

ENVIRONMENT

Wilson Bowden Developments
Plot R Kingsway Business Park
Rochdale
Remediation Strategy

ENVIRONMENT

Wilson Bowden Developments Plot R Kingsway Business Park Rochdale Remediation Strategy

Birmingham
Livery Place, 35 Livery Street, Colmore Business District, Birmingham, B3 2PB
T: 0121 233 3322

Leeds
Whitehall Waterfront, 2 Riverside Way, Leeds
LS1 4EH
T: 0113 233 8000

London
11 Borough High Street
London, SE1 9SE
T: 0207 407 3879

Manchester
11, Portland Street, Manchester M1 3HU
T: 0161 233 4260

Nottingham
Waterfront House, Station Street, Nottingham NG2 3DQ
T: 0115 924 1100

August 2024

DOCUMENT ISSUE RECORD

Document Number:	PLR-BWB-ZZ-XX-RP-YE-0001_RS		
BWB Reference:	232081		
Author:	Catherine Riley CEng, CEnv, MCIWEM	Principal Geoenvironmental Consultant	
Reviewer:	Richard Robinson BSc (Hons) MCIWEM	Associate Director (Service Manager)	
Approver:	Chris Rhodes BSc MSc (Hons)	Principal Geo- Environmental Consultant	

REVISION CONTROL

Revision	Date of Issue	Status	Update Notes:	Updated:	Approved:
P1	Aug 2024	S2	Initial Issue	-	-

Notice

This document has been prepared for the sole use of the Client in accordance with the terms of the appointment under which it was produced. BWB Consulting Limited accepts no responsibility for any use of or reliance on the contents of this document by any third party. No part of this document shall be copied or reproduced in any form without the prior written permission of BWB.

CONTENTS

1.	INTRODUCTION.....	1
	Instruction	1
	Objectives	1
	Information Sources.....	1
2.	THE SITE	2
	Site Location.....	2
	Site Description	2
	Site History	3
	Ground Conditions	3
	Previous Reports' Summary	3
3.	CONCEPTUAL SITE MODEL	6
	Summary of Significant Pollutant Linkages	6
4.	PROPOSED REMEDIATION WORKS	8
	Risks to Construction / Maintenance Workers.....	8
	Hazardous Ground Gas Protection Measures	8
	Water Supply Pipes	9
	Design Concrete Class.....	9
	Bulk Fill	10
	Procedures for Dealing with Unexpected Contamination	10
5.	ACCEPTANCE CRITERIA.....	11
	Soil Cover in Landscaping	11
	Bulk Fill	11
6.	VALIDATION TESTING AND MONITORING	12
	Soft Landscaping	12
	Bulk Fill Materials.....	12
	Ground Gas Protection Measures	12
7.	REGULATORY ISSUES.....	14
	Licensing and Permitting	14
	Waste Management	14
	Third Party Liability.....	14
8.	REPORTING	15
9.	REFERENCES	18

FIGURES

Figure 2.1: Site Location Plan
Figure 2.2: Site ACM Locations

TABLES

Table 3.1: Summary of Significant Pollution Linkages
Table 4.1: Indicative Gas Protection Measures
Table 5.1: Earthworks Volumes
Table 8.1: Mitigation and Validation Roles and Responsibilities

APPENDICES

Appendix 1: Proposed Development Plan
Appendix 2: Proposed Earthworks Drawing
Appendix 3: Soil Cover Acceptance Criteria
Appendix 4: Bulk Fill Acceptance Criteria

1. INTRODUCTION

Instruction

- 1.1 BWB Consulting (BWB) was instructed by Wilson Bowden Developments (the Client) to prepare a Remediation Strategy for the development of a site located at Plot R Kingsway Business Park, Rochdale.
- 1.2 The development is anticipated to comprise a research & development building (Use Class E) including office, laboratory & production space, function space & café, new access, car parking, servicing, boundary treatments, hard and soft landscaping and other associated works. The full proposed development is shown on the architect's site plan (DLA ref AVIC-DLA-XX-00-DR-A-99003 P04, dated 20/06/24) in **Appendix 1**.

Objectives

- 1.3 The report establishes, taking all the circumstances of the site into account, which options either singly or in combination offer the best overall approach to geo-environmental remediation for the site as a whole. There are three objectives of this report:
- i. To identify feasible remediation options for each relevant pollutant linkage;
 - ii. to carry out a detailed evaluation of feasible remediation options to identify the most appropriate option for any particular linkage; and
 - iii. to produce a remediation strategy that addresses all relevant pollutant linkages, where appropriate by combining remediation options.

Information Sources

- 1.4 Previous work has been carried out at this site by BWB, for which the following documents have been produced:
- BWB for Wilson Bowden Developments Ltd; Phase 1 Geo-Environmental Assessment; Plot P, Kingsway Business Park; reference KYP-BWB-XX-RP-YE-0001_PhI; dated July 2022; and
 - BWB for Wilson Bowden Developments Ltd; Phase 2 Geo-Environmental Assessment Report; Plot R2, Atom Valley Innovation Centre (Plot R2 AVIC); reference: KYR-BWB-ZZ-XX-RP-YE-0002_PhII-P06; dated May 2024.
- 1.5 The Phase 1 report listed above refers to Plot P, but covers the area now known as Plot R2 AVIC as well as the adjacent Plot P. The Plot P ground investigation covered part of the area of the current Plot R2 AVIC site, and information from that investigation has been incorporated into this Phase 2 Report for Plot R2 AVIC.
- 1.6 This report assumes familiarity and understanding of the contents of the aforementioned reports.

2. THE SITE

Site Location

- 2.1 The site is located at Plot R Kingsway Business Park, Rochdale in Greater Manchester located at national grid reference 391907 412651, nearest postcode OL16 4JN. The location of the site is shown in **Figure 2.1**.

Figure 2.1: Site Location Plan



Site Description

- 2.2 The current Plot R2 AVIC site comprises of an undeveloped, irregularly shaped parcel of grassed land to the east of Rochdale town centre, covering approximately 2.5 hectares. The site is undulating, with ground levels typically around 149m to 150.5m above Ordnance Datum.
- 2.3 The Oldham to Rochdale tram line is located adjoining the northern boundary of the site, with residential development beyond and to the north. The Kingsway Loop Road (Michael Faraday Avenue) bounds the site to the south. The land to the east and west of the site currently comprises undeveloped grassed fields.
- 2.4 The Stanney Brook watercourse is present around 150m to the south and west of the site boundary. Beyond the Brook is a series of engineered ponds, and immediately adjacent to these ponds the Rochdale Canal is present around 350m to the west of site.
- 2.5 A full site description and site photographs are included within the BWB Phase 1 Geo-Environmental Assessment (Ref: KYP-BWB-ZZ-XX-RP-YE-0001_Ph1) dated July 2022, which included the current footprint of the Plot R2 AVIC site as well as adjacent land.

Site History

- 2.6 Historically, the site largely comprised of several fence enclosed fields, with a persistent body of water circa 150m to the southeast. The site remained largely unchanged throughout its history. The only on-site activity was recorded between 2012 and 2018, and related to the loop road construction to the south in which material was temporarily placed on site and a path being constructed north south through the area. From 1851, the site has been immediately bordered to the north by a rail line, expanded with sidings during 1891-1908 period but was since developed into a tram line, remaining largely unchanged.
- 2.7 Off-site, the area was largely agricultural fields bounded by residential developments of Rochdale and Milnrow. Industrial developments were primarily over 650m from site

Ground Conditions

- 2.8 British Geological Survey (BGS) mapping indicates that the site is underlain by Hummocky Glacial Deposits (sand and gravel) and/or Glacial Till. These superficial deposits are underlain by Pennine Lower Coal Measures bedrock (with seams last worked in 1915 at depths of 97m to 107m bgl). The bedrock is inferred as faulted to the southwest and northeast of the site at distances of 52m and 130m respectively (both NW-SE trending faults). The BGS Lexicon database describes the bedrock as interbedded mudstone, siltstone and sandstone containing thicker coal seams towards the upper boundary.
- 2.9 The BWB ground investigation generally confirmed the published geology. Ground conditions comprised Topsoil and Made Ground (from 0.2m to 2.3m thickness) directly underlain by Hummocky Glacial Deposits. A layer of relict topsoil was encountered between 2.3m and 2.5m, below Made Ground in BH02 (2023). Hummocky Glacial Deposits typically comprised a layer of soft to firm clay (base depths of 0.8m to 3.0m) over medium dense to dense sands and sandy clays to a maximum proven depth of 15.45m. Bedrock was not encountered during either investigation
- 2.10 No groundwater was encountered during hole formation in any exploratory holes during the 2023 investigation. Groundwater monitoring during the Plot R2 AVIC (2023) investigation recorded levels between 10.4 and 11.2m below ground level. Groundwater monitoring during the Plot R2 AVIC (2022) investigation recorded levels between 2.04m and 3.13m below ground level.

Previous Reports' Summary

BWB Phase 1 Geo-Environmental Assessment – July 2022

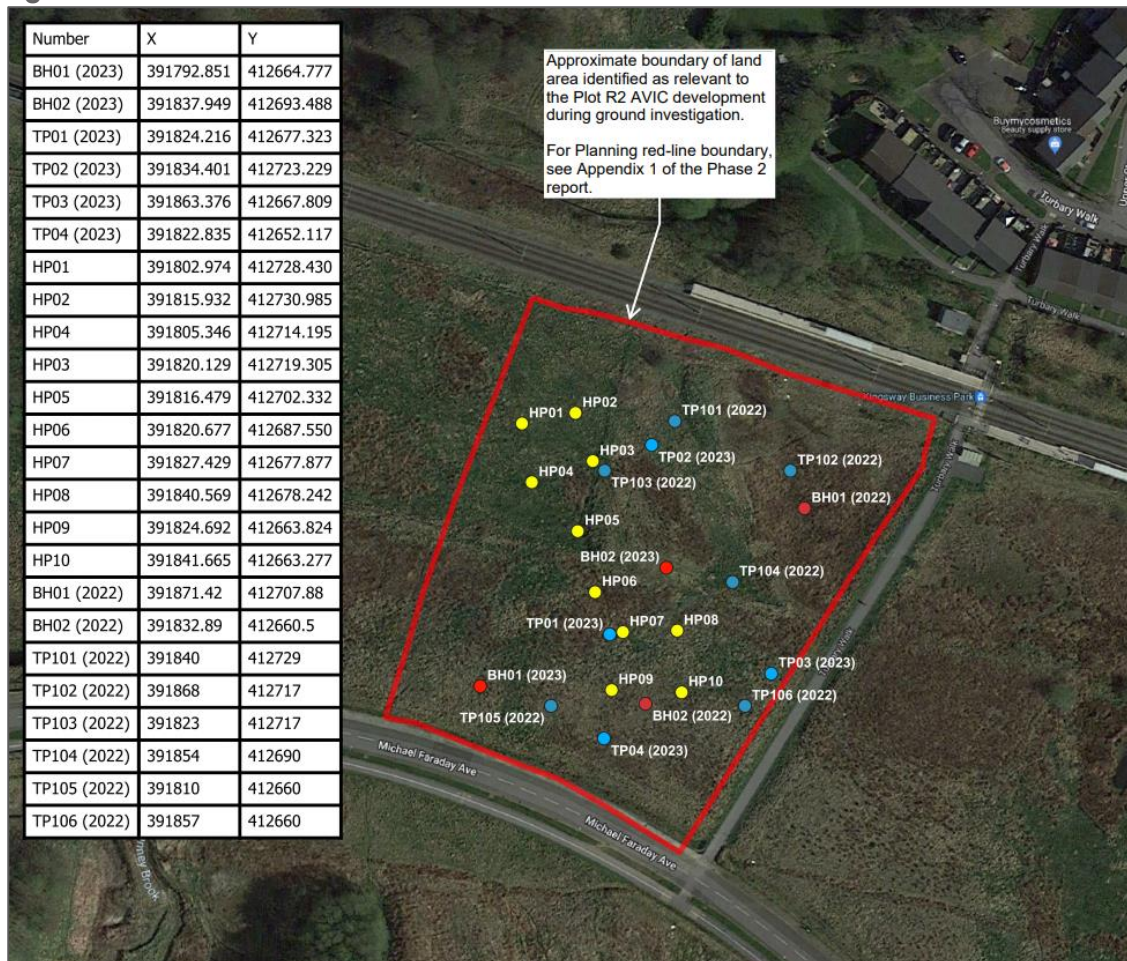
- 2.11 The report indicated that based on a proposed commercial and/or warehouse use on the site, shallow strip foundations bearing onto the superficial deposits may be suitable at the site. However, where heavier loadings were required, ground improvement was likely to be needed.

- 2.12 Earthworks were anticipated to be required at the site to enable a suitable development platform to be constructed prior to development. It was considered possible that Topsoil could be re-used at the site within areas of soft landscaping; however, assessment of the material was recommended to be undertaken prior to its reuse.
- 2.13 Limited potential for on-site contamination was identified. However, localised Made Ground and organic soils which were anticipated to be present beneath the site were identified as a potential source of ground gases. The site was therefore considered to pose a moderate to low risk to human health and a low risk to controlled waters.

BWB Phase 2 Geo-Environmental Assessment – May 2024

- 2.14 The report concluded that given the variable thickness of Made Ground and underlying soft clays up to 3.0m below ground level, ground improvement would be required for the support of shallow foundations and the floor slab of the proposed building.
- 2.15 Ground gas monitoring identified the site to be subject to a Characteristic Situation 2 gassing regime, whereby ground gas protection measures would be required.
- 2.16 Leachate assessment identified minor exceedances in the screening criteria for copper, lead, nickel and zinc. In addition, the groundwater assessment identified minor exceedances for cadmium, copper, nickel, zinc and ammonia; no exceedances were identified by the soil chemical assessment.
- 2.17 Asbestos fibres were recorded in the Made Ground of TP01 and TP03 (see **Figure 2.2**). Quantification results recorded <0.001% and 0.359% respectively. Further testing of the soils around these locations indicated that they were considered isolated areas of contamination.
- 2.18 Soils and groundwater on site were considered to pose a low to moderate risk to human health and a low risk to controlled waters receptors.

Figure 2.2: Site ACM Locations



3. CONCEPTUAL SITE MODEL

Summary of Significant Pollutant Linkages

- 3.1 The results of the investigation at the site identified the following sources and corresponding pathways and receptors which are also presented as **Table 3:1** overleaf:

Sources

- Localised ACMs within the Made Ground in two locations (TP01 and TP03); and
- Elevated methane and carbon concentrations.

Pathways

- Inhalation of particulates (specifically asbestos fibres); and
- Accumulation of gases within confined spaces to potentially lethal/ explosive levels.

Receptors

- Occupants of future development; and
- Ground workers and future maintenance workers.

Table 3:1: Summary of Significant Pollution Linkages

Source	Pathway	Receptor	Con	Prob	Risk	Mitigation
S1: Made Ground beneath the site containing ACM.	P1: Inhalation of asbestos fibres	R1: Future site users.	Md	UI	L	The proposed development is indicated to cover 95% of the site in hardstanding, theoretically eliminating the pathway between asbestos fibres in the underlying soils and the future site users. Where a linkage is present, in areas of soft landscaping, Made Ground soils should be capped to prevent direct exposure to these soils.
		R2: Ground workers and future maintenance workers	Md	Li	M	The recommendations of 'EA PPG 6 and CIRIA Report C741' should be considered prior to/during any groundworks and that suitable PPE is worn and procedures adopted. Suitable PPE should be adopted if fragments of asbestos are discovered during any groundworks and suitable control measures and notifications (if required) should be put in place.
S2: Elevated levels of Carbon Dioxide	P2: Lateral migration of ground gases and vapours, ingress through cracks, and accumulation in confined spaces	R1: Future site users	Md	Lw	M/L	Ground gas monitoring has identified the site to be subject to a Characteristic Situation 2 gassing regime, whereby ground gas protection measures will be required.
		R2: Ground workers and future maintenance workers	Md	UI	L	Ground and maintenance workers should wear appropriate PPE and adopt good hygiene practices to mitigate potential risk. A risk assessment should be undertaken for any work in confined spaces.
VH = Very High, H = High, M = Moderate, M/L = Moderate/Low, L = Low, VL = Very Low KEY: Sv = Severe, Md = Medium, Mi = Mld, Mr = Minor Hi = High, Li = Likely, Lw = Low Likelihood, UI = Unlikely						

4. PROPOSED REMEDIATION WORKS

Risks to Construction / Maintenance Workers

- 4.1 To mitigate the short-term risks to Human Health during construction and groundworks it is recommended that construction workers and services personnel should follow guidance stated in 'CIRIA C670, Site Health Handbook, Second Edition, 2008' during development works. Adequate standard personal protective equipment and the implementation of basic hygiene measures should be undertaken.
- 4.2 As a matter of good practice, and to limit the potential risk associated with wind-blown asbestos fibres which have been identified in Made Ground horizons, the generation of dust during development earthworks should be kept to a minimum by damping down work areas during dry periods.
- 4.3 Ground and maintenance workers should wear appropriate PPE and adopt good hygiene practices to mitigate potential risk. A risk assessment should be undertaken for any work in confined spaces.

Hazardous Ground Gas Protection Measures

- 4.4 Elevated concentrations of carbon dioxide have been identified at the site, which classifies as CS2. Ground gas protection measures are required to be included in the design of new structures at the site in respect to carbon dioxide.
- 4.5 It is assumed that the development will be classed as Category C building. Ground gas protection measures sufficient to achieve a minimum of 2.5 points of protection will be required (BS8485: 2015+A1:2019). Gas protection comprising a combination of floor slab construction, sub-slab ventilation and/or gas impermeable membrane may be required where occupied areas are constructed directly on the existing ground surface. An assessment of possible combinations of ground gas protection measures is presented In **Table 4:1**.

Table 4:1: Indicative Gas Protection Measures

Mitigation Type	Mitigation Measures		Points
Structural Barrier	Precast suspended segmental subfloor (i.e. beam and block)		0.0
	Cast in situ ground slab		0.5
	Cast in situ raft or suspended floor slab within minimal penetration		1.5
Ventilation	Pressure relief pathways (e.g. geo composite blankets/ strips)		0.5
	Passive subfloor venting layer (e.g. clear void, no-fines gravel)	Meeting very good performance criteria	2.5
		Meeting good performance criteria	1.5
	Active dispersal layer (usually comprising fans with active abstraction)		1.5 – 2.5
	Active positive pressurization		1.5 – 2.5

Membrane	Gas resistant membrane installed and verified in-accordance with CIRIA C735	2.0
----------	---	-----

4.6 Prior to installation of the floor slab, the detailed gas/vapour protection design and a membrane protection implementation and verification plan should be submitted to Local Planning Authority for approval. The plan should include (but not necessarily limited to):

- The membrane specification details (including product lifespan, permeation rates);
- The manufacturers installation instructions;
- Details of the installation contractor's experience including qualifications of the installers to be engaged on the works, and how the use of qualified personnel will be verified;
- The installation contractor's method statement including measures to protect the membrane during installation and construction work, how conformance with this plan will be monitored;
- Construction details (including drawings), how conformance with these details will be monitored, and how as-constructed details will be recorded;
- How the membrane will be inspected and integrity tested, including provision of photographic records;
- Locations of service penetrations and details of how these will be sealed;
- Details of independent sign off arrangements and warranties (eg. third party inspection, building control, NHBC);
- Arrangements to ensure the protection of the integrity of the membrane in the long term including long term operation and maintenance requirements.

Water Supply Pipes

4.7 Water supply pipes materials should be agreed with the local utility provider before installation to prevent tainting of water supplies from residual contamination. It is not expected that barrier piping will be required at the site.

Design Concrete Class

4.8 In accordance with recommendations of BRE Special Digest 1 'Concrete in Aggressive Ground' 2005, Design Sulphate Class DS-1 and ACEC Class AC-1 for should be adopted.

Soil Cover System

4.9 Chemical analysis of topsoil at the site has not reported any exceedances and asbestos has not been identified. It is considered that these soils will be suitable for re-use within areas of soft landscaping within the proposed development. Any surplus topsoil that cannot be re-used within the development will be removed from site.

Bulk Fill

- 4.10 A bulk earthworks programme is required to prepare the development platform and soft landscaping landforms. This is further discussed in **Section 5** below.

Procedures for Dealing with Unexpected Contamination

Soil and Groundwater Contamination

- 4.11 The contaminant concentrations identified within the soils are not considered to require active soil remediation prior to development.
- 4.12 For the duration of the redevelopment, a 'Hotspot Protocol' will need to be implemented at the Site to allow ground workers to act upon should they suspect any previously unknown soil and/or groundwater contamination to be present.
- 4.13 Localised ACM was identified within two samples of the Made Ground in TP01 and TP03 at between 0.1m and 0.2m bgl. The ACM comprised of loose fibres and loose fibrous debris of Chrysotile and Crocidolite. In both locations the Made Ground was present to around 1.0m bgl. The fibres are not visible to the naked eye, on site segregation / screening is therefore not likely to be feasible.
- 4.14 The presence of ACMs within areas not directly investigated cannot be completely discounted at this time. Therefore, appropriate precautionary methods should be adopted when handling Made Ground materials. Soils shall be kept damp to minimise the potential for dust generation and visual vigilance maintained for suspect materials. Should suspect ACMs be identified, works in that area should be halted and BWB informed. Contractors should be made aware of the potential presence of ACMs within Made Ground and allow for appropriate PPE and working methods within their risk assessments and method statements
- 4.15 If previously unidentified contamination is identified, BWB shall be informed immediately, and the Contaminated Land Officer/Environmental Services at Rochdale Metropolitan Borough Council and EA (if necessary) also informed. Suspected contaminated materials should be stockpiled separately for subsequent analysis, and if necessary, off-site disposal. Any remedial approach will require agreement with the regulators prior to implementation.

5. ACCEPTANCE CRITERIA

Soil Cover in Landscaping

- 5.1 It is assumed that topsoil used in areas of amenity landscaping will be derived from the site strip. Any surplus topsoil that cannot be re-used within the development will be removed from site. Screening criteria is presented as **Appendix 3**.

Bulk Fill

- 5.2 A bulk earthworks programme is required to prepare the development platform and soft landscaping landforms. An earthworks strategy has been prepared for the development. The proposed earthworks drawing (reference 232081-BWB-INF-XX-D-C-0630_Proposed Earthworks P02, dated 10.05.24) is presented in **Appendix 2**. The following volumes of materials are anticipated in **Table 5:1**.

Table 5:1: Earthworks Volumes

Material	Cut (m³)	Fill (m³)	Total Volume (m³)
Bulk Cut	4,678	-	4,678
Bulk Fill	-	1,758	-1,758
Arisings	792	-	792
Total Subsoil material to be exported	-	-	3,712

- 5.3 To ensure appropriate bulk fill materials are re-used appropriately, chemical testing should be undertaken at a sample frequency of 1 per 1,000m³ for any Made Ground material re-used as bulk fill.
- 5.4 The assessment criteria for comparison to soil reuse or importation onto site for use as bulk fill is presented as **Appendix 4**. The concentrations are appropriate for protection of both Human Health and Controlled Waters associated with the proposed development.

6. VALIDATION TESTING AND MONITORING

Soft Landscaping

- 6.1 Soil samples should be taken from the topsoil material re-used on site and analysed at a MCERTs and UKAS accredited laboratory for the contaminants listed in **Appendix 3**.
- 6.2 Testing frequencies will be as follows;
- One sample per 1,000m³ of site-sourced soils used in soft landscaping
 - Minimum of three samples.
- 6.3 The results should be compared to the criteria set out in **Appendix 3** to confirm suitability and should not increase the contaminant load of the site in line with guidance set out in the DoWCoP. Additionally, the material should be:
- A suitable growing medium;
 - Free from obvious contamination (i.e., staining / free product etc.) including, *inter alia*, visual, or olfactory evidence of hydrocarbon contamination;
 - Not come from areas where Japanese Knotweed or other invasive or injurious plants are suspected to have been growing;
 - Not odorous (could be considered a statutory nuisance); and
 - Free from unsuitable material (e.g., bricks, brick, tiles, metal, timber, and glass etc.).

Bulk Fill Materials

- 6.4 The importation of bulk fill materials is not considered to be required.
- 6.5 To ensure appropriate bulk fill materials are re-used appropriately, chemical testing should be undertaken at a sample frequency of 1 per 1,000m³ for any Made Ground material re-used as bulk fill.
- 6.6 Soil samples should be analysed at a MCERTs and UKAS accredited laboratory for the contaminants listed in **Appendix 4**. The results should be compared to and not exceed the imported bulk fill criteria set out in **Appendix 4** to confirm suitability and must not increase the contaminant load of the site in line with guidance set out in the DoWCoP.

Ground Gas Protection Measures

- 6.7 The type, design and installation of the ground gas protection measures should be provided in accordance with current industry guidance, namely BS 8485: 2015+A1:2019 and CIRIA C665. The membrane should be installed by a suitably qualified person(s) and independently inspected and validated in accordance with CIRIA Report C735 (2014). The overall aim is to ensure that a continuous seal is evident across the base of the building. The inspection should comprise a written and photographic record of the area inspected detailing:

- Details of materials used including batch numbers;
- Membrane conditions (tears, punctures etc);
- Defects and correction measures completed;
- Quality and appropriateness of lapped and jointed sections;
- Number, location and type of service penetrations and associated seals within the membrane;
- Continuation of the membrane through internal walls and external cavity walls; and
- Presence of appropriate venting.

6.8 The results of the independent inspection, installation and testing of the membrane will need to be recorded and provided to the Environmental Consultant for incorporation into the Site Verification report.

7. REGULATORY ISSUES

Licensing and Permitting

- 7.1 It is the contractor's responsibility to ensure that all required permits and consents are in place for the duration of the works.
- 7.2 These may include but not be limited to:
- HSE notification, authorisation for asbestos works;
 - Site waste management plan;
 - Environmental Permit for crushing and potentially, waste treatment; and
 - Material Management Plan.

Waste Management

- 7.3 The contractor shall comply with the waste management (duty of care) Regulations. All waste transfer documentation shall be retained for a minimum of 6 years. Copies of all waste transfer documentation shall be provided to the consultant for inclusion in the validation report.
- 7.4 All hazardous and non-hazardous wastes generated from the site that are destined for landfill must undergo pre-treatment to reduce the volume or hazardous nature of the waste or facilitate its handling or enhance recovery. Treatment may comprise any physical, thermal, chemical or biological processes, including sorting, that changes the characteristics of the waste. There are exemptions to the regulations where treatment is not technically feasible or where feasible treatment techniques would not reduce the hazardous nature or volume of material going to landfill.
- 7.5 A site waste management plan (SWMP) should be produced by the main contractor prior to the commencement of the project. The SWMP should describe the volumes and types of waste that are likely to be produced during a project and should set out the actions for recycling, recovery, re-use and disposal for each waste stream.
- 7.6 To manage the suitable reuse and/or importation of remediated, excavated or imported soils, and demonstrate that these material are not waste, it is recommended that a Material Management Plan (MMP) under the CLAIRE Definition of Waste Code of Practice Version 2 is completed.

Third Party Liability

- 7.7 The contractor shall take all suitable measures to prevent pollution entering drainage systems or local watercourses and to avoid any nuisance from odours to local properties. The contractor should have suitable spill kits available to contain any pollution spills/leaks and have wheel wash facilities in place should this be required.

8. REPORTING

8.1 **Table 8:1** below presents a summary of the roles and responsibilities associated with the required remediation and mitigation measures.

Table 8:1: Mitigation and Validation Roles and Responsibilities

Task	Requirement	Responsibility	Validation and Reporting
Incorporation of Hazardous Ground Gas Protection Measures	Any new properties constructed will require appropriate levels of ground gas protection measures included within their design in accordance with BS8485:2015+A1:2019 for a CS2 situation for a Type C use.	Principal Contractor to install using suitably qualified specialist installers	Reporting to be provided in a letter for agreement with the local authority. An as built detail should be provided demonstrating that the ground gas protection measures installed have been installed correctly and will meet the required performance together with photos of its installation in accordance with BS8485:2015+A1:2019. The membrane should be independently inspected and validated.
Validation of soils to be use in soft landscaping areas.	Verification of soils to confirm suitability to avoid re-use of unsuitable materials. 1 sample location per 1,000m ³ , minimum of three.	Principal Contractor/ Environmental Consultant	Confirmation to be provided and chemical laboratory certificates to be obtained.
Validation of Made Ground soils to be re-used on site for bulk fill.	Prior to the re-use, of any Made Ground soils chemical analysis should be undertaken to confirm suitability to avoid the use of unsuitable materials. Chemical testing should be undertaken at a sample frequency of 1 per 1,000m ³ for any Made Ground material re-used as bulk fill (minimum of three samples).	Principal Contractor/ Environmental Consultant	Confirmation to be provided and chemical laboratory certificates to be obtained.
Asbestos	Adoption of appropriate control methods and PPE including dampening down of soils.	Principal Contractor	-
Appropriate Concrete Class	Concrete design for shallow foundations should comply with the requirements for a Design Sulphate Class DS-1 and Aggressive Chemical Environment for Concrete Class AC-1.	Foundation Design Engineer/ Principal Contractor	-

Task	Requirement	Responsibility	Validation and Reporting
Utility Pipe Materials	Provide chemical laboratory results to the utility providers to ensure that the most suitable material is selected.	Principal Contractor	-
Waste Transfer	Handle waste generated at the site in accordance with Waste Management (Duty of Care) Regulations. All waste transfer documentation shall be retained for a minimum of 6 years.	Principal Contractor	Copies of waste transfer documentation shall be provided to the appointed Environmental Consultant for inclusion in the final validation completion report. A MMP is recommended to manage the reuse and/or importation of remediated, excavated or imported soils.

8.2 The contractor should maintain records of the works to include the following:

- Daily record sheets;
- Date and weather conditions;
- Plant, personnel and visitors present;
- Aspects relating to health and safety, environmental control and variations to the original strategy/specification; and
- All necessary certification shall be submitted for inclusion in the Health and Safety File.

8.3 Validation of the works shall be undertaken by an experienced Environmental Consultant and should include, but not be limited to, the following information:

- Type(s) and volumes(s) of any materials removed from site for disposal;
- Type(s) and volumes(s) of any materials imported to the site;
- Test results;
- Additional site investigation records if any is required or undertaken;
- A description of the works undertaken;
- Records of the works including daily diary sheets;
- Record of ground gas protection measures including gas-resistant membranes installation and inspection reports;
- Waste transfer and disposal notes; and
- Variations to the remediation strategy and justification for doing so.

8.4 On satisfactory completion of the works, the consultant shall provide a Completion Statement/ Report, as appropriate. The report shall comprise relevant site records and remain as certification that the remediation works have been carried out in

accordance with the stated strategy. Copies of the report shall be lodged with regulatory bodies for approval.

9. REFERENCES

1. British Standards Institution, (BSI), BS 8485:2015+A1:2019, Code of Practice for the characterization and remediation from ground gas in affected developments
2. British Standards Institution, (BSI), BS 10175:2011+A2:2017, Investigation of Contaminated Sites – Code of Practice
3. British Standards Institution, (BSI), BS5930:2015+A1:2020) Code of practice for ground investigations
4. British Standards Institution, (BSI), BS EN 1997-1:2004+A1:2013 Incorporating corrigendum February 2009, Eurocode 7 – Geotechnical Design – Part 1: General rules.
5. British Standards Institution, (BSI), BS EN 1997-2:2007 Incorporating corrigendum June 2010, Eurocode 7 – Geotechnical Design – Part 2: Ground Investigation and testing.
6. Building Research Establishment Special Digest 1 Third Edition. Concrete in Aggressive Ground (2005)
7. Building Research Establishment (BRE) BR211, Radon; Guidance on Protective Measures for New Buildings (2015)
8. Construction Industry Research and Information Association (CIRIA), Report 132, A Guide to Safe working on Contaminated Sites (1996).
9. Construction Industry Research and Information Association (CIRIA). 2001, C522 Contaminated land risk assessment, A guide to good practice.
10. Construction Industry Research and Information Association (CIRIA). 2007, Report C665, Assessing Risk Posed by on Hazardous Ground Gases to Buildings
11. Construction Industry Research and Information Association (CIRIA). 2014, Report C735, Good Practice on the testing and verification of protection systems for buildings against hazardous ground gases
12. Department for Communities and Local Government (DCLG), 2012, National Planning Policy Framework.
13. Department for Environment Food and Rural Affairs (DEFRA), 2012, Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance.
14. Environment Agency Guidance on Risk Management of Land Contamination <https://www.gov.uk/government/publications/land-contamination-risk-management-lcm>.
15. Environment Agency 2008, Updated technical background to the CLEA model Science Report – SC050021/SR3

16. Environment Agency 2008, Human health toxicological assessment of contaminants in soil Science Report – SC050021/SR2
17. Environment Agency 2009, CLEA Software (Version 1.05) Handbook Better Regulation Science Programme Science report: SC050021/SR4
18. Environment Agency 2008, A review of body weight and height data used within the Contaminated Land Exposure Assessment model (CLEA) Project SC050021/ Technical Review 1
19. Environment Agency, 2006, Remedial Targets Methodology, Hydrogeological Risk Assessment for Land Contamination
20. Environment Agency, 2010, Report SC030114/R1, Verification of remediation of land contamination.
21. Health and Safety Executive (HSE) 'Protection of workers and the general public during the Development of Contaminated Land (1991).
22. NHBC Guidance for the Safe Development of Housing on Land Affected by Contamination, R&D Publication 66: 2008

APPENDICES

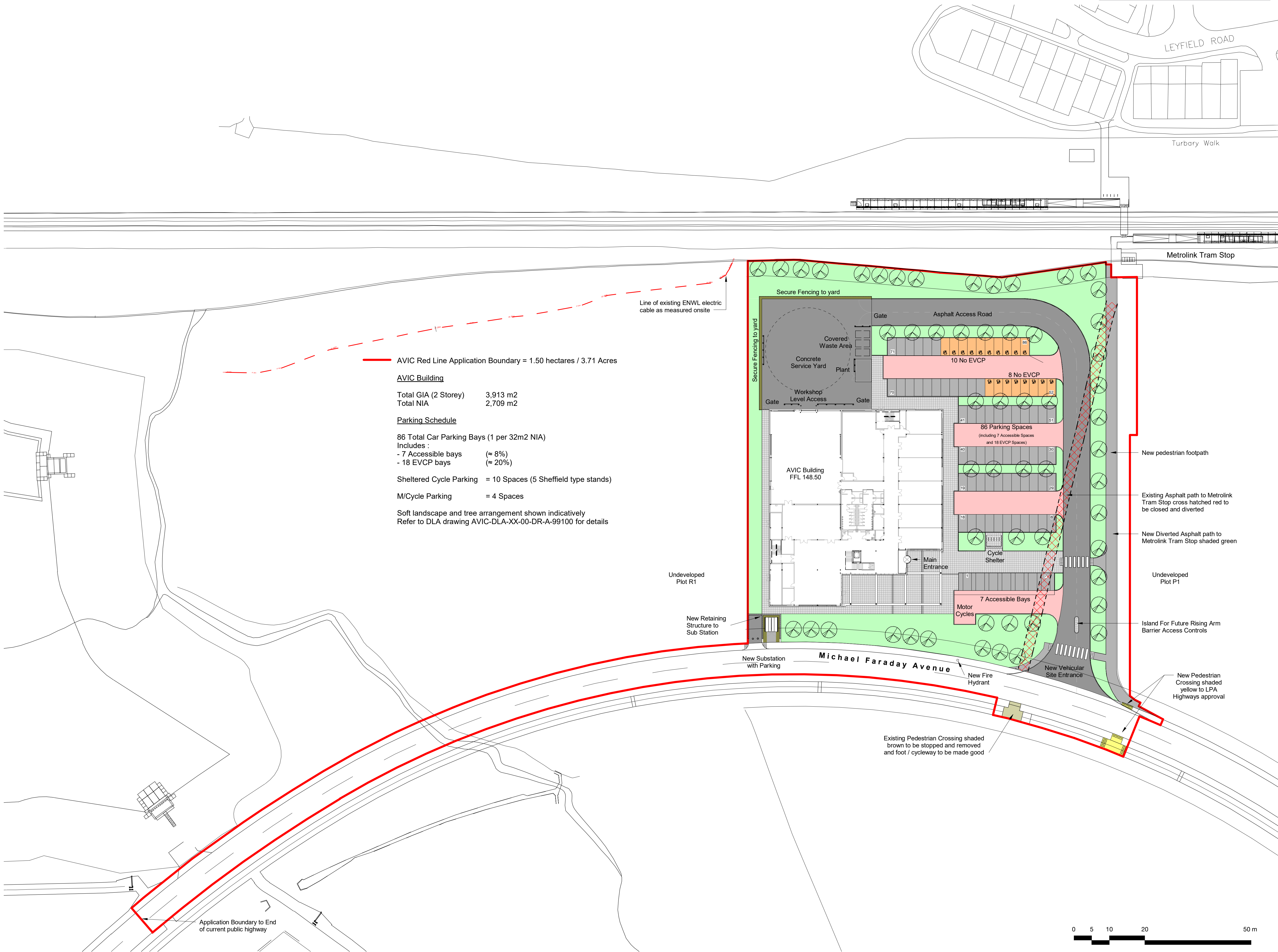
Appendix 1: Proposed Development Plan

Note: This is a colour drawing, in order to ensure any subsequent reproduction is viewed correctly it is to be re-printed in full colour

INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE COPYRIGHT OF DLA ARCHITECTURE LTD AND IS NOT TO BE REPRODUCED WITHOUT PERMISSION

DO NOT SCALE, REFER TO FIGURED DIMENSIONS ONLY

REVISIONS		
P01	FIRST ISSUE	15/04/24 PSL
P02	Application boundary revised to accommodate off site earthworks. Updated in line with Client comments	03/05/24 PSL
P03	Existing ENWL electric cable on adjacent Plot R1 indicated	16/05/24 PSL
P04	Updated with latest building arrangement	20/06/24 PSL CH



AVIC Red Line Application Boundary = 1.50 hectares / 3.71 Acres

AVIC Building

Total GIA (2 Storey) 3,913 m2
Total NIA 2,709 m2

Parking Schedule

86 Total Car Parking Bays (1 per 32m2 NIA)

Includes :

- 7 Accessible bays (≈ 8%)
- 18 EVCP bays (≈ 20%)

Sheltered Cycle Parking = 10 Spaces (5 Sheffield type stands)

M/Cycle Parking = 4 Spaces

Soft landscape and tree arrangement shown indicatively
Refer to DLA drawing AVIC-DLA-XX-00-DR-A-99100 for details



NORTH



dlA
ARCHITECTURE

6 East Parade | Leeds | LS1 2AD
0113 887 3100
www.dla-architecture.co.uk

PROJECT
**KINGSWAY BUSINESS PARK
PLOT R2**

TITLE
GA SITE PLAN

SCALE
1 : 500 @ A1

DATE
12/04/24

DLA REF
2022-040

DRAWN
PSL

REVIEWED
BLG

DOCUMENT NUMBER
AVIC-DLA-XX-00-DR-A- 99003

DOCUMENT PURPOSE
PLANNING

REVISION
P04

Appendix 2: Proposed Earthworks Drawing



Design Assumptions

- A typical 300mm Site Strip has been assumed for the whole site and is expected to comprise a variety of weathered materials and organics. Based on a works area of 11,112m², this provides a site strip volume of 3,333m³.
- As a further potential saving, the Contractor may assess and verify the suitability of reusing this material elsewhere (such in proposed landscaped areas) though any proposal must be in accordance with the BWB earthworks specification.
- In line with the BWB report 'Phase 2 Geo-Environmental Assessment KYR-BWB-ZZ-XX-RP-YE-0002', ground improvement is assumed across the site such that a minimum cbr of 15% is achieved and therefore will inform the following construction depths:
 - Building Slab = 775mm
 - Heavy Duty Construction Road = 400mm
 - Permeable Block Paving = 500mm
 - Service Yard Slab = 325mm
 - Asphalt Footpaths = 250mm
 - Block Paving Footpath = 250mm
 - Landscaping = 150mm
 - Substation = 325mm
- All material within the top 450mm of finished surface level in trafficked areas shall be non-frost susceptible. This depth may be included within any lime / cement stabilisation works.
- Cut/Fill volumes are between site strip and formation levels.
- No bulking factors have been taken into account in calculating the estimated earthworks quantities.
- The earthworks quantities have been provided by BWB for guidance only.
- It should be noted that the earthworks volumes provided by BWB are accurate to ±5%. This margin takes account of the variations that may result through the use of Civil 3D modelling software and variations in the topographic survey.
- Pre-construction survey to be undertaken to confirm the site strip assumptions and levels ahead of earthworks activities.

Bulk Cut/Fill Earthworks

Following the site strip, the bulk earthworks required to reach formation levels is anticipated to generate:

	Cut	Fill	Net
Total Net:	4,678	1,758	2,920 (Export)

Therefore the Overall Net Cut shall be taken as approx. 2,920m³ (Export)

Arisings

Construction arisings generated from drainage, foundations and services have been estimated [based on a rate of 0.075m³ per square metre of site area] at 792m³.

Summary

Topsoil		
Site Strip	3,333	(Export)
Total Topsoil	3,333m³	(Export)
The site strip will generate a net surplus in topsoil material which is to be exported from site.		

Subsoil		
Bulk Earthworks	2,920	(Export)
Arisings	792	(Export)
Total Subsoil	3712m³	(Export)
The bulk earthworks will generate a net surplus in sub-soil material.		

Important CDM / H&S note

The Designers would draw the readers attention to the key residual health and safety risks that have not been eliminated from the designs shown on this drawing by the design process. These key residual risks are identified below:

- Existing Drainage and Service Infrastructure / Utilities not to be compromised.
- Care to be taken around deep excavations and high embankments. Plant to be kept at safe distance.
- Moving plant. Care to be taken around site.
- Where temporary diversions are required for construction works, it is the duty of the Contractor to ensure diversions are in place and temporary signage to accommodate.
- HGV / Car / Pedestrian movements during operation stage of the buildings. Care to be taken during movements.

Any construction personnel including operatives intending to construct the designs shown on this drawing should ensure that they have been regularly and thoroughly briefed by the principal Contractor on all health and safety matters and have had sight of:

- The full Designers and Contractors risk assessments and risk registers.
- The developed construction health and safety plan.
- The Contractors construction method statements.

Hazards that are obvious to a competent Contractor are not shown, as are every day and low risk hazards.

PLOT R1

FFL:
148.500m

PLOT P1

PLOT Q

Footpath tie-in
point to existing
highway

Footpath tie-in
point to existing
highway

Notes

- Do not scale this drawing. All dimensions must be checked/ verified on site. If in doubt ask.
- This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.
- All dimensions in millimetres unless noted otherwise. All levels in metres unless noted otherwise.
- Any discrepancies noted on site are to be reported to the engineer immediately.
- To be read in conjunction with the BWB drawing: 232081-BWB-INF-XX-D-C-0630_Proposed Finished Levels

Legend

- Planning Boundary
- Isopachyte Cut Contour (Range from 0.0m to -2.780m)
- Isopachyte Zero Cut/Fill Contour
- Isopachyte Fill Contour (Range from 0.0m to 1.816m)
- +RH circa 0.000m Retaining wall and retained height

PROPOSALS ARE SUBJECT TO
APPROVAL

PROPOSALS ARE SUBJECT TO
CHANGE DURING DETAILED
DESIGN AND PROJECT TEAM
REVIEW.

FFL's ARE SHOWN
INDICATIVELY AND MAY VARY
BY +/- 0.5M TO SUIT
CONTRACTOR'S PROPOSED
CONSTRUCTION METHODS

P02	10.05.24	Updated to show latest planning boundary	HW	RAD
P01	26.04.24	Planning Issue	HW	RAD
Rev	Date	Details of issue / revision	Drw	Rev

Issues & Revisions

	☐ Birmingham 0121 233 3322
	☒ Leeds 0113 233 8000
	☐ London 020 7407 3879
	☐ Manchester 0161 233 4260
	☐ Nottingham 0115 924 1100
	www.bwbconsulting.com

Client

**Wilson Bowden
Developments & Rochdale
Borough Council**

Project Title

**Plot R2, Atom Valley
Innovation Centre (AVIC)**

Drawing Title

Proposed Earthworks

Drawn:	H.Watts	Reviewed:	R. Duncan
BWB Ref:	232081	Date:	Apr '24
		Scale@A1:	1:350

Drawing Status

Planning

Project - Originator - Zone - Level - Type - Role - Number	Status	Rev
232081-BWB-INF-XX-D-C-0630	S8	P02

Appendix 3: Soil Cover Acceptance Criteria

Soft Landscaping Criteria

Contaminant	Max Concentration (On-site) (mg/kg)	Suitable for Use Criteria (mg/kg)	Ref.	Adopted Screening Criteria (mg/kg)	Source
Arsenic	130	170	(c)	170	(c)
Barium	2200	0	(f)	0	(f)
Beryllium	9	63	(c)	63	(c)
Boron	0.8	46000	(b)	8	(h)
Cadmium	0.2	532	(c)	2	(h)
Chromium VI	1.8	220	(c)	18	(h)
Chromium III	41	33000	(c)	410	(h)
Copper	270	44000	(c)	2700	(h)
Lead	360	580	(d)	580	(d)
Inorganic Mercury	0.3	240	(c)	3	(h)
Nickel	100	3400	(c)	1000	(h)
Selenium	1	1800	(c)	10	(h)
Vanadium	260	5000	(c)	2600	(h)
Zinc	270	170000	(c)	2700	(h)
Cyanide (Free)	1	0	(f)	0	(f)
Cyanide (Complex)	1	0	(f)	0	(f)
Phenol	1.7	780	(c)	17	(h)
Benzene	0.005	90	(c)	0.05	(h)
Toluene	0.005	87000	(c)	0.05	(h)
Ethylbenzene	0.005	17000	(c)	0.05	(h)
Xylene*	0.01	17000	(c)	0.1	(h)
TPH (C5-C6) aliphatic	0	95000	(c)	500	(h)
TPH (>C6-C8) aliphatic	0	150000	(c)	500	(h)
TPH (>C8-C10) aliphatic	0.1	14000	(c)	500	(h)
TPH (>C10-C12) aliphatic	0	21000	(c)	500	(h)
TPH (>C12-C16) aliphatic	0	25000	(c)	500	(h)
TPH (>C16-C21) aliphatic	0	450000	(g)	500	(h)
TPH (>C21-C35) aliphatic	19	450000	(g)	500	(h)
TPH (>C6-C7) aromatic	0	76000	(c)	500	(h)
TPH (>C7-C8) aromatic	0.1	87000	(c)	500	(h)
TPH (>C8-C10) aromatic	0.1	7200	(c)	500	(h)
TPH (>C10-C12) aromatic	0	9200	(c)	500	(h)
TPH (>C12-C16) aromatic	2	10000	(g)	500	(h)
TPH (>C16-C21) aromatic	0	7600	(g)	500	(h)
TPH (>C21-C35) aromatic	10	7800	(g)	500	(h)
Total TPH (C60C40)	N/A	N/A		500	(i)
Naphthalene	1.3	1200	(c)	13	(h)
Acenaphthylene	0.09	29000	(c)	0.9	(h)
Acenaphthene	0.64	29000	(c)	6.4	(h)
Fluorene	0.49	20000	(c)	4.9	(h)
Phenanthrene	4	6200	(c)	40	(h)
Anthracene	0.95	150000	(c)	9.5	(h)
Fluoranthene	5	6300	(c)	50	(h)
Pyrene	4.5	15000	(c)	45	(h)
Benzo(a)anthracene	2.1	49	(c)	21	(h)
Chrysene	2.2	93	(c)	22	(h)
Benzo(b)fluoranthene	2.3	13	(c)	13	(c)
Benzo(k)fluoranthene	1.1	370	(c)	11	(h)
Benzo(a)pyrene	1.9	11	(c)	11	(c)
Indeno(1,2,3-c,d)pyrene	1.2	150	(c)	12	(h)
Dibenzo(a,h)anthracene	0.23	1.1	(c)	1.1	(c)
Benzo(g,h,i)perylene	1.3	1400	(c)	13	(h)
Total PAH				100	(i)
pH	-	5.5-8.5	(a)	5.5-8.5	(a)
Asbestos	-	Non-Detect**	-	Non-Detect**	-

* S4UL for xylene is based on the most conservative value of m-, p- and o-xylene.

** Below the quantifiable Limit of Detection (<0.001%)

It is noted that Adopted Screening Criteria (ASC) provide an initial assessment of the suitability of material for use on-site. Any exceedances of the ASC should be assessed by the Environmental Consultant, as these do not necessarily preclude the potential use of the material.

In accordance with CL:AIRE guidance, imported material concentrations must not be significantly elevated in comparison to material existing on site. Therefore the ASC is based on the most conservative value of:

- Suitable For Use Criteria; and
- Within one order of magnitude of the maximum recorded site concentration (to allow for soil variability).

Sources:

- (a) BS 3882:2015 Specification for Topsoil (Multi-purpose Topsoil, pH 6.0-7.0).
(b) Nable, Banuelos and Paul. Boron Toxicity. Plant and Soil, Vol.193, pp1 81-198, 1997.
(c) LQM/ClEH S4ULs for Human Health Risk Assessment. Public Parks 1% SOM. Land Quality Press, Nottingham, 2015. S4UL3271.

- (d) SP1010: C4SLs for Assessment of Land Affected by Contamination. Public Open Space 2. DEFRA, 2014.
(e) #N/A
(f) BWB Derived Criteria. Public Parks.
(g) Heavy end hydrocarbons are adjusted down to Aliphatic C₁₂-C₁₆ concentrations to ensure no visual or olfactory evidence of contamination present.
(h) One order of magnitude above maximum recorded site concentration.
(i) Hazardous Waste Threshold

Appendix 4: Bulk Fill Acceptance Criteria

Bulk Fill Re-Use Criteria

Contaminant	Max Concentration (On-site) (mg/kg)	Suitable for Use Criteria (mg/kg)	Ref.	Adopted Screening Criteria (mg/kg)	Source
Arsenic	130	640	(c)	640	(c)
Barium	2200	22000	(e)	22000	(e)
Beryllium	9	12	(c)	12	(c)
Boron	0.8	5	(b)	5	(b)
Cadmium	0.2	190	(c)	2	(h)
Chromium VI	1.8	33	(c)	18	(h)
Chromium III	41	8600	(c)	410	(h)
Copper	270	68000	(c)	2700	(h)
Lead	360	2300	(d)	2300	(d)
Inorganic Mercury	0.3	1100	(c)	3	(h)
Nickel	100	980	(c)	980	(c)
Selenium	1	12000	(c)	10	(h)
Vanadium	260	9000	(c)	2600	(h)
Zinc	270	730000	(c)	2700	(h)
Cyanide (Free)	1	43	(f)	10	(h)
Cyanide (Complex)	1	213	(f)	10	(h)
Phenol	1.7	780	(c)	17	(h)
Benzene	0.005	27	(c)	90	(h)
Toluene	0.005	56000	(c)	500	(h)
Ethylbenzene	0.005	5700	(c)	500	(h)
Xylene*	0.01	5900	(c)	500	(h)
TPH (C5-C6) aliphatic	0	3200	(c)	500	(h)
TPH (>C6-C8) aliphatic	0	7800	(c)	500	(h)
TPH (>C8-C10) aliphatic	0.1	2000	(c)	500	(h)
TPH (>C10-C12) aliphatic	0	9700	(c)	500	(h)
TPH (>C12-C16) aliphatic	0	59000	(c)	500	(h)
TPH (>C16-C21) aliphatic	0	59000	(g)	500	(h)
TPH (>C21-C35) aliphatic	19	59000	(g)	500	(h)
TPH (>C6-C7) aromatic	0	26000	(c)	500	(h)
TPH (>C7-C8) aromatic	0.1	56000	(c)	500	(h)
TPH (>C8-C10) aromatic	0.1	3500	(c)	500	(h)
TPH (>C10-C12) aromatic	0	16000	(c)	500	(h)
TPH (>C12-C16) aromatic	2	10000	(g)	500	(h)
TPH (>C16-C21) aromatic	0	7600	(g)	500	(h)
TPH (>C21-C35) aromatic	10	7800	(g)	500	(h)
Total TPH (C60C40)	N/A	N/A		500	(i)
Naphthalene	1.3	190	(c)	13	(h)
Acenaphthylene	0.09	83000	(c)	0.9	(h)
Acenaphthene	0.64	84000	(c)	6.4	(h)
Fluorene	0.49	63000	(c)	4.9	(h)
Phenanthrene	4	22000	(c)	40	(h)
Anthracene	0.95	520000	(c)	9.5	(h)
Fluoranthene	5	23000	(c)	50	(h)
Pyrene	4.5	54000	(c)	45	(h)
Benzo(a)anthracene	2.1	170	(c)	21	(h)
Chrysene	2.2	350	(c)	22	(h)
Benzo(b)fluoranthene	2.3	44	(c)	23	(h)
Benzo(k)fluoranthene	1.1	1200	(c)	11	(h)
Benzo(a)pyrene	1.9	35	(c)	19	(h)
Indeno(1,2,3-c,d)pyrene	1.2	500	(c)	12	(h)
Dibenzo(a,h)anthracene	0.23	3.5	(c)	2.3	(h)
Benzo(g,h,i)perylene	1.3	3900	(c)	13	(h)
Total PAH				100	(i)
pH	-	5.5-8.5	(a)	5.5-8.5	(a)
Asbestos	-	Non-Detect**	-	Non-Detect**	-

* S4UL for xylene is based on the most conservative value of m-, p- and o-xylene.

** Below the quantifiable Limit of Detection (<0.001%)

It is noted that Adopted Screening Criteria (ASC) provide an initial assessment of the suitability of material for use on-site. Any exceedances of the ASC should be assessed by the Environmental Consultant, as these do not necessarily preclude the potential use of the material.

In accordance with CL:AIRE guidance, imported material concentrations must not be significantly elevated in comparison to material existing on site. Therefore the ASC is based on the most conservative value of:

- Suitable For Use Criteria; and
- Within one order of magnitude of the maximum recorded site concentration (to allow for soil variability).

Sources:

- BS 3882:2015 Specification for Topsoil (Multi-purpose Topsoil, pH 6.0-7.0).
- Nable, Banuelos and Paul. Boron Toxicity. Plant and Soil, Vol.193, pp1 81-198, 1997.
- LQM/CLIEH S4ULs for Human Health Risk Assessment. Commercial 1% SOM. Land Quality Press, Nottingham, 2015. S4UL3271.

- SP1010: C4SLs for Assessment of Land Affected by Contamination. Commercial. DEFRA, 2014.
- Soil Generic Assessment Criteria for Human Health Risk Assessment. Commercial. CL:AIRE, 2010.
- BWB Derived Criteria. Commercial.
- Heavy end hydrocarbons are adjusted down to Aliphatic C₁₂-C₁₆ concentrations to ensure no visual or olfactory evidence of contamination present.
- One order of magnitude above maximum recorded site concentration.
- Hazardous Waste Threshold

