

RIDGE

VALIDATION REPORT
GORING STREET, GORING BY SEA

APPLICATION NUMBER:

AWDM/0833/21

MCCARTHY STONE LIMITED

March 2024

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1. INTRODUCTION

1.1. Instructions

Ridge and Partners LLP (Ridge) was commissioned by McCarthy Stone (the client) to monitor Validation Works in support of the discharge of contaminated land related planning conditions associated with a re-development centred on 510417 E 103118 N at Goring Street, Goring-by-Sea, BN12 5AD (hereafter referred to as the "site").

1.2. Background

A number of previous reports (detailed in Section 3) have been issued in relation to the site which document the required remediation. These reports should be read in conjunction with this report.

1.3. Proposed Development

The proposals for the site comprise the demolition of the existing structures and development of a block of thirty-five retirement living apartments, spread across three and four floors.

The ground level will include a residents lounge, bin store, scooter store, office, plant rooms and entrance lobby. Parking will be spread across the development site, but primarily in the west and east, with the construction block in the centre.

Landscaping will include shared amenity areas as well as private courtyards. With the nature of the development in mind, it is assumed that all garden maintenance will be carried out by landscape professionals on a regular but in-frequent basis.

Development plans are included as Figure 1.

This Validation Report has been written specifically in relation to the retirement living plus development and associated parking, landscaping and access.

The grant of planning for the development includes the following contaminated land conditions.

Planning Condition number 9 is as follows: With the exception of the demolition of existing buildings and removal of existing hardstanding no works pursuant to this permission shall commence until there has been submitted to and approved in writing by the local planning authority:

(a) a site investigation report documenting the ground conditions of the site and incorporating chemical and gas analysis identified as being appropriate by the Council's Environmental Health team, in accordance with BS10175:2011- Investigation of Potentially Contaminated Sites - Code of Practice; and, unless otherwise agreed in writing by the local planning authority;

(b)

(b) a detailed scheme for remedial works and measures to be undertaken to avoid risk from contaminants/or gases when the site is developed. The scheme must include a timetable of works and site management procedures and the nomination of a competent person to oversee the implementation of the works. The scheme must ensure that the site will not qualify as contaminated land under Part IIA of the Environmental Protection Act 1990 and, if necessary, proposals for future maintenance and monitoring.

If during any works contamination is encountered which has not been previously identified, it should be reported immediately to the local planning authority. The additional contamination shall be fully assessed and an appropriate remediation scheme, agreed in writing with the local planning authority. This must be conducted in accordance with DEFRA and the Environment Agency's 'Model Procedures for the Management of Land Contamination, CLR11'.

Planning Condition number 10 is as follows: The development hereby permitted shall not be occupied/brought into use until there has been submitted to the local planning authority verification by the competent person approved under the provisions of condition 9(b) that any remediation scheme required and approved under the provisions of condition 9(b) has been implemented fully in accordance with the approved details (unless varied with the written agreement of the local planning authority in advance of implementation). Unless otherwise agreed in writing by the local planning authority such verification shall comprise:

a) as built drawings of the implemented scheme;
b) photographs of the remediation works in progress;
c) certificates demonstrating that imported and/or material left in situ is free of contamination.

Thereafter the scheme shall be monitored and maintained in accordance with the scheme approved under condition 9(b), unless otherwise agreed in writing by the local planning authority.

The Ridge Ground Investigation and Additional Ground Investigation reports addressed condition 9.

This Validation Report addresses condition 10 and relates to the requirement for Validation of remedial actions. At the time of writing this report, all former buildings had been demolished, new structures had been built and landscaping was complete.

1.4. Objectives

This Validation Report provides a complete record of all remediation activities on site and the data collected as identified in the Validation Plan (within the previously issued Remediation Method Statement) to support compliance with the agreed remediation objectives and criteria. The report incorporates all site data and measurements of quality-critical parameters.

The Report includes a final statement that outlines whether the site is suitable for the intended use and poses minimal or no risks to identified receptors.

1.5. Guidance

This report has been written in accordance Land Contamination Risk Management (LCRM) published by the Environment Agency in October 2020. LCRM builds on guidance laid out within CLR 11, which has now been withdrawn. NHBC guidance has also been referred to.

1.6. Report Conditions and Limitations

This report is produced solely for the benefit of McCarthy Stone and no liability is accepted for any reliance placed on it be any other part unless specifically agreed in writing otherwise.

A significant proportion of the data has been supplied in good faith by McCarthy Stone or their representatives or Third Parties for collation into this report.

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2. PHYSICAL SETTING

2.1. Geology and Hydrogeology

The following observations are taken from the British Geological Survey (BGS) Geology of Britain Viewer. The BGS Geology of Britain Viewer (2021) indicates that the site is situated directly over Bedrock Geology of the London Clay Formation (sand). There are no records of Superficial Deposits. The table below identifies the expected composition of the published on-site strata and associated aquifer classification.

BEDROCK GEOLOGY	
Unit Name	River Terrace Deposits
Geology Description	Sand and Gravel, locally with lenses of silt, clay or peat
Aquifer Classification	Secondary B
Aquifer Description	Predominately lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.

Table 2.1: Superficial Geology and hydrogeology

BEDROCK GEOLOGY	
Unit Name	Lewes Nodular Chalk Formation
Geology Description	Composed of hard to very hard nodular chalks and hardgrounds with interbedded soft to medium hard chalks (some grainy) and marls; griotte chalks.
Aquifer Classification	Principal
Aquifer Description	Geology of high intergranular and/or fracture permeability, usually providing a high level of water storage and may support water supply/river base flow on a strategic scale.

Table 2.2: Bedrock Geology and hydrogeology

2.1.1. Radon

2.1.1.1. UKradon Interactive Map

The UKradon interactive online map indicates the entire site has been identified to lie within a Radon Affected Area estimated to have between 5% and 10% of properties above the action level. Note, this information is based on worst-case radon data within 1km grid squares.

2.1.1.2. UKradon Address Search

A radon address search was conducted (for the nearest available search [BN12 5AF]) on the UKradon website https://www.ukradon.org/.

The report confirms the property is in a radon affected area. A radon area is defined as where the radon level in at least one property in every hundred is estimated to exceed the Action Level.

The estimated probability of the property being above the action level for radon is 1-3%. There is no requirement under Building Regulations for radon protection in new buildings and extensions at the property.

2.1.2. Mining

According to the previous report there are no current or historical mine workings recorded on, or within close proximity to, the site. The site is within a general area where sporadic underground mining of restricted extent may have occurred. However, the British Geological Survey database of non-coal mining information indicated that the general area was designated with a risk rating of 'rare', the lowest risk rating. No underground natural cavities or solution features are recorded within 1km of the site.

2.1.3. Hazards

The potential for ground dissolution of soluble rock and for collapsible deposits beneath the site were given the ratings of 'very low' and 'low' respectively.

2.2. Hydrology

There are no surface water features within 250m and the site is not within a Zone 2 or Zone 3 floodplain, as defined by the Environment Agency.

2.3. Controlled Waters

2.3.1. Abstraction Licenses

According to the Crossfield Consulting Report there are no groundwater abstraction licenses for potable supple within 1km.

2.3.2. Source Protection Zones

The site is not located within a Groundwater Source Protection Zone.

2.4. Environmentally Sensitive Sites

The site does not lie within a designated environmentally sensitive area.

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3. PREVIOUS INVESTIGATIONS

Previous reports relating to the site were reviewed. All previous reports were commissioned by McCarthy Stone.

- Desk Study Appraisal (Ref: CCL03238.CJ72) – September 2019
- Ground Condition Assessment (Ref: 5015981-RDG-XX-ST-DOC-C-00GCA01) – October 2021
- Additional ground Investigation report (Ref: 5015981/T-815/ME)- December 2021
- Goring Piling Risk Assessment Report (Ref: 5015981-RDG-XX-ST-DOC-C-00PRA01)-April 2022
- Further Ground Investigation Report (Ref: 5015981-RDG-XX-ST-DOC-C-01-FGIR) – August 2022
- Further Ground Investigation Report (Post Demolition) (Red: 5015981-RDG-XX-ST-DOC-C-01-FGIR3v2)-January 2023

3.1. Crossfield Consulting - Desk Top Study (2019)

A Desk Top Study was issued by McCarthy Stone in September 2019. The risk of impact to receptors from identified potential sources was considered to be limited. Potential sources of contamination included:

- Activities and processes associated with former uses of warehouse as part of clothing manufacture, works on site, and possible Made Ground associated with historical development across the site. CoC include asbestos. petroleum hydrocarbons, PAHs and heavy metals others included the possible usage of inks and detergents in limited usage at site.
- Railway station 50m south
- Scrap Metal merchants 90m west
- Petrol station 190m east

The report recommended that a ground investigation was undertaken at the site comprising windowless sample boreholes and trial pits. It was noted that if a piled foundation solution was confirmed, deep boreholes would be required to obtain data for pile design.

The report should be read in full for completeness.

3.2. Ground Condition Assessment (2021)

A Ground Condition Assessment was issued by McCarthy Stone in October 2021. A summary of the findings is provided below. Reference should be made to the full report.

This comprised of eight windowless sample boreholes. Samples from each location were logged and analysed.

3.2.1. Fieldwork

Suitably experienced Ridge staff oversaw the intrusive investigation, which was undertaken 13-14 July 2021. Methods employed during the investigation were carried out in general accordance with statutory guidance including BS5930:2015+A1:2020 Code of Practice for Site Investigations and BS10175:2011+A2:2017 Investigation of Potentially Contaminated Sites: Code of Practice.

3.2.1.1. Windowless Sample Boreholes

Eight windowless sample boreholes (WS1-6 and WS8-9) were advanced through the base of their respective inspection pits to a maximum depth of 5.45mbgl, completed using a tracked dynamic sampling rig. It was not possible to advance proposed location WS7 due to access limitations.

The objective was to allow for the assessment of underlying ground conditions and permit in-situ Standard Penetration Testing (SPT) and falling head tests to provide geotechnical parameters for future use. Furthermore, it allowed for the production of detailed engineering logs and the recovery of samples for geotechnical and environmental testing.

Boreholes were spread across the site to allow adequate geo-environmental assessment.

WS2, WS8 and WS9 were installed with standpipes to enable future ground gas monitoring. The response zones were determined to target the groundwater; further information within the engineering logs (Appendix 2). These monitoring wells were secured within traffic-rated flush steel covers. The remaining windowless sample boreholes were backfilled with arisings in reverse order and reinstated in respect of existing conditions upon completion.

3.2.1.2. Soil Sampling

All intrusive locations were logged, and visual/olfactory evidence of contamination noted in accordance with best practice. Soil sampling of the near surface materials was undertaken to assess the contamination risks to human health and controlled waters. Samples were also removed at varying depths for geotechnical testing. Environmental samples were handled using a fresh pair of nitrile gloves. Selected samples were placed in sealable bags, sealed glass jars or plastic tubs (dependent on the exact laboratory requirement and analysis to be undertaken) and stored in a temperature-controlled environment before transit.

3.2.1.3. Ground Gas Monitoring

Ground Gas monitoring was conducted from 29 July through to 17 September 2021 over three rounds in accordance with BS8576:2013 Guidance on investigations for ground gas – permanent gases and volatile organic compounds.

All serviceable existing (named WS10, WS11 and WS12) and newly installed (WS2, WS8 and WS9) were monitored for the presence of soil gases including methane, carbon dioxide, oxygen, carbon monoxide and hydrogen sulphide. In addition, gas flow rates, downhole pressure and atmospheric pressure were also measured, using a GA5000 Geotech Gas Analyser.

Gas monitoring was conducted for at least three minutes, with readings taken at 30 second intervals.

3.2.1.4. Groundwater Monitoring

Four wells (WS8, WS9, WS10 and WS12) were developed to enable subsequent representative groundwater sampling. Wells were developed to enable subsequent representative groundwater sampling. Wells were developed (3x well volume or until the well was dry using a disposable bailer.

During purging (immediately prior to sampling) an environmental parameter measurement (pH, electrical conductivity and total dissolved solids) was taken every 3-5 minutes. When all parameters were within 10% of the last reading, over three consecutive readings, the sample was taken.

Samples were put into glass and plastic bottles, dependent on the exact laboratory and suite requirements, before transit to the laboratory.

3.2.2. Ground Conditions

Ground conditions broadly comprised of Made Ground to average depth of 0.70mbgl over river terrace deposits to a maximum depth of 5.20mbgl over weather chalk and chalk to a base exceeding 5.45mbgl.

Topsoil incorporated into the Made Ground was identified in four of the exploratory holes, with one of which being underneath a loose slightly clayey slightly silty gravelly sand, whilst concrete or macadam was identified in four exploratory holes and electrical wire was found in one. Other than the anthropogenic materials noted here, there was no evidence of contamination.

The London Clay was encountered in all exploratory holes. Its consistency was described as ranging from soft to stiff, with soil types being predominantly described as slightly sandy clay. The clay was encountered at depths ranging from 0.4 to 5.5mbgl.

Groundwater was recorded at depths between 1.61 to 4.50mbgl, however both the foundation pits were dry (although these were relatively shallow at 0.8 to 1.0mbgl).

3.2.3. Contamination Assessment

Three soil samples were sent to a UKAS accredited laboratory. These were chosen to reflect representative site conditions and to provide assessment of perceived worst-case conditions or target specific locations, at depths of 0.3 & 0.6m. Two of these samples represented typical Made Ground across the site, whilst the other sample allowed assessment of shallow natural soils nearby the possible ACMs to the north-east.

Organic matter was 2.3% in natural soils and 1.7-2.0% in Made Ground. The sample from the north-eastern part of the site tested positive for asbestos.

There were no exceedances of the GAC for the heavy metal contaminant group. Both Polycyclic Aromatic Hydrocarbons (PAHs) and Total Petroleum Hydrocarbons (TPHs) for the sample obtained from natural soil were all below LOD, whilst samples obtained from Made Ground returned parameters slightly above background levels but there were no exceedances of the GAC. All results for all samples returned below LOD for BTEX and MTBE, with no exceedances of the GAC.

3.2.4. Water Assessment

It was concluded that assessment of contamination to groundwater was not required because the underlying Secondary (A) bedrock aquifer was considered to be Low sensitivity, and the risk to surface water was considered to be Low. There are also no Source Protection Zones within 500m of the site boundary.

3.2.5. Recommendations for Future Works

Further investigation in the north-eastern portion of the site where asbestos was found was recommended prior to demolition and development, involving trial pitting and/or trenching.

It was suggested that a remediation strategy may be required for submission to the Local Authority, following additional investigation work.

A verification report was also recommended following the completion of remediation works, including documentary and photographic evidence of the remedial works completed.

3.3. Additional Ground Investigation Report (2021)

A Ground Investigation Report (Ref: 5006864-RDG-XX-ST-DOC-C-OOAGI) was issued by Ridge in October 2021. A summary of the findings is provided below.

The full report should be consulted for geotechnical aspects of this investigation. We have provided a summary of general and geo-environmental findings below.

3.3.1. Fieldwork

The Ground Investigation was undertaken from 22-26 October 2021, and comprised of four cable percussion boreholes to allow for in-situ testing and sample collection at greater depths.

Methods employed during the investigation were carried out in general accordance with statutory guidance including BS5930:1999 Code of Practice for Site Investigations (Amendment 3: 2015) and BS10175:2011+A1:2013 Investigation of Potentially Contaminated Sites: Code of Practice.

All test locations were positioned accounting for access and buried services and the investigation was spread across the site, with one intrusive location (BH1) located within the macadam surfaced car park along the northern boundary of site and a second intrusive location (BH2) located within the concrete surfaced car park on the eastern boundary, adjacent to Goring Street.

The two cable percussive boreholes (BH1 and BH2) were advanced to a maximum depth of 12.0mbgl to investigate the nature and geotechnical properties of deeper soils. Both boreholes were terminated at 12.0mbgl due to refusal
on rock chalk.

3.3.2. Summary of Ground Conditions

The following ground conditions were encountered during the investigation works. They are generally considered to be consistent with the published geology and findings from previous works.

STRATUM	DEPTH TO TOP (MBGL)	DEPTH TO BASE (MBGL)
Concrete	Ground Level	0.10 – 0.25
Made Ground	0.10 – 0.30	0.30 – 2.50
River Terrace Deposits	0.30 – 1.20	3.20 – 5.20
Weathered Chalk	3.30 – 4.70	>5.45

Chalk	4.50	>5.45

Table 3.1: Summary of Ground Conditions

3.3.2.1. Surface Coverings

The surface cover of BH1 comprised asphalt to 0.1mbgl overlying concrete to 0.2mbgl. The surface cover at BH2 comprised concrete to 0.15mbgl.

3.3.2.2. Made Ground

Made Ground was identified in both boreholes to a maximum depth of 0.4mbgl in BH2. Made Ground soils in BH1 was described as brown sandy gravelly Clay and was observed to 0.35mbgl. In BH2 red brick fill was observed between 0.15m to 0.4mbgl.

3.3.2.3. River Terrace Deposits

River Terrace Deposits described as soft brown sandy Clay was observed in BH1 between 0.35m and 6.5mbgl and in BH2 between 0.4m and 4.5mbgl. Brown slightly clayey Sand was observed within BH1 between 3.0m and 4.2mbgl.

3.3.2.4. New Pit Chalk Formation

The New Pit Chalk Formation recovered as structureless Silt was observed in BH1 between 6.5m and 7.5mbgl and in BH2 between 4.5m and 5.7mbgl. Chalk recovered as Gravels and Cobbles were observed in BH1 from 7.5m and in BH2 from 5.7m to the base of both intrusive locations at 12.0mbgl where the cable percussive rig was refused.

3.3.2.5. Groundwater Conditions

Groundwater was encountered at depths between 5.1m and 5.2mbgl during the Ground Investigation.

3.3.2.6. Visual and Olfactory Observations

The table below summarises observations made during the investigation.

HOLE ID	OBSERVATIONS
WS1	Strong hydrocarbon odour from 3.50 to 4.00m
WS2	Strong hydrocarbon odour from 3.10 to 3.50m
WS6	Strong hydrocarbon odour from 2.00 to 3.00m
WS8	Strong hydrocarbon odour from 3.10 to 3.50m

Table 3.2:Visual and Olfactory Evidence.

3.4. Goring Piling Risk Assessment Report (2022)

Instructions were received from McCarthy Stone (MCS) to prepare a Piling Risk Assessment (PRA) in relation to the re-development of the site.

3.5. Further Ground Investigation Works (2022)

Instructions were received from McCarthy Stone (MCS) undertake a Further Ground Investigation and compile a letter report based on the findings.in relation to the re-development the site.

3.5.1. Fieldwork

Suitably experienced Ridge staff oversaw the intrusive investigation, which was undertaken between the 11th and 14th April 2022. Methods employed during the investigation were carried out in general accordance with statutory guidance including BS5930:2015+A1:2020 Code of Practice for Site Investigations and BS10175:2011+A2:2017 Investigation of Potentially Contaminated Sites: Code of Practice.

The investigation comprised 2no. rotary core boreholes (BH3 and BH4) positioned close to the previous locations of the former cable percussive holes (BH1 and BH2). Both rotary core locations reached a maximum depth of 20.00mbgl.

3.5.2. Ground Conditions

The encountered geology is consistent with the initial ground investigation. Macadam/Concrete over River Terrace Deposits, with the New Pit Chalk Formation underlying.

The River Terrace Deposits was identified to an average depth of circa 4.75mbgl. The River Terrace Deposits was generally described as brown silty sandy Clay.

The New Pit Chalk Formation was identified to the maximum drill depth of 20.00mbgl in both locations. The Chalk was generally described as weak structureless off-white weathered chalk recovered in a light grey matrix (Grade Dc), to an average depth of 10.00mbgl. From 10.00mbgl to the maximum depth the chalk became medium strong off-white chalk, discontinuities very closely spaced, weathered surfaces, undulating and rough. With frequent orange staining on weathered surfaces (Grade A4 – B3).

3.5.2.1. Groundwater

Accurate groundwater levels could not be determined due to the use of water flush during rotary drilling.

At the start of the investigation on the 11th April, the existing wells were monitored and an average depth of 3.35mbgl was recorded.

During the last monitoring visiting on the 9th June 2022, an average reading of 3.36mbgl was taken between the six available monitoring wells.

3.6. Further Ground Investigation Report Post Demolition (2023)

Instructions were received from McCarthy Stone (MCS) undertake a Further Ground Investigation and compile a letter report based on the findings.in relation to the re-development of land comprising the Horton Buildings, Goring Street, Goring By Sea, BN12 5AD (hereafter referred to as the “site”).

3.6.1. Fieldwork

Suitably experienced Ridge staff oversaw the intrusive investigation, which was undertaken between the 3rd and 7th October 2022. Methods employed during the investigation were carried out in general accordance with statutory guidance including BS5930:2015+A1:2020 Code of Practice for Site Investigations and BS10175:2011+A2:2017 Investigation of Potentially Contaminated Sites: Code of Practice.

The investigation comprised 8no. trial pits, 4no. soakaway pits (three shallow, one deep) 15no, plate load tests (five locations) and 3no. foundation exposure pits.

3.6.2. Ground Conditions

The encountered geology was consistent with the previous ground investigations comprising Made Ground over River Terrace Deposits. Chalk gravel was encountered within the clay at the base of the investigation.

The River Terrace Deposits were proved to the maximum investigation depth of circa 3.00mbgl. The River Terrace Deposits was generally described as brown silty Clay. No roots were encountered with only rate rootlets present in TP04.

3.6.2.1. Groundwater

No groundwater was encountered during the investigation.

During the previous investigation, at the start of the works on the 11th April 2022, the existing wells were monitored and an average depth of 3.35mbgl was recorded.

The last monitoring visiting on the 9th June 2022, an average reading of 3.36mbgl was taken between the six available monitoring wells.

3.6.3. Contamination Assessment

Ten soil samples collected during the Ridge site investigation from Made Ground and shallow natural soils at various depths (0.10m to 0.80m) and locations were submitted to a UKAS accredited laboratory for analysis against a generic contamination suite including heavy metals, phenols, speciated polyaromatic hydrocarbons (PAHs), fractionated total petroleum hydrocarbons (TPH), BTEX and MTBE compounds and an asbestos screen.

Ridge have undertaken a screen of the soil laboratory results using generic assessment criteria. Generic assessment criteria (GAC) are conservative contaminant concentration values used for comparison purposes to assess the risk associated with contaminant concentrations found on site and are derived using non-site-specific information. In order to assess the soil analyses results with regard to potential human health risks, Ridge has adopted published guidance criteria widely referred to by professionals within the industry, which include the following:

- Suitable 4 Use Levels (S4ULs) Generic Assessment Criteria (GAC) developed by the Chartered Institute of Environmental Health (CIEH) in partnership with Land Quality Management Ltd. (LQM);
- Category 4 Screening Levels (C4SL) for lead, produced by CL:AIRE (2014); and
- The UK Soil Guideline Values (SGVs) for selected metals, BTEX and phenols, produced by the EA and Department of Environment, Food and Rural Affairs (2009).

Based on the use of the site, comparisons have been made against the 'residential end use without homegrown produce' land use setting on the basis that the proposed development comprises assisted living facilities for elderly residents and therefore it is likely that gardens will be tended by maintenance staff and homegrown produce is unlikely to be consumed.

Results were compared to the conservative 1.00% soil organic matter value unless otherwise stated.

3.6.3.1. Organic Matter

Organic matter ranged from 0.7% to 8.9% (avg. 3.1%) from the tested samples. These values correspond to TOC ranging from approximately 0.41% to 5.16% (avg. 1.80%). Two out of the ten tested samples (SA04 at 0.20m and TP04 at 0.20m) are considered to have elevated levels of organic matter. Both tests were from samples within Made Ground.

3.6.3.2. Asbestos

Asbestos was not detected within any of the tested soil samples following the asbestos screen.

3.6.3.3. Heavy Metals

There were no exceedances of the screening criteria for any heavy metal determinants from all tested soil samples. Concentrations for arsenic, chromium VI, mercury and selenium were returned below their respective laboratory Limit of Detection (LOD) from all tested samples.

3.6.3.4. Polycyclic Aromatic Hydrocarbons (PAH) and Total Petroleum Hydrocarbons (TPH)

There were no exceedances of the screening criteria for any of the PAH and TPH determinands from all tested soil samples. Furthermore, all tested determinands from all samples were recorded below their respective LOD.

3.6.3.5. BTEX and MTBE

There were no exceedances of the screening criteria from any of the tested samples for all BTEX determinants and MTBE. Furthermore, all tested determinants from all samples were recorded below their respective LOD.

3.6.3.6. Waste Material

Results from the ten samples were input into a Soils Characterisation Tool (CAT-Waste Soil) to identify whether the materials on site have hazardous properties. Following analysis using CAT-Waste Soil, all samples returned results showing no hazardous properties.

Results from two of the ten samples (SA04 at 0.20mbgl and TP02 at 0.40mbgl) were subsequently scheduled for Waste Acceptance Criteria (WAC) testing to help determine their waste classification, specifically which landfill category the material conforms to. These were selected from Made Ground, and underlying natural material, should there be a requirement to remove these soils in the future.

4. CONCEPTUAL SITE MODEL

4.1. Sources

Following investigations conducted to date and screening of chemical analysis results, the following contaminant sources were identified:

- Elevated heavy metals in made ground.

4.2. Pathways

The key environmental pathways and exposure routes by which potentially toxic substance can reach the identified potential receptors are considered to be:

- Dermal contact, inhalation and ingestion of soils and dust
- Migration of contaminants through the underlying geology

4.3. Receptors

Receptors that may be affected by the identified contaminant sources are considered to be:

- Future residential site users
- Supporting living staff members and maintenance workers such as gardeners/ landscapers/ caretakers etc.
- Construction/groundworkers (during development)
- River Terrace deposits- Secondary B aquifer
- Chalk- Primary Aquifer

4.4. Risk Assessment

4.4.1. Risk Assessment Procedure

By considering the sources, pathways and receptors (pollutant linkages), an assessment of the human health/ environmental risks is made with reference to the significance and degree of the risk. This assessment is based on consideration of whether the source contamination can reach a receptor and hence whether it is of major or minor significance.

The risk assessment has been undertaken with reference to BS 10175:2011+A2:2017 and CIRIA Document C552: Contaminated Land Risk assessment 'A Guide to Good Practice'. The risk assessment has been carried out by assessing the severity of the potential consequence, taking into account both the potential magnitude of the hazard and the sensitivity of the target.

4.4.2. Proposed Development

Landscaping will include shared amenity areas as well as private courtyards. With the nature of the development in mind, it is assumed that all garden maintenance will be carried out by landscape professionals on a regular but in-frequent basis.

The build footprint and areas of hardstanding make up at least 80% of the development, and therefore pathways from any soil contaminants will be blocked.

4.4.3. Discussion

There was just one exceedance of the more conservative Residential without Homegrown Produce GAC for lead. The sample at WS4-0.40m returned a lead concentration of 305mg/kg which marginally exceeded the lead Residential without Homegrown Produce GAC of 300mg/kg.

With reference to the proposed development layout, WS4 is not located within proposed private gardens, and therefore the Public Open Space – Residential GAC is more applicable. The returned lead concentration of 305.00mg/kg does not exceed the Public Open Space – Residential GAC of 630.00mg/kg.

Further to the above, WS4 is located below the building footprint, therefore preventing the contaminant pathway to residents and maintenance workers.

Gardening activities will be carried out by a professional contract organisation, thereby reducing risks to residential end users significantly.

4.5. Pollutant Linkage Assessment

The Pollutant Linkage Assessment below relates to current site conditions, based on the proposed development, and without mitigation measures applied.

SOURCE	PATHWAY	RECEPTOR	SEVERITY	LIKELIHOOD	RISK LEVEL
Elevated heavy metals in Made Ground	Dermal contact, inhalation and ingestion of soils and dust	Residential End Users	Mild	Low Likelihood	Low
		Construction groundworkers and maintenance workers	Minor	Low Likelihood	Very Low
	Migration of contaminants through the underlying geology	RTD – Secondary B Aquifer	Minor	Likely	Low
		Chalk – Principal Aquifer	Mild	Low Likelihood	Low

Table 4.1: Pollutant Linkage Assessment

The risk of impact to identified receptors from the identified sources was considered to be Low.

5. OUTLINE OF REMEDIAL MEASURES

An outline of remedial measures is provided below. Details relating to associated Validation of the measures is provided in Section 6.

5.1. Reasons for Remediation

Based on the investigation and testing undertaken minimal remedial works were considered necessary to ensure the site is made suitable for its intended use.

5.1.1. Topsoil

To comply with NHBC requirements a minimum of 100mm, or greater thickness of imported topsoil appropriate to the landscaping requirements was required in all areas of soft landscaping.

Following delivery to site, soils should be tested once in in situ and soils have been allowed to settle in place.

Testing for a screen of common contaminants should be carried out. Determinand groups should include asbestos, heavy metals, PAHs, TPH CWG, BTEX and MTBE. Additionally, soils should be tested for soil organic matter, pH, and for physical properties. Chemical analysis is to be undertaken by a UKAS accredited laboratory and be MCERTS compliant, where possible. Samples should be obtained in sterile, laboratory supplied glass jars/ tubs, maintained in cool conditions until dispatched to the laboratory.

A sampling frequency of one sample per $50m^3$ is required, and a minimum of three samples are required per source. For larger amounts of soil from a single source the sampling frequency can be reduced by agreement with Ridge.

5.2. Removal of Made Ground/ Waste Material

Materials that are to be removed from site will be disposed of in accordance with the Landfill Regulations 2005. This will involve verification that waste is not hazardous through use of a classification system such as CAT-WASTE Soil, and then subsequent Waste Acceptance Criteria (WAC) testing. Results will be provided to hauliers and landfill operators, to ensure that the materials are disposed of correctly. Should materials be revealed during site works that appear to be different to those tested, additional testing may be required, prior to disposal of such materials.

5.3. Water Supply Pipes

Due to the brownfield nature of the site, it was recommended that a Barrier Water Supply Pipe was installed.

5.4. Implementation of Remedial Actions

5.4.1. Watching Brief

As part of the implementation of remediation actions, a Watching Brief was maintained on site by the Site Manager. This must be undertaken to ensure actions are implemented correctly and in the instance that there are any previously unidentified areas of contamination exposed during the course of site development.

5.4.2. Discovery Strategy

Should materials different to those revealed by the investigations carried out to date be encountered during site works, or should impacted soils be suspected, actions as detailed in the Remediation Strategy should be implemented.

6. VALIDATION OF REMEDIAL WORKS

The following report section summarises the remediation works that have been carried out and the associated site visits carried out as part of the Validation works. Works are summarised in chronological order, with additional items appended.

A photographic log is presented in Appendix A.

6.1. Imported Topsoil

Delivery tickets for 15 loads of topsoil have been supplied, dating between 6/12/2023 to 10/02/2024 – a selection of which are included as Appendix B. The material originated from North Barn Farm, Titnore Ln, Worthing BN12 6NZ and was delivered to site by Euro green Environmental Limited. It is described as being BS3882 topsoil, BS3882 Sandy Loam Topdressing and BS8601 Subsoil.

The 15 x 8-wheeler loads equate to approximately 225m^3. The delivery notes for selected loads of topsoil are included in Appendix B.

This topsoil was predominantly used in the homeowners courtyard area in the south of site.

6.2. Verification Testing

6.2.1. 14 February 2024 – Site Visit – Topsoil Sampling

A ridge engineer attended the site to collect samples of topsoil. Nine samples were dispatched to DETS Environmental Testing Laboratory. Results of the testing are included as Appendix C. The number of samples taken exceeds the required ratio of one sample per 50m^3.

6.2.2. Verification Testing

Samples were submitted for a suite of common contaminants including; heavy metals, PAHs, TPH, BTEX, MTBE and asbestos. Laboratory results were compared against generic assessment criteria (GAC) including S4ULs, C4SL (lead) and SGVs for a 'residential with possible homegrown produce' end use.

Asbestos was not detected in any of the nine topsoil samples.

From all nine samples, there were no exceedances of the GAC for any of the tested contaminants. The laboratory test results are included in Appendix C.

6.3. Water Supply Pipes

SLA Barrier Pipe was used – Egeplast SLA® Barrier Pipe consists of a core pipe in accordance with BSEN 12201, upon which a protective coating is additionally extruded in order to increase its scratch and abrasion resistance. A multiple layer aluminium foil is applied as a barrier layer between the core pipe and the coating layer. The four brown double stripes serve to identify it as a multiple layer pipe.

Delivery notes for one 63mm x 25m PURITON II Barrier pipe coil, one coupler 63x63mm barrier and one 110/94mm Twin wall duct x 50m coil black electric, to the site dated 1 December 2023 are included as Appendix D.

6.4. McCarthy Stone Construction Watching Brief

McCarthy Stone Construction undertook a Watching Brief during construction works. A letter confirming that no contamination was identified during the course of site development is included as Appendix E.

Copies of the paperwork relating to this removal are included as Appendix F.

7. FINAL STATEMENT AND RECOMMENDATIONS

7.1. Site Status

Remediation actions have been implemented as per the risk assessment recommendations and therefore based on the works carried out and associated test results, the site is considered to be fit for purpose and safe for occupancy.

Imported soils have been delivered to site from reputable sources and analysed after delivery to site.

Barrier water supply pipes have been installed as per the agreed specification.

7.2. Post-Treatment Management

No on-going management is considered necessary.

FIGURE 1 – DEVELOPMENT PLANS



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Site Plan Proposed

rev.	date	changes description	status	issued by
P06	02/11/2021	Amendments following client comments received 22/10	S3	EA
P05	20/10/2021	General amendments following client comments.	S3	EA
P04	06/10/2021	Revised to the west elevation & site plan	S3	

N

0.0 2.5 5.0 10.0 12.5m

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drawn by	date created	project title
MK	Feb 2021	M&S Goring By Sea
checked by	scale at A3	document title
NA	1:250	Site Plan

region	project no.	stage no.	discipline	number
SO -	2694 -	03 -	A -	0120

status	suitability description	revision
S3	For Stage Approval	P06

APPENDIX A – PHOTOGRAPHIC LOG