imported to site are recorded, including stockpiling referencing and areas of re-use, in accordance with any Earthworks Specifications and / or site MMP. This will allow a transparent and clear audit trail of materials generated / re-used and imported to facilitate the development.

4.1.4 Waste

Subject to the proposed earthwork requirements, materials may be required to be disposed of off-site. In compliance with the Waste Framework Directive, it is proposed, where possible, to “re-use” materials and, where necessary undertake “recovery” operations, to enable incorporation of the materials within the earthworks operations. All appropriate licenses are to be obtained by the Principal Contractor, in accordance with Environmental Permitting. Where re-use and recovery is not considered viable, off-site disposal to a suitably licensed facility is to be undertaken.

Where possible, the Principal Contractor should segregate Made Ground deposits to those of natural origin to allow subsequent analysis. Where materials are geotechnically or geo-environmentally unsuitable for reuse on-site, they will be either sent to a waste recovery facility for recycling or a suitably licensed waste disposal facility.

The Principal Contractor will be responsible for characterising all wastes generated by the site in accordance with the Landfill Directive, Landfill Regulations (England and Wales), Waste Regulations (England and Wales) and the Hazardous Waste Regulations, current and applicable at the time of works. The Principal Contractor will ensure that no mixing of generated wastes occurs and that no

cross-contamination of waste streams occurs. Where practicable and cost effective, materials requiring off-site disposal should be selected and pre-treated to minimise waste volume and to maximise reduced waste classification where possible.

The Principal Contractor will be responsible for liaison with waste disposal operators and to compile and provide a complete chain of custody, in addition to complying with current waste legislation and regulation. For disposal of materials and liquids, the Principal Contractor will collate documentary evidence to demonstrate their compliance with the duty of care arising under Section 32 of the Environmental Protection Act 1990, which could include:

- Waste management licenses or exemptions;
- Completed Waste Transfer Note;
- Completed Hazardous Waste Consignment Note; and,
- Certificate of Registration for any proposed Registered Waste Carriers.

4.1.5 Other General Requirements

It is the responsibility of the Principal Contractor to ensure that all necessary Materials Management Plans, Qualified Person Declarations, Environmental Permits, Health and Safety Plans, Risk Assessments and Method Statements (RAMS), Mobile Treatment Plant, and Discharge / Abstraction Consents are obtained / approved, as required. These should be provided to the Geo-Environmental Engineer for incorporation within the proposed site Verification Report.

4.2 Pollutant Linkage 1 – Construction Workers and Future Commercial End Users

As detailed above, the presence of asbestos fibres and bulk ACM fragments, were identified within Made Ground on site in a manner which could pose a potential risk to construction workers and future commercial end users. As outlined in **Section 2.4.1**, the potential risk to construction works is considered to be relatively low providing good working practices and the preparation of a Risk Assessment and Method Statement regarding the potential to encounter asbestos by the Principal Contractor, which is explained in detail in **Section 4.1.1**.

As detailed in the remediation options appraisal in **Section 3.0**, a clean cover system (CCS) is considered the most appropriate method of mitigating the identified risk to future site residents and visitors. Minimal soft landscaping in the form of soft verges only is included as part of the proposed development. The implementation of a CCS will provide clean, safe soils for end users and prevent exposure to any potential residual contamination at depth, as well as providing a suitable growing medium for flora. Based on the proposed development and the ground investigation, the following are required in all soft landscaped areas:

- High-visibility orange marker barrier overlain by;
- CCS-450mm thick comprising a minimum of 150mm topsoil, over 300mm subsoil.

The CCS materials should be validated as suitable for use (i.e. contain contaminant concentrations at or below the residential without home grown criteria presented in Appendix B), prior to import to site in accordance with **Section 4.1.3** of this report and detailed below in the Verification Plan. The above CCS should be agreed with the Local Planning Authority, Warranty Provider and Landscape Architect, where appropriate.

Furthermore, it is recommended that the Health and Safety File for the site clearly identifies the potential for low level asbestos fibres and potential ACM contamination in Made Ground beneath the site, and the requirement for a RAMS prior to disturbance of Made Ground (i.e. in areas either beneath finished hardstanding such as roads and buildings, or beneath any clean capping in soft landscaping areas). The Health and Safety File for the site should also clearly state that a clean cover system is present in soft landscaped areas with a restriction on the planting of home-grown produce and this should be

maintained for the design life of the development and shared with all subsequent owners to ensure the associated pollutant linkages remain broken.

4.3 Pollutant Linkage 2 - Potable Water Supply Pipes

The laboratory analysis undertaken to date suggests there are limited exceedances above the UKWIR PE and PVC thresholds. Therefore, due to the presence of VOCs, SVOCs, MTBE and Total Phenols identified in shallow soils across the entire extent of the site, and that potable water supply pipes are likely to be laid in contact with Made Ground, it is recommended that barrier pipe is installed as this will protect against any contamination present. Additionally, the use of barrier pipe will negate the need for additional UKWIR testing along the potable water pipe route, as would be required by the local service provider. The Verification Plan for this for this pathway is detailed in **Section 5.0** below.

4.4 Pollutant Linkage 3 – Risk of Ground Gas to Future Commercial End Users

The Fairhurst GIR confirmed that the site is classified as CS4, and mitigation measures are required to protect end users. The source of the elevated methane and carbon dioxide on site is attributed to the underlying Tidal Flat Deposits which are present at a consistent thickness of 9.50m across the site. The high flow rates encountered are likely driven by differential pressures between the surface and underlying soils due to low and falling atmospheric pressures.

In accordance with BS8485:2015, the majority of the proposed development is classed as Type D, broadly defined as a large commercial building that is well ventilated, whilst any smaller office spaces are classed as Type C and broadly defined as small to large size rooms that have active ventilation or good passive ventilation. Under a CS4 classification Type D buildings require a gas protection score of 3.5, whilst Type C buildings require a gas protection score of 4.5.

These gas protection scores will be attained through a combination of the following protection measures:

- Cast in-situ reinforced ground bearing floor slab with minimal penetrations, providing 1.5 points as a structural barrier against ground gas ingress;
- Passive sub-floor dispersal layer design in accordance with Annex B of BS8485:2015, attaining 'good performance' thereby providing 1.5 points as ventilation;
- Installation of a gas resistant membrane across the entire extent of the proposed building, with all joints and penetrations sealed and appropriate installation validation, providing 2 points.

The combined use of the above gas protection measures provides a total score of 4.5 points ensuring both Type D and Type C areas of the proposed building are sufficiently protected.

Fairhurst are not the designers of the required gas protection system that will be used on site, and an appropriately experienced and qualified contractor needs to be appointed to advise on the design of the gas protection, in accordance with BS8485:2015+A1:2019.

4.5 Pollutant Linkage 4 – Buried Concrete

In accordance with the Ground Investigation Reports, due to potentially aggressive conditions with respect to concrete, all buried concrete in contact with the stratum below is to be appropriately specified in accordance with BRE SD1. A summary of the appropriate concrete classifications is provided below within Table 3. Where the buried concrete is in contact with more than one stratum, the worst case classification should be adopted.

Table 3 – Summary of Concrete Classifications

Material Type	Design Sulphate Class	ACEC Class
Made Ground	DS-1	AC-1
Tidal Flat Deposits	DS-4	AC-4
Sands and Gravels	DS-2	AC-2
Mercia Mudstone Group	DS-1	AC-1
Groundwater	DS-1	AC-1

The source-pathway-receptor pollutant linkage should be addressed with use of the above concrete specification and appropriate verification of such, as detailed in the Verification Plan in **Section 5.0** of this report.

5.0 VERIFICATION PLAN

In order to comply with good practices with regard to Land Contamination Risk Management (LCRM) guidance it is necessary to verify that the remedial works have been undertaken in accordance with the approved Remediation Strategy. The Verification Report should provide a clear record of the measures undertaken to render the site suitable for use.

The following table presents a summary of the required verification protocols relevant to the general requirements set out in **Section 4.1**, and the specific S-P-R linkages in **Section 4.2 to 4.5**. It is the Principal Contractor's responsibility to provide the verification evidences and information to the Geo-environmental Engineer for independent review and reporting to the Local Planning Authority.

Table 3 – Verification Plan

REMEDIATION STRATEGY	VERIFICATION REQUIREMENTS	VERIFICATION DOCUMENTATION
General Requirements: Asbestos Risk Assessments and Method Statements	- RAMS are to be provided specifically addressing the potential for ACM contamination within Made Ground and how risks to site personnel and offsite human health receptors will be mitigated during the construction works; and, - Any ACM visually identified on-site shall be handpicked and disposed of. Records of volumes removed from site, verification sampling, and confirmation of suitable waste carrier and disposal routes will be provided.	- Asbestos RAMS - Evidence of compliance: - site photographs, - site diaries, - evidences of tool box talks - evidence of watching brief - ACM removal documentations including - volume of material removed, - chemical laboratory test results of verification samples - waste carrier details and license and - receiving facility information
General Requirements: Unexpected Contamination	- If unexpected contamination is uncovered, all works in the specific area / affected works should cease and the client appointed project Geo-Environmental Engineer and Local Planning Authority should be consulted; - The verification of remediation undertaken as a result of unexpected contamination will be subject to risk assessment and remedial methods adopted; and, - The verification protocols will therefore be agreed with the Ge-	In the event that no unexpected contamination is encountered: - A brief statement from the Principal Contractor saying that no unexpected contamination was encountered during the works. In the event that unexpected contamination is encountered, exact requirement vary, however as a minimum: - Photographic evidence of unexpected contamination;

	Environmental engineer and Local Planning Authority as appropriate.	- Evidence of communication with LA and Environmental Engineer; - Remediation strategy amendments; and, - Verification sampling and testing and reporting.
General Requirements: Imported Materials	- Confirmation of suitability of materials prior to import are to be provided in accordance with Section 4.1.3 in relation to primary, secondary aggregate and imported soils; - All imported soils are to comply with the SAC specified in Appendix B; - In the case of materials imported for use in the clean cover system, this will be conducted at a frequency of 1 per 250 m³ (or minimum of 3 No. per source, whichever is greatest) prior to import for the suite set out in Appendix B as a minimum; and, - All imported materials should comply with the MMP and any Earthworks Specification Requirements.	The Principal Contractor will provide the following to the appointed Geo-environmental Engineer for all materials imported to site: - Volume, details of origin and details of where material is to be incorporated on site; - Confirmation that the material is free from visual / olfactory evidence of contamination (including presence of ACMs); - Delivery notes for all materials imported detailing the source, volume and carrier of materials, and provided for inclusion within the site Verification Report; and, - Details and results of testing in compliance with this remediation strategy and the subsequent MMP/Earthworks specification. The Contractor's appointed Geo-Environmental Engineer will review and incorporate the above information into the final Remediation Verification Report.
General requirements: Waste	- All waste disposal records are to be collated in accordance with Section 4.1.4 and provided to the Contractor's appointed Geo-Environmental Engineer; and, - A summary spreadsheet detailing total volumes, waste types and materials, and disposal facility should be provided to the engineer along	- Waste disposal records; - Summary spreadsheet including volumes removed, type of waste / confirmed waste classification and European waste code; - Details of waste carrier and its license; and, - Details of receiving site.

	with the original waste disposal tickets / consignment notes.	A Geo-Environmental Engineer will make reference to the volume and nature of any designated waste within the final Remediation Verification Report.
Pollutant Linkage 1: Construction Workers and Future Commercial Site Users As detailed in Section 4.2, The potential risk to construction works is considered to be relatively low providing good working practices and the preparation of a Risk Assessment and Method Statement regarding the potential to encounter asbestos by the Principal Contractor. A clean cover system (CCS) is considered the most appropriate method of mitigating the identified risk to future site end users. The implementation of a CCS will provide clean, safe soils for end users and prevent exposure to any potential residual contamination at depth, as well as providing a suitable growing medium for flora. The following are required in all soft landscaped areas: • High-visibility orange marker barrier overlain by;	• In all areas of proposed soft landscaping, a topographical survey shall be carried out by the Principal Contractor prior to and after placement of the clean cover system to confirm that the extents and thicknesses comply with this Remediation Strategy. • Laboratory testing of all imported materials to be used in the clean cover system should be undertaken at the appropriate frequencies as specified in Section 4.1.3, and shown to meet the Site Acceptance Criteria detailed in Appendix B of this report. This testing must be undertaken prior to placement of imported materials and all certificates passed on to the Geo-Environmental Engineer for approval. • Validation pits are to be undertaken by an independent party at locations to be determined and agreed with the Geo-Environmental Engineer to conduct both a visual inspection of the material utilised within the clean cover system to confirm the absence of visual/olfactory evidence of contamination, the depth of the clean cover system and the presence of the high-visibility marker barrier.	• Delivery records and product specification information of high-visibility marker barrier. • Confirmation that the clean cover system material is free from visual / olfactory evidence of contamination (including presence of ACMs); • Delivery notes for all materials imported detailing the source, volume and carrier of materials, and provided for inclusion within the site Verification Report; and, • Details and results of testing in compliance with this remediation strategy. • Photographic evidence displaying the placement on both the high-visibility marker barrier and minimum required depth of clean cover system.

CCS-450 comprising 150mm topsoil, over 300mm subsoil.		
Pollutant Linkage 2: Potable Water Supply Pipes As detailed in Section 4.3, Considering contamination above the UKWIR thresholds for PE and PVC pipe was identified site wide and potable water pipes are likely to be laid in the Made Ground, upgraded pipe material in the form of barrier pipe should be installed to ensure it is protective against the aggressive ground conditions.	- Subject to the pipe route (including if placed within the groundwater table), materials used in the earthworks (including any enabling works sourced materials) should be risk assessed along the length and depth of the proposed pipe network. - Contact should be made with the drinking water supplier to obtain approval for the use of barrier pipe for potable water supply pipes.	- Water supplier approvals of chosen pipe material; - Delivery records of water supply pipes; and, - Installation certificates.

Pollutant Linkage 3: Grand Gas risk to Future Commercial End Users As detailed in Section 4.4, The site is designated as Characteristic Situation 4 with the proposed development comprising a primarily Type D building with some Type C spaces, therefore requiring a gas protection score of 3.5 and 4.5, respectively. The gas protection score will be attained through the combination of a structural barrier in the form of a reinforced cast in-situ ground bear floor slab with minimal penetrations, a passive sub-floor dispersal layer and a gas resistant membrane. (TBC following ongoing monitoring and detailed ground gas risk assessment)	• Pre-installation design drawings detailing proposed gas protection measures to be included within development and subsequent approval by verifying engineer; • As-built construction plans detailing the designs and product specification utilised for each of the gas protection measures; • Description of the installation process of each gas protection measure including details of all involved parties and guarantees; • Installation of the gas protection measures undertaken by appropriately qualified and experienced contractors; • Integrity testing carried out on all gas membrane seals by appropriately qualified contractors, to be witnessed by the verifying engineer; • Independent Verification of membrane installation by qualified contractor who is suitably trained.	• Copies of qualifications held by gas protection measures installation contractors; • Site record forms should be completed for each site inspection visit; • Product Specification/Data Sheets for materials used in gas protection measures; • Photographic evidence of membrane installation showing no tears or holes with joints and penetrations appropriately sealed; • Installer to supply sign off sheets including sub grade acceptance forms, photographs etc to independent verifier for all other pours; • Independent Verification Report of membrane installation by qualified contractor providing quality assurance; and, • As built drawings demonstrating the gas protection measures implemented into the development.
Pollutant Linkage 4: Buried Concrete	• Once the desired foundation solution has been decided, reference should be made to Table 2 of this remediation Strategy to confirm the appropriate concrete classification. If in contact with more than one stratum, the worst case classification should be adopted. • If any testing undertaken suggests an increased concrete specification is required, this should be highlighted to the	• Concrete delivery slips confirming concrete specification and use in accordance with BRES D1 , • Any additional laboratory testing certificates for concrete classification purposes.

	Novated Structural Engineer and the proposed concrete material specification adjusted to suit.	
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6.0 CONCLUSIONS

Following validation of the site works, and the proposed remedial measures set out within this Remediation Strategy, it is considered the site will be rendered 'suitable for use' based on the proposed development as detailed in **Section 1.0**.

This report therefore sets out the general requirements (such as Asbestos RAMS, appropriate import/waste protocols) as well as a remediation strategy and verification plan to address the following identified source-pollutant-receptor linkages:

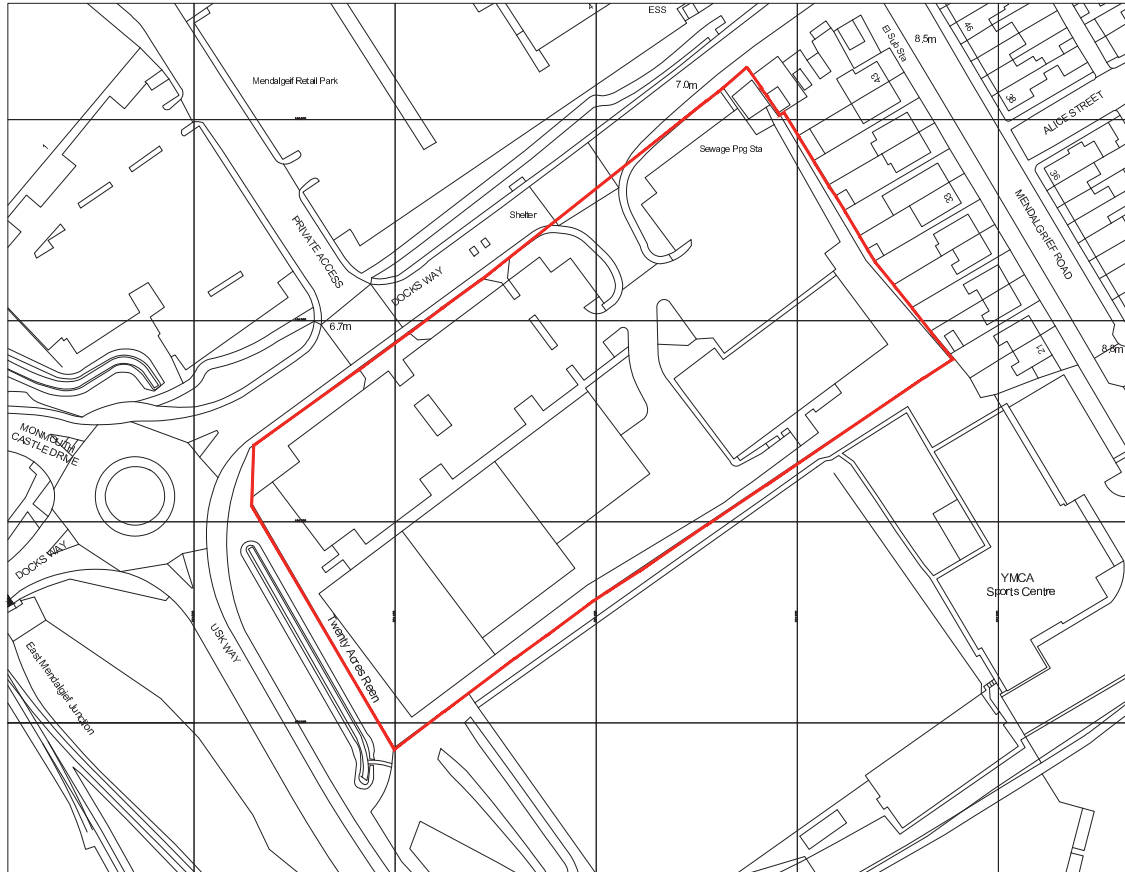
- Mitigation of potential risks to human health associated with presence of asbestos fibres and bulk ACM within the shallow soils in areas of proposed soft landscaping;
- Mitigation of potential risks to human health associated with permeation of potable water supply pipes;
- Mitigation of potential risks to human health associated with accumulation of ground gases;
- Mitigation of risk to buried concrete associated with sulphate concentrations and pH levels in soil beneath the site;

It is considered that adoption of this Remediation Strategy and Verification Plan, in conjunction with the other engineering requirements (including any MMP, Earthworks Specification, etc.) will render the site suitable for its combined residential and commercial use and suitably mitigate the potential remnant contaminated land risks.

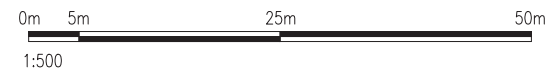
On completion of the remedial works, a Remediation Verification Report shall be completed to confirm the Remediation Strategy and Verification Plan have been carried out.

APPENDIX A - FIGURES

FIGURE 1 – SITE LOCATION PLAN

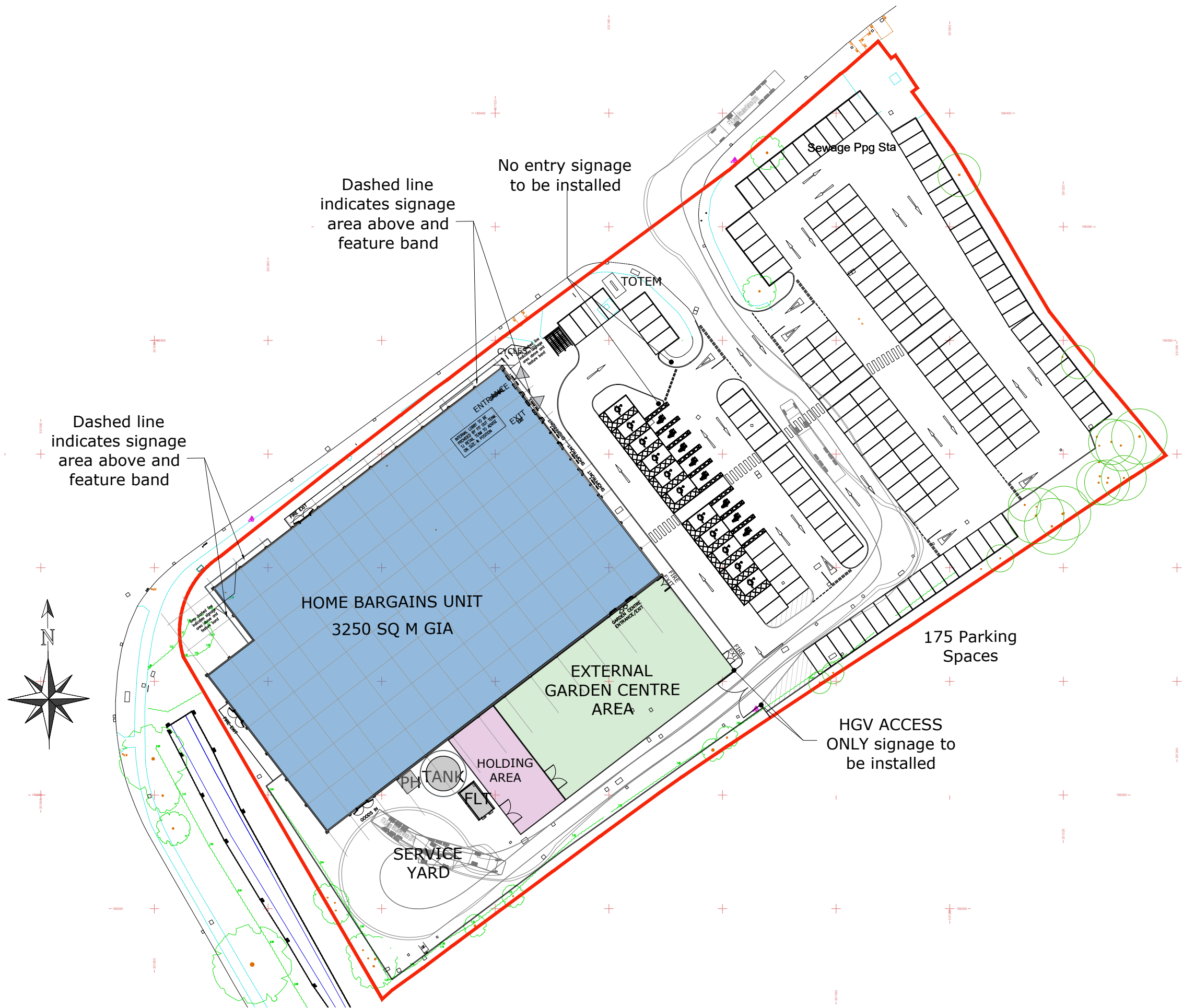


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 RED LINE = OWNERSHIP BOUNDARY



REV.	DATE	AMENDMENT
 WPL Consulting LLP 1 Airport West · Lancaster Way · Leeds · LS19 7ZA Tel: 0113 202 9444 Fax: 0113 202 9333 E-mail: mail@wplconsulting.co.uk		
PROJECT TITLE West Retail Park Docks Way Newport NP20 2NS For Home Bargains		
DRAWING TITLE Site Location Plan		
PROJECT No:	DRAWING No:	REVISION:
	LC01	
SCALE:	DATE:	DRAWN BY:
1:1250@A3	05.05.22	TR
CHECKED BY:		DATE:

FIGURE 2 – PROPOSED DEVELOPMENT PLAN



A REV.	05.05.22 DATE	GIA Sq M added, holding area and garden centre areas removed AMENDMENT
WPL WPL Consulting LLP 1 Airport West Lancaster Way Leeds LS19 7ZA Tel: 0113 202 9444 Fax: 0113 202 9333 E-mail: mail@wplconsulting.co.uk		
PROJECT TITLE Newport West Retail Park		
DRAWING TITLE Sketch Proposal Proposed Site Plan		
PROJECT No: 8658	DRAWING No: PROP01	REVISION: A
SCALE: 1:500 @ A2	DATE: 22.04.22	DRAWN BY: TR
CHECKED BY:		DATE:

APPENDIX B – SITE ACCEPTANCE CRITERIA (SAC)

**Table C-1 – Clean Cover System SAC
IMPORTED (See Section 4.1.3)**

DETERMINAND	UNITS	Concentration (mg/kg)		
		1% SOM	2.5% SOM	6% SOM
Asbestos (as detected by laboratory analysis)	% w/w	<0.1	<0.1	<0.1
ACM (as identified by on-site 'watching brief')	Visual identification	No ACM identified	No ACM identified	No ACM identified
Free cyanide	mg/kg	34	34	34
Arsenic	mg/kg	40	40	40
Barium	mg/kg	1300	1300	1300
Beryllium	mg/kg	1.7	1.7	1.7
Boron	mg/kg	11000	11000	11000
Cadmium	mg/kg	85	85	85
Chromium (III)	mg/kg	910	910	910
Chromium (VI)	mg/kg	6	6	6
Copper	mg/kg	7100	7100	7100
Lead	mg/kg	310	310	310
Mercury	mg/kg	15	15	15
Molybdenum	mg/kg	670	670	670
Nickel	mg/kg	180	180	180
Selenium	mg/kg	430	430	430
Vanadium	mg/kg	1200	1200	1200
Zinc	mg/kg	40000	40000	40000
Aliphatic TPH >C5-C6	mg/kg	42	78	160
Aliphatic TPH >C6-C8	mg/kg	100	230	530
Aliphatic TPH >C8-C10	mg/kg	27	65	150
Aliphatic TPH >C10-C12	mg/kg	48	118	283
Aliphatic TPH >C12-C16	mg/kg	24	59	142
Aliphatic TPH >C16-C35	mg/kg	8.48	21	110000
Aliphatic TPH >C35-C44	mg/kg	8.48	21	110000
Aromatic TPH >C5-C7	mg/kg	370	690	1400
Aromatic TPH >C7-C8	mg/kg	860	1800	3900
Aromatic TPH >C8-C10	mg/kg	47	110	270
Aromatic TPH >C10-C12	mg/kg	250	590	1200
Aromatic TPH >C12-C16	mg/kg	1800	419	2500
Aromatic TPH >C16-C21	mg/kg	1900	1900	1900
Aromatic TPH >C21-C35	mg/kg	1900	1900	1900
Aromatic TPH >C35-C44	mg/kg	1900	1900	1900
Naphthalene	mg/kg	2.3	5.6	13
Acenaphthylene	mg/kg	86.1	212	506
Acenaphthene	mg/kg	57	141	336
Fluorene	mg/kg	30.9	76.5	183
Phenanthrene	mg/kg	36	1500	1500
Anthracene	mg/kg	1.17	35000	37000
Fluoranthene	mg/kg	1500	1600	1600
Pyrene	mg/kg	3700	3800	3800
Benzo[a]anthracene	mg/kg	11	14	15
Chrysene	mg/kg	30	31	32

DETERMINAND	UNITS	Concentration (mg/kg)		
		1% SOM	2.5% SOM	6% SOM
Benzo[b]fluoranthene	mg/kg	3.9	4.0	4.0
Benzo[k]fluoranthene	mg/kg	110	110	110
Benzo[a]pyrene	mg/kg	3.2	3.2	3.2
Indeno(1,2,3-c,d)Pyrene	mg/kg	45	46	46
Dibenz(a,h)Anthracene	mg/kg	0.31	0.32	0.32
Benzo[g,h,i]perylene	mg/kg	360	360	360
Benzene	mg/kg	0.38	0.7	1.4
Toluene	mg/kg	869	1900	3900
Ethylbenzene	mg/kg	83	190	440
o-xylene	mg/kg	88	210	480
m-xylene	mg/kg	82	190	450
p-xylene	mg/kg	79	180	430
Total Phenols	mg/kg	440	690	1200

Notes:

- Assessment Criteria based upon 1 %, 2.5 % and 6 % soil organic content (SOM) for a commercial land-use scenario;
- Under no circumstances must hazardous waste be imported to site;
- Validation testing will be carried out in an UKAS and MCERTS accredited laboratory;
- The frequency of testing will be as recommended in Remediation Strategy or as determined at the discretion of the client appointed Geo-Environmental Engineer as appropriate for the ground conditions encountered during the works;
- The SAC have been selected based on the results of the ground investigation and geo-environmental risk assessment works undertaken to date, and the current understanding of the conceptual site model for the site. Where potential contaminants identified at preliminary risk assessment stage have not been encountered during ground investigation these have not been brought forward into the SAC.
- All materials imported for use on-site, should be free from visual / olfactory evidence of contamination (including visual presence of ACMs), complying with the criteria set out in the table above and being classified as inert.
- Delivery notes for all materials imported should be collated detailing the source, volume and carrier of materials, and provided for inclusion within the site Verification Report.
- If soils are imported from an off-site source, for instance for the 'clean cover system' or for general fill material, then consideration must be given to changing the SAC based on the source of material in consultation with the client appointed Geo-Environmental Engineer.
- Imported topsoil must also be compliant with the Landscape Architect's Specification, including any specified contaminant concentrations and quality controls such that it provides a suitable quality growing medium.