

RIDGE

REMEDIATION METHOD STATEMENT
LAND AT WELLCROSS FARM, BROADBRIDGE HEATH

DISCHARGE OF CONDITION 19
ATTACHED TO APPEAL REF: APP/Z3825/W/20/3262938

INSPIRED VILLAGES GROUP

June 2024

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VERSION CONTROL

VERSION	DATE	DESCRIPTION	REPORT REFERENCE	CREATED	REVIEWED
01	27/02/2024	RMS – First issue	5016405-RDG-XX-ST-DOC-C-00-RMS01	RM	RJH
02	07/03/2024	Updated following client comments	5016405-RDG-XX-ST-DOC-C-00-RMS01.1	RM	RJH
03	12/06/2024	Updated Following Consultation with Local Authority Environmental Protection Officer	5016405-RDG-XX-ST-DOC-C-00-RMS01.2	RM	RJH

1. INTRODUCTION

1.1. Instructions

Instructions were received from Inspired Villages Group Ltd to prepare a Remediation Method Statement (RMS) in relation to redevelopment of a site located at Wellcross Farm, Broadbridge Heath, Horsham, (hereafter referred to as "the site").

1.2. Background

Following two phases of ground investigation in relation to the redevelopment of the site, a Remediation Method Statement is required to detail remedial measures and follow-up checks currently considered necessary to ensure the site is suitable for its proposed use as a retirement living community. There are three proposed development phases, Phases 1, 2 & 3 are shown within the Client's construction plan, included as Figure 1. Remedial requirements are only recommended within Phase 3.

BWB Consulting have previously issued a Desk Top Study report pertaining to the development site (Report reference: NTW2681, dated: June 2018).

Ridge and Partners LLP (Ridge) have previously issued two reports relating to the proposed development comprising an initial Ground Condition Assessment Report (Report ref: 5016405-RDG-XX-ST-DOC-C-01-GCA01, dated 5th November 2021) and a Further Investigation Report detailing the findings of an investigation centred on previously inaccessible areas of the site (Report ref: 5016405-RDG-XX-ST-DOC-C-01-FGIR01, issued 21st August 2023). Previous reports are summarised in Section 3.

1.3. Proposed Development

Planning application DC/19/1897, relates to the entire site at Wellcross Farm and concerns the development of - '*a continuing care retirement community of 141 units of accommodation (C2 Use) and community facilities including restaurant, café, shop, hairdressers, spa and consultation / treatment suite for use by GP's and primary healthcare providers, with access, infrastructure, open space, landscaping and associated works. All matters to be reserved except for access*.'

The development includes soft landscaping in the form of communal gardens, low maintenance boarders, designated wildlife habitats and other examples of public open space. A small area recorded as a communal Productive Garden is included within the west of the Phase 3 development boundary. There is potential for home grown produce from this area only. Current development plans are included as Figure 1.

The consultation response from the contaminated land officer is detailed within Condition 19 of the appeal decision APP/Z3825/W/20/3262938, and is as follows:

Prior to the commencement of development (of each phase of the development hereby permitted) the following components of a scheme to deal with the risks associated with contamination, including asbestos contamination, of the site shall each be submitted to and approved, in writing, by the local planning authority:

A) *A preliminary risk assessment for each phase which has identified: - all previous uses - potential contaminants associated with those uses - a conceptual model of the site indicating sources, pathways and receptors - potentially unacceptable risks arising from contamination at the site.*

B) *A site investigation scheme for each phase, based on 'A)' to provide information for a detailed assessment of the risk to all receptors that may be affected, including those off site.*

C) *The site investigation results and the detailed risk assessment 'B)' and, based on these, an options appraisal and remediation strategy giving full details of the remediation measures required and how they are to be undertaken within each phase. The development shall be completed in accordance with the approved details, unless otherwise agreed to, and approved in writing, by the Local Planning Authority.*

This report has been produced to discharge Part C of Condition 19 detailed above. A Contamination Remediation Verification Report will be issued following completion of the required remedial measures detailed within Section 6 below. Please note that remediation and thus verification is not considered necessary for all phases of the proposed development.

Point A is addressed by BWB Consulting's Desk Top Study Report (NTW2681), with Point B considered satisfied by Ridge's GCA and FGIR reports (5016405-RDG-XX-ST-DOC-C-00-GCA01 and 5016405-RDG-XX-ST-DOC-C-01-FGIR01). The three reports should be read in conjunction for completeness.

Remediation and subsequent verification (Part C of Condition 19) are not required within the proposed Phase 1 and 2 development sites as defined within Figure 1. It is recommended that condition 19 be discharged for both Phase 1 and 2. Further details of specific areas requiring action are provided within later sections of this report.

1.4. Objectives

The objective of this report is to summarise remedial measures and validation requirements currently considered necessary to ensure the site is suitable for its intended end use.

The report provides the following:

- Summary of works completed to date
- Definition of identified Relevant Pollutant Linkages
- Appraisal of remedial options
- An outline of required remedial actions
- A detailed Validation Plan

1.5. Report Limitations

This report has been prepared in accordance with the instructions received from **Inspired Villages Group Limited** and includes details of remedial works required for the proposed development and the required verification of these measures.

The information contained in this report is intended for the use of the client pursuant to the development described above. The remedial solutions and details contained herein may not be appropriate to other development proposals.

1.6. Guidance

This report has been written in accordance with *Land Contamination Risk Management (LCRM) – Environment Agency 2020*, which supersedes CLR11.

2. PHYSICAL SETTING

2.1. Geology and Hydrogeology

The following observations are taken from the British Geological Survey (BGS) Geology of Britain Viewer (2024). The Geology of Britain Viewer indicates that the site is likely underlain by superficial deposits comprised Alluvium and the Arun Terrace Deposits, within central and northern portions of the site. The superficial deposits overly a bedrock geology of the Weald Clay Formation. The table below identifies the expected composition of the published strata and associated aquifer classification.

ALLUVIUM	
Unit Name	Alluvium
Geology Description	Unconsolidated detrital material deposited by a river, stream or other body of running water as a sorted or semi-sorted sediment in the bed of the stream or on its floodplain or delta. Normally soft to firm consolidated, compressible silty clay, but can contain layers of silt, sand, peat and basal gravel.
Aquifer Classification	Secondary (A)
Aquifer Description	Secondary A aquifers comprise permeable layers that can support local water supplies, and may form an important source of base flow to rivers.
ARUN TERRACE DEPOSITS	
Unit Name	Arun Terrace Deposits
Geology Description	Deposits recorded to contain sand, sandy gravel, and gravel, locally clayey. Gravel component is predominantly subangular flint with subordinate debris of chert, polished quartz grain, and larger fragments of pebbly ferruginous sandstone.
Aquifer Classification	Secondary (A)
Aquifer Description	Secondary A aquifers comprise permeable layers that can support local water supplies, and may form an important source of base flow to rivers.
WEALD CLAY FORMATION	
Unit Name	Weald Clay Formation
Geology Description	Bedrock geology comprised, dark grey thinly-bedded mudstones (shales) and mudstones with subordinate siltstones, fine- to medium-grained sandstones, including calcareous sandstone (e.g. Horsham Stone Member), shelly limestones and clay ironstones. Lithological thickness >100m.
Aquifer Classification	Unproductive Strata
Aquifer Description	Rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

Table 2.1: Geology and Hydrogeology

2.2. Hydrology

2.2.1. Surface Water Features

The River Arun runs across the eastern half of the site in a generally north to south-east direction.

2.2.2. Flooding

The central and eastern portions of the site are situated within an Environment Agency Flood Zone 3 (High probability of flooding). The north of the site is situated within an Environment Agency Flood Zone 2 (Medium probability of flooding) the remainder of the site is not considered liable to flooding.

2.2.3. Source Protection Zones

There are no Source Protection Zones (SPZs) within 500m of the site boundary.

3. PREVIOUS INVESTIGATIONS

Previous reports relating to the site were reviewed. These reports are listed below.

- Desk Top Study Report (Ref: NTW2681) – BWB Consulting – June 2018
- Ground Condition Assessment Report (Ref: 5016405-RDG-XX-ST-DOC-C-00-GCA01) – Ridge and Partners LLP – November 2021
- Further Investigation Report (Ref: 5016405-RDG-XX-ST-DOC-C-00-FGIR01) – Ridge and Partners LLP – August 2023

3.1. BWB Consulting – Desk Top Study (2018)

A summary of this document is included below. The reader should refer to the document for further information. Ridge does not guarantee the accuracy of the BWB Consulting report.

The purpose of the report was to establish the environmental and geotechnical conditions of the site mindful of the proposed residential development. This was to be achieved with an initial review of available information pertaining to the existing and historical use at the site.

The DTS undertaken by BWB identified two potential sources of contamination relating to the former and current on-site activities including filter bed (and potential associated Made Ground), agricultural uses, fly-tipping and potential asbestos contaminating materials within buildings on-site. in addition to the former and current land uses in the surrounding area including agricultural land uses, sewage works, garage, nurseries and a landing strip.

BWB Consulting determined a Moderate/Low risk rating largely due to the perceived ground gas risk Migration and accumulation of ground gasses in enclosed spaces.

3.2. Ridge and Partners LLP - Ground Condition Assessment (2021) and Further Ground Investigation Report (2023)

A Ground Condition Assessment Report was issued by Ridge in November 2021, with a supplementary Further Investigation Report issued August 2023, following a return to site to undertake an investigation of previously inaccessible areas of the site following site clearance. A summary of the findings is provided below. The full reports should be consulted for geotechnical aspects of this investigation. We have provided a summary of general and geo-environmental findings below.

3.2.1. Fieldwork

The initial Ground Investigation was undertaken between 31st August and 8th September 2021, and included 40no. Windowless Sampler Boreholes and 30no. Machine Excavated Trial Pits. Further investigation was undertaken on the 2nd August 2023 and comprised an additional 7no. Machine Excavated Trial Pits. Geotechnical and environmental laboratory testing provided supplementary information.

The locations of the Ridge windowless sampler boreholes were generally selected to target the footprints of structures which form the proposed development. With trial pits advanced to provide general site coverage, permit infiltration testing and target areas of potential contamination, defined by information presented within the historical DTS report.

3.2.2. Summary of Ground Conditions

The following ground conditions were encountered during the investigation. They were generally considered to be consistent with the published geology.

STRATUM	DEPTH TO TOP (MBGL)	DEPTH TO BASE (MBGL)
Topsoil	Ground level	0.05 – 0.60
Made Ground	Ground Level – 0.10	0.20 – 1.30
Alluvium	0.40 – 2.50	3.00 – 4.00
Arun Terrace Deposits	0.20 – 1.20	0.50 – 2.50
Weald Clay Formation – Clay	0.20 – 1.90	1.40 – >3.00

Table 3.1: Summary of Ground Conditions

3.2.2.1. Topsoil

The investigation found that Topsoil comprised the surface covering of fifty-five exploratory holes. Soils recorded as Topsoil were generally recorded to typically comprise, grass over brown gravelly sandy Silt, with frequent roots and rootlets, to depths ranging 0.10m to 0.60mbgl.

3.2.2.2. Made Ground

The Ridge ground investigation recorded material described as Made Ground, within twenty-one, exploratory holes located within the west of the Phase 3 boundary or the land north-east of the River Arun. The Made Ground encountered within twelve of the twenty-eight locations completed within the western portion of the Phase 3 boundary the two investigations and typically comprised, grass over dark brown, sandy, clayey, very gravelly Silt. Anthropogenic material was recorded as brick, wood, concrete, plastic, metal, and rare clinker. The Made ground within the western portion of the Phase 3 boundary was encountered to a depth of between 0.20m to 1.30mbgl.

Made Ground was recorded within all location north-east of the River Arun from between ground level and a depth of 0.10mbgl to a maximum depth of 1.20mbgl. The material north-east of the River Arun typically comprised, multicoloured (brown, grey, black, reddish, brown and yellow) clayey, very gravelly Sand. Anthropogenic material included glass, ash, clinker, brick and concrete.

3.2.2.3. Alluvium

Alluvial deposits were recorded within eight locations all within close proximity to the River Arun. On-site Alluvium was recorded within the GCA report as a very soft to soft, light greenish grey slightly sandy, very silty Clay, and encountered to a maximum depth in greater than 4.00mbgl.

3.2.3. Arun Terrace Deposits

Soils considered representative of the Arun Terrace Deposits were encountered across all areas of the site to underly either Made Ground or Topsoil to a depth of between 0.50m to 2.50mbgl. Soils of the Arun Terrace Deposits, typically comprised a dark orangish brown and dark orange, silty, Gravel and Sand. Gravel was recorded as fine to coarse ironstone and mudstone.

3.2.4. Weald Clay Formation - Cohesive

Cohesive material of the Weald Clay Formation was recorded within a total of sixty-six intrusive locations, underlaying a surface covering of Topsoil and/or Made Ground or shallow superficial soils of the Arun Terrace Deposits, from an initial depth of between 0.20m to 1.90mbgl to a maximum depth greater than 3.00mbgl. The material typically comprised stiff to very stiff, light orangish brown, yellowish brown and grey, slightly sandy, silty Clay, with rare fine to medium mudstone gravel.

3.2.5. Weald Clay Formation – Mudstone/Siltstone

Weak Mudstone and Siltstone characteristic of the Weald Clay Formation was noted to underly the cohesive soils of the Weald Clay Formation from an initial depth of between 1.40m to 2.50mbgl to a maximum depth >2.70mbgl. The weak rock was recorded identified within fourteen locations and inferred within fifteen further locations due to refusals within windowless sampler boreholes. The weak rock was recorded in-situ as, very weak to weak, light brown and purplish grey, Mudstone/Siltstone interbedded with ironstone <5mm thickness, and recovered as a slightly clayey, sandy Gravel.

3.3. Groundwater Conditions

Groundwater strikes were recorded within four windowless sampler borehole locations, WS01, WS04, WS06 and WS13 at depths ranging between 0.90m and 2.80mbgl. Groundwater seepage was also recorded within the base of TP03 at a depth of 2.60mbgl. Groundwater monitoring was undertaken within all eight of the installed monitoring visits between the 17th September and the 14th October 2021. Groundwater was recoded within seven wells at the following depths.

BOREHOLE	GROUNDWATER LEVEL (MBGL)				APPROX. GROUNDWATER LEVEL (MAOD)
	MR1 - 17/09/2021	MR2 - 24/09/2021	MR3 VISIT 1 - 08/10/2021	MR3 VISIT 2 - 14/10/2021	
WS02	1.45	1.56	0.69	1.35	30.74 – 29.87
WS11	2.10	2.28	1.83	2.19	28.51 – 28.06
WS13	0.97	1.04	0.74	1.19	26.94 – 26.49
WS14	1.71	1.78	0.71	1.60	30.15 – 29.08
WS20	Dry	Dry	1.40	1.98	29.72 – 29.14
WS25	Dry	Dry	No Access	1.78	29.63
WS31	Dry	Dry	No Access	Dry	-
WS33	1.96	1.96	1.31	1.92	27.05 – 26.40

Table 3.2: Groundwater Monitoring

3.3.1.1. Visual and Olfactory Observations

The report made note of rare black staining was recorded within Made Ground identified north-east of the River Arun. No further notable visual and/or olfactory evidence of contamination encountered during the investigation.

3.3.2. Contamination Assessment

3.3.2.1. Soil Assessment

Following a review of BWBs preliminary risk assessment it was deemed that there was potential for unacceptable risks to the identified receptors. The DTS report concluded that there was a Low/Moderate risk level with respect to the human health receptor. In light of the previous site classification by others, further assessment during the Ridge 2021 and 2023 investigations was considered necessary to further refine the CSM.

3.3.2.2. Generic Assessment Criteria

Ridge undertook 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.

At the time of reporting in 2021, development proposals included private residential gardens associated with cottage style dwellings situated across various areas of the site. Since issuing the 2021 GCA report Ridge have been provided with updated landscape plans.

Proposals, as of reporting, include a Productive Garden within the west of the Phase 3 development site, this is the only area across all phases of development which meets the criteria of 'Residential – With Potential for Homegrown Produce'.

Other proposed landscaping comprises communal gardens, low maintenance boarders, designated wildlife habitats and other examples of public open space. For the purpose of the report, samples collected from intrusive locations within and in immediate proximity to the proposed Productive Garden in Phase 3 (FTP01-04), have been compared against a **'Residential – With Potential for Homegrown Produce'** end use scenario. All remaining samples have been assessed with respect to the applicable **'Residential – Without Homegrown Produce'** end use scenario as an initial approach.

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), and

- Category 4 Screening Levels (C4SL) for lead, produced by CL:AIRE (2014).

A conservative Soil Organic Matter (SOM) value of 1% was used for organic contaminants (i.e. TPH and PAHs) as a worst-case scenario.

3.3.2.3. Soil Assessment Rationale

A total of twenty-three soil samples collected during both Ridge investigations (16no. 2021 and 7no. 2023) at various depths and locations were submitted to a UKAS accredited laboratory for analysis against a generic contamination suite.

The contamination suite included heavy metals, phenols, speciated polyaromatic hydrocarbons (PAHs), fractionated total petroleum hydrocarbons (TPH), BTEX and MTBE compounds and an asbestos screen. The suite was chosen to reflect commonly found contaminants. Further to this, four samples were scheduled for Waste Acceptance Criteria (WAC) testing, and four samples submitted for a specific herbicide and pesticide screen, given the historical land use of the site.

One of the samples was obtained from a bund situated within the western portion of the Phase 3 boundary and noted to contain various anthropogenic materials.

3.3.2.4. Soil Results

Organic Matter

Organic matter values were recorded between 0.5% within TP02 at 0.80mbgl, and 30.7% within FTP03 at 0.05mbgl (Average 5.71%). Elevated levels of organic matter were returned from samples obtained from both Topsoil and Made Ground which were noted to containing frequent to occasional fine roots and rootlets.

Asbestos

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

Heavy Metals

One exceedance of the applicable screening criteria was returned for Lead from WS36 at 0.80mbgl. The sample reported a Lead value of 500mg/kg, with the 'Residential - Without Homegrown Produce' assessment criteria as 310mg/kg. There were no other exceedances of the screening criteria for any of the remaining heavy metal determinands. Furthermore, concentrations for chromium VI, mercury and selenium were returned below their respective laboratory Limit of Detection (LOD) from both tested samples.

WS36 was positioned within the area referred to as Land north-east of the River Arun, given that this area is currently designated as Public Open Space, the GAC screening values for a 'POS - Residential' land use scenario are considered appropriate. The returned concentration of lead is does not exceed the applicable screening value of 630mg/kg.

Polycyclic Aromatic Hydrocarbons (PAHs)

Exceedances of the screening criteria were returned from three samples (FTP01 at 0.30mbgl, FTP03 at 0.05mbgl and FTP06 at 0.05mbgl) for the following PAH determinands, Naphthalene, Phenanthrene, Fluoranthene, Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene, Dibenz(a,h)anthracene. All samples were collected from Made Ground soils.

The exceedances were recorded against the applicable GAC for each of the respective samples, Residential With (FTP01 and 03) and Without (FTP06) as an initial approach. The results from FTP06 were subsequently compared against screening values for POS- Residential as it is considered that this end use is more applicable following review of current landscaping proposals.

Following the application of POS-Residential screening criteria to the values returned from FTP06 no exceedances have been recorded. All samples collected from Topsoil and the underlying natural soils returned values for all PAH determinands below laboratory LOD. Exceedance results are summarised in the table overleaf.

DETERMINAND	MAX. CONCENTRATION (MG/KG)	RESIDENTIAL – WITH HOME GORWN PRODUCE GAC SCREENING VALUE (MG/KG)	RESIDENTIAL – WO HOME GORWN PRODUCE GAC SCREENING VALUE (MG/KG)	POSRESI GAC SCREENING VALUE (MG/KG)	EXCEEDANCES OF SCREENING VALUE
Naphthalene	14.5	2.3	2.3	4900	TP03 at 0.05mbgl
Phenanthrene	394.0	95.0	1300	3100	TP03 at 0.05mbgl
Fluoranthene	613.0	280.0	1500	3100	TP03 at 0.05mbgl
Benzo(a)anthracene	243.0	7.2	11	29	TP01 at 0.30mbgl TP03 at 0.05mbgl
Chrysene	180.0	15.0	30	57	TP03 at 0.05mbgl
Benzo(b)fluoranthene	193.0	2.6	3.9	7.1	TP01 at 0.30mbgl TP03 at 0.05mbgl
Benzo(k)fluoranthene	81.9	77.0	110	190	TP03 at 0.05mbgl
Benzo(a)pyrene	182.0	2.2	3.2	5.7	TP01 at 0.30mbgl TP03 at 0.05mbgl
Indeno(1,2,3-cd)pyrene	91.5	27.0	45	82	TP03 at 0.05mbgl
Dibenz(a,h)anthracene	21.2	0.24	0.31	0.57	TP01 at 0.30mbgl TP03 at 0.05mbgl

Table 3.3: Exceedances – PAHs

Following the application of the potentially more appropriate general assessment criteria for 'POS – Residential' two samples, both collected from the Made Ground in the western portion of the Phase 3 boundary, returned exceedances for PAHs.

PAH SSAC

Site specific assessment criteria (SSAC) were calculated for the PAH exceedances detailed above, based on the proposed nature of the site and mindful of the age restriction of the occupants, using the CLEA v1.07 Model.

Exceedances were recorded against site specific values for Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(a)pyrene and Dibenz(a,h)anthracene, thus there is considered to be a viable risk to the future occupiers of the site.

Total Petroleum Hydrocarbons (TPH)

There were no exceedances of the screening criteria from any of the tested samples for all TPH determinands. All samples collected from Topsoil and natural materials returned values for all TPH determinands below their respective laboratory LOD.

BTEX and MTBE

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

Herbicides and Pesticides

There were no exceedances of the screening criteria from any of the tested samples for all Organochlorine Pesticide (OCP), Organophosphorus Pesticide (OPP), and Phenoxy Herbicide, determinands. Furthermore, all OCP, OPP and Phenoxy Herbicide determinands were recorded below their respective laboratory LOD.

Discussion of Soil Results

Samples were collected from both investigation areas, from Topsoil, Made Ground and shallow natural soils. Exceedances of the applicable GCA were recorded following the application of initial conservative screening values relating to a residential end use without the possibility of home grown produce.

Exceedances from two samples for PAHs were still recorded following comparison against GCA values from the potentially more appropriate but less conservative Public Open Space – Residential end use scenario, and a set of SSAC, calculated based on the proposed nature of the site and mindful of the age restriction of the occupants. The significantly elevated results were recorded from samples of Made Ground collected exclusively from the western extent of the Phase 3 boundary, during the 2023 further investigation works.

There was considered to be a viable risk presented to the associated site receptors from the following PAH determinands; Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene and Dibenz(a,h)anthracene.

The western extent of the Phase 3 boundary is not typical of the larger development site, and the contamination encountered is thought to originate from historical development of the area, which differs significantly from the predominantly agricultural land use of the larger site.

As discussed above, the results from the 2021 Ridge Ground investigation have been re-assessed as part of RMS reporting to better assess different areas of the site with respect to current landscaping and land use proposals. The discussion of results in the 2021 GCA referenced the potential for heavy metal contamination within two locations, one of the returned values was below the screening criteria for 'Residential Without Home Grown Produce' with both below 'POS – Residential' limits, thus these determinands have not been considered further.

No further evidence of contamination was recorded during the Ridge further investigation, no asbestos being recorded following the completion of an asbestos screen and the lack of exceedance from any of the tested Heavy Metal, TPH, BTEX and MTBE, Pesticide or Herbicide determinands.

3.3.2.5. Waste Material

Results from all soil samples were input into a Soils Characterisation Tool (Haz-Waste Online) to identify whether the materials on site have hazardous properties. Following analysis using Haz-Waste Online software, one sample returned hazardous properties, HP7 Carcinogenic and HP11 Mutagenic, owing to significant levels of total TPHs. The Haz-Waste Online classification report is enclosed.

Results from five of the samples (FTP01 – 0.30mbgl, TP02 – 0.80mbgl, WS22 – 0.90mbgl, WS36 – 0.60mbgl and WS39 – 0.30mbgl) was scheduled for Waste Acceptance Criteria (WAC) testing to help determine the waste classification, specifically which landfill category the material conforms to. The material was selected from material considered 'worst case Made Ground' and natural soils. The testing was completed should there be a requirement to remove these soils in the future.

Following review of WAC testing, FTP01 – 0.30mbgl was classified as Non-Hazardous owing to elevated TOC and Total PAH, all other samples were recorded as Inert. It is anticipated that Made Ground encountered within the western limits of the Phase 3 boundary will require disposal under Hazardous and Non-Hazardous waste codes should there be a requirement to remove material from site.

3.3.2.6. Groundwater Assessment

Sensitivity of Controlled Waters

The site overlies Superficial Secondary (A) Aquifers, which represent a Low sensitivity. The site does not lie within a Source Protection Zone (SPZ).

The River Arun runs through the eastern half of the site in a generally north to south-east direction.

Scope

In light of these identified receptors and to provide an indication of groundwater conditions, the following scope was devised.

- Three rounds of groundwater gauging to assess visual/ olfactory evidence of contamination in groundwater.
- Groundwater analysis of samples obtained from newly installed wells on one occasion.

Sampling and Analysis

Groundwater samples were removed using disposable bailers following equilibrium of water chemistry including pH, total dissolved solids, electrical conductivity and temperature.

Groundwater samples were submitted for a suite of contaminants including heavy metals, PAHs, TPH CWG, BTEX and MTBE.

Tier 1 Assessment

Results have been compared to applicable screening criteria including Environmental Quality Standards (EQS), Dutch Target and Intervention Levels (DT), and the conservative UK Water Supply Regulations (WSR).

These are considered as highly conservative generic screening criteria. I.e. screening criteria are not considered to be site specific.

Heavy Metals

Some determinands in the sample collected from WS02 were elevated above background levels, but there were no exceedances of the screening criteria for any of the samples. Results returned for the following determinands; Arsenic, Cadmium, Copper, Lead and Mercury were recorded below LOD.

PAHs

The majority of results were below LOD, with the exception of Naphthalene where levels were recorded slightly above the laboratory level of detection. There were no exceedances of the screening criteria for any of the samples.

TPH CWG

All results were below LOD and there were no exceedances of the screening criteria.

BTEX/ MTBE

There were no exceedances of the screening criteria, and all results were below LOD.

Summary of Groundwater Results

The majority of results were below laboratory limit of detection (LOD). There were no exceedances of the screening criteria. Some elevated results were identified in the sample obtained from WS02, nevertheless results are indicative of background groundwater conditions.

3.3.2.7. Ground Gas Assessment
Design of Monitoring Programme

In accordance with BS8576:2013 *Guidance on investigations for ground gas – permanent gases and volatile organic compounds*, the extent of monitoring deemed necessary to assess the ground gas and vapour regime is determined by the generation potential of the source, i.e. what is the risk that large volumes of gas can be generated and can plausibly migrate to pose a credible hazard to the identified receptors. This is known as a multiple-lines-of-evidence approach.

Factors detailed in the table below were pertinent in the design of the gas monitoring programme. Information detailed in the table has either been taken from the BWB Desk Top Study or interpreted from the intrusive investigation conducted.

FACTOR	MORE MONITORING REQUIRED	LESS MONITORING REQUIRED
Landfills and waste sites	-	No records of any active or historical landfill or other waste sites recorded within 250m of the site.
Ground workings	Four onsite records of historical surface ground workings on or neighbouring the site.	-
Artificial Ground	Artificial ground expected on site.	-

FACTOR	MORE MONITORING REQUIRED	LESS MONITORING REQUIRED
Made Ground Organic Content	-	No evidence of organic content in logged soils. Total organic carbon averaged 2.49% in Made Ground samples.
Natural Soils Organic Content	-	No evidence of organic content in logged soils.
Volatiles	Laboratory analysis returned elevated hydrocarbons in some shallow soils, although these were noted as heavy-end i.e. less volatile.	Negligible volatiles identified during vapour monitoring.

Table 3.4: Factors influencing design of Gas Monitoring Programme

3.3.3. Generation Potential of Source

Based on the information within Table 3.4, the generation potential is considered to be **Low** and according to guidance this would equate to 'gas monitoring might not be necessary' or 'gas monitoring over a period of 2 months with up to weekly measurements'.

Based on this, we programmed three rounds of monitoring, to provide initial indications of the ground gas regime.

3.3.4. Monitoring Programme

Gas monitoring was conducted by Ridge on three occasions between 17th September and 14th October 2021, in accordance with BS8576:2013 *Guidance on investigations for ground gas – permanent gases and volatile organic compounds.* Boreholes (WS02, WS011, WS13, WS14, WS20, WS25, WS31 and WS33) were monitored for the presence of soil gases including methane, carbon dioxide, oxygen, carbon monoxide and hydrogen sulphide.

In addition, gas flow rates and downhole 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. Due to access limitations, monitoring round three was undertaken over two different dates, the 8th and the 14th of October 2021, with the locations WS25 and WS31 being monitored on the latter.

3.3.5. Monitoring Results

The results from the three monitoring rounds are summarised in the table below. Atmospheric pressure was noted to be decreasing during round one, with steady conditions during monitoring rounds two and three.

Following the three rounds of monitoring the following 'worst-case conditions' were encountered: a maximum flow of 0.20L/hr, a maximum CO_2 concentration of 7.20%, and a maximum CH_4 concentration of 0.20%. VOC levels were highest in WS02, but all results were below 3ppm.

	MONITORING ROUND 1	MONITORING ROUND 2	MONITORING ROUND 3
Max. Flow Rate (L/hr)	0.10	0.10	0.10
Peak CH_4 (%)	0.10	0.20	0.10
Peak CO_2 (%)	6.30	6.70	7.20

	MONITORING ROUND 1	MONITORING ROUND 2	MONITORING ROUND 3
Min. O_2 (%)	15.70	15.20	13.10
Max. H_sS (ppm)	0	0	0
Max. CO (ppm)	1	0	0
Max. PID (ppm)	2.77	1.68	1.45

Table 3.5: Monitoring Summary

3.3.6. Gas Screening Value

Worst case gas levels and flow rates identified across the entire programme can be used to calculate a conservative Gas Screening Value (GSV) as defined in CIRIA C665 *Assessing Risks Posed by Hazardous Ground Gases to Buildings* (2002).

GSV = (worst case CO_2 or CH_4 concentration/ 100) x worst case flow rate
GSV = (7.20%/ 100) x 0.10L/hr
GSV = 0.0072

According to the guidance, the GSV equates to a threshold of 0.07. Therefore, there is not considered to be a viable risk attributed to ground gas at the site.

Gas Protection

Having classified the site as CS1, the report concluded that no gas protective measures are required in the proposed development.

4. CONCEPTUAL SITE MODEL

4.1. Sources

Following review of BWBs CSM and the investigation completed by Ridge, the following sources are considered to present **above low risks** to the associated site receptors.

- Elevated PAH determinands from western portion of the Phase 3 boundary.

4.2. Receptors

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

4.2.1. Human

- Site End Users (residents and visitors)
- Construction Workers (during development)
- Maintenance workers and gardeners (post development)

4.2.2. Environmental

- Onsite Secondary (A) Superficial Aquifers
- Surface Water Feature – River Arun

4.3. Pathways

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

4.3.1. Indirect

- Vertical and lateral migration of organic and inorganic compounds through underlying geology
- Vertical and lateral migration of ground gas leading to accumulation in enclosed spaces.

4.3.2. Direct

- Inhalation of contaminated dust
- Inhalation of ground gas
- Ingestion
- Dermal contact

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. Discussion

4.4.2.1. Development and Associated Human Receptors

Proposals indicate a sheltered residential end use with approximately 40 - 45% the site occupied by the proposed buildings, associated, access roads and carpark. No private residential gardens are included as part of the proposals. Therefore, a 'Residential without homegrown produce' land use classification was deemed the most appropriate in terms of the risk assessment.

4.4.2.2. Contaminants in Soil

Samples were collected from both investigation areas, from Topsoil, Made Ground and shallow natural soils. Exceedances of the applicable GCA were recorded following the application of initial conservative screening values relating to a residential end use without the possibility of home grown produce.

Exceedances from two samples for PAHs were still recorded following comparison against GCA values for a Public Open Space – Residential end use scenario where appropriate, and a set of SSAC, calculated based on the proposed nature of the site and mindful of the age restriction of the occupants. Significantly elevated results were recorded from samples of Made Ground collected exclusively from the western extent of the Phase 3 boundary during the 2023 further investigation works.

There is considered to be a viable risk presented to the associated site receptors from the following PAH determinands; Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene and Dibenz(a,h)anthracene. Mitigation measures will likely be required to permit the proposed development within this area.

Given the results of laboratory testing and field observations, the encountered shallow material within the western extents of the Phase 3 boundary is not typical of the larger development site. The contamination encountered is thought to originate from historical development of the area, which differs from the predominantly agricultural land use of the larger site.

4.4.2.3. Groundwater

The majority of results were below laboratory limit of detection (LOD). There were no exceedances of the screening criteria. Some elevated results were identified in the sample obtained from WS02, nevertheless results are indicative of background groundwater conditions.

4.4.2.4. Soil Vapour and Ground Gas

Following a three round monitoring program a GSV of 0.0072 was calculated, which according to the guidance, equates to Characteristic Situation (CS) 1 as it is below the upper threshold of 0.07. A CS1 classification is considered to be appropriate for the site. Having classified the site as CS1, no gas protective measures are required in the proposed development.

4.4.2.5. Controlled Waters

Controlled waters were considered to be medium in terms of sensitivity, with the River Arun crossing the north-east of the site. The surface watercourse is recorded approximately 225m north-east of the area considered to be impacted by PAH contamination in soil. Groundwater results were considered indicative of background groundwater conditions.

It is considered unlikely that soil contamination would impact the underlaying Secondary (A). Moreover, groundwater was identified at depths greater than the maximum observed depth of the Made Ground on site, which reduces the potential for contamination migration to depth.

4.4.3. Pollutant Linkage Assessment

The Pollutant Linkage Assessment below relates to perceived current worst-case conditions on site, prior to the application of mitigation or remedial measures.

The Pollutant Linkage Assessment below relates to perceived current worst-case conditions on site, prior to the application of mitigation or remedial measures.

SOURCE	PATHWAY	RECEPTOR	SEVERITY	LIKELIHOOD	RISK LEVEL
Elevated PAH levels – Western limits of Phase 3	Direct contact, ingestion and inhalation of impacted soils	Future site users (residential)	Medium	Low Likelihood	**Low/ Moderate**
		Gardeners and maintenance workers	Medium	Likely	**Moderate**
		Construction/ groundworkers (during development)	Low	Likely	**Low/ Moderate**
	Migration of contaminates through underlying geology and inhalation	Secondary (A) Superficial Aquifer	Low	Low Likelihood	**Low**
		Surface water features	Medium	Unlikely	**Low**

Table 4.1: Pollutant Linkage Assessment

The risk of impact to identified receptors from the identified sources is considered to be **Moderate**, as a worst case.

5. REASONS FOR REMEDIATION

The risk of impact to identified receptors from the identified sources is considered to be **Moderate.** The upper level of this risk level is defined as - *'It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation is normally required to clarify risks and to determine potential liability. Some remedial works may be required in the long term.'*

Ridge consider that remedial measures are to be undertaken, to ensure the site is suitable for its intended use.

5.1. Elevated PAHs

Elevated levels of PAH determinands (Benzo(a)anthracene, Chrysene, Benzo(b)fluoranthene, Benzo(a)pyrene, Indeno(1,2,3-cd)pyrene and Dibenz(a,h)anthracene) were identified in three of the tested samples, when compared against Residential GAC Screening Values. In light of the exceedances against the GAC, SSAC was calculated using the CLEA v1.07 Model with respect to the proposed development and the future end users of the site.

Two samples recorded exceedances against the SSAC, for PAHs. The existing PAH levels are considered to pose a risk to the associated site receptors. Remedial measures were thus considered necessary in order remove the existing linkages.

It will be possible to mitigate some risks to construction/ ground workers during site works, by way of health and safety measures inclusive of the appropriate use of PPE.

5.2. General Remediation Objectives

Remediation should prevent complete source-pathway-receptor pollutant linkages with respect to Construction/ groundworkers (during development) and act to protect services give the sites historical industrial land use.

6. OUTLINE OF REMEDIAL ACTIONS

LCRM states that the agreed remedial actions are fully compatible with other aspects of the project; remediation is carried out in a safe and effective manner; and, the requirements of regulators, insurers and funders are met. In light of this, Ridge recommends this report is forwarded to regulators for their approval prior to commencing work on site.

Key contacts are detailed in Section 6.6.

6.1. Construction Programme

Site development has been separated into three phases, with Phase 1, 2 & 3. Remediation is only considered necessary within the defined boundary of Phase 3. No remediation is required to permit the development of Phase 1 and 2. Please refer to the current phasing plan included as Figure 1.

6.2. Cover System Design

Soft landscaping on site is to comprise managed communal green spaces, rather than private gardens. A cover system comprising a **minimum of 600mm** of certified clean sub-soil / topsoil, or greater thickness appropriate to the landscaping requirements, of suitable for use cover material will be placed areas of soft landscaping within the western limits of the Phase 3 boundary as defined by the orange shaded area below within image 6.1, and the full-size plan is included as Appendix 3.



Image 6.1: Clean Cover Area

The proposed cover system has been developed in accordance with BRE 465: *Cover Systems for Land Regeneration*, assuming the most conservative exposure model 'complete intermixing'. An initial thickness of 600mm was selected as a conservative design value for Mixed Zone (M) in line with CLR 10 and Environment Agency advice regarding the depths to which soils influence exposure pathways.

Subsequently, worst case contamination concentrations were used to assess necessary cover thickness using the BRE 465 calculation spreadsheet. Results indicated an average required thickness of 468mm, and a worst-case cover requirement of 596mm for the proposed Mixed zone, as such the initial conservative estimation of 600mm was considered appropriate.

If natural ground is encountered at shallower depths than 600mm depth, it is considered that this will be suitable as subsoil within the clean cover layer if encountered. This is likely given that Made Ground was encountered to an average depth of 0.38mbgl within the Phase 3 development boundary.

Areas proposed as soft landscaping/ gardens will require import of subsoil/ topsoil to provide an adequate growing medium. Material sources will be verified together with appropriate material certification, prior to delivery to site. The soil supplier is yet to be confirmed.

The composition of the cover material is to be suitable for the proposed landscaping requirements and as a minimum the soil should be free from asbestos, metals, plastic, wood, glass, tarmac, paper and odours associated with contaminated soils and otherwise comply with the requirements of BS 3882:2007 – Specification for topsoil and requirements for use. It is likely that excess arisings from elsewhere onsite can be re-used.

Requirements regarding rooting depths should broadly follow BS3882:2015, although final details will be provided by the landscape team.

6.2.1. Imported Material

Areas proposed as soft landscaping/ gardens will require import of subsoil/ topsoil to provide an adequate growing medium.

Material sources will be verified together with appropriate material certification, prior to delivery to site. The soil supplier is yet to be confirmed.

6.2.2. Testing

Following delivery to site, soils will be tested upon delivery of any imported material or as soon as site-won material is stockpiled.

A screen of common contaminants should be carried out. Determinand groups will include asbestos, heavy metals, PAHs, TPH CWG, BTEX and MTBE. Additionally, soils will 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 will 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 considered appropriate, with a minimum of three samples are required per soil import source. For larger amounts of soil from a single source the sampling frequency can be reduced by agreement with Ridge. Sampling frequency is to be agreed with the Local Planning Authority.

6.2.3. Verification of Suitability

The installation of the clean cover system will be verified throughout installation. Photographs will be provided throughout the process, and these will include photos of a measuring staff and soil depth.
Alternatively, it may be necessary to excavate through the cover in a number of locations to ensure sufficient thickness has been placed. Evidence of level survey data before and after the placement of the cover system may also be used to verify the cover thickness.

Ridge will undertake 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); and

- Category 4 Screening Levels (C4SL) for lead, produced by CL:AIRE (2014).

In the first instance, based on the proposed future use of the site, comparisons will be made against the 'residential end use' land use setting. More specifically, comparisons will be made with the 'residential *without* possible consumption of homegrown produce' land use setting. More site-specific assessment criteria (SSAC) can be applied if necessary.

GAC that will be utilised are presented in Appendix 2.

6.3. 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 Haz-Waste On-line 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.

6.3.1. Verification

Haulage dockets and any correspondence with waste facilities will be provided. Laboratory certificates and evidence of use of waste classification system will be made available.

6.4. Implementation of Remedial Actions

The Validation Plan (table) in section 6.2 summarises required remediation actions, parties responsible for each aspect of the work, quality assurance, timescale for completion of remediation, and Validation Report Requirements. Further details regarding the Validation Report are discussed in Section 7.1 of this report.

6.4.1. Watching Brief

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

The Site Manager will supply a Watching Brief Statement following excavation and soil import works.

6.4.2. Discovery Strategy

Although robust Site Investigations have been carried out, no Site Investigation can inspect 100% of the ground and undiscovered contamination may be present (olfactory evidence of contamination, ACMs etc.). Should materials different to those revealed by the investigations carried out to date be encountered during site works, or should impacted soils be suspected, the following actions will be taken:

- Stop work in that part of the site immediately and inform the Site Manager who will document details of the discovery, including time, date and nature of materials encountered. An environmental consultant will then be contacted to discuss how this material will be dealt with and whether remediation recommendations should be amended;
- The Local Authority/Environment Agency will then be contacted to confirm agreement of any amendments to the remediation strategy;
- Should potentially impacted material be excavated during site works, this material will be segregated and stockpiled and an environmental consultant contacted immediately. Samples will then be taken from the stockpile and scheduled for chemical analysis to determine whether materials are suitable for re-use or if they should be removed from site;
- Suspected ACMs will be moistened and covered to reduce the chance of fibres becoming airborne; and,
- The discovery strategy methodology will be included within the site contractor's method statement.

Site work will be managed by the Site Manager, who should display relevant experience of managing similar development sites, including brownfield areas.

6.4.3. Health and Safety

6.4.3.1. General

Contractors working on-site will be warned that there is a residual risk of contamination within soils, given investigations carried out to date. Therefore, appropriate protection measures should be adopted to guarantee their health and safety. Guidelines detailed in the HSE publication "Protection of workers and the general public during the development of contaminated land" should be followed, including:

- Avoid direct contact with the skin and personal clothing by use of protective gloves, eye protection, etc; and
- Washing facilities should be provided and properly used, particularly before eating.

6.5. Key Contacts

Key contacts are detailed in the table below.

ROLE	COMPANY	CONTACT
Environmental Consultant	Ridge and Partners LLP	Richard Holloway
Site Manager	TBC	TBC
Contracts Manager	TBC	TBC
Groundworker	TBC	TBC
Testing Laboratory	Derwentside Environmental Testing Services (DETS)	Elizabeth O'Dolan

Table 6.1: Key Contacts

6.6. Validation Plan

The table below summarises required remediation actions, parties responsible for each aspect for the work, quality assurance, timescale for completion or remediation, and Validation Report requirements. We suggest the table is **printed and kept on site** during construction works.

	Action Required	Party Responsible for Implementation	Timescale for Completion	Validation Report Requirements/ Party Responsible	Quality Assurance
Excavation to enable installation of (600mm) cover system	Excavate to allow 600mm cover system. Note, the excavation does not need to be full 600mm depth – and will be dependent on final site/ cut levels.	Groundworker **TBC**	Presently unknown. Completed prior to the infilling and preparation of ground in specific area.	Photographic evidence and written statement of works. Possibly supply topographic survey. **Groundworker/ Ridge**	**Ridge** in attendance to verify works where required, otherwise **Site Manager** can supervise.
	Measure in levels following excavation. This may be using a measuring stick or a topographic survey.	Groundworker/ Site Manager or Environmental Consultant **TBC/ Ridge**		Photographic record of excavation works inclusive of depth measurements. Topographic survey of reduced level if commissioned. **Groundworker/ Ridge**	**Site Manager** to supervise photographic record. Periodic review of data received by **Ridge**.
Muck-away	Classification of soils prior to removal from site.	**Derwentside Environmental Testing Services** via **Ridge**	Prior to removal of soils from site.	Inclusion of soil classification output and Waste Acceptance Criteria (WAC) test sheets. **Ridge** Correspondence with waste facility to show they are happy to receive waste. **Site Manager**	**Ridge** to carry out waste classification
	Removal of waste soils from site to appropriate waste facility.	Managed by Groundworker **TBC**	Intermittent throughout works.	Haulage dockets. These must be sent to **Ridge** throughout the project. **Groundworker**	**Ridge** to review documentation.
				Photographic evidence **Site Manager**	**Ridge** to review photos.
Water Pipes	Design of appropriate water supply specification.	**TBC**	Prior to installation and to allow time for approval.	Confirmation of agreement of methodology. **TBC**	**Water Supply Company** inspections/ correspondence.
	Installation of GPS Protecta-Line barrier water pipes under agreed methodology.	**Site Manager**	Unknown, but will be implemented prior to internal finishing works.	Supply pipework specification. **Site Manager**	Specification to adhere to industry standards and **Water Supply Company** requirements.
				Photographic evidence of service installation. **Site Manager**	**Ridge** to review photos.
Soil import	Transportation of soils to site from Source Site **TBC**	**TBC**	Intermittent throughout works but prior to completion of gardens	Transfer Notes/ Delivery Dockets to be made available throughout the project. **Site Manager**	Supervised by **Site Manager**
	Remove validation samples for analysis.	**Ridge**	As above.	Photographic evidence and written statement of works including any depth measurements. **Ridge**	**Ridge** in attendance to verify works.
	Testing of imported soils. Chemical testing to include common contaminants such as asbestos, heavy metals, TPH CWG, PAHs, BTEX and MTBE.	**Derwentside Environmental Testing Services** via **Ridge**.	As above.	Soil analytical test certificates and screening with applicable soil standards. **Ridge** Results will be screened as per the methodology detailed within Section 7.4.2.	Samples to be obtained from materials already imported to development site. **Ridge** to obtain samples and report results to **Site Manager.**
Finished soft landscaped areas	Prove finish and depth of suitable soils.	**Ridge**	Prior to completion of works and before occupation	Photographic evidence of soil depth and finished surface.	**Ridge** to incorporate into Validation Report.

Table 6.2: Validation Plan

6.7. Maintenance and Long-Term Monitoring

Providing the site continues to be used for its intended (sheltered) residential use, there are no requirements for ongoing monitoring of remedial effectiveness.

If in the event a change of use is proposed, the requirement for ongoing management may need to be re-addressed. In this instance, we would recommend investigation and associated report details are made available to relevant parties.

7. VALIDATION OF REMEDIAL ACTIONS

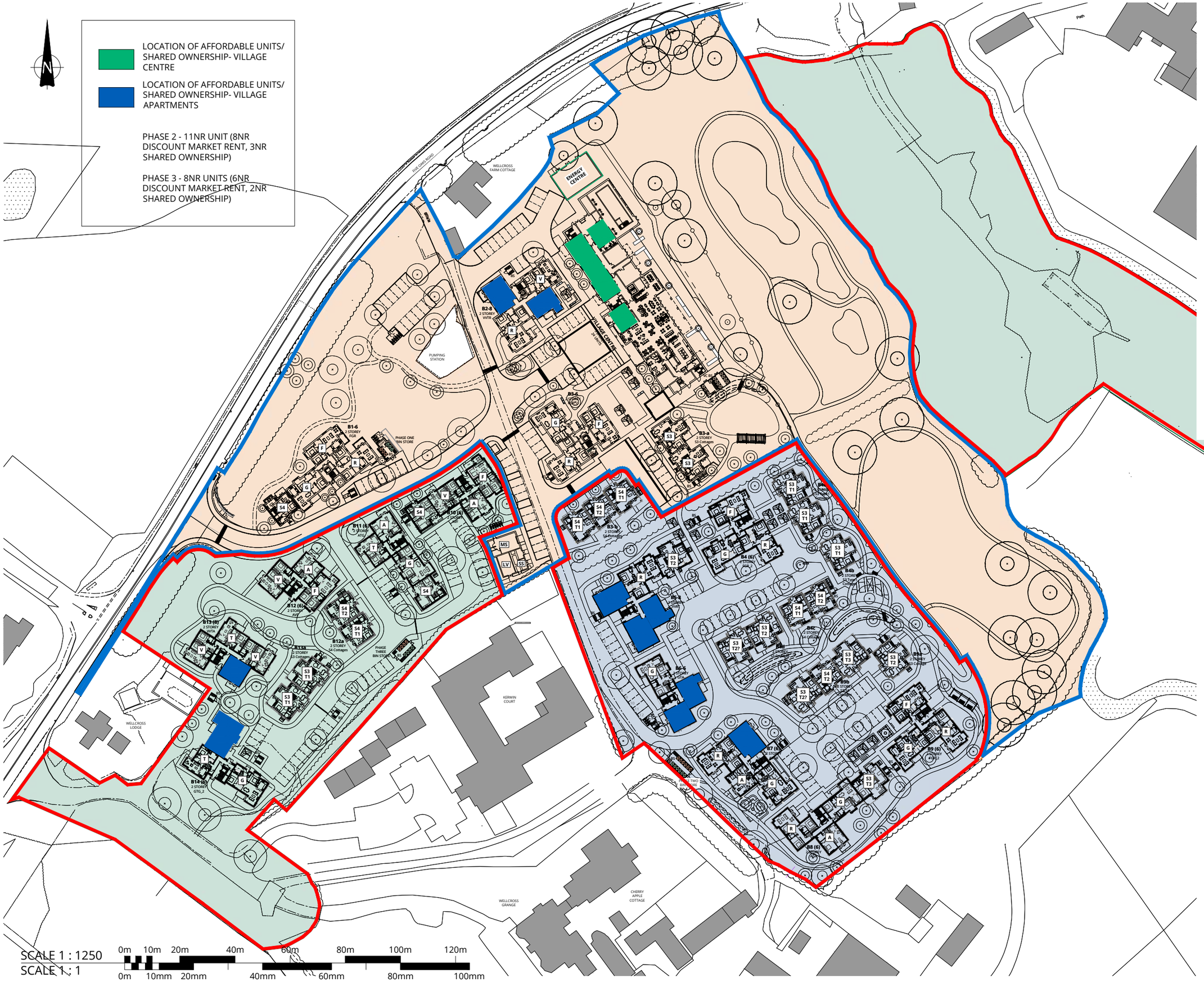
7.1. Validation Report

On completion of remedial works a Validation Report will be prepared for submission to the Statutory Authorities, to allow full discharge of the relevant planning conditions. The Validation Report provides a complete record of all remediation activities on site and the data collected as identified in the Validation Plan (Section 6.7) to support compliance with the agreed remediation objectives and criteria.

The report incorporates all site data and measurements of quality-critical parameters.

The Report should be produced by a qualified environmental specialist (such as Ridge) and should include a final statement that outlines that the site is suitable for the intended use and poses minimal or no risks to identified receptors.

FIGURE 1 – DEVELOPMENT AND PHASING PLANS



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DO NOT SCALE FROM THIS DRAWING - ALL DIMENSIONS TO BE CHECKED ON SITE, ANY DISCREPANCIES RAISED WITH URBAN EDGE

DRAWING TO BE READ IN COLOUR

LEGEND:

- SITE BOUNDARY
- PHASE 1 RESERVED MATTERS AS SUBMITTED
- PHASE 2 DEVELOPMENT SITE
- PHASE 3 DEVELOPMENT SITE

PHASING NUMBERS:

PHASE ONE	
VILLAGE CENTRE	24
VILLAGE APARTMENTS	23
PHASE TWO	
VILLAGE APARTMENTS	56
PHASE THREE	
VILLAGE APARTMENTS	38

Rev No	Description	Drawn By	Date
P01b	ISSUE FOLLOWING COORDINATION OF PH2 & PH3	JE	16.01.24
P00	ISSUED FOR PLANNING	DH	02.08.22

URBAN EDGE
architecture / landscape / masterplanning

Client
SENIOR LIVING (BROADBRIDGE HEATH) LTD

Project
PROPOSED CONTINUING CARE RETIREMENT COMMUNITY BROADBRIDGE HEATH

Drawing
PHASING PLAN AS PROPOSED

Issue Purpose
PLANNING

UE Proj No	Scale	Date	Drawn	Status	Revision
2771	1:1250@A3	JAN 2024	JE	-	P01b

Project - Organisation - Volume/System - Level - Type - Role - Number
2771-URB-BH-XX-DR-A-208910

A1 File Reference: D2661-FAB-00-XX-M2-L-1000 Phase 2 3 CMP.dwg File Date: 30-Jan-24

Legend

- Application Boundary
- Other Land within Landowners Ownership
- Existing Trees to be Retained
  To be protected in accordance with BS 5837: 2012 'Trees in relation to Design, Demolition and Construction'
  Note: Refer to the Site tree arboricultural survey & report for details
- Existing Hedgerows to be Retained
  To be protected in accordance with BS 5837: 2012 'Trees in relation to Design, Demolition and Construction'
  Note: Refer to the Site tree arboricultural survey & report for details
- Proposed Trees - Native and Semi Native
- Proposed Trees - Pleached
- Proposed Shrub Planting
- Proposed Scrub Planting
- Proposed Hedge Planting
- Proposed Amenity Lawn
- Proposed Species Rich Wildflower Meadows
- Proposed Pergolas / Covered Walkways
- Proposed Seating

Existing Emergency Access
Wellcross Farm
Pumping Station
The Green Road (BOAT)
Newbridge Nurseries
Phase 3
Phase 3
Wellcross Lodge
Existing Access
Kelvin Court (SHT)
Phase 2
Louver Barn
Wellcross Grange
Chapel Apple Cottage
Home Barn Cottage
Garden Cottage
Home Cottage
Pond

Legend Public Open Space

1. Pavilion Garden
2. Ecological Habitat Zone
3. Productive Garden
4. Sensory Garden
5. Bee Garden
6. Terrace Garden / Outdoor Dining
7. Arrival Space
8. Pocket Parks
9. Wetland
10. Wildflower Meadow
11. Green Infrastructure Zone
12. Courtyard Gardens
13. Petanque Court

Notes

- (A) Restoration of existing structural planting & new species rich planting to strengthen boundary & enhance ecological connectivity & biodiversity, woodland management including coppicing / felling to open watercourse
- (B) New species rich structural planting to screen development from Wellcross Farm, strengthen boundary & enhance ecological connectivity & biodiversity
- (C) Enhancement & management of existing trees & scrub, including new species rich native scrub & tree planting, to improve quality of green infrastructure zone
- (D) Restoration & enhancement of Arue River & floodplain with bank regrading, wetland creation & new species rich native planting to strengthen riparian corridor, enhance river's ecological biodiversity & maximise amenity value
- (E) Extension of existing riparian vegetation with new species rich native hedgerow / scrub planting to strengthen green infrastructure network & ecological connectivity & biodiversity
- (F) Restoration of existing mature native hedgerow & new species rich native planting to strengthen green infrastructure network & ecological connectivity & biodiversity
- (G) Creation of a new ecological habitat zone with new species rich native scrub & tree planting to strengthen green infrastructure network & ecological connectivity & biodiversity
- (H) New species rich structural planting to screen development from A264 vehicular bridge, strengthen boundary & enhance ecological connectivity & biodiversity
- (I) New native structural planting, hedge & pleached trees) to screen Wellcross Lodge outdoor pool from development
- (J) Retention of existing TPO trees & introduction of new trees as succession planting to preserve avenue, new species rich structural planting to strengthen boundary, screen development & enhance ecological connectivity & biodiversity
- (K) New native tree planting & species rich structural planting to mitigate for the removal of existing trees & enhance ecological connectivity & biodiversity
- (L) New wetland meadow of predominantly native species to strengthen habitats
- (M) New structural planting to screen existing pumping station
- (N) New native tree planting & species rich structural planting to mitigate for the removal of existing trees & enhance ecological connectivity & biodiversity
- (O) New wetland of predominantly native species to strengthen aquatic habitats
- (P) New structural planting to screen existing pumping station

0 5 10 20 30 40 50 75m
1:750

Revision	Date	Drawn	Checked
P5.00	08.03.23	SW	PDC
P5.01	23.03.23	SW	PDC
P5.02	13.11.23	SW	PDC
P5.03	01.12.23	SW	PDC
P5.04	30.01.24	SW	PDC

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3. This drawing is preliminary unless it has been signed off as suitable for construction.

External References
- Drawings\D2661-FAB-00-XX-M2-L-1000 Soft Mark.dwg
- Drawings\D2661-FAB-00-XX-M2-L-1002 Soft Access Split Boundaries.dwg
- Drawings\D2661-FAB-00-XX-M2-L-1003 Site Hardmark plan.dwg
- Drawings\D2661-FAB-00-XX-M2-L-1004 Site Sections.dwg
- Drawings\D2661-FAB-00-XX-M2-L-1007 Soft Mark Phase 2 3 Overlay.dwg
- Drawings\D2661-FAB-00-XX-M2-L-1008 Phase 2 3 overlay.dwg
- Drawings\D2661-FAB-00-XX-M2-L-1009 Phase 2 3 soft.dwg
- Drawings\D2661-FAB-00-XX-M2-L-1010 Phase 1 hard landscape.dwg
- Drawings\D2661-FAB-00-XX-M2-L-1011 Phase 1 hedge & wetland copy.dwg
- Drawings\Image 08 (Image\D2661-FAB-00-00-M2-L-0808.tif) file
- Drawings\Image 09 (Image\D2661-FAB-00-00-M2-L-0809.tif) file

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Project: Land at Wellcross Farm, Broadbridge Heath
Client: Senior Living (Broadbridge Heath) Ltd / Inspired Villages Group
Drawing Title: Colour Landscape Masterplan

Purpose of Issue	Drawn By	Checked By	Drawn Scale	Date of First Issue
ISSUED FOR PLANNING APPROVAL	SW	PDC	1:750 @ A1	March | 2022

Project Number	Origin	Zone	Level	File Type	Role	Number	Revision
D2661	FAB	02	00	M2	L	1000	PL06

APPENDIX 1 – REPORT CONDITIONS

This report is produced solely for the benefit of **Inspired Villages Group Limited** and no liability is accepted for any reliance placed on it by any other party unless specifically agreed in writing otherwise.

The report is based on ground investigations carried out by Ridge & third parties. Some of the opinions are based on unconfirmed data and information and are presented in good faith without exhaustive clarification. Where ground contamination is suspected but no physical Site test results are available to confirm this, the report must be regarded as initial advice only, and further assessment should be undertaken prior to detailed activities related to the Site. Where test results undertaken by others have been made available these can only be regarded as a limited sample. The possibility of the presence of contaminants, not revealed by this research cannot be discounted.

This report is prepared for the proposed uses stated in the report and should not be used in a different context without reference to Ridge and Partners LLP. In time improved practices or amended legislation may necessitate a re-assessment.

The report is necessarily limited to those aspects of land contamination specifically reported on and no liability is accepted for any other aspect especially concerning gradual or sudden pollution incidents that may occur. The opinions expressed cannot be absolute due to the limitations of time and resources within the context of the agreed brief and the possibility of unrecorded previous use and abuse of the Site and adjacent Sites. The report concentrates on the Site as defined in the report and provides an opinion on surrounding Sites. If migrating pollution or contamination (past or present) exists this can only practically be better assessed following extensive on and off Site intrusive investigations and monitoring.

APPENDIX 2 – GENERIC ASSESSMENT CRITERIA

Generic Assessment Criteria (mg/ kg) Residential with Homegrown Produce - using default/ 1% SOM

Arsenic	**32**	S4UL	Naphthalene	**2.3**	S4UL	Aliphatic >C5-C6	**42**	S4UL	Benzene	**0.087**	S4UL
Cadmium	**10**	S4UL	Acenaphthylene	**170**	S4UL	Aliphatic >C6-C8	**100**	S4UL	Toluene	**130**	S4UL
Chromium	**910**	S4UL	Acenaphthene	**210**	S4UL	Aliphatic >C8-C10	**27**	S4UL	Ethylbenzene	**47**	S4UL
Chromium (hexavalent)	**6**	S4UL	Fluorene	**170**	S4UL	Aliphatic >C10-C12	**130**	S4UL	p & m-xylene	**56**	S4UL
Copper	**2400**	S4UL	Phenanthrene	**95**	S4UL	Aliphatic >C12-C16	**1100**	S4UL	o-xylene	**60**	S4UL
Lead	**200**	C4SL	Anthracene	**2400**	S4UL	Aliphatic >C16-C21	**-**	S4UL	MTBE	**73**	S4UL
Mercury	**40**	S4UL	Fluoranthene	**280**	S4UL	Aliphatic >C21-C34	**-**	S4UL			
Nickel	**130**	S4UL	Pyrene	**620**	S4UL	Aromatic >C5-C7	**70**	S4UL			
Selenium	**250**	S4UL	Benzo(a)anthracene	**7.2**	S4UL	Aromatic >C7-C8	**130**	S4UL			
Zinc	**3700**	S4UL	Chrysene	**15**	S4UL	Aromatic >C8-C10	**34**	S4UL			
Total Phenols	**280**	S4UL	Benzo(b)fluoranthene	**2.6**	S4UL	Aromatic >C10-C12	**74**	S4UL			
			Benzo(k)fluoranthene	**77**	S4UL	Aromatic >C12-C16	**140**	S4UL			
			Benzo(a)pyrene	**2.2**	S4UL	Aromatic >C16-C21	**260**	S4UL			
			Indeno(1,2,3-cd)pyrene	**27**	S4UL	Aromatic >C21-C35	**1100**	S4UL			
			Dibenz(a,h)anthracene	**0.24**	S4UL						
			Benzo(ghi)perylene	**320**	S4UL						

The LQM/ CIEH S4ULs for Human Health Risk Assessment (LQM, 2015)

SP1010 - Development of Category 4 Screening Values for Assessment of Land Affected by Contamination (CL:AIRE, 2014)

APPENDIX 3 – CLEAN COVER AREA

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Newbridge Nurseries

Existing Emergency Access

Wellcross Farm

Phase 3

Pumping Station

Five Oaks Road (A281)

Clean Cover Required

Phase 3

Wellcross Lodge

Existing Access

Kervin Court (BIRT)

Phase 2

Legend Public Open Space

1. Pavilion Garden
2. Ecological Habitat Zone
3. Productive Garden
4. Sensory Garden

Project:	Land at Well Cross Farm, Broadbridge Heath		
Job Number:	5016405	**Client:**	Inspired Villages Group Ltd
Drawing:	5016405-Fig2	**Revision:**	-
Drawn:	RM	**Date:**	Feb 2024
Checked by:	RJH	**Scale:**	NTS

Title: Clean Cover Plan

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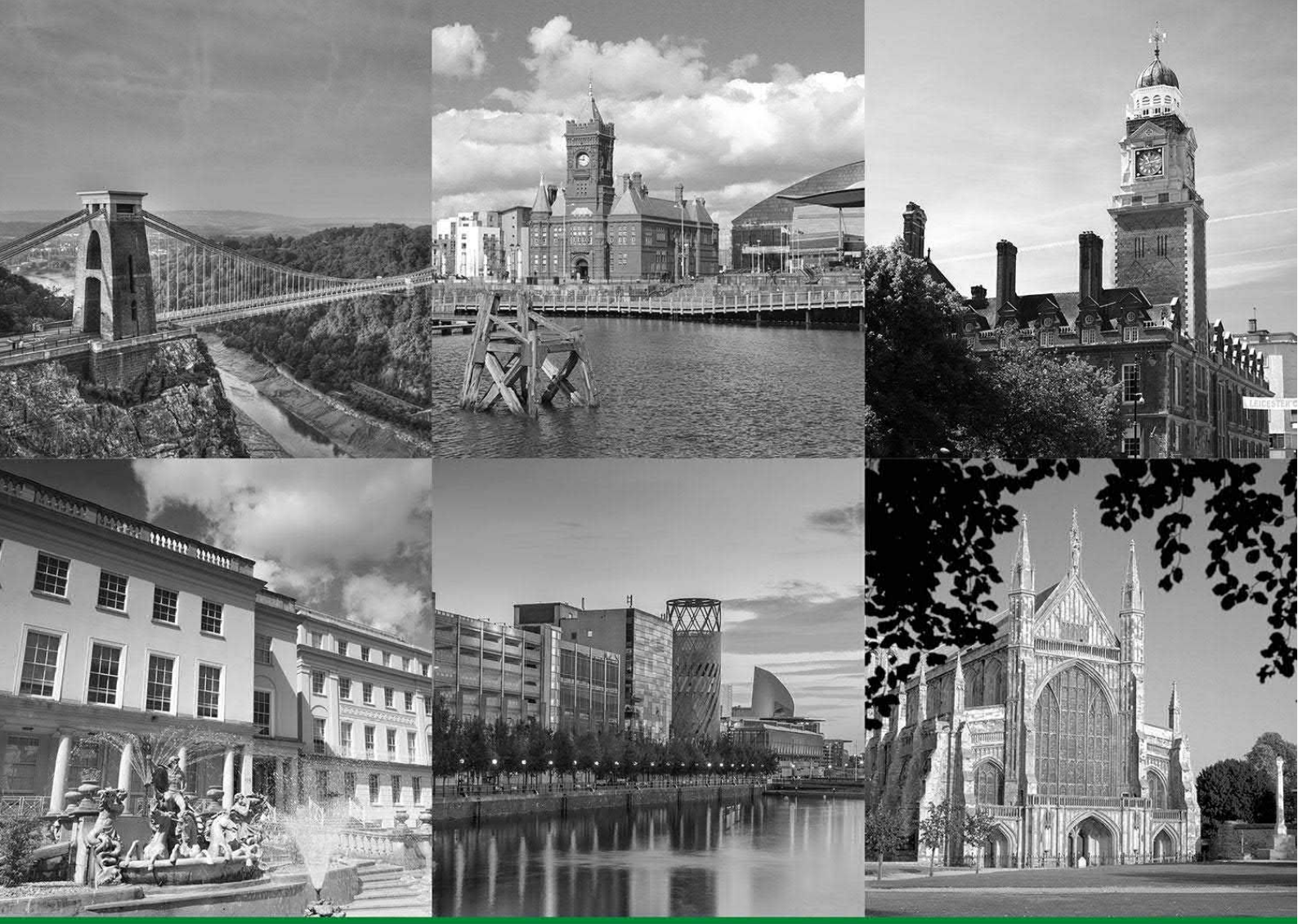

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