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# REMEDIATION STRATEGY

## for land at

## PHASE 4, EDGEHILL PARK, WHITEHAVEN

## Prepared for

## STORY HOMES

**Report No. 4046-G-R030**

**Date: November 2022**

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## Revision History

| From | Date | Comments |
|---|---|---|
| 4046-G-R030 | November 2022 | Original Report |
| | | |

# REMEDIATION STRATEGY
# for land at
# PHASE 4 EDGEHILL PARK, WHITEHAVEN

## 1 INTRODUCTION

### 1.1 The Commission and Brief

1.1.1 ID Geoenvironmental Limited (IDG), were commissioned by Story Homes (the Client) to prepare a Remediation Strategy for a site at Phase 4 Edgehill park, Whitehaven hereafter referred to as the site.

1.1.2 IDG have previously issued the following reports:

- Preliminary Geoenvironmental Investigation & Coal Mining Risk Assessment, Edgehill Park Whitehaven, Reference 4046-G-R015, dated October 2020 (Rev A issued November 2021)
- Hazardous Ground Gas Risk Assessment- Phase 4, Edgehill Park, Whitehaven, Cumbria, reference 4046-G-LR014, dated December 2020.
- Geoenvironmental Appraisal & Supplementary Mining Investigation of land at Phase 4 Edgehill Park, Whitehaven reference 4046-G-R024, dated December 2021.
- Supplementary Rotary Probehole Investigation Phase 4 Edgehill Park Whitehaven – Findings & Recommendations, letter report reference 4046-G-L020 dated 16th June 2022.
- Supplementary Hazardous Ground Gas Risk Assessment – Phase 4 Edgehill Park, Whitehaven, Cumbria reference 4046-G-L026 dated 8th November 2022.

1.1.3 This document outlines the remediation objectives necessary to protect environmental receptors, and render the site suitable for the proposed development.

1.1.4 A Method Statement should be prepared by the Contractor undertaking the works, in order to detail how the objectives will be achieved.

1.1.5 It may be the case that the remediation works are to be undertaken by more than one contractor, for example where initial works are undertaken by a demolition and remediation contractor, with placement of soil cover by the groundworker later in the project. In this situation, the Client should ensure that each Contractor has confirmed that they understand their responsibilities.

1.1.6 The Contractor's Method Statement should be submitted to, and approved by, the Client.

### 1.2 Site Description

1.2.1 A location plan is shown on Drawing No 4046-G-D038 in Appendix A. Site details are summarised in Table 1.1 and discussed further in Section 2.1.

**Table 1.1: Summary of Site Location Details**

| | |
|---|---|
| **Location** | 2.0 km southwest of Whitehaven town centre |
| **NGR** | 297360, 515800 |
| **Approximate Area** | 4.25ha |
| **Known services** | None depicted on service drawings |

1.2.2 Existing site features at the time of the ground investigation are summarised in Table 1.2.

**Table 1.2: Summary of Site Details**

| | |
|---|---|
| **Current Access** | From Phase 3 Edgehill Park/ Gamesrigg Road |
| **Topography** | Majority of site in NW slopes gently from north to south, progressing into moderately steep slopes, which fall down to the eastern and south eastern boundaries<br>Shallow former claypit with marshy base in NW up to 2.0m lower than site to the east & Phase 3. |
| **Approximate areas** | 2,100m$^2$ marsh area<br>40,400m$^2$ grass |
| **Surrounding land uses** | North & east – housing on Wastwater Road and Valley View Road respectively<br>South – Farm and outbuildings, access track and open fields.<br>West – Open fields. |

1.2.3 Detailed discussion of the sites history and operations is provided in Report 4046-G-R015. Pertinent geoenvironmental factors highlighted by the preliminary report are summarised below:

- The site is underlain by Carboniferous Middle Coal Measures comprising interbedded mudstone, sandstone and siltstone with coal seams. The Black Metal coal seam is indicated to outcrop within the site and to dip to the west below the western part of the site. The Slaty Coal is depicted to outcrop to the immediate east of the site and to dip at a shallow angle below the site.
- The site has remained relatively undeveloped, however a brickworks, clay and potentially extraction of coal at outcrop is indicated to have encroached into the northwest of the site where hummocky ground and a marshy hollow are evident. Minor localised contamination associated with made ground/colliery spoil may be present.
- Coal Authority mine shaft reference 297515-008 is located in the southwest corner of the site. Shaft references 297515-002 (Banks Pit) and 297515-003 (Baxter Pit) are located within 20m north of the site and shaft reference 297515-007 (Watson Pit) is located approximately 20m south of the site. None of the shafts are recorded as being treated.
- The east of the site is depicted as being within a Coal Authority Development High Risk Zone associated with the outcrop of the Black Metal and Slaty Coal seams.

## 1.3 The Proposed Development

1.3.1 The Proposed Story Homes Block Plan reference 66D-STO 100 Rev N dated June 2022 presented in Appendix A shows that consideration is being given to redevelopment of the site with two/three storey domestic dwellings, associated gardens, Public Open Space (POS) areas and adoptable roads and sewers.

1.3.2 At the time of reporting the Local Planning Authority are considering full Planning Permission Application for redevelopment of this site (ref 4/22/2332/0F1).

# 2 BACKGROUND

## 2.1 Report 4046-G-R015 & 4046-G-LR014 Findings

2.1.1 The findings of IDG Report reference 4046-G-R015 and the Ground Gas Risk Assessment reference 4046-G-LR014 are summarised below:

- Exploratory intrusive ground investigation comprising 6 rotary probeholes proved the Black Metal Coal between depths of 5.5m (PH634) and 22.6m bgl (PH633) and is between 0.7m and 1.2m in thickness (including a 200mm parting). The Slaty Coal was proven between 14.4m (PH634) and 30.8m bgl (PH633) and is nominally of 1.0m thickness.
- Probable shallow coal mineworkings were encountered within Probehole PH630 between 26.6m and 27.8m bgl at the site's centre considered to be associated with the Slaty Coal seam. No evidence of workings was encountered in the Black Metal Coal.

- Based upon the indicated strata dip to the west, workings within the Slaty Coal were anticipated to affect stability of structures in the east of the site where the site slopes steeply down to the boundary. Further assessment of the risk from shallow mineworkings was recommended.
- Ground gas monitoring wells were installed in four shallow boreholes with response zones in shallow bedrock and where coal was close to outcrop. Six ground gas monitoring visits did not detect any significant concentrations of methane or carbon dioxide or positive ground gas flow rates. The monitoring programme indicated the site should be classified Characteristic Situation 1 (CS1). However, further assessment of the sites ground gas regime was recommended once the further investigation and potentially treatment of shallow mineworkings had taken place.

## 2.2 Report 4046-G-R024 & 4046-G-L020 Findings

2.2.1 The findings of IDG Report reference 4046-G-R015 and the Ground Gas Risk Assessment reference 4046-G-LR014 are summarised below:

- A phase II ground investigation comprising 26 trial pits (TP750-775) and further mining investigation comprising 16 rotary probeholes (PH901-916) was carried out during September 2021. A further 23 probeholes (PH1001-PH1023) and shaft 297515-008 were drilled during June 2022 to delineate previously identified mineworkings.
- A nominal 0.3m of Topsoil/Topsoil Made Ground is present across the site.
- Up to 0.9m of Cohesive and Granular Made Ground is locally present in the NW of the site
- A thin circa 1.2m thick layer of Glacial Till is present in the west of the site.
- Residual mudstone bedrock is typically present to 1.0m depth. Two coal seams proven to outcrop in the east of the site.
- Further evidence of shallow mineworkings was proven between depths of 18.3m and 27.4m bgl within the Slaty Coal seam in rotary probeholes PH902, PH904, PH905, PH907, PH909, PH1001 & PH1012, predominantly in the northeast of the site. However, the base of shaft 297515-008 in the southeast of the site was proven at 37.5m bgl; assuming constant dip to the west, geological modelling indicates the base of the shaft coincides with the Slaty Coal seam. The Mining Influence Plan is shown on Drawing No. 4046-G-D055 Rev and the geological model (Geological Cross Sections) shown on Drawing No. 4046-G-D054 in Appendix A.
- The Report concluded that several Plots depicted on layout 66D Rev F were within the potential influence of shallow mineworkings within the Slaty Coal seam and recommended grout treatment. None of the plots depicted upon proposed layout 66D-STO 100 Rev N are within the shallow mineworkings zone of influence. However, plots 77-80 are within the influence of the infilled former shaft 297515-008 and will require bespoke foundations. Treatment (grouting and capping) of the shaft will be required.
- No significant contamination was encountered which represents a risk to human health, although slightly elevated concentrations of leachable copper, lead and nickel and significant zinc concentrations were detected in thin, localised deposits of Made Ground in the northwest of the site which could potentially represent a risk to surface water.

## 2.3 Ground Gas Risk Assessment 4046-G-L026

2.3.1 The Ground Gas risk assessment (GRA) dated October 2022 was based upon monitoring data collected between September 2020 and August 2022. Monitoring data was collected from five locations including three shallow monitoring wells installed in surface bedrock and two wells installed within shallow mineworkings.

2.3.2 Monitoring results obtained at shallow monitoring wells indicated the site could be classified CS1. However, results obtained from the deep monitoring wells detected low methane and slightly elevated carbon dioxide concentrations, associated with both positive and negative flow rates. While there was no significant evidence for gases to migrate to surface through bedrock there is

evidence that the gas source is subject to pumping. Given that there is no geotechnical requirement to treat the shallow mineworkings and there remains potential for gases to migrate to surface via unrecorded shafts or adits, it was considered prudent to classify plots within the eastern half of the site, plots within a radius of 25m around onsite shaft 271515-008 and offsite shafts 297515-002, 297515-003 and 297515-007 as CS2.

2.3.3 The zone classified as CS2 and Plots requiring ground gas protection measures are shown on Drawing No. 4046-G-D076 Rev A in Appendix A.

2.3.4 The site is not indicated to be at risk from Radon gas. Therefore, Radon gas protective measures are not required.

# 3 REGULATORS COMMENTS

## 3.1 General

3.1.1 IDGs Geoenvironmental Appraisal 4046-G-R024 has been submitted to the Local Planning Authority in support of the above Planning Application. Copies of consultation correspondence are presented in Appendix B.

## 3.2 Local Authority

3.2.1 Correspondence reference 4/22/2332/0F1 - Valley View Road, Whitehaven, dated 5th September 2022 received from the Local Planning Authority Environmental Health Officer recommends imposition of the following Conditions associated with remediation as follows:

- "Reporting of unexpected contamination - In the event that contamination is found at any time when carrying out the approved development that was not previously identified, it must be reported in writing immediately to the Local Planning Authority. A suitable investigation and risk assessment will then be agreed upon by the Council and the developer and where remediation is necessary a remediation scheme must be prepared and submitted to and approved in writing by the Local Planning Authority."

## 3.3 Environment Agency

3.3.1 Correspondence reference NO/2022/114699/01-L01 dated 24th August addressed to Copeland Borough Council recommends that "no development approved by this planning permission shall commence until a remediation strategy to deal with the risks associated with contamination of the site in respect of the development hereby permitted, has been submitted to, and approved in writing by, the local planning authority.

3.3.2 The Environment Agency also request (Further Detailed Comments), further explanation in respect of leachable copper, lead, nickel & zinc and the risk to controlled waters associated with a surface water drain discharging into the ravine southwest of the site. IDGs response is presented in Appendix B to this report. In summary, IDG concluded that there is a limited volume of Made Ground and the source of the leachable metals is likely to be metal pipe, wire and rods (& rubber hoses) as identified in TP755. Removal of the unsuitable anthropogenic material will remove the likely source of contamination. Construction of hardstanding and positive surface water drainage will mitigate against infiltration and any residual risk of leaching.

3.3.3 This report is prepared to satisfy the requirements of the proposed conditions and correspondence referenced above.

# 4 CONCEPTUAL MODEL

4.1.1 The Conceptual Site Model presented in Report reference 4046-G-R024 has been updated to reflect the findings of the GRA and comments received from the Local Authority and Environment Agency.

4.1.2 In terms of the proposed redevelopment plausible pollutant linkages, and feasible remediation options, are summarised in Table 4.1.

**Table 4.1: Revised Conceptual Site Model and Potential Remediation Options**

| Sources | Receptors | Plausible Pathways | Potential Remediation Options | Post-Remediation Pollutant Linkage |
|---|---|---|---|---|
| Leachable metals associated with metal pipe rods & wire within localised deposits of Made Ground in NW of site (TP755) | Surface water | Surface water drain Circa.20m SW of site. | Removal of unsuitable anthropogenic metal waste to remove source.<br>Construction of hardstanding and positive surface water drainage to mitigate against residual risk of leaching. | Contaminant source removed |
| Hazardous Gas (carbon dioxide, methane) associated with shallow abandoned workings within NE of site. | Human Health | Migration of Carbon Dioxide through granular strata and ingress into confined spaces leading to potential asphyxiating mixtures of gas | CS 2 Gas protection measures within proposed properties in east of site | Pollutant linkage broken |
| | Proposed Buildings | Migration of Methane through granular strata and ingress into confined spaces leading to potential explosive mixtures of gas | | Pollutant linkage broken |

**◊ transient risks to construction workers will be addressed by the adoption of appropriate health and safety measures in accordance with the Health and Safety at Work Act 1974, and regulations made under the Act including for example the COSHH Regulations.**

# 5 RISK ASSESSMENT & TARGET CONCENTRATIONS

## 5.1 Remediation Objectives

5.1.1 The remediation objectives for the redevelopment of the site are:

- Remove contamination or break pollutant linkages
- Remove/remediate significant pollution sources identified during the works that present a risk to human health and/or the environment.
- Respond appropriately to the discovery of previously unidentified contamination
- Recover materials for re-use in the proposed development (e.g. recycled aggregates)
- Manage emissions to air and water to protect local residents and the environment during remediation works.
- Allow additional protection measures to be implemented during remediation or construction works (if required).
- Construction of CS2 ground gas protection measures within Plots in the eastern half of the site.

5.1.2 The potential risks identified will be managed to break the pollutant linkages and enable development of the site for a residential end use.

5.1.3 Preparatory works will also be undertaken by the Contractor to prepare the site for the proposed development. These works are considered to comprise:

- Vegetation and topsoil strip
- Treatment & capping of mine shaft 297515-008
- Waste metal removal (TP755)
- Earthworks to alter ground levels
- Provision of a geotechnically stable development platform for properties and infrastructure

5.1.4 A watching brief should be maintained by the supervising engineer during the preparatory works to enable inspection of excavations and general fill materials for previously unidentified contamination.

## 5.2 Remediation Criteria

5.2.1 Generic assessment criteria (GACs) for the protection of Human Health for contaminants of concern for material on site are summarised in Tables 5.1 & 5.2. These screening values are applicable to all soils retained within the site (i.e. topsoil, subsoil, general fill )within soft end use areas in both residential gardens and POS and assume the following pollutant pathways to be active:

- Direct ingestion of soil and dust
- Consumption of homegrown produce and ingestion of soil attached to homegrown produce
- Indoor and outdoor dermal contact with soils and dusts
- Indoor and outdoor inhalation of dust
- Indoor and outdoor Inhalation of vapours

5.2.2 The adoption of the LQM/CIEH S4UL (2014) based GACs presented in Tables 5.1 & 5.2 is considered an appropriate method of assessing risks posed by ground contamination at the site.

5.2.3 Further discussion of the necessary frequency of testing, chemical analysis and screening criteria is presented in the IDG Soil Import Protocol provided in Appendix C.

**Table 5.1: Inorganic GACs for Topsoil, Subsoil & General Fill Material**

| Determinand | GACs (mg/kg) | |
|---|---|---|
| | Residential Gardens (Plant Uptake) | Residential POS |
| Arsenic | 37 | 79 |
| Cadmium | 11 | 120 |
| Chromium III | 910 | 1,500 |
| Chromium VI | 6 | 7.7 |
| Copper | 2400 | 12,000 |
| Lead | 200 | 630 |
| Mercury | 40 | 120 |
| Nickel | 130 | 230 |
| Selenium | 250 | 1,100 |
| Zinc | 3700 | 81,000 |
| Sulphate | 500 | 500 |
| Asbestos | Not Detected | Not Detected |
| Calorific Value | 7MJ/kg | 7MJ/kg |

**Table 5.2: Organic GACs for Topsoil, Subsoil & General Fill Material**

| Determinant | GACs (mg/kg) | | |
|---|---|---|---|
| | 1% SOM | 2.5% SOM | 6% SOM |
| Acenaphthene | 212 | 506 | 1,110 |
| Acenaphthylene | 173 | 415 | 922 |
| Anthracene | 2350 | 5360 | 10700 |
| Benz(a)anthracene | 7.22 | 10.8 | 13.3 |
| Benzo(a)pyrene | 2.21 | 2.72 | 2.99 |
| Benzo(b)fluoranthene | 2.58 | 3.30 | 3.70 |
| Benzo(g,h,i)perylene | 315 | 338 | 349 |
| Benzo(k)fluoranthene | 77.0 | 92.5 | 100 |
| Chrysene | 14.7 | 21.7 | 26.8 |
| Dibenzo(a,h)anthracene | 0.24 | 0.28 | 0.31 |
| Fluoranthene | 284 | 558 | 894 |
| Fluorene | 168 | 398 | 859 |
| Indeno(1,2,3-cd)pyrene | 27.1 | 36.0 | 41.1 |
| Naphthalene | 2.3 | 5.59 | 13.2 |
| Phenanthrene | 95.5 | 218 | 437 |
| Pyrene | 618 | 1240 | 2040 |
| Benzene | 0.087 | 0.17 | 0.37 |
| Toluene | 130 | 290 | 660 |
| Ethylbenzene | 47 | 110 | 260 |
| Xylenes (p-Xylene) | 56 | 130 | 310 |
| Aliphatic $C_5$-$C_6$ | 42 | 78 | 160 |
| Aliphatic $C_6$-$C_8$ | 100 | 230 | 530 |
| Aliphatic $C_8$-$C_{10}$ | 27 | 65 | 150 |
| Aliphatic $C_{10}$-$C_{12}$ | 130 | 330 | 760 |
| Aliphatic >$C_{12}$-$C_{16}$ | 1100 | 2400 | 4300 |
| Aliphatic >$C_{16}$-$C_{21}$ | 65000 | 92000 | 110000 |
| Aliphatic >$C_{21}$-$C_{35}$ | 65000 | 92000 | 110000 |
| Aromatic $EC_5$-$EC_7$ | 70 | 140 | 300 |
| Aromatic $EC_7$-$EC_8$ | 130 | 290 | 660 |
| Aromatic $EC_8$-$EC_{10}$ | 34 | 83 | 190 |
| Aromatic $EC_{10}$-$EC_{12}$ | 74 | 180 | 380 |
| Aromatic $EC_{12}$-$EC_{16}$ | 140 | 330 | 660 |
| Aromatic $EC_{16}$-$EC_{21}$ | 260 | 540 | 930 |
| Aromatic $EC_{21}$-$EC_{35}$ | 1100 | 1500 | 1700 |

# 6 REMEDIATION OPTIONS APPRAISAL

## 6.1 Objectives

6.1.1 The objective of meeting the remediation the remediation options appraisal is to determine the most appropriate means of objectives and remediation criteria whilst taking into account site and project specific factors including:

- Physical site constraints
- Costs
- Programme

- Sustainability
- Environmental impact
- Health and safety requirements
- Geotechnical requirements and development design
- Regulatory controls – permitting and waste

6.1.2 Several methods have the ability to meet the remediation objectives and criteria. However, their impact, requirements and effectiveness will vary. Therefore, the objective of the options appraisal is to assess the advantages and disadvantages of the various methods to determine the most appropriate method or combination of methods.

## 6.2 Remediation Options

6.2.1 A viable pollutant source, sensitive receptor and pollutant pathway have been identified at the development. It is considered that there are three main ways to mitigate or control the pollutant linkage, these are:

- Remove or treat the source of the pollutant(s)
- Remove or modify the pathway(s)
- Remove or modify the behaviour of the receptor(s)

6.2.2 Modification of the receptor behaviour is not considered plausible for a residential development, therefore the preferred approach is to protect future residents from exposure to the impacted materials. It is therefore considered that managing the pollutant sources and/or exposure pathways are the most appropriate methods of mitigating the risk to future residents.

6.2.3 Viable methods to mitigate the pollutant linkages are considered to be:

- Excavation and offsite disposal
- Isolation beneath hardstanding or plot footprints
- Solidification/stabilisation with binders (e.g. cement) to reduce mobility of contaminants

6.2.4 A feasibility assessment of the remediation methods noted above is presented in Table 6.1.

**Table 6.1: Remediation Methods Options Appraisal**

| Method | Advantages | Disadvantages | Feasible |
|---|---|---|---|
| Excavation & offsite disposal | Quick<br>Can be undertaken simultaneously with preparatory works | Excessive cost if large volumes of material require disposal<br>Vehicle movements, Release of dust | Yes |
| Isolation beneath hardstanding or plot footprints | Avoids generation of waste<br>Generally reduces earthworks requirements<br>Minimises import of materials and associated vehicle movements | May not be geotechnically suitable | Yes |
| Solidification/Stabilisation | Relatively quick<br>Avoids generation of waste<br>Reduces earthworks requirements<br>Minimises import of materials and associated vehicle movements | Does not remove the source. Residual long-term liability associated with leaving treated material in the ground at shallow depth<br>Hard spots near surface may impact on the proposed development<br>Treatability study/pilot trials are generally required to prove suitability of application<br>Contractor must hold mobile treatment license | No |

6.2.5 Based on the anticipated earthworks to be undertaken at the site, subject to screening and removal of geotechnically unsuitable material (metal pipe, rods & wire, rubber hoses), the relatively small volume of granular and cohesive Made Ground could be retained beneath hardstanding where it would be isolated from infiltration and the risk of further leaching would be mitigated.

6.2.6 Should unanticipated hydrocarbon contamination be encountered during development works then onsite treatment would not be considered an appropriate remediation option given the likely limited volume of material encountered. In this scenario, classification of the impacted material and offsite disposal is considered the most appropriate treatment method.

# 7 REMEDIATION STRATEGY (GENERAL)

## 7.1 Aims

7.1.1 The principal aim of the Remediation works is to resolve contamination issues in order to:

- Protect environmental receptors and render the site suitable for the proposed development.
- To satisfy requirements of the Local Planning Authority and the Building Warranty Provider.

## 7.2 Overview

7.2.1 The following site preparatory & remediation works are required:

- General site clearance of surface debris and vegetation
- Topsoil strip
- Treatment and capping of mine shaft 297515-008
- Re-grade of site to levels specified Story Homes
- Importation of general fill materials and placement across the site.
- Provision of remediated ground levels that enables placement of a 0.3m thick growing medium (i.e. topsoil) in garden and landscaped areas
- Provision of a minimum 0.3m thick growing medium of 'clean' topsoil in all garden and landscaped areas.
- Screening, removal and off-site disposal of unsuitable anthropogenic material from Made Ground
- Excavation and retention of localised deposits of Made Ground beneath hardstanding
- Contingency for previously unidentified contamination (hotspot protocol)
- Construction & verification of CS2 ground gas protection measures within Plots in the east of the site.

7.2.2 Following completion of remediation works, it is likely that limited regrading of the site will be carried out. The proposed regrading work does not form part of this Remediation Strategy; however, it is important to note that the Contractor shall be required to ensure that all imported materials are tested to verify that they are free from contamination. A scheme for this testing shall be developed as part of the Materials Management Plan (MMP). This Remediation Strategy will form part of the MMP.

7.2.3 The MMP will need to be developed using the CL:AIRE *Definition of Waste Code of Practice* for the site, in order to avoid excavated and imported materials being considered as waste by the Environment Agency. A detailed volumetric modelling exercise will need to be undertaken prior to the MMP being completed.

## 7.3 Site Set-up, Organisation and Safety

7.3.1 The Client shall ensure that the Contractor is provided with copies of all reports produced by IDG, in order that they can carry out their own risk assessments for the works. IDG will provide information on request relating to specific hazards associated with contamination issues respectively.

7.3.2 A detailed Method Statement shall be prepared by the Contractor undertaking the works. This should demonstrate how the Contractor intends to carry out the works in order to achieve the remediation objectives. In particular, details of the way in which different material types are to be kept separate should be clearly stated. The Contractor's Method Statement should be forwarded to IDG to enable comments to be made prior to works commencing and a pre-start meeting is advised.

7.3.3 The Contractor's Method Statement should include details of how the site will be organised in order to minimise the risks to workers and the public, associated with handling contaminated materials. The following measures may need to be considered:

- Designated 'clean' and 'dirty' areas
- Wheel washing facilities for vehicles
- Protective clothing, footwear and gloves
- Boot-washing facilities
- Refuelling of mobile plant in a designated area to prevent contamination of soils on site.

7.3.4 Although carbon dioxide concentrations in the ground are likely to be relatively low, access into excavations must be controlled and only undertaken in accordance with the Confined Spaces Regulations 1997. The atmosphere in shored trenches in excess of 1.2m should be monitored for oxygen and hazardous gas (methane & carbon dioxide), prior to personnel entering such excavations. Monitoring should continue whilst personnel are working in deep excavations.

7.3.5 The remediation works summarised above shall be supervised by a suitably qualified Geoenvironmental Engineer, and the Contractor will need to provide notice of works being carried out that require supervision.

## 7.4 Contractor's Responsibilities

7.4.1 Prior to the commencement of any works the Contractor, in agreement with the Client, shall:

- Establish the boundaries of the site and the working areas.
- Undertake a dilapidation survey of site boundaries, adjacent properties and highways, via dated photographs or video footage.
- Liaise with the Local Authority regarding working hours, noise and dust control, and protected trees.
- Complete a full services search and liaise with all relevant utility companies regarding work in close proximity to their apparatus.

7.4.2 The Contractor shall satisfy the Health & Safety Executive with regard to all matters concerning the health, safety and welfare of persons on the site.

7.4.3 The Contractor shall ensure that:

- Personnel, plant, materials and other equipment related to the contract are confined within the boundaries of the site.
- Any live services lying within the site boundary are marked and protected, or appropriate arrangements made to truncate them.
- Good practices relating to personal hygiene are adopted.
- Suitable precautions are implemented at all times to prevent off-site migration of pollutants via airborne dust.
- Suitable precautions are taken to prevent the spread of mud and debris on public highways.
- Refuelling of mobile plant is undertaken in a designated area. Above ground oil storage tanks shall comply with the requirements of Pollution Prevention Guideline PPG2. A spill kit shall be kept on site, adjacent to the designated refuelling area.

# 8 IMPLEMENTATION PLAN - PREPARATORY & REMEDIATION WORKS

## 8.1 General

8.1.1 The following section provides contractors with details of the remediation works necessary for residential development.

## 8.2 Site Clearance

8.2.1 Any trees currently under a preservation order shall be identified and agreed with relevant authorities prior to the commencement of the works. All trees subject to a TPO shall be protected by chestnut paling with fluorescent tape by the Contractor.

8.2.2 The site shall then be cleared of all residual debris, any vegetation, shrubs, bushes and unprotected trees as instructed by the Client.

## 8.3 Topsoil Strip

8.3.1 All topsoil shall be carefully stripped and placed in stockpiles. Upon completion of the stripping, the stockpiles shall be surveyed and volumes recorded. This information is to be provided to the Engineer.

8.3.2 It is estimated that approximately 4,000m$^3$ of topsoil is required for use within a 0.3m thick growing medium in garden and landscaped areas of the development.

8.3.3 Subject to the verification requirements stated in Section 9.3, topsoil generated from the topsoil strip will be considered suitable for re-use in the following scenarios:

- As a growing medium in garden and landscaped (POS) areas

8.3.4 The Contractor shall ensure good material management practices are exercised (i.e. no further material added to stockpiles once sampled) for any topsoil stockpile demonstrated by the Engineer to be suitable for re-use at the proposed development.

8.3.5 It is estimated that approximately 4,000m3 of topsoil will be disposed offsite, the Contractor shall provide the Engineer with copies of the waste transfer notes relating to the off-site disposal of the topsoil for inclusion in the Verification Report.

## 8.4 Earthworks & Excavations

8.4.1 Prior to commencement of the remediation works, and subject to approval from Story Homes, the Contractor will produce a Method Statement detailing the requirements of the re-engineering of site derived and imported fill materials within highways, driveways, property footprints and garden and landscaped areas.

## 8.5 Removal of Anthropogenic Material & Replacement of Made Ground beneath Hardstanding

8.5.1 Anthropogenic material including metal pipe, rods, wire and rubber hose was encountered within Made Ground in TP755 which is considered to be the source of leachable metal contamination and which shall be removed at the start of the remediation works.

8.5.2 Removal of all anthropogenic material will be supervised by the Engineer as per the steps provided in Section 9.4.

8.5.3 The waste material will be separated as much as is mechanically possible from the Made Ground soil and stockpiled on visqueen prior to its removal from site to a waste management facility.

8.5.4 On completion of the removal of the anthropogenic material, the Contractor shall record the extent of the excavation by survey and await the Engineer's confirmation that the excavation has

been appropriately validated. Made ground considered suitable for re-use beneath hardstanding will be recovered in accordance with Section 8.5.

## 8.6 Excavation and Retention of Localised Deposits of Made Ground Beneath Hardstanding

8.6.1 Made Ground recovered following screening and removal of the anthropogenic material described in Section 8.3 may be retained beneath hardstanding or disposed off-site, subject to the requirements of Section 8.12.

8.6.2 Made Ground considered geotechnically suitable for re-use shall be temporarily stockpiled upon visqueen or similar and suitably covered prior to its replacement beneath hardstanding or plot footprints. The contractor will provide the Engineer with volumes of Made Ground recovered which is suitable for re-use.

8.6.3 Excavations should not be left open for longer than is necessary and should be securely cordoned-off using 2m high Herras-type fencing, with appropriate warning signs whenever excavation works are suspended.

8.6.4 Placement of the Made Ground beneath hardstanding will be supervised by the Engineer. The contractor will provide the Engineer with a survey showing the made ground placement location for inclusion in the Verification Report.

## 8.7 Mineshaft Treatment

8.7.1 Untreated mineshaft 297515-008 is present in the southwest of the site. The Engineer will prepare a specification for investigation and treatment in accordance with guidance presented in CIRIA Abandoned Mineworkings Manual (C758) for approval by the Coal Authority.

8.7.2 The contractor will produce a method statement describing how the works shall be carried out to the satisfaction of the approved Treatment Specification.

## 8.8 Ground Gas Protection Measures

8.8.1 The GRA reference 4046-G-L026 carried out in accordance with CIRIA 665 (2007), BS8576 (2013) & BS8485:2015 determined that Plots located within the east of Phase 4 and Plots within 25m of onsite shaft 297515-008 and offsite shafts 297515-002, 297515-003, 297515-007 & require installation of CS2 ground gas measures. The Engineer will prepare a Verification Plan for the approval of the Local Planning Authority which determines the verification activities and (any) integrity testing necessary appropriate to the findings of the risk assessment.

8.8.2 The Verification Plan will determine the frequency of and number of inspections and integrity tests required by the Engineer.

8.8.3 The contactor shall provide the Engineer with details of the appropriately qualified installer, installation materials & method statements in accordance with the specification.

## 8.9 Dust Monitoring & Mitigation

*Dust Monitoring*

8.9.1 Dust monitoring will be undertaken at the site boundary as part of daily site inspections by the Contractor. All dust monitoring results will be recorded and retained in the site office along with dates, times, weather conditions, wind direction and the name of the individual carrying out the monitoring.

8.9.2 Where dust is identified as an issue an inspection will be undertaken by the Contractor to determine the cause. Where a site activity is identified as being the source of the dust and any implemented mitigation measures have been unsuccessful, the operation will be stopped until a suitable mitigation measure has been identified and adopted.

*General Measures*

8.9.3 The Contractor will carry out a daily visual assessment of dust emissions within the site and at the downwind site boundaries. In the event of a potential or actual dust nuisance being identified appropriate mitigation measures will be implemented, with the most effective action likely to involve damping down the source of the dust emission.

*Damping Down of Materials and Surfaces*

8.9.4 Damping down of materials will be carried out in the following situations:

- Where dust emissions have been observed by the Contractor
- Where dust is observed leaving the site boundary during routine site inspections
- Where significant dust emissions are observed on the site haul road and general site surface during routine site inspections
- During dry periods such as in the summer months
- Following any dust complaints received at the site

*Anticipated Sources of Dust*

8.9.5 Dust emissions may be generated from the following activities during the remediation works:

- Vehicle movements
- Handling and movement of stockpiled soils
- Crushing and screening of wastes/oversize materials.
- Wind blowing across the site surface and stockpiled materials

8.9.6 In addition to the above, significant amounts of dust may be generated during periods of dry weather and strong winds.

8.9.7 In order to minimise dust generation, the following control measures shall be implemented by the Contractor.

*Vehicle Movements*

8.9.8 Mud and debris on access and site haul roads shall be monitored on a daily basis by the Contractor and cleaned when required. During dry weather or periods of high traffic movements, the Contractor will ensure the roads are damped down using a water bowser.

8.9.9 A site speed limit of 10mph will be enforced for all vehicles and can be reduced in periods of dry weather and/or strong winds.

*Handling and Movement of Materials*

8.9.10 The Contractor shall carry out daily visual assessments of dust emissions across the site and decide whether remediation activities, such as movement of stockpiled soils, will be stopped due to excessive dust generation.

## 8.10 Contingency for Unknowns – Contamination 'Hotspot' Protocol

8.10.1 Should unanticipated ground conditions (e.g. hitherto unidentified Made Ground deposits or hydrocarbon hotspots) be encountered during the remediation works, all site works shall cease and the Contractor should immediately seek further advice from the Engineer.

8.10.2 Any unanticipated grossly hydrocarbon contaminated soil\fill should be excavated under full time supervision of the Engineer who will be equipped with a portable PID instrument to assist with delineation. All excavated material will be placed in temporary stockpiles on hardstand or visqueen, suitably covered and bunded.

8.10.3 Impacted soil\fill will be excavated by the Contractor and placed in temporary stockpiles on visqueen and suitably covered.

8.10.4 Excavations should not be left open for longer than is necessary and should be securely cordoned-off using 2m high Herras-type fencing, with appropriate warning signs whenever excavation works are suspended.

8.10.5 On completion of soil removal, the Contractor shall record the extent of the excavation by survey and await the Engineer's instruction to backfill the excavation.

8.10.6 Contaminated material demonstrated to be unsuitable for retention onsite (i.e. exceeds the GACs presented in Table 5.1 & 5.2) will be disposed offsite to an appropriately licensed facility.

## 8.11 Control of Water

8.11.1 If encountered, groundwater shall be controlled in accordance with CIRIA report 113 "Control of Groundwater for Temporary Works".

8.11.2 Arrangements should be made to prevent ponding in any excavation "hollows"; the Contractor shall ensure that ground levels are of sufficient gradient to enable the collection of surface water run-off in sumps or grips.

8.11.3 Pumping from over-excavated sumps may be required to maintain satisfactory working conditions.

8.11.4 Any potentially contaminated water shall not be allowed to escape to other areas until the results of the analysis are available and, if required, a suitable means of water treatment has been agreed.

8.11.5 Treated water shall then be tankered off-site or be discharged to sewer; subject to analytical results and local water treatment company consent.

## 8.12 Importation of Fill Materials

8.12.1 At the time of reporting IDG have not been provided with current detailed Engineering Design Drawings. However, it is anticipated that general fill material will be imported to achieve the proposed development ground levels.

8.12.2 All imported fill material should be of clean natural origin. Imported fill must be sampled at a frequency of 1:250m$^3$, with a minimum of six samples per source, and be subjected to a chemical analysis suite which encompasses the GAC's presented in Tables 5.1 & 5.2 to demonstrate its suitability for use on the proposed residential development.

8.12.3 Imported fill material will be placed across highways, driveways, plot footprints and garden and landscapes areas. The Contractor is to produce an Earthworks Strategy to demonstrate how the imported fill materials will be placed and compacted during the remediation works.

## 8.13 Offsite Disposal of Material (Export to Landfill)

8.13.1 Materials that are unsuitable for retention and re-use on site shall be placed in temporary stockpiles on polythene sheeting and be suitably covered to minimise the potential for dust\odour nuisance and prevent surface water run-off. Stockpiles of material should be exported from site as soon as practically possible.

8.13.2 Any material exported from site to landfill should be hauled by a registered waste carrier in accordance with the requirements of the Duty of Care Regulations, 1991 and the Landfill (England & Wales) Regulations 2002.

8.13.3 A waste consignment note should be completed, signed and retained by the parties involved. The transfer note should include the volume of waste, the nature of the material and a statement of its chemical composition, details of the source and destination sites, and details of the haulier.

8.13.4 In order to protect the general public from dust emissions, wagons that are to be used for the offsite disposal of materials must be sheeted. In addition, the Contractor must ensure that no fluids seep from the wagons.

8.13.5 The Contractor must provide the Engineer with copies of the waste consignment notes for any waste materials that are disposed off-site.

# 9 ENGINEERING SUPERVISION AND VERIFICATION PLAN

## 9.1 Engineer Responsibilities

9.1.1 Provided that the Contractor advises their intended programme of works in a timely fashion, the Geoenvironmental Engineer will ensure that the requirements of this Remediation Strategy are complied with.

9.1.2 Site works shall be supervised throughout by a suitably qualified Engineer. Supervision may be part-time for certain activities but must be full-time during the *topsoil stripping works, delineation and removal of anthropogenic material, replacement of Made Ground beneath hardstanding and shaft treatment works*.

9.1.3 The responsibilities of the Geoenvironmental Engineer shall include the following:

- Supervision of the remediation works outlined above.
- Advice on the correct handling of materials encountered.
- Retrieval of soil samples and the subsequent scheduling of appropriate laboratory analysis to enable verification of various aspects of the works, as required.
- Liaison with statutory authorities as required.

## 9.2 General Site Clearance

9.2.1 Photographic records of the site clearance should be taken by the Engineer for inclusion in the Verification Report and should include evidence of standoff areas for any trees that have a preservation order.

## 9.3 Topsoil Strip

9.3.1 Photographic records of the Topsoil strip and nature of the exposed subsoil to should be taken by the Engineer for inclusion in the Verification Report. These should demonstrate either absence of evidence for any previously unidentified Made Ground and any indication of previously unidentified mine entries.

9.3.2 The Engineer shall present stockpile survey and volumes provided by the contractor in the verification report.

9.3.3 It is anticipated that approximately 4,000m3 of topsoil is required for use in the 0.3m thick growing medium in garden and landscaped areas of the development. The Engineer is to sample any topsoil stockpile that is intended to be re-used on site as a growing medium. The sample frequency shall be 1:100m$^3$ with samples tested for an analysis suite that encompasses the GACs presented in Tables 5.1 and 5.2. However, calorific value and sulphate analysis can be omitted from the testing suite as these are not relevant GACs for a topsoil material.

9.3.4 Should the chemical analysis confirm the topsoil is suitable for re-use, the Engineer will inform the Contractor and, subject to good material management (i.e. no further material is placed on the stockpile), the topsoil will be considered suitable for use in the 0.3m thick growing medium.

9.3.5 Approximately 4,000m3 of topsoil is likely to be disposed offsite, the Contractor shall provide the Engineer with copies of the waste transfer notes relating to the off-site disposal of the topsoil for inclusion in the Verification Report.

## 9.4 Removal of Anthropogenic Material

9.4.1 The anthropogenic waste including metal pipe, rods wire and rubber hose encountered at TP755 is considered the likely source of leachable metal contamination and shall be removed at the start of remediation works.

9.4.2 The following steps shall be followed by the Engineer:

*Delineation & Excavation*

9.4.3 Removal of the unsuitable anthropogenic material will be undertaken to the satisfaction of the Engineer. The unsuitable anthropogenic material will be excavated and mechanically separated from any soil/made ground considered suitable for re-use to the satisfaction of the Engineer.

*Stockpiling*

9.4.4 Made Ground and anthropogenic waste shall be placed upon separate temporary stockpiles on visqueen. Made Ground will be tracked in and sealed by heavy plant. Photographic records of the anthropogenic material and Made ground stockpiles shall be taken by the Engineer for inclusion in the Verification Report.

*Anthropogenic Material Fate*

9.4.5 Offsite disposal with copies of the waste transfer notes provided by the Contractor for inclusion in the Verification Report.

## 9.5 Replacement of Made Ground beneath Hardstanding

9.5.1 Localised thin deposits of Made Ground in the northwest of the site contain leachable metals and shall be either disposed off-site or retained beneath hardstanding to minimise infiltration and potential further leaching.

9.5.2 Made Ground shall be excavated and separated from natural soils to minimise stockpile volumes to the satisfaction of the Engineer.

*Stockpiling*

9.5.3 Made Ground will be placed upon visqueen tracked in by heavy plant and sealed. Photographic records of the Made Ground stockpile shall be taken by the Engineer for inclusion in the Verification Report.

*Made Ground Fate*

9.5.4 The following two scenarios are considered acceptable for the fate of the excavated Made Ground:

- Offsite disposal with copies of the waste transfer notes provided by the Contractor for inclusion in the Verification Report.
- Made ground considered suitable for re-engineering as general fill shall be retained beneath hardstanding. The location of its placement shall be documented by the Engineer and shown on the Drawing presented in the Verification Report.

## 9.6 Treatment of Mineshaft

9.6.1 Coal Authority Mineshaft 297515-008 shall be treated in accordance with the specification provided by the Engineer and the method statement provided by the contractor.

*Verification*

9.6.2 The contractor will provide the Engineer with detailed records as required by the Specification.

9.6.3 The Engineer will provide an independent Shaft Treatment Verification Report for the approval of the Coal Authority.

## 9.7 Earthworks & Excavations

9.7.1 The Contractor will provide the Engineer with a survey detailing the depth and extent of all deep excavations (>2m bgl) undertaken during the remediation and preparatory works for inclusion in the Verification Report.

## 9.8 Dust Monitoring & Mitigation

9.8.1 The Contractor will provide the Engineer with copies of their dust monitoring records and photographic evidence of mitigation measures (if required) for inclusion in the Verification Report.

9.8.2 Screening to remove anthropogenic material and stockpiling of the Made Ground shall be supervised by the Engineer. The Engineer shall provide photographic evidence for inclusion in the Verification Report.

9.8.3 Contingency for Unknowns – Contamination 'Hotspot' Protocol

*Verification Requirements – Made Ground Hotspot Excavation*

9.8.4 Any unanticipated Made Ground encountered should be excavated under full time supervision of the Engineer. The Engineer will ensure that all excavated material will be placed in temporary stockpiles on hardstand or visqueen, suitably covered and bunded.

9.8.5 Following the removal of the Made Ground; the Engineer will inspect and sample the resultant excavation.

9.8.6 A minimum of 5 validation samples will be taken from the excavation sidewalls and base. In larger excavations, additional validation samples will be taken from the exposed excavation surfaces on a 10m grid. Validation samples shall be tested for GACs presented Tables 5.1 & 5.2.

9.8.7 The Engineer will instruct continued removal of impacted material and re-validate the resultant excavation should the initial validation samples record concentrations in excess of the GACs presented in Tables 5.1 & 5.2.

*Verification Requirements - Hydrocarbon Contamination Hotspot Excavation*

9.8.8 Any unanticipated grossly hydrocarbon contaminated soil\fill should be excavated under full time supervision of the Engineer who will be equipped with a portable PID instrument to assist with delineation. The Engineer will ensure that all excavated material will be placed in temporary stockpiles on hardstand or visqueen, suitably covered and bunded.

9.8.9 Following the removal of the hydrocarbon impacted material; the Engineer will inspect and sample the resultant excavation.

9.8.10 A minimum of 5 validation samples will be taken from the excavation sidewalls and base. In larger excavations, additional validation samples will be taken from the exposed excavation surfaces on a 10m grid. Validation samples shall be tested for GACs presented Tables 5.1 & 5.2.

9.8.11 The Engineer will instruct continued removal of impacted material and re-validate the resultant excavation should the initial validation samples record concentrations in excess of the GACs presented in Tables 5.1 & 5.2.

*Verification Requirements - Characterisation of Excavated Hotspot Arisings*

9.8.12 The Engineer will sample the hotspot arisings at a frequency of 1:250$m^3$, dispatch the sample(s) to a UKAS accredited laboratory where it will be scheduled for an appropriate range of determinands to characterise the contaminated material.

9.8.13 On identification of the nature of contaminated material the Engineer will liaise with the LPA's EHO to discuss/obtain approval for an appropriate course of action.

9.8.14 Hotspot arisings demonstrated to be unsuitable for retention onsite (i.e. exceeds the GACs presented in Tables 5.1 & 5.2) will be disposed offsite to an appropriately licensed facility.

9.8.15 Full details of the location and nature of the contamination hotspot accompanied with chemical test results and the fate of hotspot arisings, together with regulatory correspondence will be provided in the Verification Report.

## 9.9 Control of Water

9.9.1 Should any contaminated water be removed from site, either by tanker or discharge consent, the Contractor is to provide the Engineer with all relevant chemical analysis and documentation (i.e. waste consignment note if tankered offsite or a copy of the discharge consent is disposed to sewer) for inclusion in the Verification Report.

## 9.10 Importation of Fill Materials

9.10.1 All imported fill material must be sampled by the Engineer at a frequency of 1:250m3, with a minimum of six samples per source. Samples shall be subjected to a chemical analysis suite which encompasses the GACs presented in Tables 5.1 & 5.2 to demonstrate its suitability for use on the proposed residential development.

9.10.2 Full details of the source locations of the imported fill materials accompanied with chemical test results demonstrating its suitability for use on the residential development will be provided in the Verification Report.

## 9.11 Offsite Disposal of Material (Export to Landfill)

9.11.1 The chemical analysis presented in the site investigation reports is likely to be considered suitable for waste characterisation purposes.

9.11.2 However, for any unexpected contamination, waste soils shall be sampled at a frequency of 1:250m$^3$ and be submitted to a UKAS accredited laboratory for a schedule of chemical tests as directed by the Engineer to characterise the material for disposal. The chemical test results will be required to satisfy the "duty of care" obligations of the licenced waste carrier and receiving landfill.

9.11.3 The Contractor must provide the Engineer with copies of the waste consignment notes for any materials that are disposed off-site for inclusion in the Verification Report.

## 9.12 Verification Report

9.12.1 On satisfactory completion of all the contractor's preparatory and remediation works the Geoenvironmental Engineer will prepare a Verification Report. Copies of the Verification Report will be issued to the Client and the Local Authority. The Verification Report will stand as certification that the preparatory and remediation works have been carried out in accordance with this Remediation Strategy.

# 10 POST REMEDIATION WORKS

## 10.1 Placement of Topsoil (0.3m Thick Growing Medium)

10.1.1 Topsoil validated as being suitable for re-use in accordance with Section 8.3 shall be placed in garden and landscaped areas of the development.

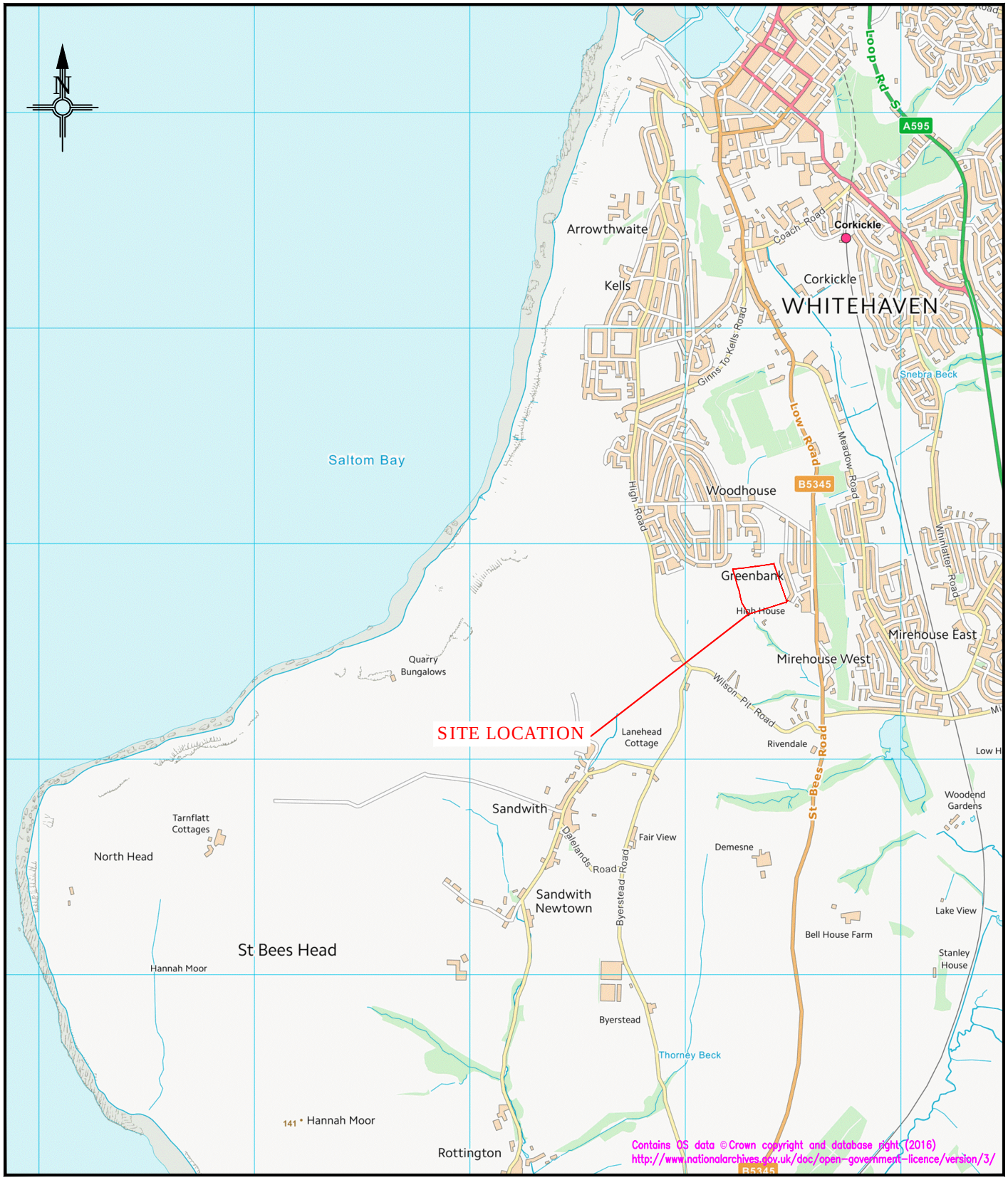
10.1.2 Formal verification of the thickness of placed topsoil is not required.

## 10.2 Verification of Ground Gas Protection Measures

10.2.1 The Engineer will provide independent Verification Reports in accordance with the Verification Plan approved by the Local Planning Authority and Building Control/NHBC.

10.2.2 The frequency of the Verification Reports will be set out in the Ground Gas Protection Measures Verification Plan prepared by the Engineer.

**APPENDIX A**

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| | |
|---|---|
| CLIENT | Story Homes |
| JOB TITLE | Phase 4, Edgehill Park, Whitehaven |
| DRAWING TITLE | Site Location Plan |

| DRAWN BY | SIGNATURE | DATE | STATUS |
|---|---|---|---|
| NW | | 5-10-20 | FINAL |

| APPROVED | SIGNATURE | DATE | SCALE | DRG No. |
|---|---|---|---|---|
| BRB | | 5-10-20 | 1:25,000@A4 | 4046-G-D038 |

A4 border: 186 x 218

## KEY

- Phase 4 Boundary
- PH1000 — IDG Probehole 2022
- PH900 — IDG Probehole 2021
- PH600 — IDG Probehole 2020
- TP750- — IDG Trial Pit 2021
- PH300 — IDG Probehole Dec 2016
- A-A' — Geological Cross Section (Drawing 4046-G-D054 Rev A)
- BGS Inferred Coal Outcrop
- IDG Inferred Un-Named Coal Outcrop
- 296515-001 — CA Recorded Mine Shaft

| Revision | Description | Date |
|---|---|---|
| F | Final PH1000 positions depicted. | 28-10-22 |
| E | Proposed PH1000 series depicted. | 19-12-21 |
| D | Geological Section A-A', B-B' & C-C' | 15-12-21 |
| C | Final Exploratory Hole Positions | 29-9-21 |
| B | Revised Proposed RH NO. & Positions | 5-7-21 |
| A | Supplementary Probeholes & Trial Pits | 6-6-20 |

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CLIENT: Story Homes

JOB TITLE: Phase 4 Edgehill Park, Whitehaven

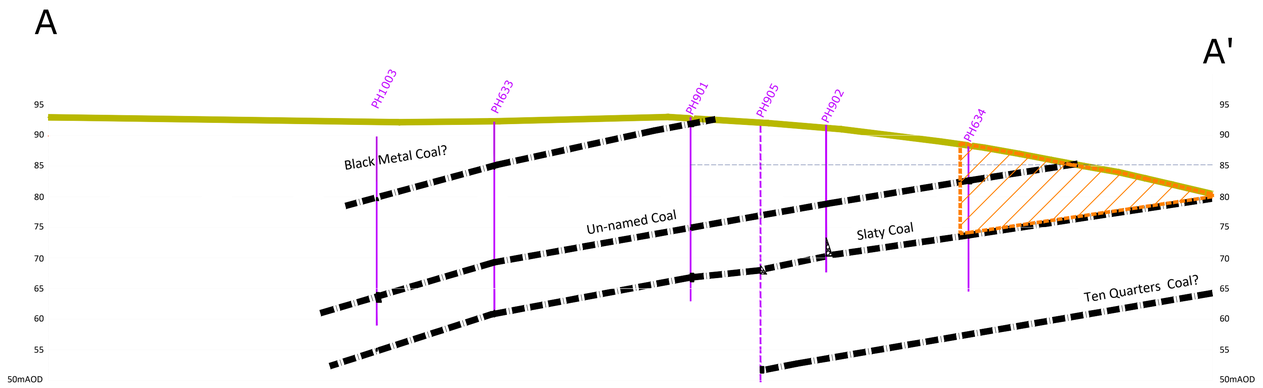
DRAWING TITLE: Exploratory Hole Location Plan

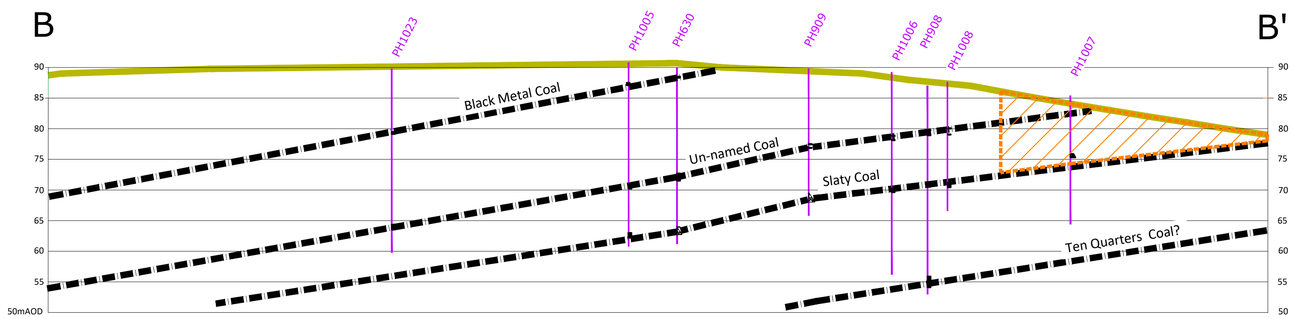
STATUS: FINAL

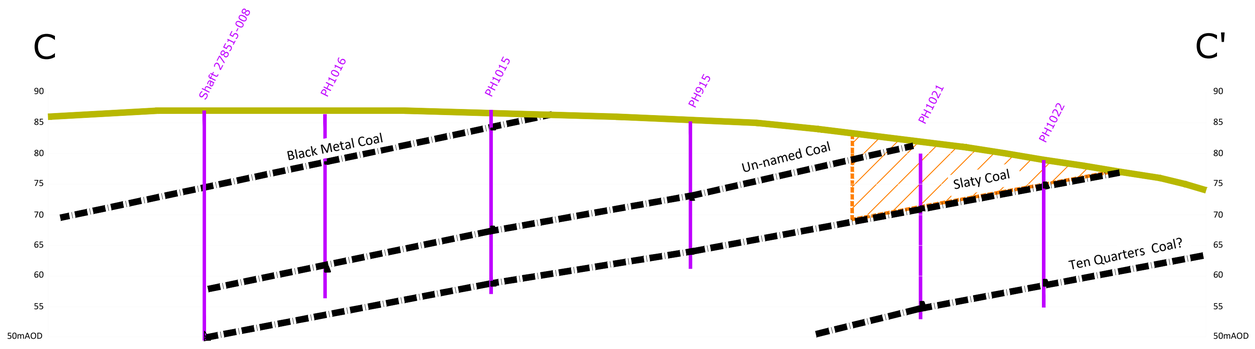
| DRAWN BY | SIGNATURE | DATE |
|---|---|---|
| NW | | 3-10-20 |
| APPROVED | SIGNATURE | DATE |
| BRB | | 5-10-20 |

| SCALE | DRG No. |
|---|---|
| 1:500@A1 | 4046-G-D040 |

A0 Border: 8.417 x 5.17




## KEY

- Inferred Coal Seam
- A-A' Line of Section (Drawing No. 4046-G-D040)
- PH6- IDG Probehole 2020
- PH9- IDG Probehole 2021
- PH10- IDG Probehole 2022
- Slaty Coal Seam Zone of Influence
- Probable Shallow Coal Workings

| Revision | Description | Date |
|---|---|---|
| A | Revised using PH1000 probeholes | 4-11-22 |

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CLIENT: Story Homes

JOB TITLE: Edgehill Park Phase 4

DRAWING TITLE: Geological Cross Sections

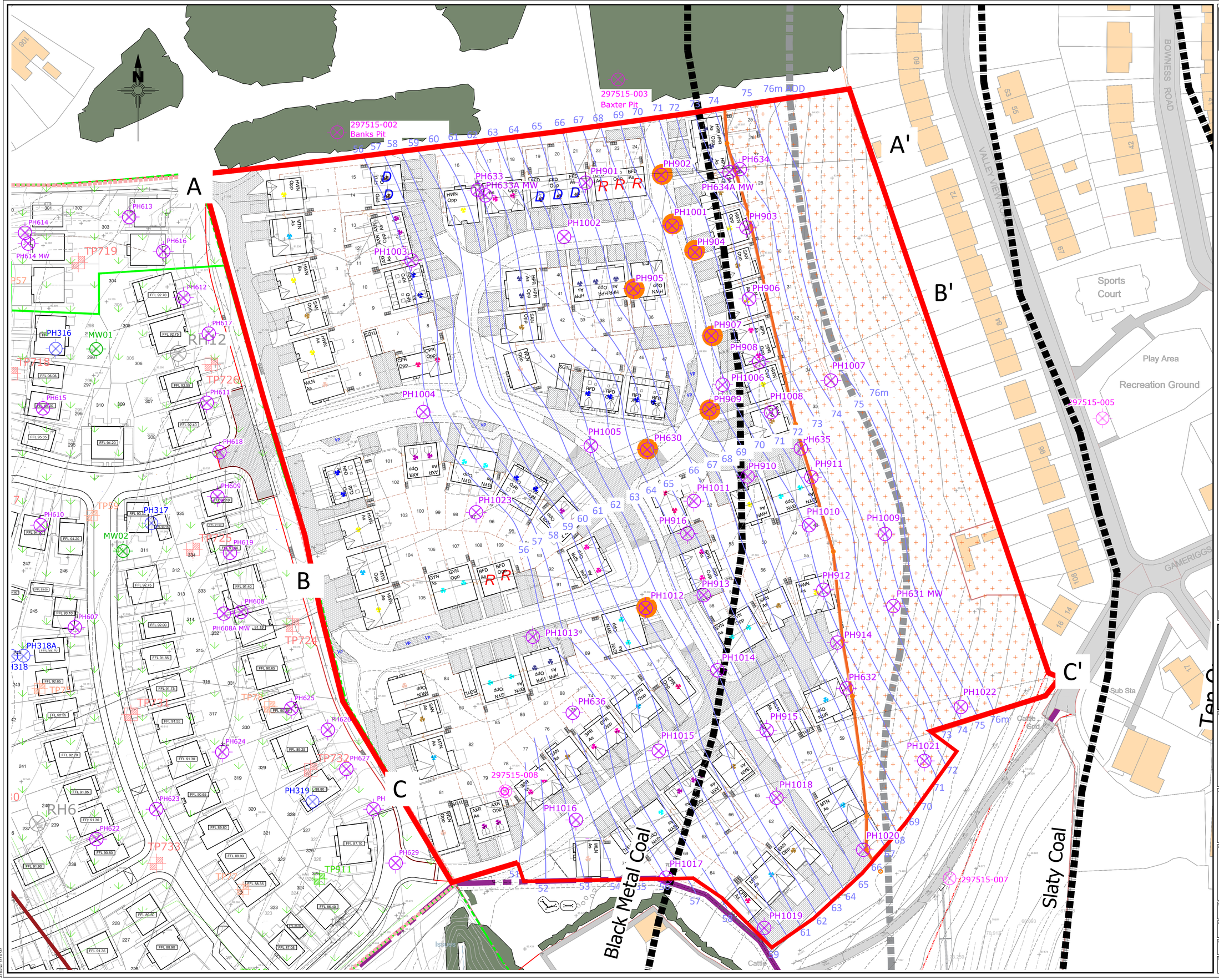
STATUS:

| DRAWN BY | SIGNATURE | DATE |
|---|---|---|
| NW | | 23-11-21 |

| APPROVED | SIGNATURE | DATE |
|---|---|---|
| BRB | | 14-12-21 |

| SCALE | DRG No. |
|---|---|
| 1:500@A1 | 4046-G-D054 |

A1 Border 617 X 617






KEY

- Phase 4 Boundary
- PH1000 — IDG Probehole 2022
- PH900 — IDG Probehole 2021
- PH600 — IDG Probehole 2020
- Evidence of Abandoned Workings
- 72 — Base of Coal Contour (m AOD)
- Shallow Coal Workings Surface Influence (i.e. 10x seam thickness)
- BGS Inferred Coal Outcrop
- IDG Inferred Un-Named Coal Outcrop
- 296515-001 — CA Recorded Mine Shaft

| Revision | Description | Date |
|---|---|---|
| D | Story Homes Layout 66D EHP4 Rev K shown | 15-6-22 |
| C | Final PH1000 & Mine Influence Area Positions | 14-6-22 |
| B | Anticipated Treatment Area Depicted | 17-5-22 |
| A | 66D Rev F Layout dated 3--5-22 | 6-5-22 |

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CLIENT: Story Homes

JOB TITLE: Phase 4 Edgehill Park, Whitehaven

DRAWING TITLE: Mining Influence Plan

STATUS: Final

| DRAWN BY | SIGNATURE | DATE |
|---|---|---|
| NW | | 26-10-21 |
| APPROVED | SIGNATURE | DATE |
| BRB | | 15-12-21 |

SCALE: 1:500@A1 — ORG No.: 4046-G-D055

A1 Border 617 X 617

## KEY

- Phase 4 Boundary
- Surface Within 25m of Slaty Coal Seam
- 25m Radius of Former Mine Shaft
- CS2 Gas Protection Measures Required (subject to final site levels)
- 296515-001 — CA Recorded Mine Shaft
- 72 — Slaty Seam Structure Contours (m AOD)

| Revision | Description | Date |
|---|---|---|
| A | 25m offsite shaft radius edited | 15-11-22 |

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CLIENT

Story Homes

JOB TITLE

Phase 4 Edgehill Park, Whitehaven

DRAWING TITLE

Characteristic Situation 2 Ground Gas protection Measures

| STATUS | | |
|---|---|---|
| FINAL | | |
| DRAWN BY: NW | SIGNATURE | DATE: 4-11-22 |
| APPROVED: BRB | SIGNATURE | DATE: 4-11-22 |
| SCALE: 1:500@A1 | DRG No.: 4046-G-D076 | |

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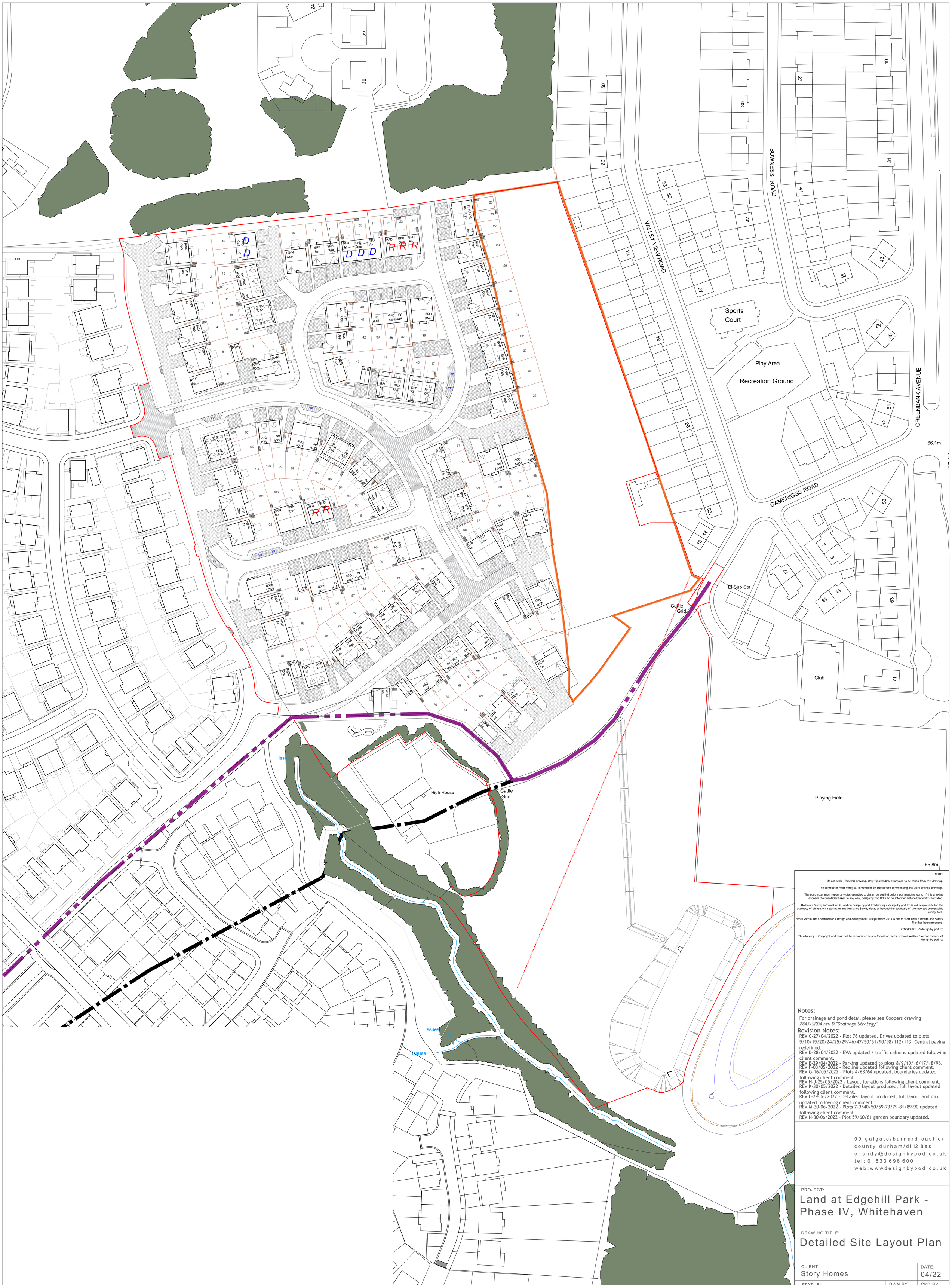


NOTES

Do not scale from this drawing. Only figured dimensions are to be taken from this drawing.

The contractor must verify all dimensions on site before commencing any work or shop drawings.

The contractor must report any discrepancies to design by pod ltd before commencing work. If this drawing exceeds the quantities taken in any way, design by pod ltd is to be informed before the work is initiated.

Ordnance Survey information is used on design by pod ltd drawings. design by pod ltd is not responsible for the accuracy of dimensions relating to any Ordnance Survey data, or beyond the boundary of the inserted topographic survey data.

Work within The Construction ( Design and Management ) Regulations 2015 is not to start until a Health and Safety Plan has been produced.



## Notes:

For drainage and pond detail please see Coopers drawing *7843/SK04 rev D "Drainage Strategy"*

## Revision Notes:

REV C-27/04/2022 - Plot 76 updated, Drives updated to plots 9/10/19/20/24/25/29/46/47/50/51/90/98/112/113. Central paving redefined.
REV D-28/04/2022 - EVA updated / traffic calming updated following client comment.
REV E-29/04/2022 - Parking updated to plots 8/9/10/16/17/18/96.
REV F-03/05/2022 - Redline updated following client comment.
REV G-16/05/2022 - Plots 4/63/64 updated, boundaries updated following client comment.
REV H-J-25/05/2022 - Layout iterations following client comment.
REV K-30/05/2022 - Detailed layout produced, full layout updated following client comment.
REV L-29-06/2022 - Detailed layout produced, full layout and mix updated following client comment.
REV M-30-06/2022 - Plots 7-9/40/50/59-73/79-81/89-90 updated following client comment.
REV N-30-06/2022 - Plot 59/60/61 garden boundary updated.

99 galgate/barnard castle/
county durham/dl12 8es
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PROJECT:
# Land at Edgehill Park - Phase IV, Whitehaven

DRAWING TITLE:
# Detailed Site Layout Plan

| CLIENT: | | DATE: |
|---|---|---|
| Story Homes | | 04/22 |
| STATUS: PLANNING | DWN BY: JG | CKD BY: AD |
| SCALE: 1:500 | SHEET SIZE: A0 | REVISION: N |
| PROJECT NO: 66D-STO | DRAWING NO: 100 | |

**APPENDIX B**

iD GeoEnvironmental Limited

**Head Office**
Caledonian House, Tatton Street,
Knutsford, Cheshire, WA16 6AG
t: 01565 755557
www.id-geo.co.uk

Our Ref: 4046-G-L027

Date: 9th November 2022

Mr Matt Davis
Story Homes
Story House
Lords Way
Kingmoor Business Park
Carlisle
CA6 4SL

Dear Mr Davis,

**Environment Agency Correspondence Reference NO/2022/114699/01-L01 in Respect of 109 Dwelling Houses & Associated Infrastructure. Land to the West Pit Road/High Road, Whitehaven**

We have reviewed the above Environment Agency consultation received by Copeland Borough Council and are pleased to present our comments below. A copy of the EA correspondence is provided in Appendix A to this letter.

***Condition***
We acknowledge the Agency's comments with respect to the Remediation Strategy provided separately; The Remediation Strategy will provided a revised conceptual model incorporating an updated assessment of risks to controlled waters. Further comment is provided below.

***Further Detailed Comments***
We acknowledge that the report does not identify a pollutant linkage and that Table 3.1 does not include any mention of a potential pathway to controlled waters. However, an assessment of the risks to Controlled Waters Receptors was provided in detail within the "Preliminary Geoenvironmental Investigation & Coal Mining Risk Assessment" Report reference 4046-G-015, dated October 2020. The report stated (Section 6, Controlled Waters Receptors preceding Table 3.1);

- The underlying rocks are classified as Secondary A aquifer. However, the site does not lie within a Source Protection Zone and there are no (known) sources of leachable contamination on the site surface.
- The nearest surface watercourse is an unnamed spring, which is indicated to issue 19m southwest of the site and to flow in a southerly direction. It is reasonable to assume that the spring is fed by groundwater present beneath the site and adjacent land. In the absence of a leachable source of contamination and of any abstractions associated with either groundwater or the spring, the risk of contamination is considered negligible.
- Based on the above, the site's environmental setting has been assessed as low sensitivity.

Section 9.2.8 of report 4046-G-R024 provided a brief discussion of the significance of leachable copper, lead, nickel & zinc detected in thin deposits of between 0.3m and 0.9m of Made Ground at TP753 & TP755. We did not provide further detailed discussion of risks to controlled waters within Report 4046-G-R024 as, despite detection of leachable metals, we did not consider the risk to be significant for the reasons discussed below, although on reflection more detailed discussion should have been presented within the report to reflect the ground investigation findings given the contradiction with the preliminary conceptual site model.

Made Ground was only proven in a total of 4 trial pits (TP750,TP752, TP753 & TP755) located in the northwest corner of the Phase 4 site where there was evidence of historical surface excavation (assumed to be clay extraction). The Made Ground generally comprised sandy gravelly clay and cobbly gravelly sand interpreted to be re-worked Glacial and weathered mudstone bedrock, with varying frequency of anthropogenic material (typically brick & concrete gravel and cobbles), although metal rods, pipe & wire and rubber tubing were locally noted at TP755. In the absence of other sources, it is likely that the metal objects in TP755 represent the source of the leachable zinc. It should be noted that any coarse or unsuitable anthropogenic material (metal pipes, wire and tubing) will be removed and disposed as waste during site preparatory works, which is likely to remove the leachable zinc source.

The stone-lined surface water drain which discharges southwest of the siteis not associated with a groundwater spring/issue as stated in the PCM. As stated in the report "post investigation it was established that a surface water course which issued into a ravine southwest of the site is associated with an historical surface water drain and not a groundwater issue". Investigations undertaken by Story Homes during 2021 identified the stone-lined drain terminated at the edge of a former clay excavation site within the boundary of the adjacent Phase 3 development, which we note to be proximal to TP755 and the observed metal rods, pipe and tubing. The adjacent clay excavation site was re-instated during 2020-21 using natural clay and mudstone sourced from within the Phase 3 site. It is anticipated that the Made Ground at TP755 will be similarly removed and site development levels restored using natural material sourced from adjacent Phase 3 (see Definition of Waste below).

As an aside, it should be noted that it is not uncommon to detect slightly elevated concentrations of metals within natural Glacial deposits, particularly deposits containing a high frequency of volcanic rock such as those deposits in the vicinity of the Lake District Borrowdale Volcanic group. The BGS soil chemical studies (National Soil Inventory) show that the natural soil within Cumbria and in particular within the Western Lakes statistically contain some of the highest background concentrations of copper, lead, nickel and zinc detectable across the UK).

However, we also note that while BGS UK Soil Observer (UKSO) metal concentrations are significantly elevated in the vicinity of Whitehaven, the BGS Regional Geochemistry of the Lake District and Adjacent Areas 1992, considers elevated zinc concentrations detected in stream sediments in the vicinity of the "Cumbria Coalfield are more likely to be attributable to historical industrial pollution". In the context of regional elevated background concentrations, the concentrations of copper lead and nickel are not considered significant.

In summary,

- Thin deposits of Made Ground locally identified in the northwest of the Phase 4 site contained concentrations, of leachable zinc which are significant. However, the extent and volume of Made Ground are limited and therefore the source of the potentially leachable metals is not significant. It is likely that the leachable zinc concentrations originate in metal pipe and tubing detected in TP755. This material will be removed and disposed as waste during site preparatory works. A specific requirement for this action will be included within the Remediation Strategy.

- Construction of hardstanding and positive surface water drainage implemented as part of the development will significantly reduce infiltration and further mitigate any leaching potential and represent a significant improvement over existing conditions.

***Definition of Waste***

A MMP has already been drafted which allows for import to Phase 4 of 13,679m$^3$ of material excavated from the adjacent Phase 3 to make up site levels. However, we understand that Story Homes are revising site levels and that this volume is likely to reduce. A copy of the Draft MMP is presented in Appendix B.

Further details (confirmation of final site levels, Planning Permission, contractors etc.), are awaited to finalise the MMP prior to submission for QP Declaration.

All materials imported to Phase 4 will be chemically assessed to establish suitability for re-use and that they do not represent a risk to the environment and controlled waters.

We trust that that the above clarifications are appropriate. Please do not hesitate to contact us if you have any questions.

Yours sincerely,

**Nick Ward BSc (Hons), FGS**
**for and on behalf of**
**iD GEOENVIRONMENTAL LIMITED**

Appendix A: Environment Agency Correspondence 2022/114699/01-L01
Appendix B: Draft MMP dated 14th September 2022

**APPENDIX A**

| | | |
|---|---|---|
| | **Our ref:** | NO/2022/114699/01-L01 |
| Copeland Borough Council | **Your ref:** | 4/22/2332/0F1 |
| Development Control | | |
| The Copeland Centre Catherine Street | **Date:** | 24 August 2022 |
| Whitehaven | | |
| Cumbria | | |
| CA28 7SJ | | |

Dear Sir/Madam

**109 DWELLING HOUSES AND ASSOCIATED INFRASTRUCTURE INCLUDING LANDSCAPING, OPEN SPACE, ACCESS, HIGHWAY AND DRAINAGE.**
**LAND TO THE WEST OF VALLEY VIEW ROAD, WHITEHAVEN**

Thank you for consulting us on the above application.
Our comments are the same as our response to the preceding preparatory groundworks application 4/22/2217/0F1 (our ref NO/2022/114475 dated 8 June 2022).

We have reviewed the following report:

- Geoenvironmental Appraisal Ref 4046-G-R024 prepared by iD GeoEnvironmental Ltd, dated December 2021.

**Environment Agency position**
The previous use of the proposed development site presents a high risk of contamination that could be mobilised during construction to pollute controlled waters. Controlled waters are particularly sensitive in this location because the proposed development site is located upon a Highly Vulnerable Secondary A aquifer

The application demonstrates that it will be possible to manage the risks posed to controlled waters by this development. Further detailed information will however be required before built development is undertaken. We believe that it would place an unreasonable burden on the developer to ask for more detailed information prior to the granting of planning permission but respect that this is a decision for the local planning authority.

In light of the above, the proposed development will be acceptable if a planning condition is included requiring the submission of a remediation strategy. This should be carried out by a competent person in line with paragraph 183 of the National Planning Policy Framework.

Without this condition we would object to the proposal in line with paragraph 174 of the National Planning Policy Framework because it cannot be guaranteed that the development will not be put at unacceptable risk from, or be adversely affected by, unacceptable levels of water pollution.

**Condition**
No development approved by this planning permission shall commence until a remediation strategy to deal with the risks associated with contamination of the site in respect of the development hereby permitted, has been submitted to, and approved in writing by, the local planning authority. This strategy will include the following components:

1. A preliminary risk assessment 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

2. A site investigation scheme, based on (1) to provide information for a detailed assessment of the risk to all receptors that may be affected, including those off-site.

3. The results of the site investigation and the detailed risk assessment referred to in (2) 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.

4. A verification plan providing details of the data that will be collected in order to demonstrate that the works set out in the remediation strategy in (3) are complete and identifying any requirements for longer-term monitoring of pollutant linkages, maintenance and arrangements for contingency action.

Any changes to these components require the written consent of the local planning authority. The scheme shall be implemented as approved.

**Reasons**
To ensure that the development does not contribute to, and is not put at unacceptable risk from or adversely affected by, unacceptable levels of water pollution in line with paragraph 174 of the National Planning Policy Framework.

**Further detailed comments**
The conclusions from the report suggest there is no pollutant linkage to the groundwater or surface water from metals contamination in the made ground, Table 3.1 does not include any mention of potential pathway to controlled Waters.
However, leaching tests outline exceedance of thresholds for copper, lead and zinc in cohesive and granular made ground.
Further to on-site investigations, it has been demonstrated that a surface water drain is discharging into a ravine. However the report concludes there is no risk to groundwater, and Table 9.1 revises the conceptual site model and again does not include Controlled Waters.
Further explanation of the potential detriment to water quality from the risk assessment to Controlled Waters is required for both groundwater and surface water . There are clearly soluble components of tin in the made ground that either require treatment or

Cont/d..

more detailed risk assessments as per the Environment Agency guidance “Remedial Target Methodology - tiered assessments for Controlled Waters”.

**Informative – Definition of waste**
The management, use and re-use of material on this site should follow the CL:AIRE Definition of Waste Code of Practice (DoW CoP) which enables the re-use of excavated materials on-site or their movement between sites. Use of the DoW CoP supports the sustainable and cost effective development of land and can provide an alternative to Environmental Permits or Waste Exemptions.

It is recognised that further testing will be required before any earthworks under the DoW CoP is accepted. The remediation strategy should review risks for relocating materials to ensure contaminants present do not cause harm or environmental issues as per a materials management plan. A contingency plan for non-compliant materials should be established and agreed with the Planning Authority.

If the material cannot be demonstrated to be suitable for re-use on site, or if the developer wishes to import inert *wastes* to make up the levels, then an environmental permit (Deposit for Recovery permit) will be required. In addition, should any treatment of the stockpiled material be required in order to make it suitable for use, then that treatment will require an environmental permit.

Yours faithfully

**Mrs Liz Locke**
**Sustainable Places Officer**

e-mail clplanning@environment-agency.gov.uk

End

**APPENDIX B**

**Phase 3A** **Deficit/Surplus= + 6549**

| MM Reference | Description of MM | Cut Volume ($m^3$) | Stockpile Reference ($m^3$)* | Placement Location ($m^3$) | Surplus Volume ($m^3$) | Balance ($m^3$) |
|---|---|---|---|---|---|---|
| MM1 | Foundation & Civils Arisings | 2500 | SP301 | Phase 4 | 2500 | |
| | | | | | | |
| SP7 | Spoil: Foundation and Civils Arisings | 2634 | | Phase 4 Subject to EA agreement | 2634 | |
| SP09 | Subsoil/General Fill (natural brown very gravelly cobbly clay with occasional anthropogenic material derived from recent construction activities) | 1415 | | Phase 4 Subject to EA agreement | 1415 | |
| | | | | | | |
| | | **6549** | | | **6549** | **0** |

**Phase 4** Total Area 43,431
Development Area (m2) estimated 35,838 **Deficit/Surplus= - -31980**

| MM Reference | Description of MM | Cut Volume ($m^3$) | Stockpile Reference ($m^3$)* | Placement Location ($m^3$) | Fill Volume ($m^3$) | Surplus Volume ($m^3$) | Balance ($m^3$) |
|---|---|---|---|---|---|---|---|
| MM1 | Topsoil Strip | 13,029 | SP401 | Phase 4 Gardens and Landscaping | 4301 | | |
| | | | SP402 | Placement 0.15m thk on batter slope | 1139 | | |
| | Surplus Topsoil | | SP403 | Disposal off site | | 7590 | |
| MM2 | Civils Arisings (surface & foul sewers, private drainage) = natural clay | 3980 | | Placement in civils "low" as constuction proceeds | 3980 | | |
| MM3 | Foundation Arisings (30m3 per plot) = natural clay | 3150 | | Placement in civils "low" as constuction proceeds | 3150 | | |
| Import SP7 | Spoil: Foundation and Civils Arisings | 2634 | | Import to Phase 4 Subject to EA agreement | 2634 | | |
| Import SP09 | Subsoil/General Fill | 1415 | | Import Phase 4 Subject to EA agreement | 1415 | | |
| Import 1 | | | | | | | |
| Import 2 | | | | | | | |
| Import 3 | | | | | | | |
| Import 4 | | | | | | | |
| | | **24208** | | | **11179** | | -20801 |

**APPENDIX C**

# IDG Protocol for Soil Cover Validation
# Residential with Consumption of Homegrown Produce

## Introduction

Isolation of Made Ground material beneath a cover of "clean" subsoil and topsoil in residential gardens is often recommended where Made Ground is to be left in-situ; most notably when it contains some inorganic and organic contaminants at concentrations above guidance threshold values.

A cover is only required in residential gardens underlain by Made Ground. The soil cover breaks direct contact pollutant linkages between the contaminants in the Made Ground and future residents.

The Local Authority's Environmental Health Department and the NHBC (or other warranty providers) generally require as a condition of planning a validation report be submitted to confirm the thickness and chemical suitability of the cover soils placed in residential garden areas. Validation reports are normally prepared by independent geoenvironmental consultants such as ID Geoenvironmental Limited.

Soil cover validation requires independent assessment of;

- Confirmation of the chemical/physical suitability of the cover soil (i.e. topsoil and subsoil).
- Verification of the thickness of the placed cover soils.

## Sources of Cover Soils

*Site Won Materials*

It is often possible to "win" suitable subsoil and/or topsoil materials from a development site. However, in order to ensure that materials are suitable for use, and remain suitable for use during the development process, careful assessment, segregation and handling of the soil will be required.

Natural clay or sand excavated during site remediation works or during development (such as during the excavation of service trenches or foundations) can often be suitable for use as a subsoil. Topsoil can sometimes be won from landscaped areas of the site during the remediation and preparatory works stages of the development.

Site won materials should be subject to the same validation requirements as for imported materials.

*Imported Cover Soils*

Imported cover soils can be derived from three different sources;

- Greenfield
- Brownfield
- Recycling Centre

IDG advocates the sampling of cover soils after importation to site. Where soil is sampled at source, additional confirmatory testing may be required following import to site.

### *Inspection and Sampling of cover soil following import to site by IDG*

In most cases, soil is delivered to site prior to sampling and chemical testing. Such soils should be stockpiled in a secure location on site and IDG should be contacted to arrange for visual inspection, sampling and chemical testing. Once the stockpile has been sampled no further material should be added to the stockpile. It is strongly recommended that soils should not be placed in gardens, prior to confirmation of the suitability of the soil by IDG. This normally takes two weeks from initial notification.

**Soil Suitability**

*Physical Suitability*

Suitable soil material should:

- Principally comprise natural materials.
- Be clean and free of foreign debris, building waste materials or contaminants.
- Not have a stone content of greater than 20% by visual estimation.
- Have a maximum stone size of 150mm in any one direction.
- Not have been sourced from an area within 7m laterally, or 3m vertically, of Japanese Knotweed plants, and not contain any Japanese Knotweed fragments (rhizomes, leaves, stems etc).

*Chemical Suitability*

A summary of recommended sampling frequencies and chemical analysis suites for varying sources of cover soils is presented in Table 1 overleaf. In addition further analysis may be required depending on the historical land uses of the sites the cover soils are derived from.

IDG will inspect soil chemical test results provided by the soil supplier or in certain circumstances visit and sample the source location. On receipt of written confirmation from IDG, the Client should instruct his Contractor to commence importation. It is recommended that each imported batch of soil be placed in separate stockpiles whilst chemical test results are awaited.

On importation to site, IDG should inspect the stockpiled material and the Contractor should provide the Client with appropriate haulage notes detailing the source and volume of material imported.

The number of samples to be tested and the chemical analysis suite undertaken will be dependent on the nature of the source and the quantity of material to be imported. Both the testing ratios and chemical analysis suites presented in Table 1 should be agreed with the Local Authority (EHO) before testing is undertaken.

A less frequent sampling rate may be appropriate where large volumes (say >2,000$m^3$) of soil are imported from a single, relatively homogenous greenfield source.

The Client\Contractor will be notified of the soil's suitability (or otherwise) immediately following receipt of the results (typically taking 7 working days). Chemical assessment criteria for cover soils are presented in Tables 2 and 3 below.

Chemical testing to determine the relative concentrations of determinands present should be supplemented by total organic carbon analysis (TOC). It is widely accepted that soil organic matter contains 58% carbon. Therefore the soil organic matter (SOM) content may be derived by means of the following equation:

$$SOM = TOC / 0.58$$

The appropriate screening criteria presented in Tables 2 and 3 should be relative to the average SOM of the proposed cover soils.

# IDG Protocol for Soil Cover Validation
# Residential with Consumption of Homegrown Produce

| | Table 1 – Sampling Frequency and Chemical Analysis Suites Summary Table | | | | |
|---|---|---|---|---|---|
| | **Nature of Source Material** | **Sampled** | **Sampling Frequency** | **Minimum Testing Suite** | **Sampling Requirements** |
| **Site Won Material** | Greenfield | On site | 1:100m³ - Topsoil | pH, metals, speciated PAH, Total Organic Carbon & Asbestos Screen | Minimum of 3 samples to be tested from each designated stockpile.<br>No further material to be added to the stockpile once it has been sampled. |
| | | | 1:250m³ - Subsoil | | |
| | Brownfield | | 1:50m³ - Topsoil | pH, metals, speciated PAH, TPHCWG, BTEX, Total Organic Carbon & Asbestos Screen. Additional analysis may be required based on the history of the donor site | Minimum of 6 samples to be tested from each designated stockpile.<br>No further material to be added to the stockpile once it has been sampled. |
| | | | 1:100m³ - Subsoil | | |
| **Imported Cover Soils** | Greenfield | At source | 1:100m³ - Topsoil | pH, metals, speciated PAH, Total Organic Carbon & Asbestos Screen | Two sampling methodolgies can be used;<br>• Sampling from stockpile. Minimum of 3 samples to be tested from each designated stockpile. No further material to be added to the stockpile once it has been sampled.<br>• In-situ sampling of cover soils on a grid pattern across a designated area of the site. An adequate number of samples should be taken to satisfy the sampling frequency. |
| | | | 1:250m³ - Subsoil | | |
| | | Following delivery to site | 1:100m³ - Topsoil | pH, metals, speciated PAH, Total Organic Carbon & Asbestos Screen | Minimum of 3 samples to be tested from each imported batch of stockpiled material.<br>No further material to be added to the stockpile once it has been sampled. |
| | | | 1:250m³ - Subsoil | | |
| | Brownfield | At source | 1:50m³ - Topsoil | pH, metals, speciated PAH, TPHCWG, BTEX, Total Organic Carbon & Asbestos Screen. Additional analysis may be required based on the history of the donor site | Minimum of 6 samples to be tested from each designated stockpile.<br>No further material to be added to the stockpile once it has been sampled. |
| | | | 1:100m³ - Subsoil | | |
| | | Following delivery to site | 1:50m³ - Topsoil | pH, metals, speciated PAH, TPHCWG, BTEX, Total Organic Carbon & Asbestos Screen. Additional analysis may be required based on the history of the donor site | Minimum of 6 samples to be tested from each imported batch of stockpiled material.<br>No further material to be added to the stockpile once it has been sampled. |
| | | | 1:100m³ - Subsoil | | |
| | Recycling Centre | At recycling centre | 1:50m³ – Topsoil & Subsoil | pH, metals, speciated PAH, TPHCWG, BTEX, cyanide, phenols, Total Organic Carbon & Asbestos Screen | Minimum of 6 samples to be tested from each designated stockpile.<br>No further material to be added to the stockpile once it has been sampled. |
| | | Following delivery to site | 1:50m³ – Topsoil & Subsoil | pH, metals, speciated PAH, TPHCWG, BTEX, cyanide, phenols, Total Organic Carbon & Asbestos Screen | Minimum of 6 samples to be tested from each imported batch of stockpiled material.<br>No further material to be added to the stockpile once it has been sampled. |

*Hard to Excavate Layers*

Cover layers can often include a "difficult to dig" or capillary break layer of coarse natural or recycled aggregate. Where this aggregate is sourced from recycled materials (such as crushed demolition arisings) asbestos screening tests should also be undertaken.

**Table 2 - Common Inorganic Determinands**

| Contaminant | Assessment Concentration (mg/kg) | | | Source |
|---|---|---|---|---|
| | % Soil Organic Matter | | | |
| | 1% | 2.5% | 6% | |
| pH | >6 to <8 | | | Initial assessment only |
| Arsenic | 37 | | | S4UL LQM/CIEH 2015 |
| Cadmium | 11 | | | S4UL LQM/CIEH 2015 |
| Chromium | 910 | | | S4UL LQM/CIEH 2015 value for Chromium III |
| | 6 | | | S4UL LQM/CIEH 2015 value for Chromium VI |
| Copper | 2,400 | | | S4UL LQM/CIEH 2015 |
| Lead | 200 | | | SP1010: Development of C4SLs for Assessment of Land Affected by Contamination-Policy Companion Document, December 2014. |
| Mercury | 40 | | | S4UL LQM/CIEH 2015 |
| Nickel | 130 | | | S4UL LQM/CIEH Revised Aug 2015 |
| Selenium | 250 | | | S4UL LQM/CIEH 2015 |
| Zinc | 3,700 | | | S4UL LQM/CIEH 2015 |
| Asbestos | Not Detected | | | UKAS accredited asbestos screen |

## Table 3 - Common Organic Determinands

| Contaminant | Assessment Concentration (mg/kg) | | | Source |
|---|---|---|---|---|
| | % Soil Organic Matter | | | |
| | 1% | 2.5% | 6% | |
| Benzene | 0.21 | 0.23 | 0.49 | IDG Assessment criteria based on S4UL parameters and C4SL exposures for residential with homegrown produce **without indoor inhalation pathway** |
| Toluene | 280 | 337 | 770 | |
| Ethyl Benzene | 200 | 253 | 580 | |
| Xylenes (p-xylene) | 360 | 454 | 1000 | |
| **Benzo(a)pyrene (as surrogate marker) | 1.6 | 1.95 | 2.14 | |
| Acenaphthene | 222 | 528 | 1,150 | |
| Acenaphthylene | 180 | 431 | 954 | |
| Anthracene | 2,390 | 5,440 | 10,900 | |
| Benz(a)anthracene | 9.15 | 12.3 | 14.3 | |
| Benzo(a)pyrene | 2.25 | 2.74 | 3.00 | |
| Benzo(b)fluoranthene | 2.63 | 3.33 | 3.71 | |
| Benzo(g,h,i)perylene | 318 | 340 | 349 | |
| Benzo(k)fluoranthene | 78 | 93 | 101 | |

| Contaminant | Assessment Concentration (mg/kg) | | | Source |
|---|---|---|---|---|
| | % Soil Organic Matter | | | |
| | 1% | 2.5% | 6% | |
| Chrysene | 15.3 | 22.3 | 27.1 | |
| Dibenzo(a,h)anthracene | 0.25 | 0.29 | 0.31 | |
| Fluoranthene | 286 | 561 | 898 | |
| Fluorene | 173 | 409 | 880 | |
| Indeno(1,2,3-cd)pyrene | 27.7 | 36.4 | 41.4 | |
| Naphthalene | 27 | 64.4 | 147 | |
| Phenanthrene | 97 | 221 | 442 | |
| Pyrene | 622 | 1,250 | 2,040 | |
| GRO $C_5$-$C_6$ | 90* | 180* | 380* | IDG Assessment criteria based on S4UL parameters and C4SL exposures for residential with homegrown produce **without indoor inhalation pathway** |
| GRO $C_6$-$C_8$ | 150* | 340* | 770* | |
| GRO $C_8$-$C_{10}$ | 58 | 130 | 300 | |
| DRO $C_{10}$-$C_{12}$ | 83 | 190 | 420 | |
| DRO $C_{12}$-$C_{16}$ | 150 | 330 | 670 | |
| DRO $C_{16}$-$C_{21}$ | 270 | 550 | 940 | |
| LRO $C_{21}$-$C_{35}$ | 1,100 | 1500 | 1,700 | |
| Phenol | 152 | 278 | 535 | |

* BTEX compounds must also be assessed with Aromatic C5-C7, Aromatic C7-C8, GRO C5-C6 and TPH C6-C8 bandings
**Benzo(a)pyrene assessed as surrogate marker for genotoxic PAH. Oral HCV based on minimal risk value (CLAIRE 2014, Appendix E Table 2.2) $ID_{Oral}$ of 0.021 ug/kgBW/day compared to oral, dermal and inhalation exposures and $ID_{Inhal}$ og 0.0003 ug/kgBW/day compared to inhalation exposure.

### Placed Thickness Validation

Thickness can only be checked after placement, but should be done before turfing, fencing etc. Thickness will be checked via the excavation of an appropriate number of inspection trial pits. Typically one trial pit for every two gardens will be required.

The thickness of cover is dependent on the nature and degree of contamination (and often the Local Authority whose area the site lies within), but typically between 600mm and 1,000mm is required. Where underlying materials do not contain contaminants above critical concentrations but contains materials generally considered undesirable as a near-surface material in garden areas (i.e. construction rubble) then a 300mm thick cover, in accordance with NHBC Standards, Chapter 9.2, should be adequate.

Soil cover is usually placed many weeks after completion of the preparatory\remedial works, and issue of the associated Verification Report. Consequently, site visits, to generate supplementary letter reports, are typically required after soil cover has been placed in the gardens of each plot, or set of plots.

### Issue of Soil Cover Validation Reports

Validation reports will be issued by IDG following the confirmation of the placed thickness within each plot, or set of plots. Each report will contain the following information;

- Details of the provenance of the subsoil and topsoil.
- Chemical test data.
- An interpretation of the chemical data indicating whether the soils are suitable for use in a clean cover layer.
- Photographs of the excavated trial pits confirming the thickness of placed soils.
- A data table indicating the thickness of cover soils within each trial pit excavated.

Soil Cover Validation Reports will be issued to the Client, Local Authority and to the NHBC by email.