

# Lower Ashley Road, Bristol

# **Remediation Strategy**



### **Report for:**

Prelon Housing Ltd

#### **Project Reference:**

CS-0554

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#### **Document Revision**

Client		Prelon Housing Ltd		Project Reference	CS-0554	
Site Address		Lower Ashley Road, Bristol				
Issue	Date	Revision Details	Prepared by	Checked by	Approved by	
01	14/11/19	Original Issue	Jon Adams	Kate Wooldridge	Kate Wooldridge	

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#### CONTENTS

1	INTRODUCTION	.1
1.1 1.2 1.3 1.4 1.5 1.6	BACKGROUND SITE LOCATION AND DESCRIPTION PREVIOUS REPORTS PROPOSED DEVELOPMENT OBJECTIVES REPORT LIMITATIONS	1 1 1 1 2
2	BACKGROUND INFORMATION AND SITE SETTING	. 3
2.1 2.2 2.3 2.4 3	INFORMATION SOURCES GEOLOGY, HYDROLOGY AND HYDROGEOLOGY SITE HISTORY SUMMARY OF PREVIOUS FINDINGS REFINED CONCEPTUAL SITE MODEL	3 3 3 3
3.1 3.2 3.3	GENERAL SOURCES RISK EVALUATION REMEDIATION STRATECY	6 6 6
4		. 8
4.1 4.2 4.3 4.4 4.5	REMEDIATION OBJECTIVES REMEDIATION STRATEGY RISK MITIGATION SOIL RE-USE OPPORTUNITIES RESIDUAL RISK AND UNCERTAINTY	8 8 9 10
5	MANAGEMENT OF WORKS	11
5.1 5.2 5.3 5.4 5.5 5.6	HEALTH AND SAFETY ON-SITE MATERIAL MANAGEMENT WASTE MANAGEMENT STRATEGY WASTE CHARACTERISATION UNEXPECTED CONTAMINATION CONTROL MEASURES AND MONITORING	11 11 12 12 12
6	VERIFICATION	13
6.1 6.2 6.3 6.4 6.5	CAPPING SOILS IN SOFT LANDSCAPING AREAS GROUND GAS PROTECTION POTABLE WATER SUPPLY PIPEWORK RECORD KEEPING REMEDIATION COMPLETION REPORT	13 14 14 14 15



#### APPENDICES

- A DRAWINGS
- B IMPORTED SOIL/SOIL RE-USE CRITERA



#### 1 INTRODUCTION

#### 1.1 Background

Following instruction from Prelon Housing Ltd (the 'client'), this report presents a Remediation Strategy for a proposed residential development at Lower Ashley Road, Bristol (the 'site').

#### **1.2** Site Location and Description

The site occupies an area of approximately 1200 square metres (m<sup>2</sup>) and is located around National Grid Reference (NGR): 359933, 174340 within the city of Bristol. The nearest postcode for the site is BS2 9NP.

The site comprises a rectangular shaped disused parcel of land, with ground cover comprising a mixture of hard landscaping and gravel. Site boundaries comprise hoarding with double vehicular gates located on the southern boundary. The site is relatively flat with a slightly drop to the east.

The wider surrounding area comprises predominately residential properties with the M32 motorway approximately 140m to the east.

#### 1.3 **Previous Reports**

Previous reports pertaining to the site are listed in Table 1.1. Pertinent information is summarised in this report where appropriate. However, reference should be made to these reports directly for further detail.

#### Table 1.1 Summary of Previous Reports

Date	Title	Reference	Author
October 2004	Remediation Verification Report	4B/321/008	SLR Consulting Ltd
August 2017	Ground Investigation Report	2017Aug_LOW1869_GI Report	T&P

#### 1.4 Proposed Development

Information presented to T&P Regeneration Ltd (T&P) indicates that the proposed development is intended to comprise the construction of 2N° three storey residential apartment buildings with associated areas of communal and private soft landscaping with hard landscaped areas and parking.

It should be noted that the 2017 investigation was undertaken in the context of a previous proposed development plan, which did not include any areas of soft landscaping. However, development proposals have since changed to include a single private garden and a small soft landscaped area in the north-east of the site. In addition, various small decorative borders are proposed across the site.

Proposed Development and Landscaping Plans are included within Appendix A.

#### 1.5 Objectives

The objective of this remediation strategy is to outline the risk mitigation measures required to address identified unacceptable risks presented to human health or the environment in the context of the site's proposed future end use as a residential development.



#### 1.6 Report Limitations

The recommendations, interpretations and conclusions of this report are based solely on the site conditions observed and the ground conditions revealed during previous site investigation works undertaken by T&P and/or third parties. No responsibility can be accepted for the accuracy of third-party data. Due to the inherent variability of the ground conditions between exploratory hole positions these conditions can only be interpreted and are accurate only for the date of the investigation works.



#### 2 BACKGROUND INFORMATION AND SITE SETTING

#### 2.1 Information Sources

Reference has been made to previous reports and publicly available information from the Environment Agency, MAGIC and BGS websites, as relevant. Background and site setting information has been provided to provide context to the site, proposed development and remediation strategy.

#### 2.2 Geology, Hydrology and Hydrogeology

The published solid and drift geological mapping (1:50,000 sheet 233) indicates the solid geology underlying the entire site comprises sandstone of the Redcliffe Sandstone Member. Superficial deposits are not recorded.

The Redcliffe Sandstone Member is defined as a Secondary A Aquifer. The site is not, however, located in a groundwater Source Protection Zone.

The closest surface water feature is the River Frome which is located approximately 150m to the east and flows via a culvert under the M32 motorway.

#### 2.3 Site History

The site history is summarised from publicly available historical maps.

In summary, the site was occupied by terraced residential housing from the earliest maps available (late 1800's) until 1984 when the site was converted to a petrol station. The site remained as a petrol filling station until decommissioned in 2004, no details of the former tanks are available other than that discussed within the 2004 remediation report.

#### 2.4 Summary of Previous Findings

A summary of principal findings of previous reports is provided below. Further detail can be obtained with reference to the original reports.

#### 2.4.1 2004 Remediation Verification Report

In June 2004, SLR Consulting Limited (SLR) was retained by Malthurst Retail Limited to oversee the decommissioning/removal of underground fuel storage tanks/pipework associated with the site's former use as a petrol filling station with subsequent removal of hydrocarbon impacted soil/bedrock attributed to a historical leak from below ground fuel storage tanks. The remediation was undertaken in consultation with the Environment Agency and Local Authority.

Approximately 887 tonnes of contaminated soil was removed from site to an appropriate offsite facility along with 408 tonnes of inert material. The majority of the hydrocarbon impact was recorded between 4.5 and 6.0 metres below ground level (mbgl). The excavation was backfilled with 708 tonnes of recycled Type 2 material.

Validation soil samples were collected from the base and sides of the remediation excavation prior to backfilling. Results were compared against remediation clean up criteria and all results were reported to be below defined thresholds. However, the report noted that access limitations due to structural concerns of damage to neighbouring properties limited the extent of excavation to the north and south of the site, where residual hydrocarbon contamination may remain.

Pre- and post-works groundwater monitoring was completed by SLR which indicated that "groundwater quality has significantly improved" in light of the source removal and that residual hydrocarbon impact would further naturally degrade over time. It was concluded that no groundwater remediation was required.



#### 2.4.2 2017 Ground Investigation Report

An intrusive ground investigation was undertaken by T&P across the site between 8<sup>th</sup> and 9<sup>th</sup> May 2017, comprising excavation of 6N° trial pits and drilling of 2N° rotary core boreholes, with subsequent gas and groundwater monitoring.

#### **Ground Conditions**

During the investigation made ground was encountered across the entire site to a typical depth of approximately 0.60mbgl. Deeper made ground to a depth of approximately 5.50mbgl was encountered within the western section associated with the removed tanks. Underlying the made ground and covering the majority of the site area, firm to stiff reddish brown clay was encountered at depths between 1.30 and 3.20mbgl. Solid mudstone was encountered beneath this to maximum depths of between 6.80 and 8.30mbgl, further underlain by sandstone to a maximum depth of 9.80mbgl.

No significant visible or olfactory evidence of gross contamination was noted during the ground investigation. However, a slight hydrocarbon odour was noted within TP01 in the central southern site area between 1.30 and 1.50mbgl.

#### **Groundwater**

Groundwater was encountered in post-works monitoring, ranging between 2.19 and 2.47mbgl in monitoring wells installed within the mudstone bedrock. No visual or olfactory evidence of contamination was observed.

#### Human Health Risk Assessment

Soil laboratory analysis results were compared against generic standards<sup>1</sup> for a 'residential without homegrown produce' end use in consideration of the proposed development plan at the time of investigation, which did not include any areas of soft landscaping. However, in consideration of current development proposals which include a single private garden and small soft landscaped area in the north-east of the site a 'residential with homegrown produce' end use is considered more appropriate.

Following statistical analysis of the data no elevated soil concentrations were encountered during the previous investigation, and it is noted that the concentrations encountered also fall below a 'residential without homegrown produce' end use. However, asbestos was detected within 2N° samples of made ground, with both quantified as less than 0.1% asbestos. This material was deemed unsuitable to remain within areas of soft landscaping but could remain beneath hard standing or a suitable capping layer in areas of soft landscaping.

#### Controlled Waters Risk Assessment

Due to access constraints residual contamination impact was reported to potentially remain following the 2004 site remediation. However, no subsequent visual or olfactory evidence of hydrocarbon contamination was noted during the T&P ground investigation (aside from a slight hydrocarbon odour within TP01) or groundwater monitoring visits.

Laboratory analysis of water samples obtained during the 2017 investigation recorded hydrocarbon compounds typically below the assessment criteria or level of detection. In addition, concentrations were found to be several orders of magnitude lower than those encountered as part of the remediation report, which suggests that natural attenuation/degradation of residual dissolved phase groundwater contamination has been occurring. The residual risk to Controlled

<sup>&</sup>lt;sup>1</sup> The LQM/CIEH S4ULs for Human Health Risk Assessment. Nathanail, C.P. et al., 2015.

SP1010. Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination. CLAIRE. 2014.



Waters was therefore considered to be low, but it was noted that a Piling Risk Assessment may be required, subject to final foundation design.

#### Phytotoxic Risk Assessment

A single marginally elevated concentration of zinc was encountered with respect to the phytotoxic assessment criteria. However, this was not considered to present a potential significant risk providing a suitable topsoil material is placed within areas of planting and/or made ground is removed prior to planting.

#### Ground Gas Risk Assessment

Six ground gas monitoring visits were undertaken between May and July 2017.

Calculated Gas Screening Values (GSVs) were found to be in line with a Green/Characteristic Situation 1 (CS1) classification under the CIRIA/NHBC traffic light system. However, a maximum concentration of carbon dioxide of 18% by volume was noted during the third visit, which was considered to be potentially reflective of aerobic biodegradation of dissolved residual phase hydrocarbons/organics in groundwater.

Initially high levels of Volatile Organic Compounds (VOCs) were found during the first three monitoring visits, in the order of approximately 70ppm. However, these decreased significantly by the final three visits to between 1.4 and 7.2ppm.

Groundwater sampling was undertaken to investigate whether dissolved phase groundwater contamination may represent a potential source of sub-surface vapours. The results did not indicate any significantly elevated concentrations of hydrocarbons.

In light of the initially high VOCs, high peak carbon dioxide value and potential for residual hydrocarbon impact, it was considered that a potential risk to future residents remains. As such, it was recommended that passive Amber 1/CS2 gas protection measures be incorporated into the design as a preventative risk mitigation measure.

#### Potable Water Supply

Three elevated concentrations of benzo(a)pyrene (BaP) were recorded, all located within the made ground recorded in TP04 from a range of depths up to 2.00mbgl. Given these results and the potential for residual hydrocarbon content within the groundwater, upgraded potable pipework was recommended for the site.



#### 3 REFINED CONCEPTUAL SITE MODEL

#### 3.1 General

Following completion of previous ground investigation and risk assessment, a refined conceptual site model has been developed as detailed below. Further detail of the assessment undertaken is provided in previous reports as listed in Table 1.1.

#### 3.2 Sources

With consideration of the assessment summarised in Section 2, the following Areas of Potential Concern (APC) have been identified which require risk mitigation:

- **APC 1:** Made ground/fill associated with previous site development and subsequent remedial work.
  - Asbestos encountered within the made ground presenting a potential human health risk (APC 1A).
  - Elevated concentrations of benzo(a)pyrene with respect to potable water supply pipework (APC 1B).
- APC 2: Potential residual minor hydrocarbon contamination from historical tanks on site.
  - High peak carbon dioxide and initially high VOC concentrations encountered during gas/groundwater monitoring.

#### 3.3 Risk evaluation

National guidance<sup>2,3,4</sup> has been considered in the development of the conceptual model for the site to inform an estimation of risk in relation to each plausible source-pathway-receptor (SPR) identified. Table 3.1 presents a summary of the (SPR) relationships identified as a moderate/low risk or higher which will require remedial action and/or management to mitigate unacceptable risks identified, further detail of which will be provided in later sections of this report.

<sup>&</sup>lt;sup>2</sup> Contaminated Land Risk Assessment. A Guide to Good Practice. CIRIA C552. 2001.

<sup>&</sup>lt;sup>3</sup> Model Procedures for the Management of Land Contamination. Environment Agency. CLR11. 2004.

<sup>&</sup>lt;sup>4</sup> Guidance for the Safe Development of Housing on Land Affected by Contamination. NHBC. 2008.



#### Table 3.1 Source-Pathway-Receptor (SPR) Relationships Requiring Risk Mitigation

APC N°	Source	Pathway (s)	Receptor	Consequence	Probability	Risk classification*	Comment
<u>On-site</u> Made ground/fil 1 associated with pre- site development a subsequent reme- work.	<u>On-site</u> Made ground/fill associated with previous site development and	Dust migration/inhalation	Future residents, maintenance workers and off-site residents/workers	Medium	Likely	Moderate	Asbestos encountered
	subsequent remedial work.	Permeation into drinking water supplies	Future residents	Medium	Likely	Moderate	Elevated BaP
2	<u>On-site</u> Potential residual minor hydrocarbon contamination from historical tanks on site.	Gas/vapour inhalation	Future residents and maintenance workers	Medium	Low likelihood	Moderate/Low	High peak carbon dioxide and initially high VOC concentrations encountered



#### 4 **REMEDIATION STRATEGY**

#### 4.1 Remediation Objectives

The objective of the proposed remedial strategy is to render the site suitable for a proposed residential end-use. In addition, the remedial strategy will address statutory risks, such that the site would not be determined as Contaminated Land under Part 2A of the Environmental Protection Act 1995.

#### 4.2 Remediation Strategy

Remedial recommendations are made in the context of the proposed development which will comprise the construction of 2N° three storey residential apartment buildings. A single private garden is proposed in the north-east of the site, adjacent to a small soft landscaped communal area. Elsewhere, communal areas are intended to be hard landscaped, thus severing any potential source-pathway-receptor contaminant linkage.

In the absence of confirmed cut/fill estimates and information on proposed level changes within the development, remediation measures have been presented in the context of existing site levels. However, in the event that site levels are raised, this may in effect provide a suitable capping thickness and could achieve the remedial requirements set out below subject to the placement/import of chemically suitable material.

#### 4.3 Risk Mitigation

As summarised in Table 3.1, several SPR relationships have been identified which are considered to present an unacceptable risk to identified receptors, and which will require risk mitigation measures to be applied, as discussed further in subsequent sections. Reference should be made to the Remedial Strategy Plan included within Appendix A.

Recommendations for risk mitigation actions are made in the context of client supplied development information including earthworks strategy and landscaping proposals. In the event that significant changes to the development proposals are made, these recommendations should be reviewed and updated as necessary.

Remediation verification requirements are set out within Section 6.

#### 4.3.1 Area of Private Soft Landscaping – Unit C2

• In the proposed private garden shown on the plan within Appendix A, a minimum 600mm capping layer of chemically and physically suitable topsoil/sub-soil should be provided. A high visibility geotextile marker should be provided at the base and sides of excavations as a marker layer where existing made ground soils are to remain.

#### 4.3.2 Areas of Communal Soft Landscaping and Decorative Borders

• Within the proposed communal soft landscaped area, a minimum 300mm capping layer of chemically and physically suitable topsoil/sub-soil should be provided, increasing to 450mm in areas of detailed planting as necessary. A high visibility geotextile marker should be provided at the base and sides of excavations as a marker layer where existing made ground soils are to remain.



#### 4.3.3 Ground Gases

 Gas protection measures for CS2 should be designed in line with BS8485<sup>5</sup>, with a minimum gas protection score of 3.5 to be achieved for a Type B building. It is anticipated that protection measures would comprise a passive sub floor ventilation layer, together with installation of a dual-purpose waterproofing layer which will also serve as a gas/vapour protection barrier.

#### 4.3.4 Potable Water Supply Pipework

• Upgraded water supply pipework shall be used within the development.

#### 4.3.5 General Recommendations

- Where specialist planting is dictated by landscaping proposals, a deeper growth medium may be required, including up to 900mm for tree pits (which may also require specialist installation in line with BS 5837<sup>6</sup>). These details should be confirmed with the project landscaping adviser.
- Vigilance should be employed for any unforeseen ground conditions when excavating in previously inaccessible areas and when grubbing out, where specialist advice may be required.
- The required thickness and quality of capping soils to support the necessary plant growth should be discussed and agreed separately with the project landscaping team as necessary.
- On-site boreholes should be protected until such time as the regulators have confirmed agreement with the gas risk conclusions. Following approval from the regulators, the monitoring boreholes should be decommissioned in line with Environment Agency guidance.

#### 4.4 Soil Re-Use Opportunities

A key aim of the project is to maximise the reuse of soils on-site and minimise the amounts of off-site disposal. To achieve this whilst accomplishing the remedial objective, a number of potential re-use opportunities have been identified and which are described in later sections of this report which may be undertake in line with the CL:AIRE Definition of Waste Code of Practice (DoW:CoP).

#### 4.4.1 Made Ground

Due to the presence of asbestos it is considered that opportunities for reuse of made ground within soft landscaped areas are negligible. Furthermore, given the relatively flat nature of the site it is considered unlikely that significant level raising and associated earthworks would be undertaken to facilitate the proposed development. However, in the event that significant areas of fill are proposed, it is considered that site-won made ground could be reused as general fill at depth.

#### 4.4.2 Natural Soils

Site-won natural soils, for example those arising from foundation excavations, are considered chemically and physically suitable for reuse as sub-soil in proposed soft landscaped areas, although a suitable topsoil growth medium should be provided.

<sup>&</sup>lt;sup>5</sup> Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings. BS8485. 2015.

<sup>&</sup>lt;sup>6</sup> Trees in relation to design, demolition and construction. Recommendations. BS 5837 2012.



As such, it is recommended that excavated natural soils are carefully stockpiled and segregated to allow reuse as capping soils across the site, thus minimising costs associated with import of clean capping.

#### 4.5 Residual Risk and Uncertainty

Subject to implementation of the risk mitigation measures described throughout Section 4.3, it is considered that no areas of uncertainty or residual risk will remain.



#### 5 MANAGEMENT OF WORKS

#### 5.1 Health and Safety

The works should be carried out in accordance with the Construction (Design & Management) Regulations 2015. These regulations place specific responsibilities on the Principal Contractor, Principal Designer and Employer. The Employer should appoint a Principal Designer and a Principal Contractor for the works.

The Principal Contractor shall develop appropriate methods of working to ensure the health and safety of workers, visitors and neighbours and also protect the environment, in accordance with management procedures outlined in their Construction Phase Plan.

Following completion of the remediation works, pertinent information shall be supplied to the Principal Designer for incorporation into the site Health and Safety File.

#### 5.2 On-Site Material Management

In the event that on-site re-use of made ground is proposed, this may be undertaken in accordance with the CL:AIRE Development Industry Definition of Waste Code of Practice. In this case, a Materials Management Plan (MMP) shall be prepared to document the principles of re-use outlined within this Remediation Strategy.

Alternatively, application of a U1 waste exemption may be an appropriate route to support reuse of smaller volumes of site won soils in construction projects. This allows re-use of suitable waste rather than virgin raw material providing site complies with standard rules as set out by the Environment Agency<sup>7</sup>.

Re-use of aggregates from inert waste may also be undertaken in line with the WRAP Quality Protocol.

#### 5.3 Waste Management Strategy

It is a requirement of the Landfill Regulations 2002 that all waste must be treated to reduce its quantity and/or its environmental impact before being disposed of to landfill. This process has been undertaken as part of this remediation design and is demonstrated by the following:

- Intrusive ground investigation has been undertaken at the site in order to identify areas where contamination deemed to present an unacceptable risk to identified receptors is present. Reference should be made to previous ground investigation reports for further details.
- The Principal Contractor is required to further reduce the volume of material for off-site disposal and/or treatment by the sorting of inert rubble, metal, etc. from all excavated and/or stockpiled soils where practically possible.

In line with the waste hierarchy, it is preferable to retain as much site won material as possible, in line with the reuse opportunities set out in Section 4.4.

Excavated soils requiring off-site disposal will be transported in road going lorries, in accordance with appropriate duty of care requirements<sup>8</sup>. The waste haulier will be a licensed waste carrier, with evidence of registrations obtained prior to consigning waste for off-site treatment and/or disposal. Appropriate controls will be put in place for handling/transportation of materials containing asbestos. Laboratory results of the excavated material will be passed on to the haulier and the material will be transported and disposed of accordingly.

<sup>&</sup>lt;sup>7</sup> <u>https://www.gov.uk/guidance/waste-exemptions-using-waste</u>

<sup>&</sup>lt;sup>8</sup> Waste Duty of Care Code of Practice. Defra. 2016.



Demolition rubble or other recyclable aggregates, metals or other inert and recoverable materials may be segregated for re-use on-site or sent for off-site recycling to an appropriately licensed facility.

#### 5.4 Waste Characterisation

A review of ground investigation data has been completed to support waste characterisation and pre-classification in the event that off-site disposal of soils is required, which is separate to human health or other environmental risk assessment completed to support the remediation strategy. Reference should be made to the 2017 report for detail on this assessment.

In summary, the waste assessment and asbestos quantification results indicate that the soils on-site will likely be treated as non-hazardous.

#### 5.5 Unexpected Contamination

If during the subsequent construction works additional suspected contaminated soils (e.g. visible/odorous hydrocarbon impacted soils) or structures/infrastructure with the potential to contain contamination are subsequently revealed, it will be necessary to contact a suitably qualified environmental consultant who will be able to attend site and advise upon the most appropriate course of action.

#### 5.6 Control Measures and Monitoring

An environmental risk assessment shall be undertaken by the Principal Contractor which shall establish appropriate environmental control measures and monitoring protocols required during the works, which should be documented within a site-specific Environmental Management Plan. The Principal Contractor shall implement appropriate dust and noise control measures as appropriate and shall ensure that competent staff are on-site to implement the controls when necessary. Where movement of asbestos impacted soils/material is required, appropriate controls shall be implemented e.g. damping down and monitoring undertaken as required.

In addition to the above, construction and groundworkers should be made aware of the potential risks associated with made ground soils and when working with soils which may be potentially impacted by asbestos, should allow for appropriate precautionary working practices, personal protective measures and air monitoring in line with Control of Asbestos Regulations: 2012 – 'CAR:2012', as necessary.



#### 6 VERIFICATION

#### 6.1 Capping Soils in Soft Landscaping Areas

#### 6.1.1 Imported Soils

Where imported soils are required within the development as capping soils in soft landscaped areas, they shall comply with the soil criteria in Appendix B for a 'residential with homegrown produce' or 'POSresi' end use, as appropriate. All imported soils shall be free of asbestos (<0.001%w/w). Furthermore, it is recommended that the suitability of topsoil in accordance with BS3882<sup>9</sup> is considered, in consultation with a specialist landscaping consultant.

Details of the proposed source of material shall be supplied. It is recommended that soils are tested at source prior to movement and importation to confirm suitability.

Additionally, representative soil samples should be collected of imported soils for chemical analysis once received at site at a minimum frequency of 1 per 100m<sup>3</sup> with a minimum of 3 samples per source. The frequency of testing may need to be increased to 1 per 50m<sup>3</sup> if the origin of the topsoil is a brownfield site or an unknown source.

All samples shall be submitted to a laboratory with UKAS and MCERTS accredited methods (as appropriate).

Testing shall comprise the following, as a minimum:

- Metals.
- Speciated Polycyclic Aromatic Hydrocarbons (PAHs).
- pH.
- Phenols.
- Total organic carbon.
- Asbestos screening.

In addition to the above, where material has been imported from a brownfield site, testing shall include banded petroleum and diesel range hydrocarbons within the carbon range C6-C35.

#### 6.1.2 Site Won Soils

Existing ground information has determined that on-site natural soils may be suitable for re-use in all areas of the development and may be re-used without further testing. However, opportunities for re-use of made ground within soft landscaped areas are considered negligible.

#### 6.1.3 Visual Inspections

Visual inspection should be undertaken to confirm placement of appropriate thickness of capping soils and presence of geotextile membrane is in line with the requirements of Section 4.3. In acknowledgement of the limited soft landscaping proposed, it is recommended that  $2N^{\circ}$  inspections are undertaken; one within the private garden and one within the communal soft landscaped area.

<sup>&</sup>lt;sup>9</sup> Specification for Topsoil - 2015



#### 6.2 Ground Gas Protection

Following confirmation of construction design details, a ground gas protection design should be prepared and finalised in accordance with BS8485:2015<sup>10</sup> to demonstrate how the necessary gas protection score shall be achieved (Type B, CS2 – score of 3.5 required). It is understood that this will be prepared by others and is not available at this time.

A Gas Protection Verification Plan should be prepared in line with CIRIA C735<sup>11</sup> which sets out the requirements for gathering information to demonstrate that the gas protection measures meet the remediation objectives. This report would typically include clear assignment of responsibilities for verification, details of the type and frequency of inspection/testing required aligned with the construction programme and records which must be kept. As part of this process, the responsible part for the Verification Plan should review the design to confirm the suitability of the proposed products, particularly with regard to their durability within the construction process. It is important to ensure that the proposed verification activities are appropriate and proportionate to the level of risk.

#### 6.3 Potable Water Supply Pipework

Records of supplier details, pipework materials and location/depth of installation shall be maintained on-site for issue to the regulators where required.

#### 6.4 Record Keeping

Records of operations relating to the remediation works will be maintained on-site by the Principal Contractor and provided to the client for inclusion within the Remediation Completion Report. These records shall include the following, where relevant/appropriate:

- Photographic records during construction works showing extents of excavation, placement of geotextile membranes and imported material for capping layers, where appropriate;
- Photos from inspection pits confirming required thickness of capping soils;
- Environmental monitoring undertaken (if required);
- Volumes of waste materials disposed off-site including tickets/waste consignment notes;
- Volumes of imported fill;
- Validation sample locations;
- Chemical validation test results including supplier certificates for imported fill;
- Details of variations and/or contingency arrangements as a result of design variation; and,
- Inspection records for gas protection measures including photos, integrity test data, defects and remedial measures undertaken (as appropriate) with reference to the requirements of the Gas Protection Verification Plan.

In addition, where reuse of materials is undertaken in line with an MMP the following shall be recorded:

- Wagon movements on- and off-site;
- On- and off-site soil movement records; and,
- Volumes and placement locations/depths of soil reuse.

<sup>&</sup>lt;sup>10</sup> Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings. BS:8485 (2015) + A1 2019.

<sup>&</sup>lt;sup>11</sup> Good Practice on the Testing and Verification of Protective Systems. CIRIA C735. (2014).



#### 6.5 Remediation Completion Report

A Remediation Completion Report will be prepared that will include a summary of the works undertaken to demonstrate that the remediation objectives have been met. Supporting information will be provided as summarised in Section 6.4, the report will also serve to demonstrate compliance with the principles of material re-use outlined within the supporting MMP and will be submitted to CL:AIRE as a final record, if required.

The Remediation Completion Report shall be issued to the regulators upon completion of the works.

Appendix A – Drawings





PROPOSALS SUBJECT TO: SITE SURVEY; STATUTORY APPROVALS; DESIGN DEVELOPMENT.

#### 20/09/19 Planning comments - 450mm recesses, core bay widths, mansards TE 21/05/19 Amended to planners comments MH 17/05/19 Amended to planners comments MH 07/02/19 Amended to planners comments MH A Date Description Drawn Rev.

# **ANGUS MEEK** ARCHITECTS

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Job Name: Client:

17 - 29 LOWER ASHLEY ROAD PRELON PROPERTIES ST. PAULS, BRISTOL Drawing Title:

**Ground Floor Plan - Proposed** 

0 1m 2m Scale Sheet @ A1 1:100 Drawing Status: PLANNING

Date Drawn Checked PCW April 2019 LD Drawing No. Rev. Job No. Stage 2510 P 201 D



nted in groups of 3 of the same spe	cies					NORTH	
2 No. PaBS 2 No. AGARU 1 No. TRAJA 1 No. AGARU 3 No. THYAG 1 No. VbD 19 No. Gn 1 No. JASOF MELARU NARobv 1 No. HYSERAF 18 No. Crocsp 1 No. HYDQUSQ 1 No. HYDQUSQ 1 No. HYDQUSQ 1 No. HYDQUSQ 1 No. HAKm	A No. BUDDAWHP 1 No. BUDDAWHP 1 No. Pf 'LRR' 1 No. Sn 'BL' 3 No. HYDMAMAS 5 No. CAP 3 No. Ma'SC' 1 No. FATJA 6 No. VINMIGEJ 6 No. Bd 1 No. COTWAJW -24 No. EFEG 1 No. BW No. SKIJARE 0 HYDMAMAS 5 No. CAP 3 No. Ma'SC' 1 No. FATJA 6 No. VINMIGEJ 6 No. Bd 1 No. COTWAJW -24 No. EFEG 1 No. PYRWA No. PYRWA	Co Co	PLANT SCHEI         Trees         No.       Abbrev       Spe         1 No. PRUROSA Prur         Shrubs         No.       Abbrev       S         2 No.       ABEGR       //         2 No.       BERATRA       E         2 No.       BRASU       E         2 No.       BUDDAWHP       E         5 No.       CAP       O         2 No.       CORALSV       O         2 No.       CAP       O         2 No.       EAB       E         1 No.       COTWAJW       O         2 No.       CARE       E         1 No.       COTWAJW       O         2 No.       EAB       E         1 No.       EEGE       E         1 No.       ELANCA       E         2 No.       FATJA       F         1 No.       HEBMAR       H         1 No.       HEBMAR       H         1 No.       HZQUSQ       H         1 No.       LAH       L         5 No.       LAH       L         5 No.       LAH       L         5 No.       LAH       L	DULE  acies Name elanchier lamarc. 'Autumn Brilliance' nus subhirtella 'Autumnalis Rosea'  Species Name Abelia grandiflora Berberis darwinii Berberis thunbergii 'Atropurpurea' Brachyglottis 'Sunshine' Buddleia davidii 'White Profusion' Choisya 'Aztec Pearl' Cornus alba 'Siberica Variegata' Cotoneaster watereri 'John Waterer' Escallonia 'Apple Blossom' Elaeagnus ebbingei 'Gilt Edge' Elaeagnus ebbingei 'Limelight' Euonymus fortunei 'Emerald Gaiety' Elaeagnus angustifolia 'Caspica' Escallonia rubra 'Crimson Spire' Fatsia japonica Garrya elliptica Hebe 'Silver Queen' Hamamelis intermedia 'Jelena' Hebe 'Marjorie' Hydrangea macrophylla 'Lanarth Wh Hydrangea quercifolia 'Snow Queen' Ilavandula angustifolia 'Hidcote' Ligustrum ovalifolium 'Aureum' Lonicera 'Loughall Green' Mahonia eurybracteata 'Soft Caress' Mahonia japonica Nandina domestica Osmanthus burkwoodii Perovskia atriplicifolia 'Blue Spire' Philadelphus 'Belle Etoile' Photinia 'L ittle Red Robin'	Height         Girth           250-300cm         425-600cm 14-16cm           425-600cm 14-16cm         30-40cm           20-30cm         30-40cm           30-40cm         40-60cm           30-40cm         40-60cm           30-40cm         60-80cm           80-100cm         30-40cm           60-80cm         80-100cm           150-175cr         10-20cm           60-80cm         40-60cm           100-125cr         30-40cm           30-40cm         60-80cm           40-60cm         30-40cm           60-80cm         40-60cm           30-40cm         60-80cm           100-125cr         30-40cm           60-80cm         100-125cr           30-40cm         60-80cm           100-125cr         30-40cm           60-80cm         100-125cr           30-40cm         60-80cm           100-125cr         30-40cm           60-80cm         100-125cr           30-40cm         60-80cm           100-125cr         30-40cm           60-80cm         20-30cm           40-60cm         30-40cm           30-40cm         30-40cm	Specification Multi-Stemmed : 3 Branches: 1 Extra Heavy Standard :Clear S Specification Bushy :3 brks Branched :5 brks Branched :5 brks Branched :3 brks Bushy Branched :6 brks n Leader n Leader With Laterals :7/10 br Bushy Branched :5 brks n Leader With Laterals :7/10 br Bushy Branched :5 brks Branched :3 brks Branched :3 brks Branched :5 brks n Leader With Laterals Bushy :7 brks Branched :5 brks n Leader With Laterals Bushy :7 brks Branched :6/9 brks Bushy Bushy :6/9 brks Bushy :3 brks	RB 3tem 1 2L 2L 2L 2L 2L 2L 2L 2L 2L 2L
TNO. VIBTIG	A No. JASNU 4 No. LONLOGR 9 No. BcP 5 No. VINMIVA 1 No. SVML 1 No. LIGAURA 4 No. LONLOGR 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		I NO.       PT LRR       F         2 No.       Pf 'LRR'       F         6 No.       PURC       F         6 No.       PYRWA       F         3 No.       ROMJU       F         3 No.       SALOFPU       S         10 No.       SARHOHU       S         10 No.       SARHOHU       S         13 No.       SKIJARE       S         13 No.       SKIJARE       S         1 No.       SN'BL'       S         1 No.       SN'BL'       S         1 No.       SH'BTIG       N         1 No.       VIBTIG       N         1 No.       VIBTIG       N         1 No.       VIBTIG       N         24 No.       VINMIGEJ       N         5 No.       VINMIVA       N         Climbers       No.       Cler         1 No.       CLETA       Cler         1 No.       HEDHI       Hed         1 No.       JASNU       Jasi         4 No.       JASNU       Jasi         1 No.       LONPESE       Lon         2 No.       JASOF       Jasi         1 No.	Photinia 'Little Red Robin'         Photinia 'Little Red Robin'         Pyracantha coccinea 'Red Cushion'         Pyracantha 'Watereri'         Rosmarinus officinalis 'Miss Jessopp         Salvia officinalis 'Purpurascens'         Sarcococca hookerana humilis         Spiraea japonica 'Goldflame'         Skimmia japonica reevesiana         Sambucus nigra 'Black Lace'         Syringa vulgaris 'Mme Lemoine'         Viburnum bodnantense 'Dawn'         Viburnum tinus 'Gwenllian'         Viburnum tinus 'Gwenllian'         Viburnum tinus 'Gwenllian'         Vinca minor 'Gertrude Jekyll'         Vinca minor 'Variegata'         Ecies Name       He         matis armandii       60         matis tangutica       60         dera colchica 'Sulphur Heart'       60         darangea petiolaris       60         minum nudiflorum       60         minum nudiflorum       60         icera periclymenum 'Belgica'       60         icera periclymenum jasminoides       60 <th>30-40cm 30-40cm 20-30cm 40-60cm 's Upright' 30-40cm 20-30cm 20-30cm 20-30cm 20-30cm 125-150cn 80-100cm 80-100cm 80-100cm 80-100cm 10-20cm 10-20cm 10-20cm 10-20cm 10-20cm 80cm -80</th> <th>Branched :4/6 brks Branched :4/6 brks Leader With Laterals :3 brks : RB Bushy :6/9 brks Branched :5 brks Pot Size s :Caned 3L 3L 3L 3L 3L 3L 3L 3L 3L 3L</th> <th>3L 3L C 2L 2L 2L 2L 10L 10L 5-7. 9cn</th>	30-40cm 30-40cm 20-30cm 40-60cm 's Upright' 30-40cm 20-30cm 20-30cm 20-30cm 20-30cm 125-150cn 80-100cm 80-100cm 80-100cm 80-100cm 10-20cm 10-20cm 10-20cm 10-20cm 10-20cm 80cm -80	Branched :4/6 brks Branched :4/6 brks Leader With Laterals :3 brks : RB Bushy :6/9 brks Branched :5 brks Pot Size s :Caned 3L 3L 3L 3L 3L 3L 3L 3L 3L 3L	3L 3L C 2L 2L 2L 2L 10L 10L 5-7. 9cn
		28 To 34	1 No. BAMJAPA Pseu         1 No. BAMNIGC Phyll         1 No. BAMNIGC Phyll         1 No. BAMNIGC Phyll         Herbaceous         No. Abbrev       S         4 No. AGARU       A         12 No. BBW       B         23 No. BcP       B         21 No. EPIRU       E         6 No. GERBR       G         10 No. HELLOR       H         3 No. HEUMIPP       H         16 No. CAMMAWN       La         8 No. OrigV'CC'       O         5 No. PoSW       P         13 No. PULRU       P         2 No. SbSC       S         4 No. SEDTE'M'       S         7 No. THYSERAF       T         Bulbs       No. Abbrev       Speci         18 No. Crocsp       Croct         19 No. Gn       Galar         30 No. NARobv Narci       Grasses         No. Abbrev       Species         1 No. HAKm       Hakone	udosasa japonica 60-80cm       Severa         lostachys nigra       125-150cm       Severa         lostachys nigra       40-60cm       Severa         ispecies Name       Severa       Severa         ispecies Name       Country Cream       Severa         isedum telephium maximum 'Atropurp       Numonaria rubra       Silver Carpet'         isedum telephium maximum 'Atropurp       Nymus 'Anderson's Gold'       Severa         hymus serpyllum 'Rainbow Falls'       Gra       Gra         issus pseudonarcissus obvallaris Gra       Gra       Gra         issus pseudonarcissus obvallaris Gra       Severa       Gra         ichloa macra 'Aurea' Full Pot       Ne       Ne	al shoots :C 7.5 al shoots :10 brks 15- al shoots :05 brks 3L <u>Specification</u> Full Pot Full Pot hite' pureum' <u>ecification Density</u> ade 5/6 20/m <sup>2</sup> ade 6/+ 20/m <sup>2</sup> ade 7/8 20/m <sup>2</sup>	L Counted 20L Counted 2/m <sup>2</sup> Pot Size Density 1-1.5L 3/m <sup>2</sup> 2L 9/m <sup>2</sup> 2L 9/m <sup>2</sup> 1-1.5L 9/m <sup>2</sup> 1-1.5L 9/m <sup>2</sup> 0.5L 6/m <sup>2</sup> 3L 9/m <sup>2</sup> 1-1.5L 9/m <sup>2</sup> 9/m <sup>2</sup> 1-1.5L 9/m <sup>2</sup> 2L 9/m <sup>2</sup> 1-1.5L 5/m <sup>2</sup> 2L 6/m <sup>2</sup> 1-1.5L 16/m <sup>2</sup> 1-1.5L 16/m <sup>2</sup>	

# Imendations"; services, ted with a single ensure that pits are with double stub r and 500mm



50 Ridgeway Road, Long Ashton, Bristol BS41 9ES Tel:01275 393450 Fax:01275 394776 E-mail:mail@bridgesdesign.co.uk

#### Site Boundary

#### Area of Private Soft Landscaping - Unit C2

A minimum 600mm capping layer of chemically and physically suitable topsoil/sub-soil should be provided. A high visibility geotextile marker should be provided at the base and sides of excavations as a marker layer where existing made ground soils are to remain.

#### Areas of Communal Soft Landscaping and Decorative Borders

A minimum 300mm capping layer of chemically and physically suitable topsoil/sub-soil should be provided, increasing to 450mm in areas of detailed planting as necessary in accordance with the development landscaping proposals. A high visibility geotextile marker should be provided at the base and sides of excavations as a marker layer where existing made ground soils are to remain.

#### General notes

- If during the subsequent construction works further suspected contaminated soils (visual/odorous impacted soils) are revealed then it will be necessary to contact a suitably qualified environmental consultant who will be able to attend site and advise upon the most appropriate course of action.
- It should be noted that in the absence of confirmed cut/fill estimates and information on proposed level changes within the development, remediation measures have been presented in the context of existing site levels. However, in the event that site levels are raised this may in effect provide suitable capping material.
- Imported soils should comply with remediation criteria for a 'residential with homegrown produce' or 'POSresi' end use, as appropriate.
- Re-use of on-site soils should be completed in accordance with a Material Management Plan in line with the CL:AIRE DoW CoP. Where specialist planting is dictated by landscaping proposals, a deeper growth medium may be required, including up to 900mm for tree pits (which may also require specialist installation in line with BS 5837). These details should be confirmed with the project landscaping adviser.
- Upgraded water supply pipework shall be used within the development. Records of supplier details, pipework materials and location/depth of installation shall be maintained on-site for issue to the regulators where required.

NIT A1

91

Scaled in Metres

• Gas protection measures for Amber 1/CS2 should be designed in line with BS8485, with a minimum gas protection score of 3.5 to be achieved for a Type B building. It is anticipated that protection measures would comprise a passive sub floor ventilation layer, together with installation of a dual-purpose waterproofing layer which will also serve as a gas/vapour 15

Base Comp DWG DWG DWG Date:	<u>Map</u> any: - Ang Title: - Gro Number: - - 20/09/19	us Meek Arch ound Floor Pla 2510/P201 F	nitects an - Propose Rev D	d		
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	Pr	elon Hous	ing Ltd			
Project Lower Ashley Road					Unit 4 Brui	Regen nel Lock Development, Smeaton Poad, Bristol, BS1 6SE
Remedial Strategy Plan					Em	Tel: 0117 927 7756 ail:Info@TP-regen.co.uk
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UNIT B1 71m<sup>2</sup>

<u>24</u>

В

LOWER ASHLEY ROAL

52

UNIT C 67m<sup>2</sup> 28d3p Appendix B – Remediation Criteria



#### **IMPORTED SOIL TARGET CONCENTRATIONS - HUMAN HEALTH - MAY 2015**

	Assessment Criteria (Residential with homegrown produce)	Assessment Criteria (Residential without homegrown produce)	Assessment Criteria (POS <sub>RESI</sub> )	Source
Heavy Metals				
Arsenic	37.0	40.0	79.0	C4SL
Cadmium	26.0	150.0	220.0	C4SL
Chromium III	910.0	910.0	1500.0	S4UL
Hexavalent chromium	21.0	21.0	21.0	C4SL
Lead*1	200.0	310.00	630.00	C4SL
Mercury - inorganic	40.0	56.0	120.0	S4UL
Nickel	180.0	180.0	230.0	S4UL
Vanadium	410.0	1200.0	2000.0	S4UL
Selenium	250.0	430.0	1100.0	S4UL
Phytotoxic Metals				
Copper	2400.0	7100.0	12000.0	S4UL
Zinc	3700.0	40000.0	81000	S4UL
Boron	290.0	11000.0	21000.0	S4UL
Organics				
Phenol	280.0	750.0	760.0	S4UL
PAHs				
Naphthalene*3	2.3	2.3	4900.0	S4UL
Acenaphthylene*3	170.0	2900.0	15000.0	S4UL
Acenaphthene*3	210.0	3000.0	15000.0	S4UL
Fluorene*3	170.0	2800.0	9900.0	S4UL
Phenanthrene*3	95.0	1300.0	3100.0	S4UL
Anthracene*3	2400.0	31000.0	74000.0	S4UL
Fluoranthene*3	280.0	1500.0	3100.0	S4UL
Pyrene*3	620.0	3700.0	7400.0	S4UL
Benz(a)anthracene*3	7.2	11.0	29.0	S4UL
Chrysene*3	15.0	30.0	57.0	S4UL
Benzo(b)fluoranthene*3	2.6	3.9	7.1	S4UL
Benzo(k)fluoranthene*3	77.0	110.0	190.0	S4UL
Benzo(a)pyrene*2	5.0	5.3	10	C4SL
Indeno(123-cd) pyrene*3	27.0	45.0	82.0	S4UL
Dibenz(ah)anthracene*3	0.24	0.31	0.57	S4UL
Benzo(ghi)perylene*3	320.0	360.0	640.0	S4UL
Fuel range hydrocarbons				
Benzene	0.87	3.3	140.0	C4SL
Toluene	130.0	880	56000.0	S4UL
Ethyl Benzene	47.0	83.0	24000.0	S4UL
Xylenes	56.0	79.0	41000.0	S4UL
Aromatic C5-C7	70.0	370.0	56000.0	S4UL
Aromatic C7-C8	130.0	860.0	56000.0	S4UL
Aromatic C8-C10	34.0	47.0	5000.0	S4UL
Aromatic C10-C12	74.0	250.0	5100.0	S4UL
Aromatic C12-C16	140.0	1800.0	3800.0	S4UL
Aromatic C16-C21	260.0	1900.0	3800.0	S4UL
Aromatic C21-C35	1100.0	1900.00	3800.0	S4UL
Aromatic C35-C44	1100.0	1900.0	3800.0	S4UL
Aliphatic C5-C6	42.0	42.0	570000.0	S4UL
Aliphatic C6-C8	100.0	100.0	60000.0	S4UL
Aliphatic C8-C10	27.0	27.0	1300.0	S4UL
Aliphatic C10-C12	130.0	130.0	1300.0	S4UL
Aliphatic C12-C16	1100.0	1100.0	1300.0	S4UL
Aliphatic C16-C35	65000.0	65000.0	250000.0	S4UL
Aliphatic C35-C44	65000.0	65000.0	250000.0	S4UL
Inorganics				
Asbestos	N	lo significant detectio	n	Various

Notes:

All values are mg/kg unless stated

C4SL – Category 4 Screening Level as produced by Defra –based on 6% SOM S4UL – Suitable 4 Use Levels as produced by Land Quality Management – based on 1% SOM. \*1 – C4SL for lead based on the LLTC of 3.5µg/dL<sup>-1</sup> and C4SL exposure changes. \*2 – BaP can be considered as a marker compound for consideration of other PAHs. \*3 – Threshold values may be discounted based upon use of BaP as a marker compound.



#### **IMPORTED SOIL TARGET CONCENTRATIONS – PHYTOTOXIC - MAY 2015**

	Phytotoxic thresholds for plants	Source				
Phytotoxic Metals						
Selenium	10.0	SGV9 Document				
Boron	3.0					
Copper	130.0					
Nickel	70.0	ICRCL 59/65				
Zinc	300.0					
Cadmium	8.0					
Chromium	154.0	Amended Dutch RIVM – Ecotoxilogical risk				
Mercury	28.0					