Remediation Strategy

Land at Wakefield Road, Smithies, Barnsley

For Gleeson Developments Ltd

Report no: 5249/2

Date: January 2025

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REMEDIATION STRATEGY
for land at
WAKEFIELD ROAD, SMITHIES, BARNSLEY

1 INTRODUCTION

1.1 The commission and brief

1.1.1 Lithos Consulting Limited has been commissioned by Gleeson Developments Ltd to prepare a Remediation Strategy for land off Wakefield Road, Smithies, Barnsley.

1.1.2 The following reports have already been produced by third parties:

- Coal Mining Risk Assessment (Ref. 17176-RLE-17-00-RP-O-002) issued by Rodgers Leask Environmental (RLE) in May 2017 to Harworth Estates Ltd.
- Phase 2 Geo-Environmental Report (Ref. 17176-RLE-17-00-RP-O-003, Rev. A) issued by RLE in January 2018 to Harworth Estates Ltd.
- Technical Note – Coal Mining Investigation (Ref. 17176-RLE-19-XX-RP-O-004, Rev. P01) issued by RLE in November 2019 to Harworth Estates Ltd.
- Technical Note – Contamination and Remediation Summary (Ref. 17176-RLE-19-XX-RP-O-005, Rev. P01) issued by RLE in November 2019 to Harworth Estates Ltd.
- Technical Note – Foundations and Earthworks (Ref. 17176-RLE-19-XX-RP-O-006, Rev. P01) issued by RLE in November 2019 to Harworth Estates Ltd.
- Technical Note – Remedial works to northwest area (Ref. 17176-RLE-19-XX-RP-O-007, Rev. P02) issued by RLE in August 2020 to Harworth Estates Ltd.
- Technical Note – Drill and Grout Areas (Ref. 17176-RLE-19-XX-RP-O-008, Rev. P01) issued by RLE in August 2021 to Harworth Estates Ltd.

1.1.3 The appointed Remediation Contractor will need to familiarise themselves with the above Reports and comply with all relevant recommendations contained therein.

1.1.4 This Remediation Strategy includes reference to third party drawings. The appointed Remediation Contractor will need to ensure that they are provided with any subsequent revisions of these drawings immediately prior to commencement of the works

1.1.5 This document outlines the remediation objectives necessary to protect environmental receptors and render the site suitable for the proposed development. A Method Statement should be prepared in order to detail how the objectives will be achieved.

1.1.6 The Method Statement should be accompanied by a Designer's Risk Assessment in accordance with the CDM Regulations, 2015. The Method Statement and Risk Assessment should be submitted to and approved by the Engineer or Gleeson's Site Manager.

1.2 The proposed development

1.2.1 The proposed residential development comprises 216 plots with associated roads and infrastructure, as shown on Drawing 5249/2 presented in Appendix A.

1.2.2 It is understood that significant earthworks regrade is required to facilitate development levels and consequently, where possible, Gleeson are proposing to place footings in engineered fill.

1.2.3 Access to the development will be from Wakefield Road to the east of the site.

1.2.4 The Local Planning Authority (Barnsley Council) has granted outline planning permission for redevelopment of this site (Ref. 2017/1451) on the 25th June 2019. The following Conditions associated with remediation were imposed on the Decision Notice:

- **Condition 6:** *No development shall take place until a detailed remediation and restoration scheme, including any contamination or land requiring remediation to the previous use of any part of the site in connection with coal mining, to bring the site to a condition suitable for the intended use by removing unacceptable risks to human health, buildings and other property and the natural and historical environment has been submitted to and approved in writing by the Local Authority. The above scheme must include all works to be undertaken, proposed remediation objectives and remediation criteria, an appraisal of remedial options, and proposal of the preferred option(s), and a timetable of works and site management procedures. The scheme must ensure that the site will not qualify as contaminated land under Part 2A of the Environmental Protection Act 1990 in relation to the intended use of the land after remediation. Development shall not commence until the measures approved in the scheme have been implemented/ or the development shall not be implemented, otherwise than in compliance with the requirements of the approved scheme which shall be implemented in accordance with the approved timetable of works. On the completion of measures identified in the approved remediation scheme, a Validation Report (that demonstrates the effectiveness of the remediation carried out) must be submitted to the Local Authority.*

1.2.5 Condition 6 essentially requires the following:

- Remediation Strategy
- Earthworks Specification
- Drilling & Grouting Specification (shallow coal mining & mine entry treatment)
- Remediation Validation Report

1.2.6 This report has been prepared to support the requirements of Condition 6, however, further reports will be required to fully satisfy/discharge the Condition.

1.2.7 Condition 12 related to coal mining risk assessment and investigation which was discharged under planning application Ref. 2021/0718.

2 BACKGROUND

2.1 Site description

2.1.1 Site details are summarised below.

Detail	Remarks
Location	2.5 km north of Barnsley city centre
NGR	SE 347 087
Area	7.7 ha
Known live services	Overhead electric

2.1.2 The site location is shown on Drawing 5249/1 in Appendix A.

2.1.3 A full site description is provided in the Phase 2 Geo-Environmental Report by RLE.

2.2 Ground investigation

2.2.1 The following ground investigations have been conducted at the site:

- **RLE (July 2017):** To investigate shallow ground conditions and to target areas of interest identified within the preliminary CSM. Exploratory holes comprised 23 trial pits (TPs 1 to 16, 5A, 6A, 8A & 8B, 10A, 13A & 16A; 5 trial trenches (TTs 1 to 5) and 18 mini-boreholes (WSs 1 to 18).
- **RLE (November 2017):** To delineate coal tar contamination encountered in the initial investigation and to obtain additional topsoil samples. Exploratory holes comprised 13 trial pits (TPs 101 to 113) and 30 hand dug pits (TS101 to 130).
- **RLE (September & October 2019):** To investigate shallow mine workings and mine entries. Exploratory holes comprised 104 rotary boreholes with 30 no. drilled for shallow workings and 74 no. drilled to investigate 6 of the 9 mine entries (2 shafts & 4 adits, with one of the adits originating off site to the west, dipping towards the east beneath the site).
- **RLE/Sirius (May & June 2021):** To provide further site wide data with respect to shallow workings previously identified and enable design of drilling and grouting remediation works. Exploratory holes comprised 35 rotary boreholes (R100 to 133).

2.2.2 All exploratory hole locations are shown on Drawing 5249/6 included in Appendix A.

Made Ground

2.2.3 Made Ground was broadly divided into the following types:

- **Made Ground Topsoil:** Encountered in 39 holes across the site to between 0.2m and 0.7m (average 0.3m) depth comprising dark brown ashy clayey sandy topsoil with gravels of brick, coal, sandstone and ceramic and fragments of metal, glass, tarmac & wood in occasional locations.
- **Granular Made Ground:** Encountered in 25 holes across the site to between 0.5m and >2.6m (average 1.4m) depth comprising black/grey and brown ashy clayey Gravel of brick, mudstone and sandstone.
- **Cohesive Made Ground:** Encountered in 24 holes across the site to between 0.6m and 2.1m (average 1.1m) as black/grey and brown Clays with gravel of coal, clinker, brick, shale, sandstone and mudstone. Also encountered as stiff reddish orange and dark brown Clays with gravels of brick, red shale, mudstone and sandstone.
- **Reworked Natural Ground:** Encountered in 6 holes in the east of the site to between 0.7m and 1.8m (average 1.2m) depth comprising orangish brown, yellow and grey clayey Sands and sandy Clays with gravel and cobbles of sandstone, mudstone, coal and rare brick.

2.2.4 The spatial distribution of the made ground is shown on the RLE Drawing 17176-RLE-19-XX-DR-0-004, Rev. A included in Appendix A

Obstructions

2.2.5 Historical plans and previous reports show that buildings have been present across the northern part of the site as identified in Drawing 5249/3, which shows the footprints of the former structures and areas of hardstand.

2.2.6 Whilst trial trenches/pits were excavated by RLE in the northern area (previously occupied by a colliery and more recently an engineering works) they did not specifically target the former buildings in the far north of the site. The Contractor should therefore anticipate relict foundations in this part of the site.

2.2.7 RLE's trial pit (TP113) in the north of the site encountered a concrete obstruction at 1.6m bgl.

Natural ground

2.2.8 Natural ground comprised the following:

- **Topsoil:** Encountered in 12 holes to around 0.3m depth generally in the south of the site comprising dark brown clayey Topsoil material.
- **Cohesive Residual Soil:** Encountered in 46 holes across the site to between 0.7m and >4.5m (average 2.3m) depth comprising orangish brown and grey Clays with gravel of mudstone and siltstone.
- **Granular Residual Soil:** Encountered in 8 holes across the site to between 0.4m and >3.0m depth comprising clayey, sandy Gravel of mudstone and siltstone.
- **Weathered Coal:** Encountered in 7 holes advanced at or very near to outcrop comprising black clayey Gravel of coal.
- **Coal Measures Bedrock:** Encountered in 27 holes from between 0.7m and 4.5m depth comprising extremely weak to very weak grey Mudstones, yellowish grey Siltstones and yellowish brown Sandstones.

Groundwater

2.2.9 Perched groundwater strikes were encountered in 7 holes between 1.8m and 4.0m depth and similar levels were recorded in the gas monitoring wells (between 1.5m & 4.1m depth).

2.2.10 There are no potable groundwater abstractions within 2 km of the site boundary.

2.2.11 The site is not located within a groundwater Source Protection Zone (SPZ).

2.2.12 Groundwater (underlying aquifer) is likely to be at significant depth within the Coal Measures geology and will be protected from overlying low permeability soils and strata.

Surface water

2.2.13 A pond (in the south) and open drainage ditches are present within the site boundary. The River Dearne lies approximately 0.7km to the south of the site.

Shallow mine workings

2.2.14 Based on the RLE's Coal Mining Risk Assessment (CMRA) and investigations in 2019 and 2021 respectively, the following sequence is present beneath the site:

Seam name(s)	Approximate thickness (m)	Approximate depth below Two Foot (m)	Approximate thickness (m) proved by drilling	Remarks
Two Foot	0.56 to 0.63	-	0.1 to 1.0	No workings identified in BHs
Abdy (Winter)	1.22 to 1.42	~16	0.1 to 1.2	Workings identified in the north of site
Top Beamshaw	1.21 to 1.84	~30	0.2 to 1.3	No workings identified in BHs
Low Beamshaw	0.52 to 0.64	~37	0.5 to 1.0	Workings identified in the south
Kent's Thin	0.29 to 0.76	~56	0.3 to 1.0	

2.2.15 Shallow workings have been identified within the Abdy (Winter) seam in the north of site with possible workings in the northeast, and within the Low Beamshaw in the south of site. At this stage, these seams will require treatment via drilling and grouting where the thickness of competent bedrock cover is <10 times seam thickness in accordance with CIRIA C758D.

2.2.16 Additionally, whilst no workings were encountered in the Two Foot and Top Beamshaw, these seams outcrop on the site and are present at depths that could have been worked by bell pitting. Furthermore, evidence of bell pitting within the Abdy seam is tentatively attributed to the RLE descriptions in TP15 & RBH19 and TP08A which encountered the Abdy seam and Two Foot seam respectively at shallow depth, overlain by made ground.

2.2.17 The further delineation and treatment of shallow mine workings will be detailed in a Drilling & Grouting Specification to be provided under separate cover by Lithos.

Mine entries

2.2.18 The Mining Remediation Authority[1] indicate records of 8 mine entries within, or within 20m of, the site boundary, five of which are shown to be on site. The recorded locations of these shafts are indicated on Drawing 5249/3A, and details for each are summarised below:

Mine entry reference	Feature type	Source of data	Location	Remarks
434408-010	Shaft	BGS Plans CA Mining Report	Offsite	
434408-001	Shaft	CA Mining Report	Offsite	
434408-021	Adit	CA Mining Report	Offsite	Trending towards the site
434408-006	Shaft	BGS Plans CA Mining Report	Offsite	
434408-018	Adit	CA Mining Report	Onsite	Trending towards the site Evidence of linear area of voids/backfilled ground during the ground investigations by RLE
434408-022	Adit	BGS Plans CA Mining Report	Onsite	
434408-017	Adit	CA Mining Report	Onsite	
434408-007	Shaft	CA Mining Report	Onsite	Evidence of soft backfill to >10.5m depth was encountered during the RLE ground investigations
434408-023	Shaft	CA Mining Report	Onsite	Not located

2.2.19 A further plan by RLE of the mine entry investigations is included as Drawing Ref. 17176-RLE-19-XX-DR-0-008 in Appendix A.

2.2.20 The further delineation and treatment of mine entries will be detailed in the Drilling & Grouting Specification.

Hazardous gas

2.2.21 RLE indicated the site could be at risk from hazardous gas due to mine shafts and mineworkings and possibly made ground depending on the coal and ash (organic) content. Consequently, 10 monitoring wells were installed across the site and 6 monitoring visits were undertaken between the 1st August 2017 and the 14th December 2017.

2.2.22 Maximum steady concentrations of methane and carbon dioxide were 0.1% and 14.6% respectively. No significant flows were recorded.

2.2.23 RLE provisionally classified the site as requiring Amber 1 gas protection measures (NHBC traffic light system) and recommended basic radon protection measures for all new dwellings at the site.

[1] *On 28th November 2024, the Coal Authority changed their name to the Mining Remediation Authority.*

Contamination

2.2.24 **Topsoil:** The topsoil was divided into 4 areas:

- Made Ground Topsoil 1A (north) – No significant contaminants of concern but not suitable for reuse due to poor quality & anthropogenic content.
- Made Ground Topsoil 1B (former track in southwest & around TP10) – Elevated concentrations of arsenic, lead and PAHs therefore not suitable for reuse.
- Made Ground Topsoil 1C – No significant contaminants of concern and underlying made ground is essentially reworked natural soils and therefore suitable for reuse.
- Natural Topsoil 6 – No significant contaminants of concern and therefore suitable for reuse.

2.2.25 The topsoil areas are shown on RLE Drawing 17176-RLE-19-XX-DR-0-005 included in Appendix A.

2.2.26 **Made Ground:** Elevated concentrations of arsenic, PAHs and TPH were encountered within the made ground across the site.

2.2.27 **Coal Tar Area:** Visual and olfactory evidence of hydrocarbon contamination was observed within TT03 to 05. Aliphatic and aromatic TPHs were recorded in 2 samples from TT04 & 05 with elevated concentrations of speciated PAH and VOCs/SVOCs recorded in TT05 which correspond to the visual and olfactory evidence of hydrocarbon contamination (free product) identified in the investigation. RLE delineated the plume (TPs 101 to 111 excavated adjacent to TT05) and estimated there was c. 1,100m^3 of coal tar impacted material. The approximate extent of the area is show on RLE Drawing Ref: 17176-RLE-19-XX-DR-0-011 (included in Appendix A) and was tentatively attributed to adit ref: 434408-017. Further investigation (TPs 112 & 113) in the vicinity of TT04 (elevated TPH concentration) did not identify visual or olfactory evidence of contamination.

Combustibility

2.2.28 Four calorific value (CV) tests were undertaken on samples obtained from weathered coal with CV results between 14MJ/kg and 24MJ/kg. It was recommended that outcropping coal seams be removed from beneath plots and within 1m from the surface of proposed garden and landscaped areas.

2.2.29 No significant deposits of Ash & Clinker were encountered by RLE during the ground investigations.

Soluble sulphate and pH

2.2.30 RLE recommended a concrete classification of DS-4 AC-5 for the site based on the total potential sulphate results.

Conceptual Site Model (CSM)

2.2.31 Assessment of the site investigation data enabled formulation of an initial conceptual model by RLE, which is presented as Appendix E of their Phase 2 Geo-Environmental Report (Ref. 17176-RLE-17-00-RP-O-003, Rev. A).

2.2.32 Based on review of the additional technical notes by RLE the following CSM is presented by Lithos:

Receptors	Pathways	Contaminant source	Remediation options
Human health (Future residents) ◊	Consumption of contaminated vegetables Ingestion Inhalation (dust and/or vapours) outdoors Dermal contact	Metals, PAHs in the made ground Coal tar impacted material (c. 1,100m^3)	Placement of 600mm clean soil cover in garden and 450mm in landscaped areas in areas of residual made ground/ contaminated Made Ground Topsoil post earthworks[2] Treatment or removal of 'free product' coal tar impacted material.
	Migration & accumulation of explosive gas	Ground gases & hydrocarbons in the made ground	CS2 gas protection measures should be assumed subject to potential additional monitoring post earthworks. Subject to review of following remediation/validation works of the coal tar impacted area upgrade gas membrane to vapour (hydrocarbon) membrane in plots within the remediated coal tar impacted area as a precautionary measure.
	Infiltration of water supply pipes	Hydrocarbons in the coal tar impacted area Potential for BTEX, halogenated aliphatics & aromatics, Phenol, CN, Sulphate, Sulphide & Chloride in the made ground	Treatment or removal of 'free product' coal tar impacted material Water Company likely to require "Protectaline" pipework in north of the site.
Buildings	Migration & accumulation of explosive gas	Methane in the made ground	CS2 gas protection measures should be assumed subject to potential additional monitoring post earthworks.
	Contact with outcropping coal seam	Potentially combustible coal seam.	Where foundations are likely to intersect with outcropping coal seams the coal should be removed from beneath plots and within 1m from the surface of proposed garden and landscaped areas.
	Contact with "aggressive" soil and/or groundwater	Sulphate in the made ground	Design Sulphate Class DS-4' ACEC Classification of AC-5 for sub-surface concrete. This will be subject to potential further testing and assessment post earthworks.
Plants	Uptake of phytotoxic elements	Cu, Ni, Zn & B in the made ground	Placement of clean soil cover in garden and landscaped areas where residual made ground remains
Perched Groundwater	Migration of leachable components of the made ground and/or infiltration of hydrocarbons from the coal tar impacted area	Coal tar impacted material (c. 1,100m^3) Metals, PAHs in the made ground	Treatment or removal of 'free product' coal tar impacted material.

[2] *Dependent on the earthworks/remediation works this may include a high visibility marker layer or hard to dig layer at the base.*

Receptors	Pathways	Contaminant source	Remediation options
Deeper Groundwater (Aquifer)	Migration of leachable components of the made ground and/or infiltration of hydrocarbons from the coal tar impacted area	Coal tar impacted material (c. 1,100m^3) Metals, PAHs in the made ground	Treatment or removal of 'free product' coal tar impacted material In conjunction with the above due to likely aquifer being at significant depth and the protection afforded by the overlying low permeability strata further residual risks do not warrant further assessment/ remedial action.
Surface Waters – On Site	Migration of leachable components of the made ground and/or infiltration of hydrocarbons from the coal tar impacted area Surface water run-off		Surface Water Management Plan, inclusive of surface water grips etc. On site open drainage ditches to be contained/culverted in line with the sites drainage strategy SUDS pond to be lined.
River Dearne	Impacted perched groundwater		Treatment or removal of 'free product' coal tar impacted material Removal, sealing-off or diversion of all former (redundant) site drainage.

◊ 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.

3 RISK ASSESSMENT & TARGET CONCENTRATIONS

3.1 Clean-up criteria at this site are not driven by risks to controlled waters, therefore in the absence of a site-specific Quantitative Risk Assessment, it is conservatively proposed that Lithos' generic soil screening values for a residential-with-gardens end use (assuming gardens with 600mm clean soil cover) be adopted as remedial targets for hydrocarbon contamination in soils on this site.

3.2 These screening values are based on an inhalation pathway. However, some contaminants reach residual saturation before a vapour risk is predicted to occur by the QRA model. Lithos recognise that it is unacceptable to leave free product in the ground where redevelopment of a site is proposed. Consequently, this Remediation Strategy advocates the removal/ treatment of soils that contain significant free product at all depths. This includes the identified coal tar impacted area.

3.3 In this context, significant free product is readily identifiable by the naked eye, and pervasive throughout the soil mass, probably with noticeable seepages. Traces of free product in fissures or localised, cobble-sized pockets would not normally be considered significant.

3.4 Information on the derivation and use of these screening values is presented in Appendix B (Scenario B).

4 EARTHWORKS LEVELS, REGRADE & ANTICIPATED FOUNDATIONS

4.1 It is understood that significant earthworks regrade is required to facilitate development levels and consequently, Gleeson are proposing to found footings in engineered fill.

4.2 Raft foundations (or reinforced strips/grillage) may provide a suitable foundation solution if the full thickness of made ground is subject to turnover (excavation, screening/sorting and replacement in engineered layers, with compaction). Fill would need to be compacted to an End Product Specification in accordance with NHBC Chapter 4.6 to achieve >95% of the maximum dry density (4.5kg rammer) and less than 5% air voids.

4.3 If it is intended to construct low-rise buildings which derive direct support from engineered fill, an Earthworks Specification document will be required and this would include definition of fill types and requirements for acceptability & testing, compaction trials, control testing and monitoring of fill performance. The Earthworks Specification would need to be prepared in accordance with NHBC Chapter 4.6 on Engineered Fill.

4.4 For plots in areas of entire cut RLE considered the natural weathered Coal Measures to have an allowable bearing pressure of 125kN/m2 and therefore traditional strip/trench fill foundations from a minimum depth of 900mm would be suitable for the proposed new dwellings.

4.5 Alternative foundations (piles) were recommended for foundations >2.5mbgl in areas of significant tree influence and deep made ground and/or fill.

4.6 Revision of the foundation solutions outlined above is likely to be necessary on completion of the site preparatory and remediation earthworks, especially where deeper excavation is necessary to remove relict obstructions.

4.7 Final site levels should then be issued by the Engineering Designer, via an External Works Drawing, which should show:

- Proposed finished floor levels
- Proposed finished road levels
- Garden & driveway levels and gradients

5 REMEDIATION STRATEGY (GENERAL)

5.1 Aims

5.1.1 Remediation aims are to:

- Resolve contamination issues in order to protect environmental receptors, and render the site suitable for the proposed development
- Provide a stable development platform (to agreed levels and gradients) for subsequent construction of the proposed development and associated infrastructure
- Satisfy requirements of the Local Planning Authority and warranty provider

5.2 Overview

5.2.1 The following remediation works are required:

- General site clearance of surface materials and vegetation
- Topsoil and subsoil strip (including segregation and separate stockpiling of soil types)
- Inspection of exposed natural strata for mine entries (including shafts, adits and bell pits)
- Turnover (excavation, screening/sorting and replacement in engineered layers, with compaction) of the full thickness of made ground to enable:
    - Removal of identified coal tar contamination; with subsequent treatment and/or off-site disposal
    - Removal of other identified unexpected, localised fuel/oil contamination; with subsequent treatment and/or off-site disposal
    - Removal of below ground obstructions
    - Preparation of the ground for highway construction
    - Excavation and removal of localised visual/olfactory evidence of contamination
- Backfill of all resultant excavations, with appropriate compaction
- Creation of "clean corridors" for subsequent placement of sewers in the northern area.
- Removal of hydrocarbon coal tar impacted soils/free product, or subject consultation with a remediation contractor by ex-situ on-site bioremediation or stabilisation, for subsequent re-use on site
- Regrade of site to levels specified by Gleeson (approximately 600mm below final "soft" end use areas and 750mm below proposed slab levels)
- Excavation of made ground beneath proposed adoptable road footprints and controlled re-engineering of selected materials in layers to approximately 600mm below final road levels
- Removal of unexpected underground tanks
- Location and treatment of mining related features i.e. shafts, adits and bell pits
- Drilling & grouting of shallow mine workings
- Provision of gas protection measures in plots (subject to confirmation of CS2 classification from the proposed post earthworks monitoring) and vapour (hydrocarbon) membranes in plots in the remediated coal tar impacted area
- Provision of a cover layer of 'clean' soils in all garden and landscaped areas where residual made ground, contaminated Made Ground Topsoil or combustible coal remains post earthworks.

5.3 Site set-up, organisation and safety

5.3.1 Site cabins and welfare facilities are to be established at a location to be agreed with the Engineer or Gleeson's Site Manager. All welfare facilities must be established in accordance with the relevant health & safety statutory requirements. Provision should be provided on site for car parking for all site employees

5.3.2 All site personnel should undergo a site-specific health and safety induction prior to commencement of work on site.

5.3.3 The Engineer or Gleeson's Site Manager should be informed prior to any proposed entry of a confined space or deep excavation. Entry must be restricted to suitably qualified and equipped personnel.

5.3.4 Access into excavations etc. must be controlled and undertaken in accordance with the CDM Regulations 2015, most notably Regulation 22, to mitigate risk of collapse or asphyxiation.

5.3.5 During the remediation works, all personnel on site will comply with guidance provided in the Health and Safety Executive (HSE) document "Protection of Workers and the General Public during the Redevelopment of Contaminated Land". In summary, the following should be provided:

- Protective clothing, footwear and gloves. (Personnel should be instructed in why and how they are to be used)
- Hand-washing and boot-washing facilities
- Designated smoking areas

5.3.6 If at any time during the works personnel begin to feel unwell, they are to inform the Engineer or Gleeson's Site Manager, who will determine appropriate action.

5.3.7 All visitors to site must enter and register at the main Site Office.

5.4 Contractor's responsibilities

5.4.1 Prior to the commencement of any works the Contractor, in agreement with the Engineer or Gleeson's Site Manager, should:

- Comply with any requirements of Gleeson's contract documentation
- 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/dust/odour control, and protected trees
- Liaise with the Local Water Company regarding any proposed discharge to sewer
- Complete a full services search and liaise with all relevant utility companies regarding work in close proximity to their apparatus
- Prepare a detailed Method Statement outlining how the objectives of this Remediation Strategy will be achieved (and obtain approvals)
- Inform the Engineer or Gleeson's Site Manager of any risk, identified and assessed, which could impact upon the Engineer's or Gleeson's Site Manager activities
- Prepare the necessary COSHH statements and Health & Safety Plan in accordance with CDM regulations

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

5.4.3 The Contractor should 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.
- Adequate controls for risks associated with the overhead power lines are in place.

- Good practices relating to personal hygiene are adopted.
- Suitable precautions are implemented at all times to prevent off-site migration of contaminants via airborne dust and vapours.
- 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 should comply with the requirements of Pollution Prevention Guideline PPG2. A spill kit should be kept on site, adjacent to the designated refuelling area. (Lithos are aware that some of the EA PPG documents have been withdrawn from the gov.uk website. However, whilst some references to UK legislation and guidance are now outdated; the PPGs still set out key principles and provide a useful, concise overview).

5.5 Materials Management Plan

5.5.1 This project will involve the re-use of both natural and made ground soils on site and the import of natural soils from another development site(s). Therefore, the Contractor should consider the need to prepare a Materials Management Plan (MMP) in accordance with the CL:AIRE Code of Practice (v2, March 2011).

5.5.2 The MMP will document how all of the materials to be excavated during the proposed site preparatory and remediation earthworks are to be dealt with. In summary the MMP should provide:

- Details of the parties that will be involved with the implementation of the MMP
- A description of the materials in terms of potential use and relative quantities of each category
- The specification for use of materials against which proposed materials will be assessed, underpinned by an appropriate risk assessment related to the place where they are to be used
- Details of where and, if appropriate, how these materials will be stored
- Details of the intended final destination and use of these materials
- Details of how these materials are to be tracked
- Contingency arrangements that must be put in place prior to movement of these materials
- Verification Plan

5.5.3 The MMP should include consideration of the following factors:

- Any risks posed by the excavated materials to both human health and the environment
- Suitability for use
- Certainty of use
- Anticipated quantities of materials

5.5.4 The MMP should also detail how materials will be tracked throughout the earthworks in order that the subsequent Verification Report can provide an auditable trail. The tracking system must include:

- Annotated plans of the site(s) identifying different excavation areas, stockpile locations, treatment areas (if applicable) and placement locations
- Inspection procedures
- Registered waste carrier and non-waste haulier
- Tracking form / control sheets
- Treatment results (if applicable)
- Delivery tickets for non-waste materials (if moving from one site to another)
- Acceptance procedures for non-waste materials

5.5.5 Finally, the MMP will have to set out a Verification Plan that identifies how the placement of materials is to be recorded and the quantities of material to be used. It will contain a statement on how the use of the materials relate to the remediation or design objectives.

5.5.6 Once completed, the MMP will need to be reviewed by a Qualified Person (QP), who will submit an online Declaration to CL:AIRE and send a copy to Gleeson.

5.6 Engineering supervision and verification

5.6.1 Site works should be supervised throughout by a suitably qualified Geoenvironmental Engineer, who will report to a Project Manager. Supervision may be part-time for certain activities but must be full-time/appropriately competent independent party during the removal of any grossly contaminated soil/fill and any placement of fill to an engineering specification.

5.6.2 The Engineer or Gleeson's Site Manager will ensure that the requirements of this Remediation Strategy are complied with in a safe and orderly manner.

5.6.3 The responsibilities of the Engineer or Gleeson's Site Manager should include, but not be limited to, the following:

- Ensuring that all site personnel are suitably qualified and given an appropriate induction at the beginning of their first day
- Supervision of the remediation and ground preparatory works
- Provision of advice on the correct handling of materials and conditions encountered
- Provision of guidance on the appropriate protective clothing and safety equipment that is to be made available and used
- Ensuring that personal hygiene arrangements are adequate
- Retrieval of soil and water samples and the subsequent scheduling of appropriate laboratory analysis to enable verification of various aspects of the works, and to advise the Project Manager of progress
- Liaison with statutory authorities as required

5.6.4 The Engineer will maintain records of the works to include the following:

- Daily record sheets to include a summary of the day's activities
- Date and weather conditions
- Plant, personnel and visitors present
- Aspects relating to Health and Safety, Environmental Control, or non-compliance with either this Remediation Strategy or the Contractor's Method Statement
- Site surveys as necessary to record the locations of demolition, excavation and filling activity
- Test results

5.6.5 On satisfactory completion of all the works the Engineer will prepare a Verification Report, in accordance with the Environment Agency's online guidance "Land Contamination Risk Management" which replaced CLR11 in October 2020. Copies of the Verification Report will be issued to the local planning authority, warranty provider and Gleeson.

5.6.6 The Verification Report will stand as certification that the remediation and ground preparatory works have been carried out in accordance with this Remediation Strategy.

5.6.7 The Verification Report will include:

- A summary of the preparatory & remediation works undertaken, including any works associated with unforeseen ground conditions
- Verification test results associated with "coal tar impacted area" treatment, including plans showing sample locations & levels, and the extent of any excavations. Photographs should also be included
- Verification test results associated with "hot-spot" treatment, including plans showing sample locations & levels, and the extent of any "hot-spot" excavations
- Details of the fate of any arisings excavated from "hot-spot(s)"
- Verification test results associated with proposed source materials for clean cover
- Copies of any correspondence with Regulators relating to specific aspects of the remediation works
- Reference to the MMP and associated tracking system, including alterations made and why.
- Treatment records (if undertaken)
- Reference to waste transfer documentation, including return loads (if applicable)
- Record of quantity of materials used
- A receipted copy of the Qualified Person's Declaration

5.6.8 The Verification Report will also provide recommendations with respect to:

- Foundation Solution(s)
- Gas Measures
- Placement of Soil Cover
- Handling of Contaminated Soils

5.6.9 The above recommendations will take account of the actual remediation works undertaken and may differ significantly from recommendations originally presented in the site investigation report.

6 REMEDIATION STRATEGY (SPECIFIC OBJECTIVES)

6.1 Contingency for unknowns

6.1.1 Even after an appropriate preliminary investigation and ground investigation, with exploratory holes on a closely spaced grid (say trial pits at 30m centres), a geoenvironmental appraisal is typically based on inspection of the ground underlying less than 0.5% of the total site area (and much less at depths in excess of about 3.5m). Consequently, there is always a possibility that unanticipated ground conditions will be encountered during the remediation works.

6.1.2 If unanticipated ground is encountered during the remediation works, the Contractor should immediately seek further advice from the Engineer.

6.1.3 In order to assess the nature of any unanticipated grossly contaminated soil/fill, and (if necessary) allow revision of this Strategy document, it should be placed in temporary stockpiles on hardstand or an impermeable membrane, suitably covered and bunded.

6.1.4 Analysis of at least 6 samples, for an appropriate range of determinands should be undertaken. On receipt of the results, the Engineer will liaise with the Contractor regarding the most appropriate remediation option.

6.1.5 Gleesons or their appointed Contractor might consider it appropriate to commission additional ground investigation to better delineate ground conditions (e.g. coal tar impacted area and/or the shallow mine workings extent) in advance of the proposed remediation works.

6.2 Well decommissioning

6.2.1 Monitoring wells should be decommissioned in order to prevent the possibility of gas migration into sub-floor voids and cross-contamination between residual contamination in the made ground and the perched groundwater. Decommissioning could be achieved by filling the well with pea gravel and then bentonite pellets (uppermost 4m; to be wetted after placement). The headworks (raised helmet or stop-cock type cover) should then be removed and the surface made good.

6.2.2 Ideally the upper length of HDPE well pipe should be back-screwed and removed from the borehole, with the resultant 'hole' to be filled with bentonite pellets (to be wetted after placement).

6.3 Japanese Knotweed

6.3.1 Gleeson have advised that no invasive weeds were recorded on site.

6.4 Site clearance

6.4.1 Any trees currently under a preservation order should be identified and agreed with relevant authorities prior to the commencement of the works. All trees subject to a TPO should be clearly identified and protected by fencing in accordance with BS5837: 2012.

6.4.2 The site should then be cleared of all residual debris, any vegetation, shrubs, bushes and unprotected trees as instructed by Gleeson.

6.5 Topsoil & subsoil strip

6.5.1 At the appropriate time (but well in advance of any proposed build), topsoil within the northern area should be stripped in order to check for unrecorded mining related features.

6.5.2 Topsoil should be stripped in cognisance of RLE Drawing Ref: 17176-RLE-19-XX-DR-0-005 (refer to Appendix A) to ensure suitable topsoils are adequately segregated from unsuitable topsoils and separately stockpiled; refer to Section 6.6.

6.5.3 Topsoil is best stripped using tracked plant and this should be undertaken in the driest conditions possible. Wheeled plant (e.g. dumpers required to move the stripped topsoil across the site) should only be allowed on areas from which the topsoil has already been removed.

6.5.4 Topsoil should not be stripped during or after periods of heavy rainfall, when there are pools of water on the surface, or when the ground is frozen or covered by snow.

6.5.5 Following excavation of made ground in the north a nominal thickness of subsoil (probably c. 300mm) should also be excavated, to ensure thorough inspection of natural ground for mining related features.

6.5.6 Care should be taken to avoid mixing of topsoil with the underlying subsoil.

6.5.7 In addition to timing, consideration should be given to the area stripped at any given time and implications for surface water run-off. It would be prudent to prepare both a silt and surface water management plan (SWMP).

6.6 Topsoil stockpiling

6.6.1 Topsoil stockpiles should be located in areas of the site where the material can be left undisturbed, and it won't interfere with site operations. Unnecessary double-handling of the soils should be avoided where possible.

6.6.2 Stockpiles should not be positioned within the root or crown spread of retained trees, or adjacent to watercourses, ditches or existing or future excavations.

6.6.3 Stockpile locations should first be cleared of any vegetation, made ground and development waste.

6.6.4 The soil should be tipped in a line of heaps to form a windrow, starting at the furthest point in the storage area and working back towards the access point.

6.6.5 Adjacent windrows should be placed sufficiently apart to allow tracked plant to gain access between them, so that the soil can be heaped up to the maximum height.

6.6.6 Topsoil stockpiles should not be greater than 2.5m in height. In large stockpiles adequate oxygen supply is unlikely to penetrate more than 1m from the surface; stockpiles should therefore be as low and narrow as possible so that the core material is within 1m of the surface.

6.6.7 Stockpile surfaces should be firmed and re-graded to form a smooth gradient, using tracked plant, to prevent rainwater ponding and infiltration.

6.6.8 A maximum side slope of approximately 1 (vertical) in 2 (horizontal) is recommended.

6.6.9 Stockpiles should be fenced off to prevent any disturbance or contamination by other construction activities.

6.6.10 The Engineer may instruct analysis (pH, metals, asbestos ID, TOC, banded TPH & speciated PAH) of further samples from Topsoil stockpiles.

6.6.11 If the soil is to be stockpiled for more than 6 months, the surface of the stockpiles could be seeded with a grass/clover mix to minimise soil erosion and to help reduce infestation by nuisance weeds that might spread seed onto adjacent land.

6.6.12 Management of weeds that do appear should be undertaken during the summer months, either by spraying to kill them or by mowing or strimming to prevent their seeds being shed.

6.6.13 The site should be managed so as to keep soil storage periods as short as possible.

6.7 Made Ground Topsoil

6.7.1 Made Ground Topsoil, typically 300mm thick is present in areas of the site. Previous testing of the soils by RLE suggests the material is **not suitable** for re-use where present in the north of the site. Made Ground Topsoil in the south of the site was deemed **suitable** for reuse in gardens. The extent of the natural and different Made Ground Topsoils is identified on RLE Drawing Ref: 17176-RLE-19-XX-DR-0-005 in Appendix A.

Unsuitable Made Ground Topsoils (Areas 1A & 1B)

6.7.2 The unsuitable Made Ground Topsoils should be delineated, 'chased-out' by excavation, and placed in a designated stockpile. This work should be supervised by the Engineer.

6.7.3 The Engineer may instruct analysis (pH, metals, asbestos ID, TOC, banded TPH & speciated PAH) of further samples from the Made Ground Topsoils stockpiles.

6.7.4 Where these soils are to remain beneath proposed garden/landscaped areas, they will require isolation beneath at least 600/450mm clean soil cover respectively. However, given the compressible nature of topsoil it must be overlain by no more than 1m of soil.

6.7.5 Alternatively, these soils can be managed appropriately offsite e.g. disposal.

Suitable Made Ground Topsoils (Area C)

6.7.6 The suitable Made Ground Topsoils (essentially reworked natural soils) should be delineated, 'chased-out' by excavation, and placed in a designated stockpile. This work should be supervised by the Engineer.

6.7.7 After stripping and stockpiling it is recommended that these soils are inspected, and any significant anthropogenic materials are screened or picked out prior to placement in garden areas.

6.7.8 Further sampling of the stockpile of Made Ground Topsoil generated following a strip is recommended to further assess its suitability for re-use/retention on site.

6.8 Shallow mineworkings

6.8.1 RLE's CMRA indicated that there are known shallow mine workings within the Abdy seam beneath the northwest of the site with further unrecorded shallow workings in the Two foot, Abdy and Top Beamshaw considered highly likely.

6.8.2 RLE's investigations (2019 and 2012) encountered evidence of workings in the Abdy seam, possible evidence of workings (broken ground) in the Low Beamshaw at 7.6m to 12.6m depth in RBH18A and Kent's Thin at 26.6m and 28.3m depth in RBH17.

6.8.3 The current anticipated extent of the workings that require drilling and grouting is presented in RLE's Drawing (17176-RLE-19-XX-DR-0-012) presented in Appendix A.

6.8.4 Lithos will prepare a detailed Specification for treatment of the workings and liaise with the relevant regulatory authorities (Local Authority, Mining Remediation Authority (MRA) & warranty provider).

6.9 Mine entries

6.9.1 Evidence of two mine entries has been encountered during previous drilling investigations as shown on RLE Drawing 17176-RLE-19-XX-DR-O-008 in Appendix A. These entries will need exposing by excavation and the location and diameter accurately recording during site preparatory works to allow design of appropriate shaft caps.

6.9.2 Additionally, the further recorded entries (3 on site, 3 off site) not identified in the site investigation works will require their location confirming or demonstrating they lie outside the proposed development boundary. Given the significant depth of made ground, RLE's recommendation of a bulk earthwork cut in the northwest of site to expose these features in large areas/panels during the site preparatory works is considered appropriate. This could be undertaken simultaneously to the proposed remediation and earthworks.

6.9.3 Consequently, for now the MRA will expect Gleeson's layout to assume potential no-build "zones of influence" around each shaft based on the following calculation:

Zone of influence = 0.5 x assumed shaft diameter + departure + drift/made ground depth

6.9.4 Treatment of the mine entries will be included in the specification for treatment of mine workings mentioned above.

6.10 Asbestos

6.10.1 Localised fragments of Asbestos Containing Materials (ACMs) may be encountered during the 'turnover' works; see Section 6.11. Where practicable suspected asbestos-containing material should be recovered by hand and placed in double sealed bags, within a sealed skip for off-site disposal at a suitably licensed landfill site. Personnel involved in this activity should be equipped with appropriate personal protective equipment, including dust masks (minimum FFP3).

6.10.2 Any topsoil where asbestos is positively identified and considered representative of near-surface soils, must be isolated beneath the proposed minimum 600mm thick surface cover of "clean" soil, plus potentially a high-visibility marker barrier (dependant on assessment of results/risks) in garden/landscaped areas.

6.10.3 Non topsoil ACM impacted material e.g. subsoils or made ground can be placed below hardstand (parking areas) or floor slabs (buildings).

6.11 Turnover of made ground

6.11.1 Turnover (excavation, screening/sorting and replacement in engineered layers, with compaction) of the full thickness of made ground across the site is required in order to:

- Facilitate the identification of mine entries (recorded & unrecorded)
- To remove relict foundations & obstructions
- To remove biodegradable & other unsuitable materials from the made ground
- To remove the soil/fill grossly contaminated with hydrocarbons
- To allow new foundations to be supported by the engineered fill
- To prepare the ground beneath proposed new estate roads

6.11.2 Further details of specific operations associated with turnover are described in the following sections.

6.12 General excavation

6.12.1 Excavation of made ground will be undertaken in a controlled manner, working from a line agreed with the Engineer or Gleeson's Site Manager in linear panels.

6.12.2 Excavated material should be removed from each panel and screened to remove oversize (> 200mm) and other unsuitable (e.g. anthropogenic or biodegradable materials), prior to replacement.

6.12.3 Each panel should be inspected by the Engineer or Gleeson's Site Manager, and have its depth and extent recorded by survey, prior to backfilling.

6.12.4 Any excavated and screened material that needs to be stockpiled temporarily should be placed in areas designated by the Engineer or Gleeson's Site Manager. Any stockpile of made ground should be assumed to be contaminated, and it should be ensured that such materials are not allowed to cross-contaminate any clean soils or controlled waters.

6.13 Excavation of coal outcrops

6.13.1 Where foundations are likely to intersect with outcropping coal seams the coal should be removed from beneath plots and from within 1m of the final garden level (FGL) of the proposed garden and landscaped areas.

6.14 Site regrade & import of fill

6.14.1 The site will be subject to a significant earthworks programme to facilitate the development.

6.14.2 This will require the import and placement of naturally occurring, geotechnically suitable materials from a donor site(s). Gleeson have undertaken earthworks modelling to derive cut & fill estimates (refer to Drawing Ref. 5249/8. This indicates a shortfall of fill material of approximately 39,000m^3.

6.14.3 However, topsoil (& made ground) first needs to be stripped, segregated and separately stockpiled; see Sections 6.5 to 6.7.

6.14.4 To minimise this import volume the naturally occurring subsoil arisings from the development excavations (i.e. main drainage, foundations and attenuation pond) should be utilised.

6.14.5 The appointed Contractor should undertake their own modelling exercise to confirm quantities for tendering/construction purposes.

6.14.6 Importation of bulk fill materials will need to comply with the Earthworks Specification (to be produced by Lithos under separate cover).

6.15 Underground tank removal

6.15.1 There are no known underground fuel or chemical storage tanks, however, they may still be present in the former colliery/engineering works area in the north.

6.15.2 If encountered, each tank should be carefully emptied of any residual product, purged of potentially explosive vapour, and safely disposed of from the site by an appropriately qualified and licensed contractor.

6.15.3 Any underground distribution pipe work should be purged of any residual product and explosive vapours and then carefully removed.

6.15.4 The Engineer will inspect the resultant excavations and supervise the chasing-out of any grossly contaminated soil/fill encountered (see Section 6.166.16).

6.16 Excavation of contaminated soil/fill

6.16.1 With the exception of the coal tar impacted area, no hydrocarbon contamination of concern has been recorded to date. However, the possibility that localised ‘hot-spots’ will be encountered during the turnover of the made ground cannot be discounted.

6.16.2 Consequently, the made ground should be carefully inspected during turnover (including preparation of the ground beneath highways, foundation and drainage excavations etc).

6.16.3 Any visually/olfactory evident contaminated material (including fuel/oils) encountered during turnover should be excavated under the full-time supervision of the Engineer, who will be equipped with a portable PID instrument to assist with delineation.

6.16.4 Each excavated ‘hot-spot’ of potentially significant contaminated soil should be placed in a separate stockpile on hardstand or an impermeable membrane, suitably covered and bunded.

6.16.5 Following excavation of the grossly contaminated ground, the Engineer will inspect and sample the resultant excavations.

6.16.6 A minimum of 5 verification samples should be taken from the excavation sidewalls and base. These samples should be tested for TOC, BTEX compounds, speciated PAH & speciated TPH. Analysis for other determinands may be appropriate and will be requested by the Engineer as necessary.

6.16.7 In larger excavations (including that to chase out the coal tar impacted material), additional verification samples should be taken from the exposed excavation surfaces on a 10m grid.

6.16.8 The Engineer will instruct continued removal of soil/fill if verification samples yield concentrations in excess of the clean-up criteria outlined in Section 3.

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

6.16.10 Excavated contaminated soils should either be treated or disposed of off-site; see Sections 6.17 and 6.18 respectively.

6.16.11 On completion of tank/soil removal, excavations are to be backfilled (see Section 6.14 & 6.23).

6.17 On-site treatment of contamination

6.17.1 Offsite management of the coal tar impacted materials (c.1,100m^3) to landfill (see Section 6.18) may prove to be the only viable option, however, treatment on site of this hydrocarbon contaminated material might be considered by the Contractor.

6.17.2 The heavy end lubricating range organics (C16-C35) identified in coal tar impacted soils may be problematic for bioremediation and require a longer timeframe. Consideration of this by the Contractor should be given to the range of contamination present when selecting material for on-site treatment and timescales.

6.17.3 As an alternative to bioremediation, consideration could be given to stabilisation (chemical and physical immobilisation of contaminants). Stabilisation can be achieved by the use of specially modified clays. The process incorporates reactive reagents to bind contaminants chemically within the supporting clay media. A feasibility study will be required to confirm that a significant reduction in leachate potential (mobility) can be achieved by stabilisation.

6.17.4 Stabilisation is likely to provide a more appropriate treatment solution if any "heavy" (lubricating oil range) hydrocarbon contamination is encountered, since ex-situ bioremediation may not feasible.

6.17.5 Once a decision on how the hydrocarbon contamination will be dealt with has been made (i.e. stabilisation/bioremediation or landfill), this should be detailed in the Contractor's Method Statement, a copy of which should be kept on site and made available to the Engineer and Gleeson prior to any works on site commencing.

6.17.6 Should the coal tar impacted material be considered suitable for treatment on site, it is anticipated that the volume of soil/fill requiring treatment will exceed 1,000m^3. Therefore, if on-site treatment is proposed, a Mobile Treatment Licence will be required, and a Deployment Form must be completed and submitted to the Environment Agency.

6.17.7 At all times during on-site treatment, Best Practicable Means must be employed to minimise dust, odour and VOC generation, and their migration off site.

6.17.8 Excavated soils should be screened, to remove oversize (concrete and brick), and the remaining fines hauled to a treatment area.

6.17.9 Within an impacted mass, contaminant concentrations are likely to vary significantly, and segregation of very heavily contaminated material from less contaminated material may not be practical. However, deliberate "overdig" of soil that has not been impacted, for mixing with contaminated soil, is not acceptable.

6.17.10 If ex-situ bioremediation is proposed, the treatment area should be formed on an impermeable composite liner (clay with polythene membrane, or HDPE sheeting, or concrete hardstand) in an area of site agreed with the Engineer. A collection trench should be constructed along the width of the treatment area to gather any runoff. Treatment areas should be situated to pose the least risk of odour nuisance to offsite receptors.

6.17.11 Sampling of the windrows/stockpiles should be carried out at a rate of one sample per 200m^3, or a minimum of 6 samples, whichever yields the larger number. Chemical analysis of these samples at weekly intervals will enable determination of the average concentration of each contaminant of concern (T_0, T_1, T_2 etc concentrations) in each windrow/stockpile, and the production of degradation curves.

6.17.12 A windrow/stockpile will be deemed to have been successfully treated once two consecutive sampling rounds yield US_{95} concentrations of all the contaminants of concern below agreed clean-up criteria.

6.17.13 As discussed in Section 3, in the absence of a site-specific Quantitative Risk Assessment, it is conservatively proposed that Lithos' generic soil screening values for a residential-with-gardens end-use (assuming gardens with 600mm clean soil cover) be adopted as remedial targets for hydrocarbon contamination in soils on this site. Information on the derivation and use of these screening values is presented in Appendix B (Scenario B).

6.17.14 Should stabilisation be undertaken, validation samples should be taken at a minimum rate of 1 composite sample per 200m^3 of treated soil (with a minimum of 6 samples if the volume treated is less than 1,200m^3), and results compared against those from the feasibility study to confirm that the treatment achieved the required reduction in leachate potential.

6.17.15 Treated soils should be placed in areas where they will not be subsequently disturbed (e.g. by deep excavations for drainage etc), where they will be suitably isolated from end-users of the site.

6.17.16 Retention and re-use of treated material on site should be undertaken in accordance with the principles of the CL:AIRE Code of Practice (v2, March 2011); i.e. the treated material must be suitable for use and must not pose risk to controlled waters.

6.17.17 Given the anticipated physical nature of the treated soils, the deposition area may need to surcharge with a stockpile of subsoil and/or aggregates to ensure that excessive settlements do not occur.

6.18 Export to landfill

6.18.1 Excavation arisings that are unsuitable for retention and re-use on site should be placed in temporary stockpiles on hardstand or polythene sheeting and be suitably covered to minimise the potential for vapour/dust/odour nuisance and prevent surface water run-off.

6.18.2 Given the proximity of existing housing and businesses, and in order to avoid any potential odour nuisance, stockpiles of material should be exported from site as soon as practically possible. Stockpiles should also be situated to pose the least risk of odour nuisance to offsite receptors.

6.18.3 Any material exported from site to landfill should be hauled by a registered waste carrier in accordance with the requirements of the Waste Regulations 2011 and the Landfill (England & Wales) Regulations 2002.

6.18.4 A transfer 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.

6.18.5 In order to protect the general public from dust and vapour emissions, wagons that are to be used for the haulage of the contaminated material from the site must be sheeted. In addition, the Contractor must ensure that no fluids seep from the wagons.

6.18.6 In order to provide the landfill facility with information regarding chemical composition of the waste, further analysis of any material that requires removal from site may be required.

Waste classification

6.18.7 Sampling and characterisation of stockpiled materials generated during the site preparatory works is likely to be required if off-site disposal is proposed.

6.18.8 It should be noted that the classification and assessment of waste soils under the Environment Agency's Technical Guidance WM3[3], is a complex process.

6.18.9 It is critical if material is to be exported from site that this is allocated an appropriate waste code, following the steps within WM3. Waste carriers transporting, and sites accepting, this material should have a corresponding code within their permits. It is the responsibility of those generating the waste (i.e. the site), to ensure that the waste is handled and disposed of appropriately.

6.18.10 With respect to **asbestos**, waste soils will be classed hazardous if the soil mass contains more than 0.1% asbestos fibres that are free and dispersed. However, WM3 states that where the waste contains identifiable pieces of asbestos (i.e. any particle of a size that can be identified as potentially being asbestos by a competent person if examined by the naked eye), then the waste is hazardous if the concentration of asbestos in the pieces alone is 0.1%. If a stockpile of soil contained rare fragments of broken asbestos-cement sheeting, the whole stockpile would be classed as hazardous unless all the fragments could be picked-out (even though the concentration of asbestos in the soil mass might be orders of magnitude less than 0.1%).

6.18.11 Contractors exporting waste from the site should review the site investigation data and make their own assessment. Alternatively, Lithos could undertake this assessment once exported waste streams have been identified.

6.19 Control of water

6.19.1 Perched groundwater should be controlled in accordance with CIRIA report 113 "Control of Groundwater for Temporary Works".

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

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

6.19.4 The Contractor should make all necessary arrangements to prevent off-site migration of contaminated sediment via surface water run-off and avoid any pollution. This will necessitate the installation of surface water grips, and removal, sealing-off, or diversion of all redundant former site drains (and any land drains).

[3] Technical Guidance WM3 – Guidance on the classification and assessment of waste. Environment Agency 2015

6.19.5 A Surface Water Management Plan should be prepared by the Contractor, describing the mitigation measures that will be put in place to intercept direct run-off from any disturbed areas, stockpiles etc, thereby preventing any potential impact of adjacent land and nearby watercourses. Surface water run-off will probably require treatment (as a minimum to allow settlement of fines) prior to consented discharge.

6.19.6 It is quite likely that perched waters will be encountered during the remediation earthworks; most commonly associated with redundant drains and buried structures.

6.19.7 Some perched water may be contaminated with hydrocarbons and/or VOCs (e.g. potentially perched groundwater encountered in the coal tar impacted area).

6.19.8 It should be noted that significantly elevated concentrations of hydrocarbons and heavy metals are often associated with sediment within the former drainage network below brownfield sites such as this, and that these, if released, pose potential risk to waters.

6.19.9 Any potentially contaminated water should 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.

6.19.10 Water collected in sumps should be passed through a series of oil/water separators to remove any oily contamination. Oils trapped in the absorbent medium should be disposed of to a suitably licensed landfill site.

6.19.11 Treated water should then be tankered off-site, or be discharged to sewer, subject to analytical results and local water treatment company consent.

6.20 Removal of below ground obstructions

6.20.1 All relict foundations associated with former structures/buildings in the north of the site should be chased out and grubbed-up, in order to remove potential obstructions to new foundations and infrastructure.

6.20.2 Drawing 5249/3 shows the location of all significant structures/buildings recorded on historical OS plans.

6.20.3 Where relict structures are found to retain fluid contaminants, they should be drained first. The drained fluids should be stored in appropriate, sealed tanks/containers and analysed for a range of determinands to be agreed with the Engineer. Fluids may then be tankered off-site, or be discharged to sewer, subject to analytical results and local water treatment company consent.

6.20.4 Deep excavations for the removal of structures etc will be unstable in the short term and continuous side support will be necessary.

6.20.5 Where significantly deep foundations (e.g. piles) cannot be removed by conventional means, they are to be cut at a depth to be agreed with the Engineer or Gleeson's Site Manager and the position of the remaining lower section is to be accurately recorded by survey.

6.20.6 Suitable materials derived from grubbing-up should be stored in a location on site, to be agreed with the Engineer or Gleeson's Site Manager, prior to crushing (see Section 6.21). Any unsuitable materials should be removed to a suitably licensed landfill site (see Section 6.186.18).

6.21 Crushing

6.21.1 Production of a selected granular fill should be possible if suitable materials (generated by grubbing-up of old foundations and other relict structures) are crushed.

6.21.2 The crushed product should be screened to remove any unsuitable elements and stockpiled for re-use during the subsequent construction works. Generation of a Class 6 material as defined in the Highways Agency Specification (Series 600) should be possible.

6.21.3 The Engineer should check the suitability of crushed product for re-use, instruct the removal of any unsuitable material and schedule appropriate confirmatory geotechnical or chemical testing.

6.21.4 A minimum of 3 samples (or 1 sample per $500m^3$, whichever is the greater) should be taken from any stockpile of specific crushed product and sent to a UKAS accredited laboratory for analysis to assess whether the material conforms to requirements as defined in of the Highways Agency Specification for Highway Works; Series 600.

6.21.5 A minimum of 3 samples (or 1 sample per $500m^3$, whichever is the greater) should be taken from any stockpile of specific crushed product and sent to a UKAS accredited laboratory for asbestos analysis. Any samples in which asbestos is positively identified should be subject to asbestos quantification analysis.

6.22 "Clean" corridors

6.22.1 Along the line of proposed new sewers, made ground will be excavated to its full thickness, or at least 1.0m below deepest sewer invert whichever is the lesser, to a width agreed with Gleeson.

6.22.2 The resultant excavation will only be backfilled with "clean" material which might comprise any of:

- Site-won natural soils;
- Crushed concrete; and/or
- Suitable imported natural soils or quarry aggregate.

6.23 Highways

6.23.1 The Contractor should consult the adopting authority regarding preparation of the ground beneath new highways (as outlined below, or in any proposed alternative specification) in advance of the works. The Contractor should also agree acceptable performance criteria, with the Engineer and the adopting authority.

6.23.2 However, it is considered that the following options would be suitable to enable the construction of the highways.

6.23.3 Following removal of made ground highways should be raised to formation level, either with:

- Suitable aggregate placed & compacted in accordance with The Highways Agency Specification for Highway Works (SHW) Series 600, or
- Suitable screened & selected site-won material, placed & compacted in accordance with SHW Series 600. Unsuitable materials include any soft or wet materials, biodegradables including topsoil, wood, scrap metal, frozen & oversize material.

6.23.4 Where excavation associated with ground improvement (e.g. turnover of made ground) beneath a highway results in sub-formation slopes greater than 1:5 (v:h), the sub-formation should be stepped (max. 0.5m high) and benched (min. 1m wide). Where the excavation works exceed 1m in depth, the footprint of earthworks should be extended beyond the highway footprint a minimum of 1m, plus the depth of excavation. The Engineer will keep records of any such work undertaken.

6.23.5 Crushing of demolition/hardstand/foundation arisings will generate aggregate, which (subject to confirmatory testing) should be suitable for use as unbound pavement materials within the highways.

6.23.6 The suitability of site-won material for placement as engineered fill should be confirmed by field trials and geotechnical laboratory testing, which will yield the following information:

- Number of passes with the compaction plant (to be used during subsequent earthworks)
- Maximum layer thickness (plant dependent)
- Acceptance criteria: minimum dry density & moisture content range

6.23.7 The engineered fill should achieve at least 95% maximum dry density, with air voids comprising less than 10%, as determined by 2.5kg laboratory compaction tests.

6.23.8 Where the made ground is re-engineered in accordance with the above specification, it is considered that a CBR value of 5% should be achievable; however, this should be verified by field trials.

6.23.9 The Contractor should ensure that only suitable granular fill is placed within 450mm of estate road formation in order to protect cohesive sub-grade materials (including natural cohesive soils). Such fill should be placed in accordance with the Specification for Highway Works.

6.23.10 The Contractor will arrange for the necessary compliance testing to be undertaken at formation level on road alignments, as required by the adopting authority and Engineer. As a minimum this should comprise plate load tests, carried out to determine the CBR at formation level, at approximate 25m intervals. Test locations should be staggered across the width of the highway to ensure the whole highway area is assessed.

6.24 Boundary issues

6.24.1 Gleeson's Designer should ensure that proposed levels tie in with the surrounding infrastructure, and ground levels of adjacent properties (after allowance for the placement of any required soil cover). Specific consideration to the cutting of slopes or retaining walls close to boundaries.

6.24.2 Advice should be sought from the Engineer if mobile contamination or redundant drains/utilities are encountered close to the site's boundaries.

6.25 Surveying

6.25.1 The Contractor should arrange for the following survey work as directed by the Engineer or Gleeson's Site Manager:

- All setting out necessary to allow the works to proceed
- Recording of the depth and lateral extent of excavations to remove obstructions, contaminated soils (including the coal tar impacted area) etc
- Recording of the positions of any relict obstructions (i.e. piles) left in-situ
- Recording the depth & extent of each excavation panel during turnover of made ground, prior to backfilling
- Recording of natural ground levels, where natural ground encountered during the earthworks
- Recording the final location of potentially combustible or treated hydrocarbon-contaminated soils
- Recording the locations and volumes of all stockpiles of suitable materials left on site for Gleeson 's use during the development works
- As-built survey of the finished surface on completion of the remediation contract

6.25.2 The Contractor should supply the results of this survey work to the Engineer or Gleeson's Site Manager for inclusion in the Verification Report.

6.26 Placement of soil cover

6.26.1 Clean inert soil will be placed over any residual made ground and/or unsuitable Made Ground Topsoil or coal outcrops in proposed garden and landscaped areas (but not beneath hardstanding). This cover layer is to comprise:

- **Back gardens**: 600mm "clean" subsoil and topsoil
- **Front gardens/POS**: 450mm "clean" subsoil and topsoil
- **Where coal outcrops within 1m of FGL**: 1000mm "clean" subsoil and topsoil (bottom 450mm could be Made Ground Topsoil, demolition rubble or other site won material as approved by the Engineer)

6.26.2 Dependent on the earthworks/remediation a 150mm 'hard dig' layer, or a high-visibility contaminated ground warning / marker barrier, such as Lotrak Alarm18 may be required to be placed at the base of the soil cover system. This will be specified in the earthworks/remediation phase Verification Report.

6.26.3 Following the proposed earthworks, some gardens may be underlain by natural soils or clean imported fill only, and where this is the case placement of 150mm of topsoil will suffice.

6.26.4 If any garden is directly underlain by bedrock, placement of 450mm of subsoil/topsoil will be required (in accordance with NHBC Standards, Chapter 10.2).

6.26.5 Any material imported for use as cover should be validated in accordance with Lithos' Protocol for Importation & Use of Soil Cover (Capping), copied in Appendix C. This Protocol includes chemical assessment criteria which should not be exceeded.

6.26.6 This work may be undertaken as part of the contract for the preparatory & remediation works, in which case imported soils should be stockpiled in a location agreed with the Engineer. Alternatively, the developer may choose to import soil at a later stage in the development.

6.27 Topsoil placement

6.27.1 NHBC Conditions require garden areas to be provided with topsoil to a thickness of not less than 100mm. Topsoil thicknesses in excess of 400mm should generally be avoided.

6.27.2 Prior to placement of topsoil, the underlying subsoil should be loosened by ripping or rotovating. Stones and other objects greater than 50mm should be removed from the prepared surface, and the loosened subsoil should be roughly levelled so that an even depth of topsoil can be achieved.

6.27.3 For the loosening to be most effective, it should be undertaken when the subsoil is dry to the full depth of working.

6.27.4 Subsequent trafficking over the loosened subsoil should be minimised.

6.27.5 Topsoil should not be placed during or immediately after heavy rain.

6.27.6 An excavator with a toothed bucket should be used to load the topsoil from stockpile into dumpers, to prevent excessive smearing.

6.27.7 The dumper should tip the topsoil onto the receiving surface, and topsoil should then be spread to the required depth by an excavator. Both the dumper and excavator should avoid tracking over the placed topsoil.

6.27.8 After re-spreading topsoil, any large compacted lumps should be broken down to produce a fine tilth suitable for planting, turfing and seeding (< 10mm maximum aggregate size).

6.28 Hazardous gas/vapour protection

6.28.1 Based on the site characterisation discussed above, the proposed foundation solution, and with reference to the gas protection "scoring" system outlined in BS8485:2015+A1:2019, Lithos consider that the following protective measures are likely to be incorporated in all new buildings:

Charac. situation (Wilson & Card, '99)	**Gas "score" req'd by BS8485**	**Protective measures (Residential) (See footnote for definition of Building Type A)**		
		Floor slab (BS8485 "score")	**Sub-floor ventilation (BS8485 "score")**	**Membrane Type (BS8485 score")**
2	3.5	*Select one from:* Block & Beam – (0). Reinforced ground bearing slab – (0.5). Reinforced, cast in-situ suspended slab (with minimal and suitably sealed service penetrations & joints) – (1.5). Reinforced ground bearing raft (with limited-service penetrations cast into slab). Note: the venting area through any down stand beam should be 3 times greater than that provided by the side ventilation (air bricks) – (1.5).	*Select one from:* Passive sub-floor ventilation; venting layer could be: A min. 150mm clear void (2.5), or A proprietary void former providing an equivalent clear void depth of 60mm; see Section B7 in BS8485 (2.5), or Min. 300mm thick blanket of min. 20mm single size rounded or sub-angular gravel (1.0). Min. ventilation = 1,500 mm^2/m run of external wall (via air bricks on each of 2 opposite sides), with 100mm pipes at 1.75m centres or honeycombing of any sub-floor sleeper walls.	Gas resistant membrane meeting all of the following criteria: • sufficiently impervious to gases with a methane gas transmission rate <40.0 ml/day/m^2/atm (average) for sheet and joints (tested in accordance with BS ISO 15105-1 manometric method); • sufficiently durable to remain serviceable for the anticipated life of the building and duration of gas emissions; • sufficiently strong to withstand in-service stresses (e.g. settlement if placed below a floor slab); • sufficiently strong to withstand the installation process and following trades until covered (e.g. penetration from steel fibres in fibre reinforced concrete, penetration of reinforcement ties, tearing due to working above it, dropping tools, etc); • capable, after installation, of providing a complete barrier to the entry of the relevant gas; • a minimum 0.4 mm thickness (1600g polyethylene) reinforced membrane (virgin polymer); and • verified in accordance with CIRIA C735∞ (2.0)

Footnotes:

∞ In accordance with CIRIA C735, a Verification Plan should be prepared which outlines the activities (inspection and testing), the relevant personnel, and the type of records to be collected. Gas membranes need to be visually inspected to establish possible damage. For CS3 sites inspection & verification should be carried out by an independent third party. However, whilst conflicts of interest in verification should be avoided, the Developer's staff on site could undertake inspection & verification on CS2 sites. In all circumstances, the verifier should be competent, experienced and suitably trained.

1. Building Type A is defined in Table 3 and Section 7 of BS8485:2015+A1:2019 as: private ownership with no building management controls on alterations to the internal structure, the use of rooms, the ventilation of rooms or the structural fabric of the building. Examples include private housing and some retail premises
2. A combination of two or more of the three types of protection measures (slab, ventilation & membrane) should be used to achieve the BS8485 score.
3. The membrane should always be lapped and sealed in accordance with BRE\Environment Agency Report BR 414 (2001) – "Protective Measures for housing on gas-contaminated land". The membrane should be continuous across internal walls & the cavity, and there should be a cavity tray in external walls.
4. In all cases there should be minimum penetration of floor slab by services; any penetrations should be suitably sealed.
5. Check manufacturer's specification if hydrocarbon vapours are present; hydrocarbons will degrade some membrane materials.

6.28.2 The monitoring undertaken to date, does not meet the minimum frequency set out in CIRIA C665. However, with the planned bulk earthworks and drilling & grouting, the ground gas regime may alter, meaning there is little merit in undertaking additional monitoring now. Once all preparatory works (earthworks and drill & grout) are complete, additional gas monitoring is recommended, which can take the form of spot (likely 6-months) or continuous (likely 6-weeks) monitoring depending on build programme constraints.

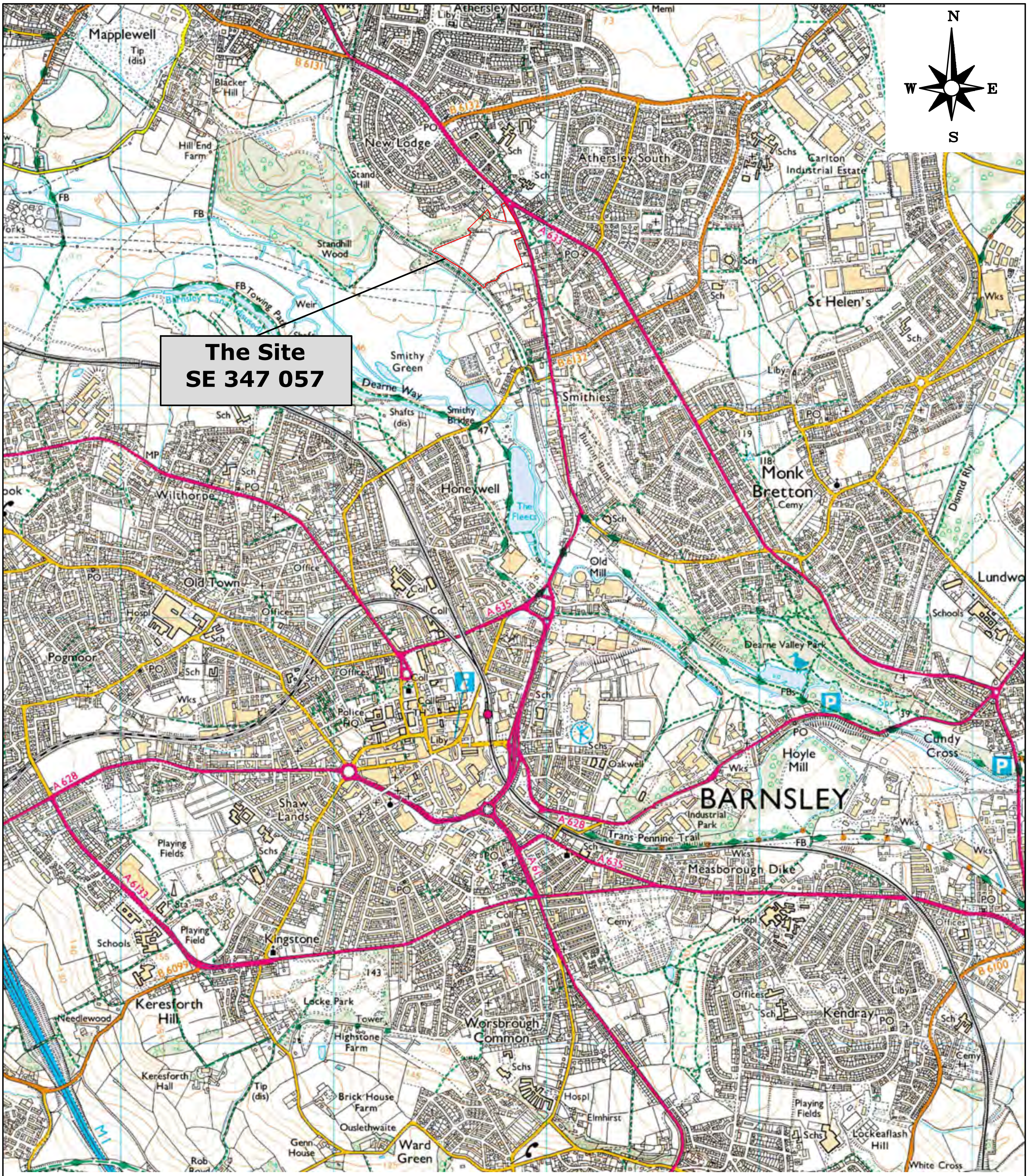
6.28.3 The Gas Risk Assessment will be updated on completion of this post earthworks ground gas monitoring exercise.

6.28.4 Requirement for upgraded vapour resistant membranes will be assessed post remediation/earthworks with recommendations provided in the earthworks/remediation Verification Report.

6.28.5 In general accordance with CIRIA, YALPAG guidance and NHBC guidance a Gas Protection Strategy and Verification Plan should then be prepared which will detail site specific requirements for the gas protection system with respect to the development.

APPENDIX A

DRAWINGS



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LITHOS CONSULTING
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Tel 01937 545330

CLIENT	JOB TITLE	DRAWING TITLE	DRAWN	DATE
GLEESON HOMES	WAKEFIELD ROAD (SMITHIES) BARNSLEY	SITE LOCATION PLAN	JBR	07/01/2025
			CHECKED: AG	DATE: 07/01/2025

STATUS			
FOR COMMENT ☐	DRAFT ☐	FOR APPROVAL ☐	FINAL ☑

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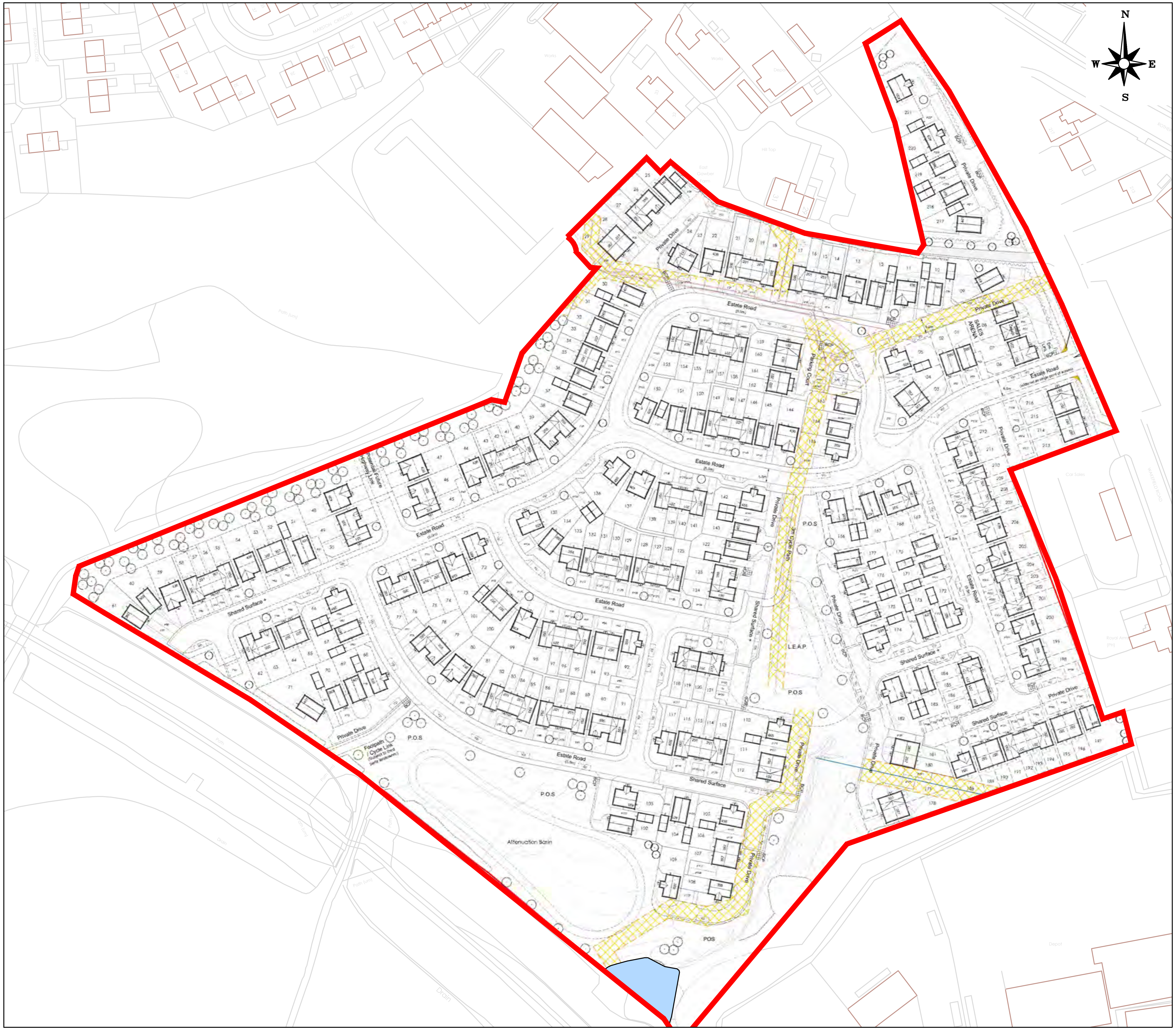

NOTES

APPROXIMATE SITE BOUNDARY

REPRODUCED FROM GLEESON HOMES DRAWING REFERENCE 1225.06 Rev. AG, DATED 22nd AUGUST 2024

REV.	DESCRIPTION	DATE

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CLIENT

GLEESON HOMES

JOB TITLE

WAKEFIELD ROAD (SMITHIES) BARNSLEY

DRAWING TITLE

PROPOSED SITE LAYOUT

DRAWN	DATE	STATUS
JBR	07/01/2025	FOR COMMENT ☐ FOR APPROVAL ☐
CHECKED	DATE	DRAFT ☐
AG	07/01/2025	FINAL ☑

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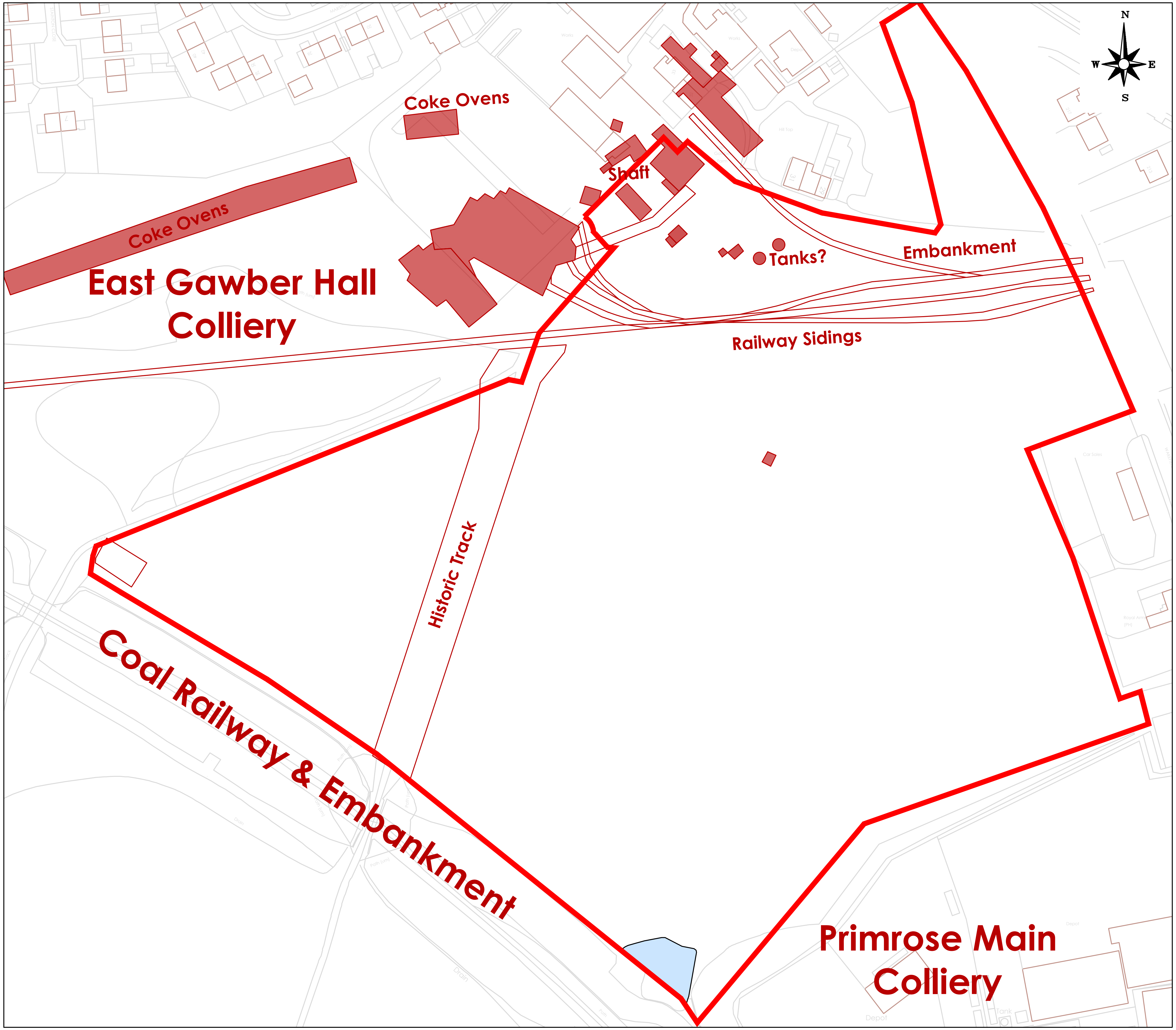

NOTES

FORMER BUILDING

OUTLINE OF FORMER HISTORICAL FEATURE

REV.	DESCRIPTION	DATE

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CLIENT

GLEESON HOMES

JOB TITLE

WAKEFIELD ROAD (SMITHIES) BARNSLEY

DRAWING TITLE

HISTORICAL SITE FEATURES

DRAWN	DATE	STATUS
JBR	07/01/2025	FOR COMMENT ☐ FOR APPROVAL ☐
CHECKED	DATE	
AG	07/01/2025	DRAFT ☐ FINAL ☑

SCALE	SHEET	DRAWING NO.	REVISION
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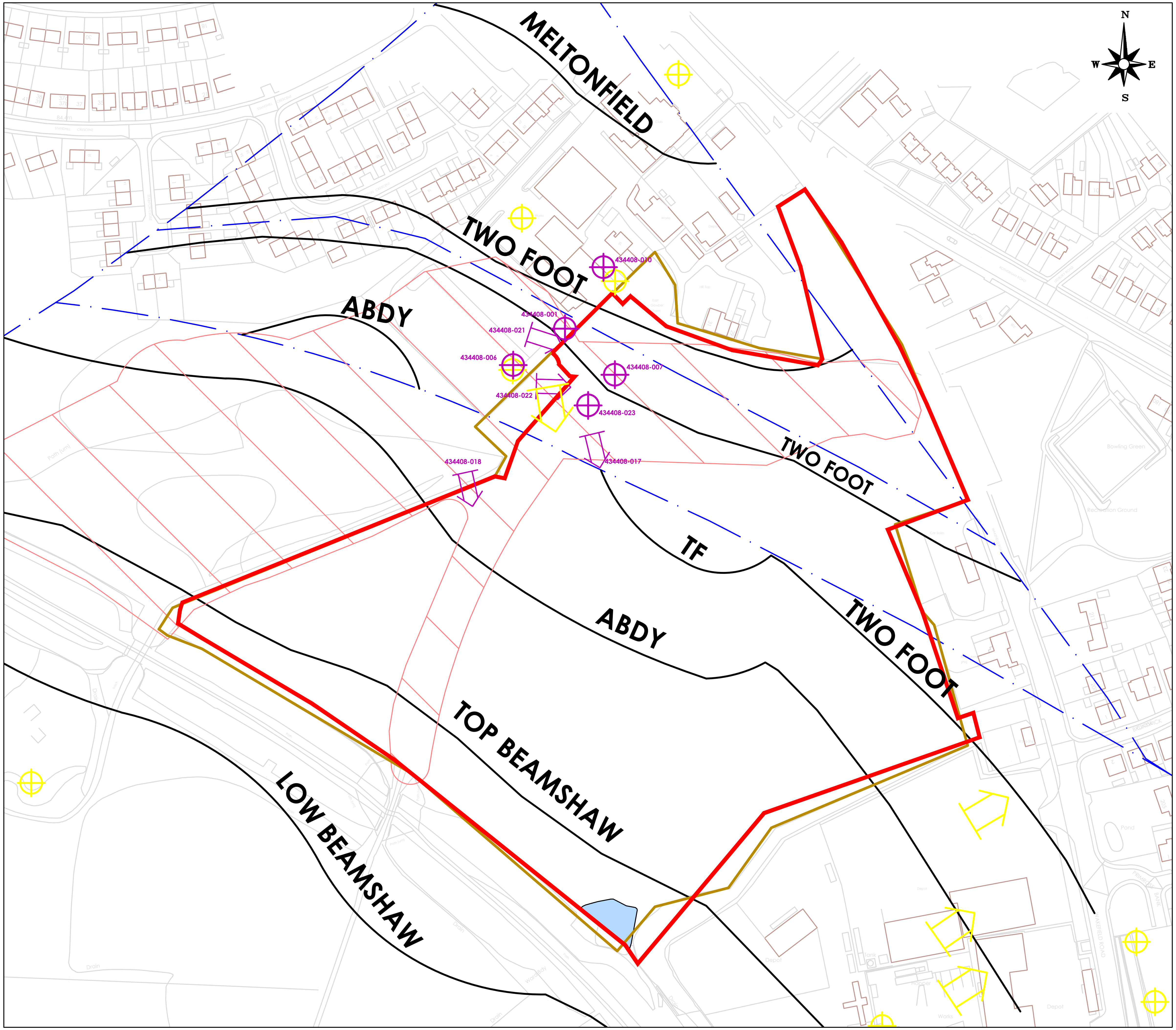

NOTES

- COLLIERY SPOIL (FROM BGS PLANS)
- GEOLOGICAL FAULT (FROM BGS PLANS)
- COAL OUTCROP (FROM BGS PLANS)
- MINE SHAFT (FROM BGS PLANS)
- MINE SHAFT (FROM CA MINING REPORT)
- APPROXIMATE SITE BOUNDARY
- APPROXIMATE RLE SITE BOUNDARY

REV.	DESCRIPTION	DATE

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CLIENT

GLEESON HOMES

JOB TITLE

WAKEFIELD ROAD (SMITHIES) BARNSLEY

DRAWING TITLE

GEOLOGY & MINING FEATURES

DRAWN	DATE	STATUS
JBR	07/01/2025	FOR COMMENT ☐ FOR APPROVAL ☐
CHECKED	DATE	
AG	07/01/2025	DRAFT ☐ FINAL ☑

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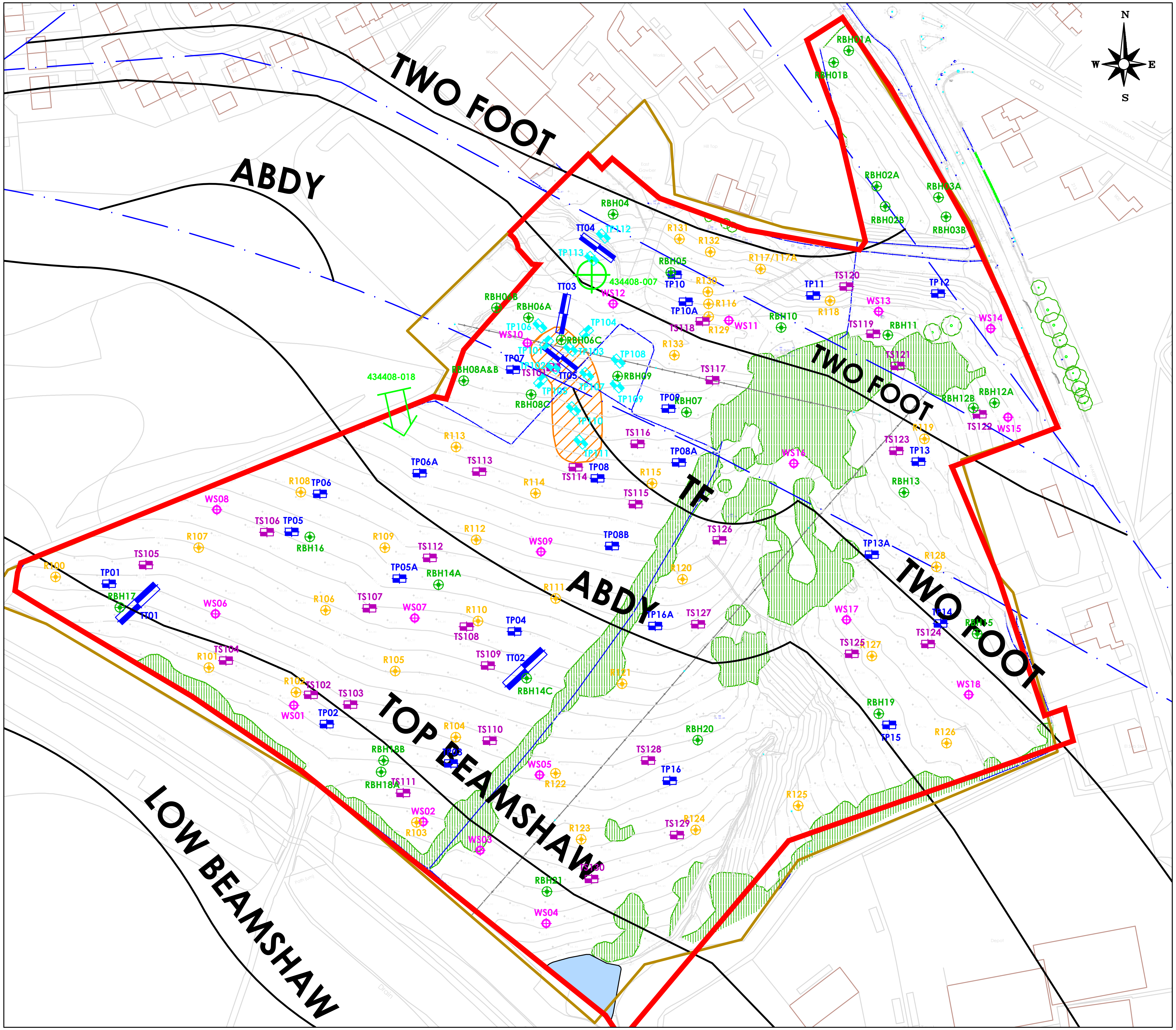

NOTES

RLE 2017 INVESTIGATION

- TRIAL PIT/TRENCH LOCATION (JULY 2017)
- WINDOW SAMPLE LOCATION (JULY 2017)
- SUPPLEMENTARY TRIAL PIT LOCATION (NOVEMBER 2017)
- SUPPLEMENTARY HAND DUG TOPSOIL LOCATION (NOVEMBER 2017)

RLE 2019 INVESTIGATION

- PROBEHOLE LOCATION (SEPTEMBER & OCTOBER 2019)
- MINE SHAFT/ADIT (LOCATED BY DRILLING)

RLE/SIRIUS 2021 INVESTIGATION

- PROBEHOLE LOCATION (SEPTEMBER & OCTOBER 2019)
- APPROXIMATE SITE BOUNDARY
- DENSE VEGETATION

REV.	DESCRIPTION	DATE

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JOB TITLE

WAKEFIELD ROAD (SMITHIES) BARNSLEY

DRAWING TITLE

THIRD PARTY EXPLORATORY HOLE LOCATIONS

DRAWN	DATE	STATUS
JBR	07/01/2025	FOR COMMENT ☐ FOR APPROVAL ☐
CHECKED	DATE	DRAFT ☐
AG	07/01/2025	FINAL ☑

SCALE	SHEET	DRAWING NO.	REVISION
1:1500	A3	5249/6	

ISOPACYTHE BANDING LEVELS

CUT Depth Bands

Band 1	-0.00	-0.10
Band 2	-0.10	-0.20
Band 3	-0.20	-0.30
Band 4	-0.30	-0.40
Band 5	-0.40	-0.50
Band 6	-0.50	-1.00
Band 7	-1.00	-2.00
Band 8	-2.00	-5.00
Band 9	-5.00	-10.00
Band 10	-10.00	

FILL Depth Bands

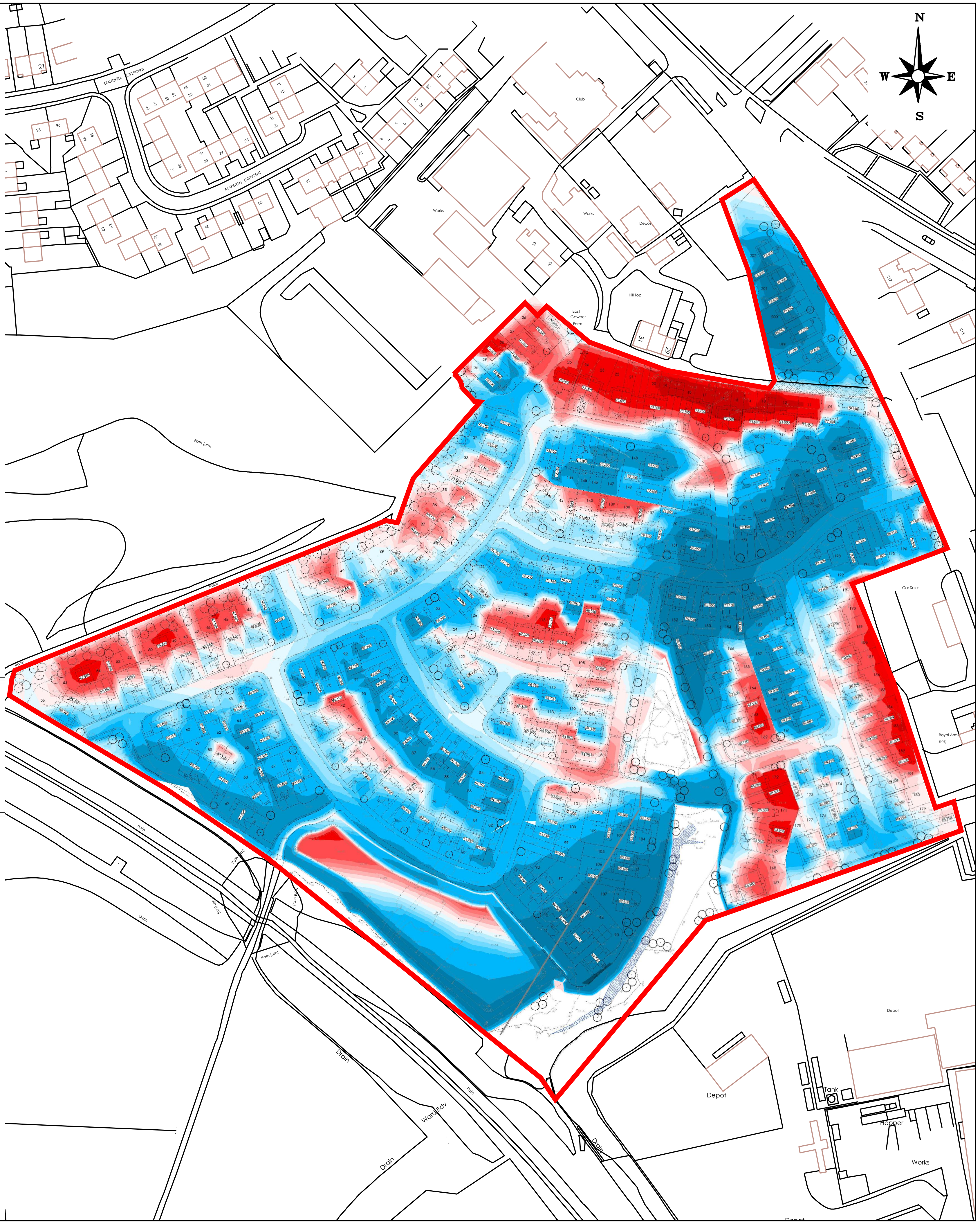
Band 1	0.00	0.10
Band 2	0.10	0.20
Band 3	0.20	0.30
Band 4	0.30	0.40
Band 5	0.40	0.50
Band 6	0.50	1.00
Band 7	1.00	2.00
Band 8	2.00	5.00
Band 9	5.00	10.00
Band 10	10.00	

Prismoidal Volume Calculations

Summary of Total Volumes of Cut/Fill:
PGM1 (Existing) model: WAKEFIELD RD\PDS\DGM\EXISTING.DGM
PGM2 (Proposed) model: WAKEFIELD RD\PDS\DGM\PROPOSED JULY 22.DGM

PGM2 surface relative to PGM1 surface:

	Cut	Fill
Total Gross:	9573.2	48263.6
Nett:		38690.5



NOTES

APPROXIMATE SITE BOUNDARY

REPRODUCED FROM SITE INFASTRUCTURE SERVICES' DRAWING REFERENCE GHY-WR-B-CAF-01 Rev. B, DATED 15th JULY 2022

REV.	DESCRIPTION	DATE

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CLIENT

GLEESON HOMES

JOB TITLE

WAKEFIELD ROAD (SMITHIES) BARNSLEY

DRAWING TITLE

CUT & FILL ANALYSIS

DRAWN	DATE	STATUS
ET	19/12/2024	FOR COMMENT ☐ / FOR APPROVAL ☐
CHECKED	DATE	
DJ	19/12/2024	DRAFT ☐ / FINAL ☑

SCALE	SHEET	DRAWING NO.	REVISION
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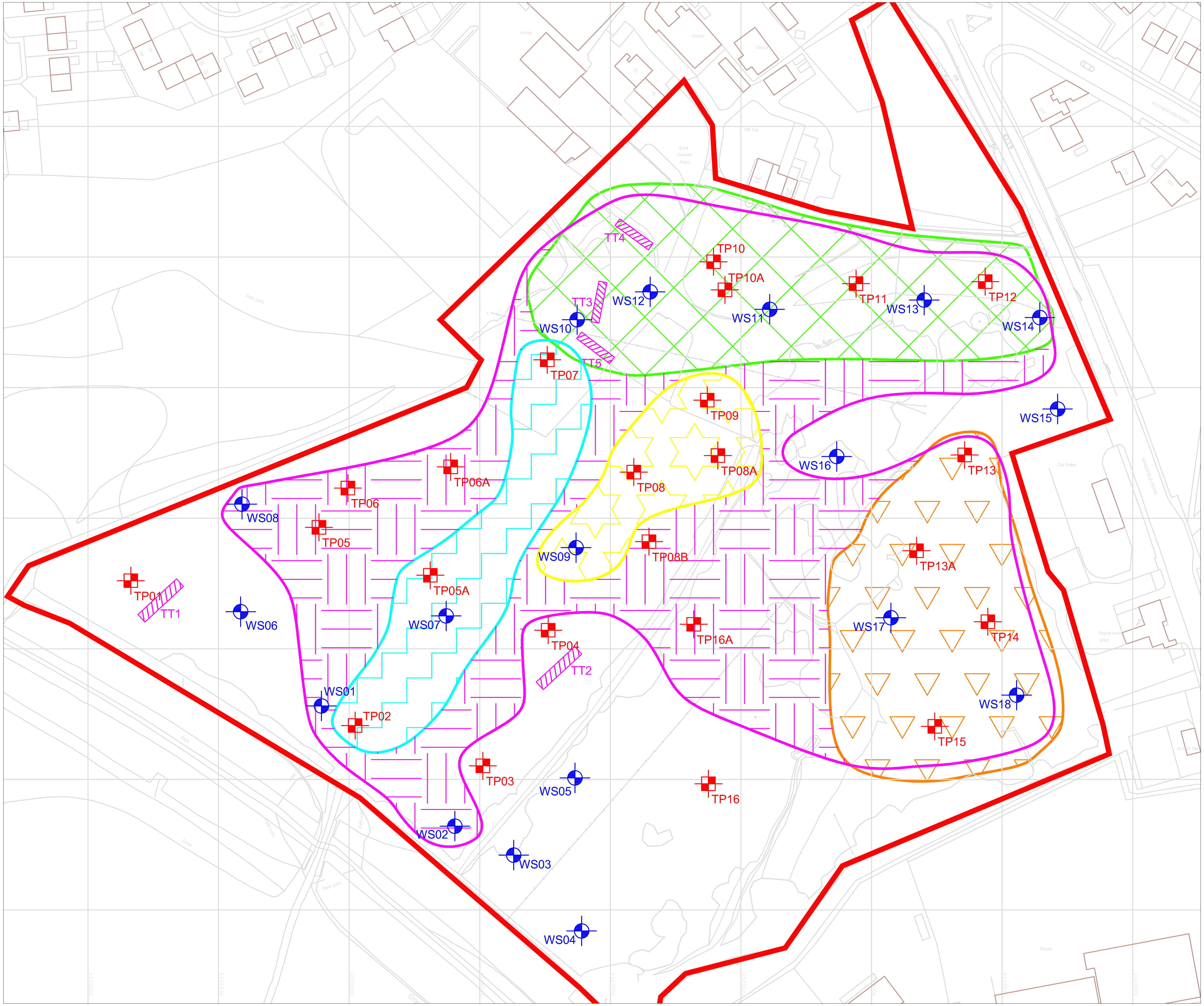
A3



GENERAL NOTES

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ALL LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.

ANY DISCREPANCIES NOTED ON SITE ARE TO BE REPORTED TO THE ENGINEER IMMEDIATELY.

KEY

TP01 — APPROXIMATE LOCATION AND REFERENCE OF TRIAL PIT EXCAVATED BY RLE.

WS01 — APPROXIMATE LOCATION AND REFERENCE OF WINDOW SAMPLE SUNK BY RLE.

TT1 — APPROXIMATE LOCATION AND REFERENCE OF TRIAL TRENCH EXCAVATED BY RLE.

APPROXIMATE EXTENTS OF MADE GROUND STRATUM 2: VICINITY OF FORMER COAL MINE, RAILWAYS / INFRASTRUCTURE

APPROXIMATE EXTENTS OF MADE GROUND 3: HISTORIC TRACK

APPROXIMATE EXTENTS OF MADE GROUND 4: CENTRAL AREA, IN VICINITY OF FORMER COLLIERY AND RAILWAY

APPROXIMATE EXTENTS OF MADE GROUND 5: REWORKED NATURAL IN EAST OF SITE

MADE GROUND STRATUM 1: TOPSOIL

Rev	Date	Amendments	By	Chk
A	11/11/19	UPDATED STRATUM REFS	AT	SF

RLRE

Client
HARWORTH ESTATES

Project
ATHERSLEY

Drawing Title
INTRUSIVE LOCATION PLAN

Status
INFORMATION

Scale	Drawn	Checked	Date
NTS	AT	IPB	19/09/17

Drawing No. 17176-RLE-19-XX-DR-0-004 Rev. A

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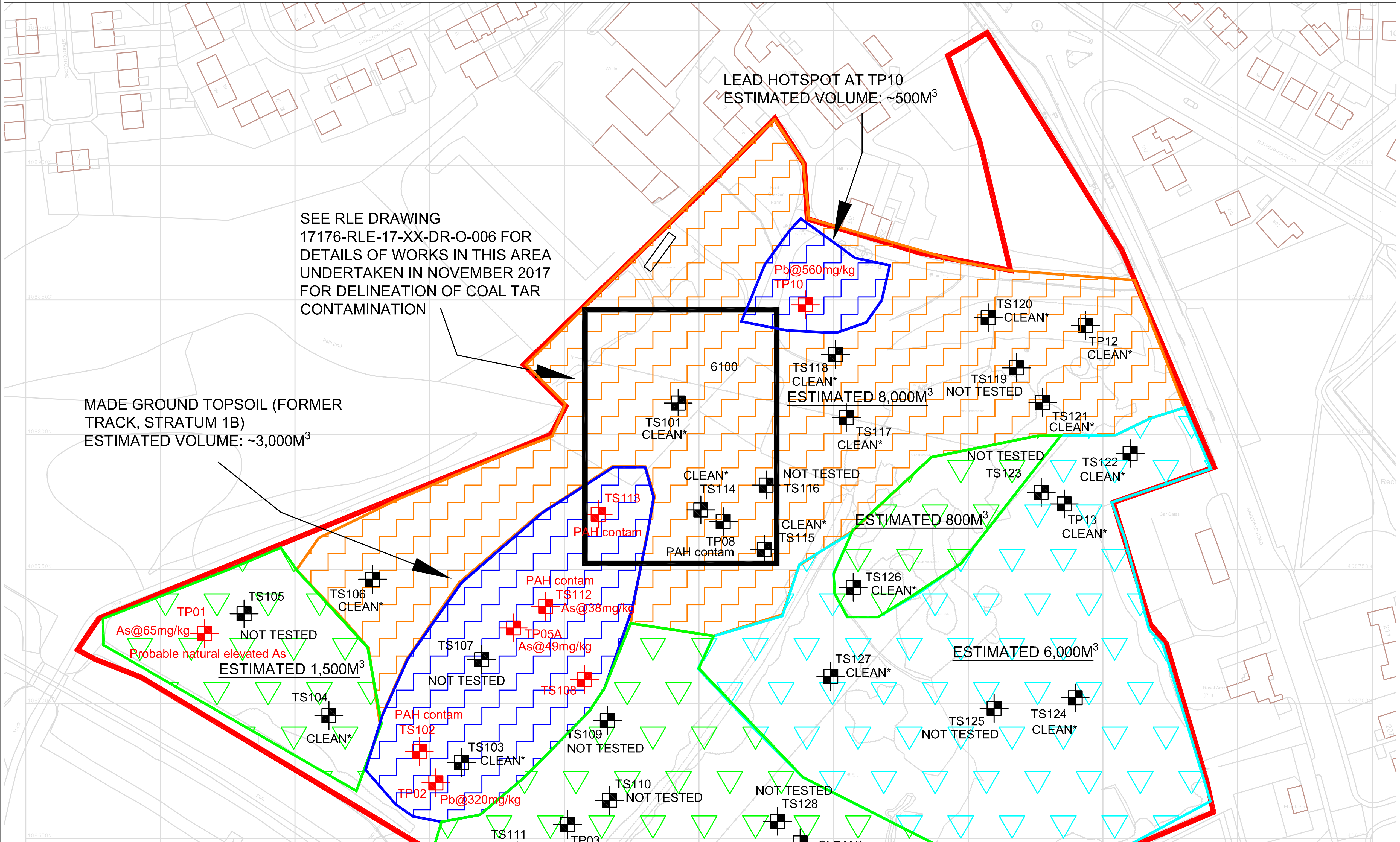
A3



APPROXIMATE VOLUMES OF TOPSOIL:

(ASSUMING AVERAGE THICKNESS OF 0.3M ACROSS ENTIRE SITE)
TOTAL TOPSOIL VOLUME: **~24,450M^3**

NATURAL TOPSOIL - **~7000M^3**
MG TOPSOIL (SUITABLE) - **~6,000M^3**
MG TOPSOIL (UNSUITABLE) - **~8,000M^3**
MG TOPSOIL (CONTAMINATED) - **~3,500M^3**

GENERAL NOTES

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ALL LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.

ANY DISCREPANCIES NOTED ON SITE ARE TO BE REPORTED TO THE ENGINEER IMMEDIATELY.

KEY

TP01 / TP01 — APPROXIMATE LOCATION AND REFERENCE OF TOPSOIL SAMPLED FROM TRIAL PIT EXCAVATED BY RLE IN JULY 2017.
- TOPSOIL SAMPLES IN EXCEEDANCE OF THE GENERIC ASSESSMENT CRITERIA* HIGHLIGHTED IN RED

TS01 / TS01 — APPROXIMATE LOCATION AND REFERENCE OF ADDITIONAL TOPSOIL SAMPLE EXCAVATED BY RLE IN NOVEMBER 2017.
- TOPSOIL SAMPLES IN EXCEEDANCE OF THE GENERIC ASSESSMENT CRITERIA* HIGHLIGHTED IN RED

MADE GROUND TOPSOIL - NOT SUITABLE TO REMAIN IN-SITU DUE TO:
- STATISTICAL ARSENIC AND PAH CONTAMINATION ACROSS A BROAD AREA OF A FORMER TRACK IN SOUTHWEST OF SITE (STRATUM 1B)
- HOT SPOT OF LEAD CONTAMINATION IN THE NORTH OF THE SITE (STRATUM 1A)

MADE GROUND TOPSOIL STRATUM 1A - NOT SUITABLE FOR REUSE/SALE DUE TO VERY POOR QUALITY, GRAVELLY ASHY NATURE. NO CONTAMINANTS OF CONCERN IDENTIFIED

MADE GROUND TOPSOIL 1C - SUITABLE FOR REUSE/SALE. NO CONTAMINANTS OF CONCERN IDENTIFIED, MATERIAL IS OF ACCEPTABLE QUALITY.

NATURAL TOPSOIL STRATUM 6 - SUITABLE FOR REUSE/SALE. NO CONTAMINANTS OF CONCERN IDENTIFIED, MATERIAL IS OF ACCEPTABLE QUALITY. FURTHER ASSESSMENT REQUIRED FOR POSSIBLE AS HOTSPOT AT TP01

*ALL SAMPLES TESTED HAVE BEEN SCREENED AGAINST GENERIC ASSESSMENT CRITERIA (GAC) DERIVED USING THE CONTAMINATED LAND EXPOSURE ASSESSMENT MODEL (CLEA), INCLUDING C4SL AND S4UL VALUES FOR CONTAMINANTS BASED ON A RESIDENTIAL END USE WITH PLANT UPTAKE SCENARIO.

Rev	Date	Amendments	By	Chk
A	11/11/19	NEW DRAWING TEMPLATE	AT	SF

RLRE

Client
HARWORTH ESTATES

Project
ATHERSLEY

Drawing Title
TOPSOIL TEST LOCATION PLAN

Status
INFORMATION

Scale	Drawn	Checked	Date
A3 @NTS	AT	IPB	11/11/19

Drawing No.	Rev.
17176-RLE-19-XX-DR-0-005	A

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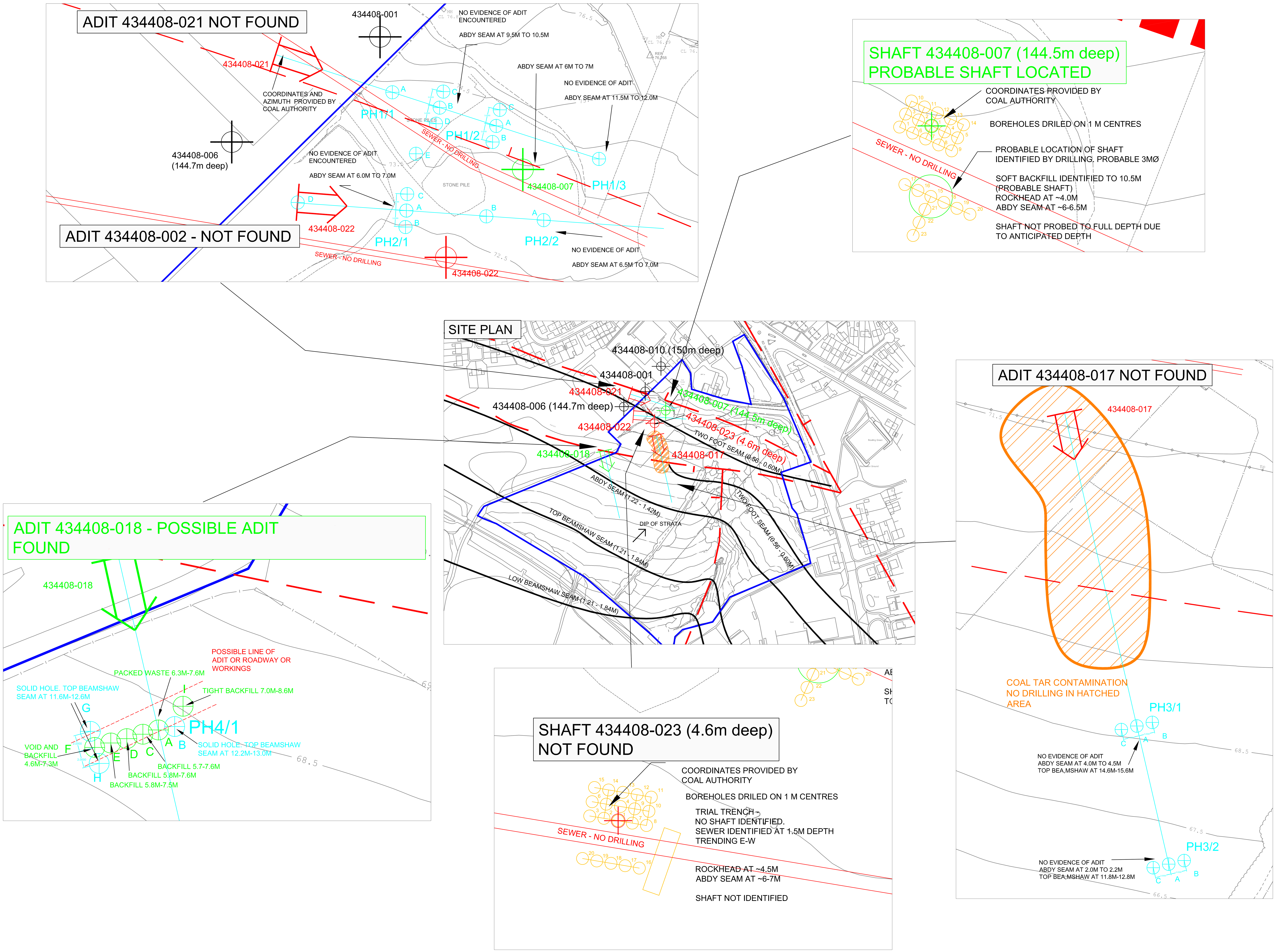
A1



GENERAL NOTES

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ALL LEVELS ARE IN METRES UNLESS NOTED OTHERWISE.

ANY DISCREPANCIES NOTED ON SITE ARE TO BE REPORTED TO THE ENGINEER IMMEDIATELY.

KEY

SITE BOUNDARY

COAL SEAM (NAMED) WITH THICKNESS

FAULT (INFERRED) WITH TICK ON DOWNTROWN SIDE

APPROXIMATE LOCATION OF MINESHAFT WITHIN 20M OF THE SITE (POSITION PROVIDED BY COAL AUTHORITY) **NOT INVESTIGATED**

APPROXIMATE LOCATION OF SHAFT ON SITE (POSITION PROVIDED BY COAL AUTHORITY) **NOT IDENTIFIED BY ROTARY DRILLING**

LOCATION OF MINESHAFT **IDENTIFIED** ON SITE BY ROTARY DRILLING

LOCATION OF POSSIBLE ADIT **IDENTIFIED** ON SITE BY ROTARY DRILLING

APPROXIMATE LOCATION OF ADIT ON SITE **NOT IDENTIFIED BY ROTARY DRILLING**

11 ROTARY PROBEHOLE DRILLED TO INVESTIGATE SHAFT LOCATIONS

E ROTARY PROBEHOLE DRILLED TO INVESTIGATE ADIT LOCATIONS - **ADIT NOT IDENTIFIED**

E ROTARY PROBEHOLE DRILLED TO INVESTIGATE ADIT LOCATIONS - **POSSIBLE ADIT IDENTIFIED**

APPROXIMATE LINE OF ADIT BASED ON COAL AUTHORITY RECORDS

APPROXIMATE AREA OF KNOWN COAL TAR CONTAMINATION - NO DRILLING FOR ENVIRONMENTAL REASONS

Rev	Date	Amendments	By	Chk

Client

HARWORTH ESTATES

Project

WAKEFIELD ROAD ATHERSLEY

Drawing Title

MIINE ENTRY INVESTIGATION PLAN

Status

INFORMATION

Scale	Drawn	Checked	Date
A1@ A1@ NTS	AT	IPB	08/11/19

Drawing No.	Rev.
17176-RLE-19-XX-DR-0-008	P01

Scale Bar: 1:250 2 4 6 8 10 12 14 16 18

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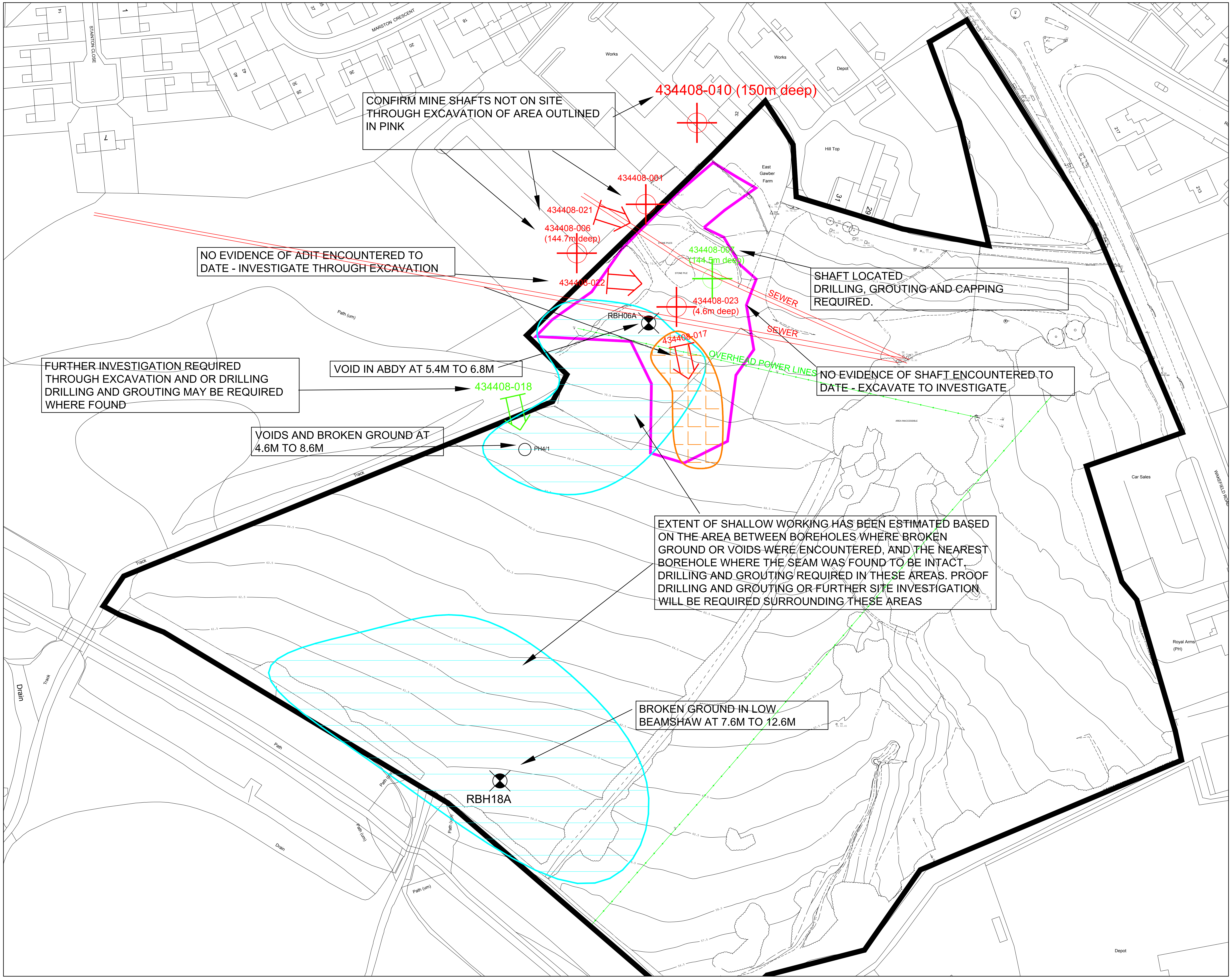
A2



KEY

- SITE BOUNDARY
- APPROXIMATE LOCATION OF MINESHAFT ON OR WITHIN 20M OF THE SITE (POSITION PROVIDED BY COAL AUTHORITY) NOT IDENTIFIED BY ROTARY DRILLING
- LOCATION OF MINESHAFT IDENTIFIED ON SITE BY ROTARY DRILLING
- APPROXIMATE LOCATION OF ADIT ON OR WITHIN 20M OF THE SITE (POSITION PROVIDED BY COAL AUTHORITY) NOT IDENTIFIED BY ROTARY DRILLING
- LOCATION OF POSSIBLE ADIT IDENTIFIED ON SITE BY ROTARY DRILLING
- ESTIMATED EXTENT OF IDENTIFIED POSSIBLE SHALLOW WORKINGS REQUIRING TREATMENT
- ESTIMATED EXTENT OF IDENTIFIED COAL TAR REQUIRING TREATMENT
- ESTIMATED EXTENT OF MATERIAL TO BE EXCAVATED TO IDENTIFY MINE ENTRIES

Rev	Date	Amendments	By	Chk

Client
HARWORTH ESTATES

Project
ATHERSLEY

Drawing Title
NW AREA REMEDIATION WORKS PLAN

Status
INFORMATION

Scale	Drawn	Checked	Date
1:100 at A2	AT	IPB	06/08/20

Drawing No.	Rev.
17176-RLE-19-XX-DR-0-011	PO1

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