

Pile Design Contamination Risk Assessment

Site: Castleton Sidings, Heywood Road, Rochdale

Reference: 14-768-R5-1

Date: March 24





E3P

Taylor Road
Trafford Park
Urmston
Manchester
M41 7JQ

+ 44 (0) 161 707 9612
<https://e3p.co.uk>

Registered in England
CRN: 08725262

QUALITY ASSURANCE

Report reference		14-768-R5			
REV REF:	DESCRIPTION	AUTHOR	CHECKED	AUTHORISED	DATE
R5-1	First issue	NS	JS	SC	05/03/24

This report has been prepared for the sole benefit, use, and information of the client. The liability of Environmental Engineering Partnership Limited T/A E3P with respect to the information contained in the report will not extend to any third party. This report has been prepared by the qualified persons as listed below.

WRITTEN BY	QUALIFICATIONS	POSITION
Nicola Sellars	MSci (Hons), FGS, MEnvSc	Senior Consultant
REVIEWED BY	QUALIFICATIONS	POSITION
Jessica Sheridan	MeSci, FGS	Senior Consultant
AUTHORISED BY	QUALIFICATIONS	POSITION
Stephanie Cox	BSc (Hons), FGS, PIEMA, MEnvSci, Cenv	Director



TABLE OF CONTENTS

1. INTRODUCTION	4
1.1. Background	4
1.2. Proposed Development.....	4
1.3. Scheme background.....	5
1.4. Scope of Works.....	5
1.5. Previous Works	6
1.6. Confidentiality	6
2. GROUNDWATER CONTROLLED WATER RISK ASSESSMENT.....	7
2.1. Ground Conditions.....	7
2.2. Tier 2 Controlled Water Risk Assessment	8
2.2.1. Site Sensitivity Summary.....	8
2.2.2. Tier 2 Assessment Summary.....	9
3. PILE DESIGN CONTAMINATION RISK ASSESSMENT	11
3.1. Pile Design	11
3.2. Contamination risk Assessment	11
4. CONCLUSION.....	13
APPENDIX I LIMITATIONS.....	14
APPENDIX II GLOSSARY	20
APPENDIX III DRAWINGS	23

DRAWINGS

14-768-001 - Site Location Plan
14-768-105 - Exploratory Hole Location Plan
14-768-106 - Depth of Made Ground Plan
14-768-107 - Depth and Thickness of Peat Plan
14-768-118 - Contamination Issues Plan
14-768-010 - Controlled Waters Conceptual Site Model
McAuliffe Volumetric Appraisal Drawing No. KELL 3703 VA 02
Kellen Homes Finished Floor Levels Drawing No. KH003-010
Kellen Homes Development Strategy Drawing No. KH003-101



1. INTRODUCTION

1.1. BACKGROUND

E3P has been instructed by Kellen Homes to undertake a contamination risk assessment for penetrative foundation systems, which is referred to as a Contamination Piling Risk Assessment, for a proposed low-rise residential development at the land off Heywood Road, Castleton, otherwise known as Castleton Sidings.

1.2. PROPOSED DEVELOPMENT

Kellen Homes are considering the proposed acquisition and future redevelopment of the site with a hybrid planning application comprising the following:

-  Full planning application for residential development, including access, car parking, landscaping, open space and associated engineering and infrastructure including an electric substation and foul water pump station.
-  Outline planning permission with all matters reserved for the principle of development to facilitate the East Lancashire Railway (ELR) extension.

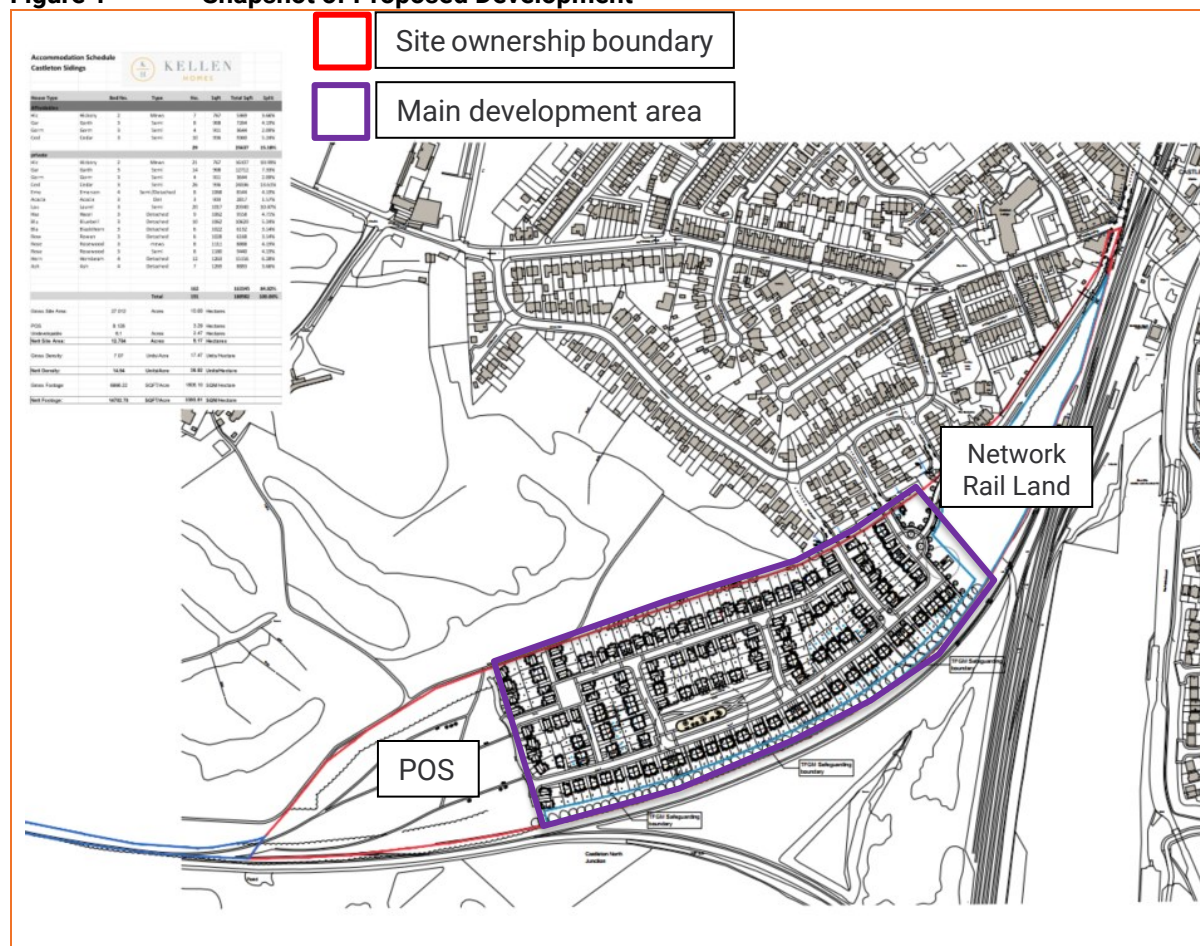
Kellen Homes Development Strategy Drawing No. KH003-101 (Appendix III) identifies the proposed development layout.

The site is separated into three areas;

-  The south western quarter of the site falls within a designated area of greenbelt and will form an area of future Public Open Space (POS).
-  The central sector (derelict sidings) will form the main residential development area.
-  The north eastern quarter falls within an area of Network Rail operated land and will ultimately form part of the development for the East Lancashire Railway (ELR) extension.

A snapshot of the proposed development layout is indicated in Figure 1, overleaf.

Snapshot of Proposed Development



1.3. SCHEME BACKGROUND

E3P has been provided with the following correspondence from the Environment Agency in relation to their Statutory Consultation to the planning application SO/2023/123300/01-L01 dated 3 August 2023:

Condition

Piling or any other foundation designs using penetrative methods shall not be permitted other than with the written consent of the local planning authority, which may be given for those parts of the site where it has been demonstrated that there is no resultant unacceptable risk to groundwater. The development shall be carried out in accordance with the approved details.

Reason

To ensure that the proposed piling operation and installation, does not harm groundwater resources in line with paragraph 174 of the National Planning Policy Framework and Position Statement J of the 'The Environment Agency's approach to groundwater protection'.

1.4. SCOPE OF WORKS

E3P has prepared this Contamination Piling Risk Assessment in due consideration of the Regulatory Authorities requirement to demonstrate that the proposed construction works will not present any unacceptable risk to controlled waters of the wider environ.



1.5. PREVIOUS WORKS

The following phases of Geo-Environmental investigations have previously been carried out at the site:

-  **E3P** – *Phase I & II Geoenvironmental Site Assessment*. Ref: 14-768-R1-3, dated March 2023.
-  **E3P** – *Supplementary Ground Investigation*. Ref: 14-768-L4-2, dated 13th March 2023.
-  **E3P** – *Supplementary Controlled Waters Assessment*. Ref: 14768-L5-1, dated February 2024.

These reports have been used to form the basis of this Piling Risk Assessment.

1.6. CONFIDENTIALITY

E3P has prepared this report solely for the use of the client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from E3P; a charge may be levied against such approval.

STAGE 1

STAGE 1 VOLUMES : TOPO LEVELS DOWN TO BOTTOM OF PEAT LEVELS (MADE GROUND + PEAT)					
Group	Volumes (m³)			Cut / Fill Areas (m²)	
	Cut/Material	Fill/Void	Balance	Cut/Material	Fill/Void
Back Gardens	2221	1	2219	1281	26
Frontages	21484	3	21480	5752	22
Plots	24793	3	24791	10700	46
POS	4689	3	4686	1472	29
Roads	29856	0	29855	7220	18
Shared Driveways	7804	0	7804	1546	0
Total	90847	10	90836	27972	142

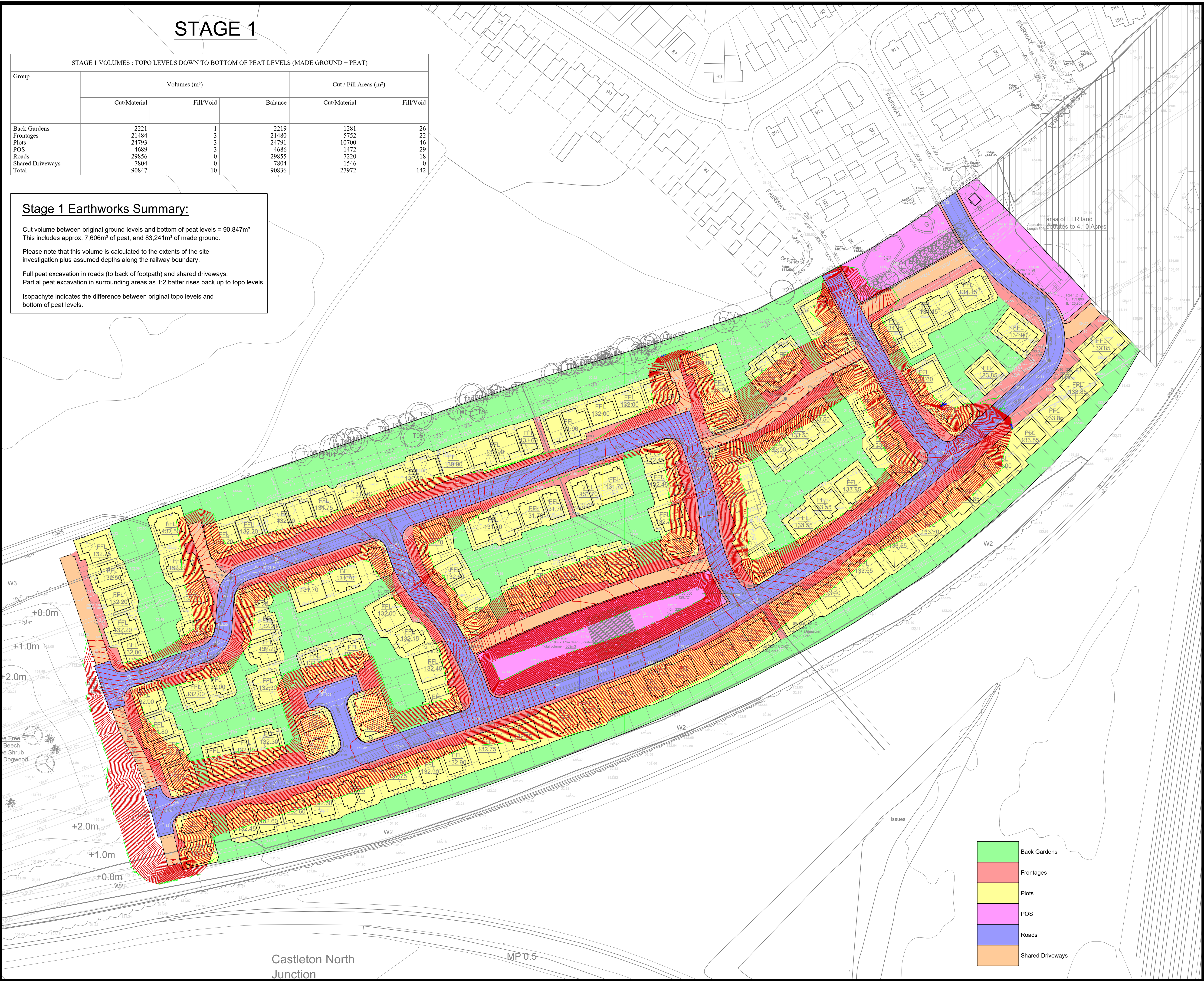
Stage 1 Earthworks Summary:

Cut volume between original ground levels and bottom of peat levels = 90,847m³
This includes approx. 7,606m³ of peat, and 83,241m³ of made ground.

Please note that this volume is calculated to the extents of the site investigation plus assumed depths along the railway boundary.

Full peat excavation in roads (to back of footpath) and shared driveways.
Partial peat excavation in surrounding areas as 1:2 batter rises back up to topo levels.

Isopachyte indicates the difference between original topo levels and bottom of peat levels.



N

Approx North

McAuliffe

THE BROWNFIELD EXPERTS

Surveying & Engineering Department

Legend

Cut

Fill

Zero

Planning levels

Topographic levels

12.345

12.345

— Drawing Revisions:

+ Rev. 01 - 24/02/2022 - Updated layout, levels and SI information.

+ Rev. 02 - 31/03/2022 - Updated layout, levels and SI information.

Title	Revision	Consultant	Date	Notes
Revised Drainage Option 1.dwg	01	Kellen Holmes	11/03/2022	Engineering layout / levels
PS-2020-TS-02.dwg	02	Paragon Surveys	26/04/2021	Topographical Survey
KELLEN Depth to peat.dwg	-	Kellen Holmes	-	Point depth isopachyte
KELLEN Thickness to peat.dwg	-	Kellen Holmes	-	Point thickness isopachyte

JOB

CASTLETON SIDINGS

ROCHDALE

DRAWING

VOLUMETRIC APPRAISAL (REV 02)

SHEET 1/2

DATE: 31/03/2022

DRAWN: JY

CHECKED: PC

SCALE: N.T.S

www.mcauliffegroup.co.uk

McAuliffe

THE BROWNFIELD EXPERTS

McAuliffe Civil Engineering Ltd.

McAuliffe House
Northcott Road
Wolverhampton
West Midlands
W V14 OTP
Tel: 01902 354400

St Baldred's Hall
239 Ashley Road
Hale
Cheshire
WA15 9NE
Tel: 0161 928 7740

DRAWING No: KELL 3703 VA 02 (1)



2. GROUNDWATER CONTROLLED WATER RISK ASSESSMENT

2.1. GROUND CONDITIONS

MADE GROUND

Made Ground deposits have been encountered within all of the exploratory hole locations from ground level to a maximum proven depth of 6.60 m bgl (RO227). The full depth of Made Ground remained unproven in c. 50% of exploratory hole locations.

The material generally comprises a black slightly clayey gravelly medium sand / sandy gravel. Gravel constituents predominantly include mudstone, brick, clinker, coal, and ceramic with less frequent inclusions of metal, shale, glass and timber/wood. Track ballast comprising greyish black subangular gravel was encountered in areas along rail tracks, with a thickness of c. 0.50-1.00 m.

Obstructions (reinforced concrete slabs and redundant services) were encountered frequently across the site, together with visual and olfactory evidence of (hydrocarbon) contamination.

The E3P Depth of Made Ground Plan is presented as drawing no. 14-768-106 in APPENDIX III.

PEAT

Blackish brown pseudo fibrous PEAT was encountered beneath the Made Ground in 27 no. locations.

The peat encountered beneath the site was found to range in thickness from 0.20 to 2.60 m thick (CP102), although was predominantly 1.0 m thick or less, and noted to be generally thicker towards the south and west of the site and absent in the east (towards the Network Rail Land).

The E3P Depth and Thickness of Peat Plan is presented as drawing no. 14-768-107 in APPENDIX III.

DRIFT

Drift deposits were encountered beneath the Made Ground and Peat (where proven) and comprised of alternating SAND/GRAVEL and sandy CLAY extending to depths in excess of 60.50 m bgl (RB101). Where encountered, the shallowest drift deposits were noted to be predominantly granular.

Drift deposits were generally described as follows:

- ✳ Medium dense light brown variably slightly clayey SAND with occasional gravel of fine to coarse angular to rounded of sandstone. Loose silty sand was encountered in WS103 from 4.50 m bgl. The granular soils were also noted to be loose and collapsing in TP207 and TP212
- ✳ Light brown sandy GRAVEL of medium subangular to rounded mudstone and sandstone.
- ✳ Stiff to very stiff medium to high strength sandy CLAY with occasional gravel of fine to coarse angular to rounded mudstone. At one location (CP101), directly beneath the Made Ground, a soft very low strength brown sandy CLAY was encountered between 4.20 m and 5.00 m bgl.

SOLID

The solid geology was not encountered within the deeper cable holes or rotary open holes which extended to a maximum depth of 60.50 m bgl. A nearby BGS borehole indicates rockhead at circa 81.00 m bgl.



GROUNDWATER

Groundwater strikes were generally encountered during the fieldwork as seepages between 1.20 m and 4.80 m bgl.

During the subsequent monitoring visits (March-August 2021), the monitoring wells were predominantly found to be dry or containing only small volumes of water.

Water sampling undertaken during January-February 2024 recorded water levels in the west of the site (WS105, WS301-WS305) to be between 1.75 m and 3.02 m bgl (approximately 129-130.25 mAOD based on approximate elevation of 132 mAOD).

2.2. TIER 2 CONTROLLED WATER RISK ASSESSMENT

2.2.1. SITE SENSITIVITY SUMMARY

The site sensitivity with respect to controlled waters is summarised within Table 1.

Table 1 Controlled Waters Sensitivity Profile

RISK PROFILE	DISCUSSION	SENSITIVITY RATING
Groundwater Source Protection Zone or Drinking Water Safeguard Zone	The site is not situated with a Groundwater Source Protection Zone.	Low
Distance to the Closest Groundwater Abstraction Point	None identified within a 1 km radius.	Low
Aquifer Classification in Superficial Drift Deposits	Secondary Undifferentiated / Secondary A Aquifer	Medium
Aquifer Classification in Bedrock	Secondary A Aquifer – overlain by circa 80 m of drift, thus reducing the sensitivity.	Low/Medium
Viability for Anthropogenic Soil in Direct Contact with Aquifer (Drift or Bedrock)	Variable MADE GROUND with hydrocarbon impact is present in the near surface, overlying natural drift strata. Bedrock aquifer is c. 80 m deep and therefore of reduced sensitivity.	Medium
Is the Site Located Within 50 m of a Surface Watercourse?	The risk to surface water is negligible given the absence of a viable receptor within influencing distance of the site	Low



2.2.2. TIER 2 ASSESSMENT SUMMARY

A Tier 2 Controlled Water Risk Assessment was completed by E3P as part of the Phase II Geo-Environmental Site Assessment ref; 14-768-R1-3, dated March 2023 and Supplementary Controlled Waters Assessment Letter, ref; 14-768-L5-1, dated February 2024, the findings of which are summarised as follows:

- ✳ Historically, the site has been subjected to extensive industrial uses including railway sidings and, engineering stores/sheds. Widespread leachable heavy metal, PAH, TPH and SVOC contamination has been identified in the soils across the site, thus posing a risk to controlled waters.
- ✳ The site is underlain by a mixed geology, generally cohesive clay in the northeast of the site and generally granular sand and gravel in the southwest, with thick bands of clay beyond 10.0 m bgl. The clay deposits will afford for the protection of the underlying bedrock aquifer. Given the extensive thickness of drift (>60.0 m) and absence of a nearby water abstraction borehole, the risk to the underlying bedrock aquifer is considered to be significantly reduced and therefore deemed to be at a low risk from on-site contamination.
- ✳ However, high concentrations of naphthalene and aromatic hydrocarbon fractions were recorded in the initial groundwater sample taken from WS105 (sample-1, March 2021) in the west of the site, potentially representative of a plume.
- ✳ The site sits at an approximate elevation of 130-135 m AOD and is inferred to slope very gently down to the southwest. The land to the north west and Roeacre Brook (circa 150 m to the north west) is noted to be at a lower elevation (~125 m AOD) and thus down hydraulic gradient of the site. Although this is considered outside of typical influencing distance, a surface water drain is present along the northern boundary, which may act as a conduit for site derived contamination to enter nearby watercourses. The ditch was dry at the time of the initial phase of works but further sampling was recommended when possible.
- ✳ Further sampling of WS105 (sample-2) was therefore undertaken in November 2021 to determine whether the identified elevated concentrations were persistent within the shallow/perched groundwater. The results again showed high concentrations of volatile compounds at this location, including naphthalene and aromatic hydrocarbon fractions, together with heavy metals and non-volatile PAHs.
- ✳ Water samples taken from surrounding boreholes to the north west (WS101 and RO223) and west (RO221) of WS105 contained elevated heavy metal concentrations, but did not identify elevated volatile compounds, thus indicating no significant migration of volatile contamination towards the west or north west i.e. down-gradient and in the direction of the Roeacre Brook / peripheral drainage channels.
- ✳ Subsequent sampling of the on-site drainage ditch also confirmed the absence of TPH/volatile compound exceedances. Furthermore, the ditch was not observed to be flowing and is considered more likely to hold excess run-off and terminate within the site boundary, rather than acting as a tributary to the off-site watercourse. There is therefore not considered to be a complete pollutant linkage between the groundwater contamination identified at the site and the Roeacre Brook.
- ✳ Additional wells were also installed to the south and east of WS105 to assess the extent of groundwater impact. TPH fractions, naphthalene and SVOCs have been found in exceedance of GAC values in WS301 and WS303, located to the east of WS105, albeit at lower concentrations than in WS105. Only heavy metals and non-volatile PAH compounds were found to be in exceedance in WS302, WS304 and WS305, suggesting the contamination is not migrating much further south.



- ✿ The identified hydrocarbon and volatile contamination in the groundwater (WS105, WS301 and WS303) is located within the area of defined visual and olfactory hydrocarbon contamination in soils (refer to drawing no. 14-768-118). It is therefore considered likely that the contamination is confined to the perched water and is directly derived from the soils as a point source. No surface water receptors have been identified within influencing distance of the site to the south or east. There is therefore considered to be no unacceptable degree of future risk to controlled waters receptors from the site.
- ✿ As part of the previous human health risk assessment (E3P Supplementary Site Investigation, ref: 14-768-L4-2, March 2023) it was recommended that remedial treatment would be necessary for the soils to mitigate long term potential vapour accumulation and migration, odour issues, risk to construction workers/end users and potential future risks to controlled waters.
- ✿ Point source removal and ex-situ treatment of the soils by a specialist contractor is considered the most viable option. This method would remediate the soil impact and as a result remove the point source and result in improved groundwater conditions.
- ✿ Upon removal of the point source of impact and monitoring of groundwater, the site will pose no significant risk to controlled waters.
- ✿ During the enabling works, the following surface water management mitigation measures should be adopted to ensure no risk to neighbouring water courses:
 - Treatment of pumped water from excavations and discharge to local sewers (in accordance with the relevant permit),
 - Prevention of run-off to local drainage ditches (bund along length of ditches) in accordance with an appropriate surface water management plan.
 - Ensure any stockpiles of excavated materials are located in central areas of the site and banded to prevent any lateral runoff.



3. PILE DESIGN CONTAMINATION RISK ASSESSMENT

3.1. PILE DESIGN

A foundation zoning plan has not yet been prepared for the site, but it is anticipated that the majority, if not all, plots will be constructed using driven piled foundations.

3.2. CONTAMINATION RISK ASSESSMENT

The purpose of the piling risk assessment is to ensure that the proposed piling method will not have an adverse impact by creating new pathways for the migration of contamination, considering the protection both of water resources and human health.

The piling risk assessment considers six pollution scenarios based on the site setting and ground investigation findings. These are discussed in Table 2.

Table 2 Potential Pollution Scenario

GENERIC POLLUTION SCENARIO	RISK	SITE CONSIDERATIONS
Creation of preferential pathways associated with potentially soluble phase compounds within the perched aquifer	LOW	Due to the depth of bedrock (c. 80 m) piles will not extend to bedrock and where cohesive drift deposits are present, the aquitard will not be fully punctured, and no preferential pathway will be created. Where granular drift is the founding strata, given the high permeability of the deposits, no aquitard is deemed to be present and a potential pathway for contamination from shallow soils through the granular drift deposits already exists prior to the use of piles across the site. Where driven piles are utilised, soils are displaced horizontally, with the density of the soils around the piles increasing which in turn reduces soil permeability. As such, no new preferential pathway will be created between perched aquifers and controlled water receptors. Additionally, the likelihood of down-ward vertical migration along the driven pile shaft, particularly in view of lateral compaction, is significantly reduced and the risk low.
Creation of preferential pathways, through a low permeability surface layer, to allow upward migration of landfill gas, soil gas or contaminant vapors to the surface	LOW	Following completion of remediation, enabling works and piling works, post remediation ground gas monitoring is to be undertaken. The findings of which will determine the appropriate gas protection measures required in the proposed development for protecting end users of the site. Areas with elevated concentrations of TPH, SVOCs and mercury have been identified. In the areas where impacted material remains, or is re-placed, VOC resistant membranes will be required to reduce the long-term risks to receptors.
Direct contact of site workers and others with contaminated soil arisings that have been brought to the surface.	LOW	The use of driven piles will not generate any return materials to the surface.



GENERIC POLLUTION SCENARIO	RISK	SITE CONSIDERATIONS
Direct contact with the pile and potentially contaminated soil and leachable compounds The driving of solid contaminants down into the aquifer during piling	LOW LOW	The concrete will be specified to a recognised standard according to the pH and sulphate concentrations recorded in the E3P site investigation. The land remediation (point source removal/treatment) works will significantly reduce the overall risk to controlled waters. The primary movement of soil during piling is lateral with a small potential for soils in contact with the sides and that base to be dragged down slightly before it is displaced. However, document EA NC/99/73 concludes that there are no recorded cases of this occurring. Additionally, the underlying secondary A aquifer is considered low sensitivity due to its depth, and because the site is not located within a source protection area or within a drinking water safeguard zone. As the proposed piling methods are only likely to result in minimal vertical displacement of soils through the underlying drift and given the low sensitivity of the receptor the risk is considered to be low.
Contamination of groundwater and, subsequently, surface waters by concrete, cement paste or grout	LOW	Precast driven piles do not utilise liquid cement or grout. During the enabling works, the following surface water management mitigation measures should be adopted to ensure no risk to neighbouring water courses:  Treatment of pumped water from excavations and discharge to local sewers (in accordance with the relevant permit),  Prevention of run-off to local drainage ditches (bund along length of ditches) in accordance with an appropriate surface water management plan.  Ensure any stockpiles of excavated materials are located in central areas of the site and banded to prevent any lateral runoff.



4. CONCLUSION

The Piling Risk Assessment has determined that based on the ground and perched groundwater conditions within the Made Ground and underlying drift strata, the use of a driven precast piles bearing within the underlying drift will pose a low risk.

The contamination in the shallow Made Ground and groundwater will be subject to remediation before the foundation works commence. E3P consider that the underlying Secondary A aquifer will therefore not be detrimentally impacted by the use of driven piles at the site.

Risks to nearby surface water courses during the remediation, enabling and foundation works phase will be managed to ensure run off is controlled appropriately.

END OF REPORT

APPENDIX I

LIMITATIONS



GENERAL

1. This report and any associated works (together comprising the "Services") were compiled and carried out by E3P for the client (as present in Section 1) under the E3P "Terms of Business" or with those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed and outlined in the body of the report.
2. Unless explicitly agreed otherwise, in writing, this report has been prepared under E3P Standard Terms and Business as included within our proposal to the Client.
3. Project-specific appointment documents may be agreed upon at our discretion and a charge may be levied for both the time to review and finalise appointment documents and also for associated changes to the appointment terms. E3P reserves the right to amend the fee should any changes to the appointment terms create an increased risk to E3P.
4. The report needs to be considered in light of the proposal and associated limitations of scope. The report needs to be read in full and isolated sections cannot be used without full reference to other elements of the report and any previous works referenced within the report.

PHASE 1 GEOENVIRONMENTAL AND PRELIMINARY RISK ASSESSMENTS

5. Coverage: This section covers reports with the following titles or combination of titles: Phase 1; Desktop Study; Geoenvironmental Assessment; Development Appraisal; Preliminary Environmental Risk Assessment; Constraints Report; Due Diligence Report; Geotechnical Development Review; Environmental Statement; Environmental Chapter; Baseline Environmental Assessment; Project Scope Summary Report (PSSR), Program Environmental Impact Report (PEIR), Geotechnical Development Risk Register; Agricultural Land Assessment; Mineral Safeguarding Assessment; Desk Top Coal Mining Risk Assessment; Hydrogeological Appraisal; Construction Environmental Management Plan; and Site Water Management Plan.
6. The works undertaken to prepare this report comprised a study of available and easily documented information from a variety of sources (including the Client), together with (where appropriate) a brief walkover inspection of the Site and correspondence with relevant authorities and other interested parties. Due to the short timescales associated with these projects responses may not have been received from all parties. E3P cannot be held responsible for any disclosures that are provided post-production of our report and will not automatically update our report.
7. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only for the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, E3P reserves the right to review such information and, if warranted, to modify the opinions accordingly.
8. It should be noted that any risks identified in this report are perceived risks based on the information reviewed. Actual risks can only be assessed following intrusive investigations of the site.



9. Where mention has been made to the identification of Japanese Knotweed and other invasive plant species and asbestos or asbestos-containing materials, this is for indicative purposes only and does not constitute or replace full and proper surveys completed by suitably qualified and experienced specialists in these fields.
10. E3P does not warrant work/data undertaken/provided by others.

INTRUSIVE INVESTIGATION REPORTS

11. Coverage: The following report titles (or combination) may cover this category of work: Geoenvironmental Site Investigation; Geotechnical Assessment; GIR (Ground Investigation Reports); Preliminary Environmental And Geotechnical Risk Assessment; Preliminary Summary; Coal Mining Risk Assessment, Ground Gas Addendum; and, Geotechnical Risk Register.
12. The investigation has been undertaken to provide information concerning either:
 - I. The type and degree of contamination present at the site in order to allow a generic quantitative risk assessment to be undertaken; or
 - II. Information on the soil properties present at the site to allow for geotechnical development constraints to be considered.
13. The scope of the investigation was selected on the basis of the specific development and land use scenario proposed by the Client and may be inappropriate to another form of development or scheme. If the development layout was not known at the time of the investigation the report findings may need revisiting once the development layout is confirmed.
14. Unless otherwise specified in the scope of works, any site drawing(s) provided in this report is (are) not meant to be an accurate base plan but is (are) used to present the general relative locations of features on, and surrounding, the site. Features (intrusive and sample locations etc) annotated on site plans are not drawn to scale but are centred over the approximate location. Such features should not be used for setting out and should be considered indicative only.
15. For contamination purposes, the objectives of the investigation are limited to establishing the risks associated with potential contamination sources with the potential to cause harm to human health, building materials, the environment (including adjacent land), or controlled waters.
16. For geotechnical investigations, the purpose is to broadly consider potential development constraints associated with the physical property of the soils underlying the site within the context of the proposed future or continued use of the site, as stated within the report.
17. The amount of exploratory work, soil property testing and chemical testing undertaken has necessarily been restricted by various factors which may include accessibility, the presence of services; existing buildings; current site usage or short timescales. The exploratory holes completed assess only a small percentage of the area in relation to the overall size of the Site, and as such can only provide a general indication of conditions.



18. The number of sampling points and the methods of sampling and testing do not preclude the possible existence of contamination where concentrations may be significantly higher than those actually encountered or ground conditions that vary from those identified. In addition, there may be exceptional ground conditions elsewhere on the site which have not been disclosed by this investigation and which have therefore not been taken into account in this report.
19. The inspection, testing and monitoring records relate specifically to the investigation points and the timeframe that the works were undertaken. They will also be limited by the techniques employed. As part of this assessment, E3P has used reasonable skill and care to extrapolate conditions between these points based on assumptions to develop our interpretation and conclusions.
20. The assumption made in forming our conclusions is that the ground and groundwater conditions (both chemically and physically) are the same as have been encountered during the works undertaken at the specific points of investigation and at the time of the investigation.
21. Conditions can change between investigation points both spatially and over time and these interpretations should therefore be considered indicative. The assessment of extreme weather events and their impact on ground conditions is not within the scope of E3P's work.
22. The risk assessment and opinions provided are based on currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values. Specific assumptions associated with the risk assessment process have been outlined within the body or associated appendix of the report.
23. Additional investigations may be required in order to satisfy relevant planning conditions or to resolve any engineering and environmental issues.
24. Where soil contamination concentrations recorded as part of this investigation are used for commentary on the potential waste classification of soils for disposal purposes, these should be classed as indicative only. Due consideration should be given to the variability of contaminant concentrations taken from targeted samples versus bulk excavated soils and the potential variability of contaminant concentrations between sampling locations. Where major waste disposal operations are considered, targeted waste classification investigations should be designed and the waste classification and any subsequent disposal option agreed upon with licenced subcontractors and/or the relevant regulators.
25. The results of the asbestos testing are factually reported and interpretation is given as to how this relates to the previous use of the site, the types of ground encountered and site conceptualisation. This does not however constitute a formal asbestos assessment. These results should be treated cautiously and should not be relied upon to provide detailed and representative information on the delineation, type and extent of bulk ACMs and/or trace loose asbestos fibres within the soil matrix at the site.
26. If costs have been included in relation to additional site works, and/or site remediation works these must be considered as indicative only and must be confirmed by a qualified quantity surveyor.



EUROCODE 7: GEOTECHNICAL DESIGN

27. On 1st April 2010, BS EN 1997-1:2004 (Eurocode 7: Geotechnical Design – Part 1) became the mandatory baseline standard for geotechnical ground investigations.
28. In terms of geotechnical design for foundations, slopes, retaining walls and earthworks, EC7 sets guidance on design procedures including specific guidance on the numbers and spacings of boreholes for geotechnical design, there are limits to methods of ground investigation and the quality of data obtained and there are also prescriptive methods of assessing soil strengths and methods of design. Unless otherwise explicitly stated, the work has not been undertaken in accordance with EC7. A standard geotechnical interpretative report will not meet the requirements of the Geotechnical Design Report (GDR) under Eurocode 7. The GDR can only be prepared following confirmation of all structural loads and serviceability requirements. The report is likely to represent a Ground Investigation Report (GIR) under the Eurocode 7 guidance.

DETAILED QUANTITATIVE RISK ASSESSMENTS AND REMEDIATION AND ENABLING WORK STRATEGY REPORTS

29. These reports build upon previous report versions and associated notes. The scope of the investigation, further testing and monitoring and associated risk assessments were selected based on the specific development and land use scenario proposed by the Client and may not be appropriate to another form of development or scheme layout. The risk assessment and opinions provided are based on currently available approaches in the generation of Site Specific Assessment Criteria relating to contamination concentrations and are not considered to represent a risk in a specific land use scenario to a specific receptor. No liability can be accepted for the retrospective effects of any future changes or amendments to these values, associated models or associated guidance.
30. The outputs of the Detailed Quantitative Risk Assessments are based upon the manipulation of standard risk assessment models. These are our interpretation of the risk assessment criteria.
31. Before adoption on-site, assessment criteria will need to be discussed and agreed upon with the Regulatory Authorities prior to adoption on site. The regulatory discussion and engagement process may result in an alternative interpretation being determined and agreed. The process and timescales associated with the Regulatory Authority engagement are not within the control of E3P. All costs and programmes presented as a result of this process should be validated by a quantity surveyor and should be presumed to be indicative.
32. E3P does not accept liability for any subcontract work that has not been completed in strict accordance with an approved E3P Remediation and Enabling Works Strategy.

GEOTECHNICAL DESIGN REPORT (GDR)

33. The GDR can only be prepared following confirmation of all structural loads and serviceability requirements. All the relevant information needs to be provided to allow for a GDR to be produced.



MONITORING (INCLUDING REMEDIATION MONITORING REPORTS AND BUILD PHASE MITIGATION)

34. These reports are factual and comprise monitoring, normally groundwater and ground gas and data provided by contractors as part of earthworks or remedial works.
35. The data is presented and will be compared with assessment criteria.

APPENDIX II

GLOSSARY



TERMS

ACM	Asbestos-containing material	MMP	Materials management plan
ADS	Acoustic design statement	ND	Not detected
AST	Above-ground storage tank	NDP	Nuclear density probe
BGS	British Geological Survey	NMP	Noise management plan
BSI	British Standards Institute	NPSE	Noise policy statement for England
BTEX	Benzene, toluene, ethylbenzene, xylenes	NR	Not recorded
CA	Coal Authority	PAH	Polycyclic aromatic hydrocarbon
CBR	California bearing ratio	PCB	Polychlorinated biphenyl
CIEH	Chartered Institute of Environmental Health	PI	Plasticity index
CIRIA	Construction Industry Research Association	PID	Photo ionisation detector
CLEA	Contaminated land exposure assessment	POS	Public open space
CML	Council of Mortgage Lenders	PPE	Personnel protective equipment
CoC	Contaminants of concern	ProPG	Professional practice guidance
CSM	Conceptual site model	QA	Quality assurance
DNAPL	Dense non-aqueous phase liquid (chlorinated solvents, PCB)	SGV	Soil guideline value
DWS	Drinking water standard	SPH	Separate-phase hydrocarbon
EA	Environment Agency	SPT	Standard penetration test
EQS	Environmental quality standard	SVOC	Semi-volatile organic compound
FFL	Finished floor level	TPH	Total and speciated petroleum hydrocarbon
GAC	General assessment criteria	TPH CWG	Total Petroleum Hydrocarbon (Criteria Working Group)
GL	Ground level	UKWIR	United Kingdom Water Infrastructure Risk
GSV	Gas screening value	UST	Underground storage tank
HCV	Health criteria value	VCC	Vibro-concrete column
ICSM	Initial conceptual site model	VOC	Volatile organic compound
LEL	Lower explosive limit	VRSC	Vibro-replacement stone columns
LMRL	Lower method reporting limit	VSC	Vibro-stone columns
LNAPL	Light non-aqueous phase liquid (petrol, diesel, kerosene)	WHO	World Health Organisation
MCV	Moisture condition value	WRAP	Waste and Resources Action Programme



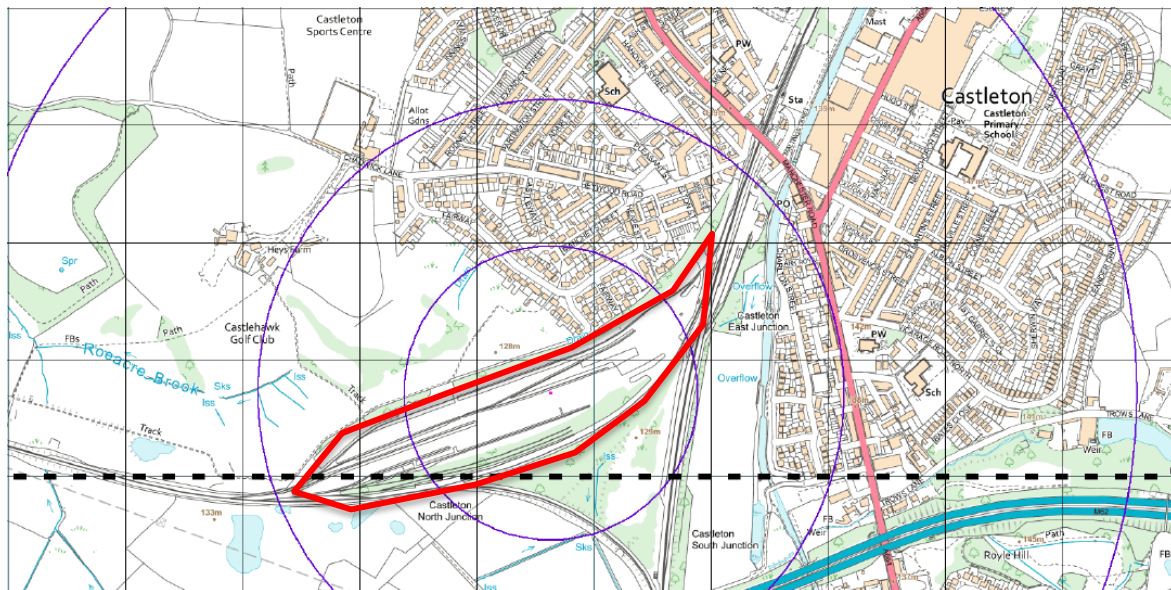
MIBK	Methyl isobutyl ketone	WTE	Water table elevation
m	Metres	ppm	Parts per million
km	Kilometres	mg/m³	Milligram per metre cubed
% v/v	Percent volume in air	m bgl bgl	Metres below ground level
mb	Millibars (atmospheric pressure)	m bcl	Metre below cover level
l/hr	Litres per hour	mAOD	Metres above ordnance datum (sea level)
µg/l	Micrograms per litre (parts per billion)	kN/m²	Kilonewtons per metre squared
ppb	Parts per billion	µm	Micrometre
mg/kg	Milligrams per kilogram (parts per million)		

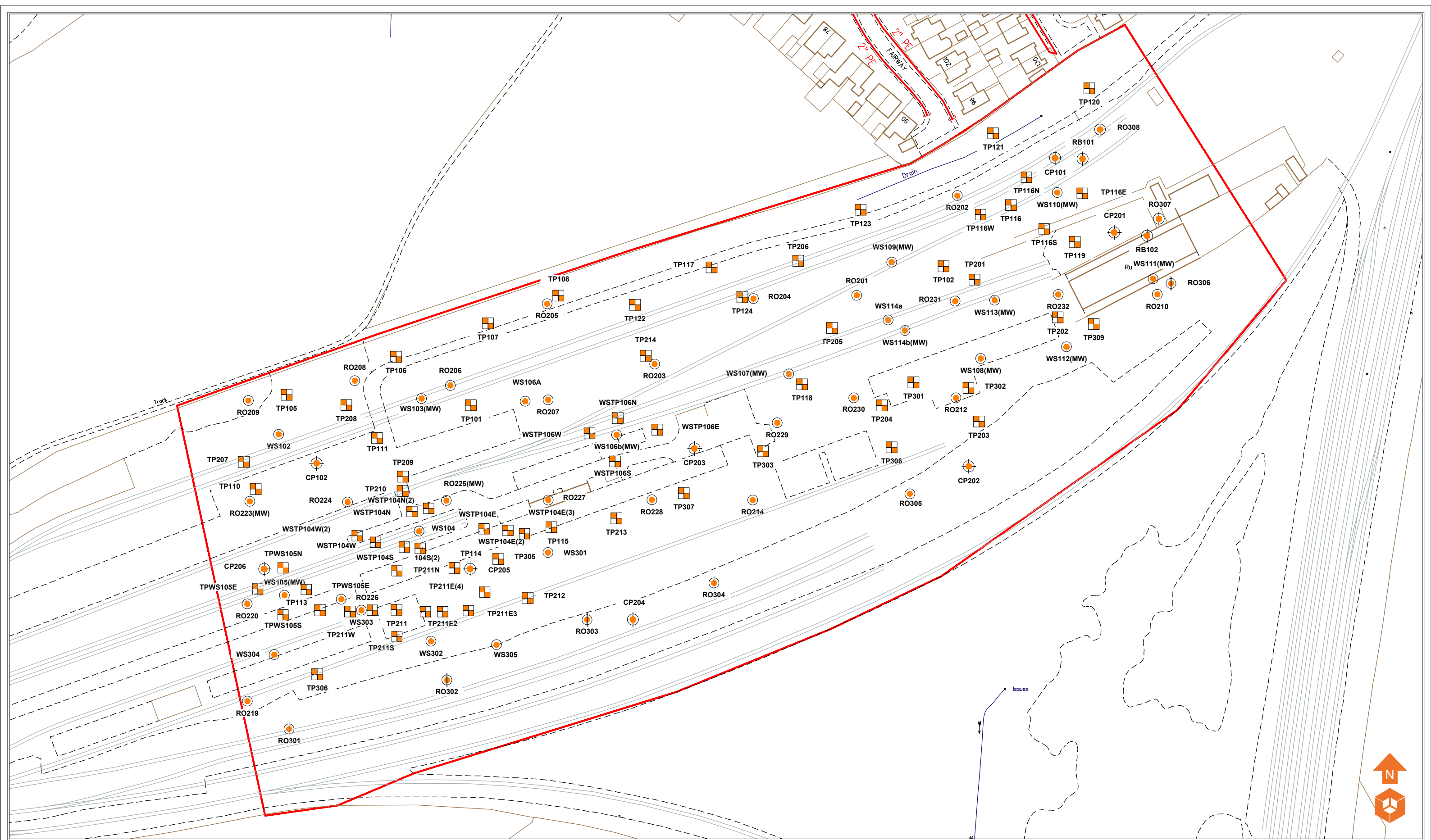
APPENDIX III

DRAWINGS



DRAWING 14-768-001 – SITE LOCATION PLAN





Location Symbols

Approximate Window Sample Probehole Location (March 2021)

Approximate Window Sample Probehole Location with Install (March 2021)

Approximate Trial Pit Location (March 2021)

Approximate Rotary Borehole Location (March 2021)

Approximate Trial Pit Location (June 2021)

Approximate Rotary Borehole Location (July 2021)

Approximate Hand Dug Pit Location (July 2021)

Approximate Stockpile Sample Location (July 2021)

Approximate Location of Rotary Borehole

Approximate Cable Percussive Borehole Location (March 2021)

Approximate Cable Percussive Borehole Location (June 2023)

Approximate Window Sample Probehole Location (December 2023)

Notes:

P1	REVI	14.12.2023	OW	JS
P1	REVG	29.08.2023	LM	JS
P1	REVG	30.01.2023	EB	JS
P1	REVI	16.01.2023	HM	JS
P1	REVE	12.12.2022	HM	EC
P1	REVD	19.10.2022	HM	EC
P1	REVC	30.03.2022	EB	JS
P1	REVB	11.03.2022	HM	JS
P1	REVA	25.03.2021	EB	EF
Phase	Issue	Date	Drawn	Checked

Client:

Kellen Homes

Job Title:

Heywood Road,
Castleton

Job No:

14-768

Drawing No:

005

Drawing Title:

Exploratory Hole
Location Plan

Date:

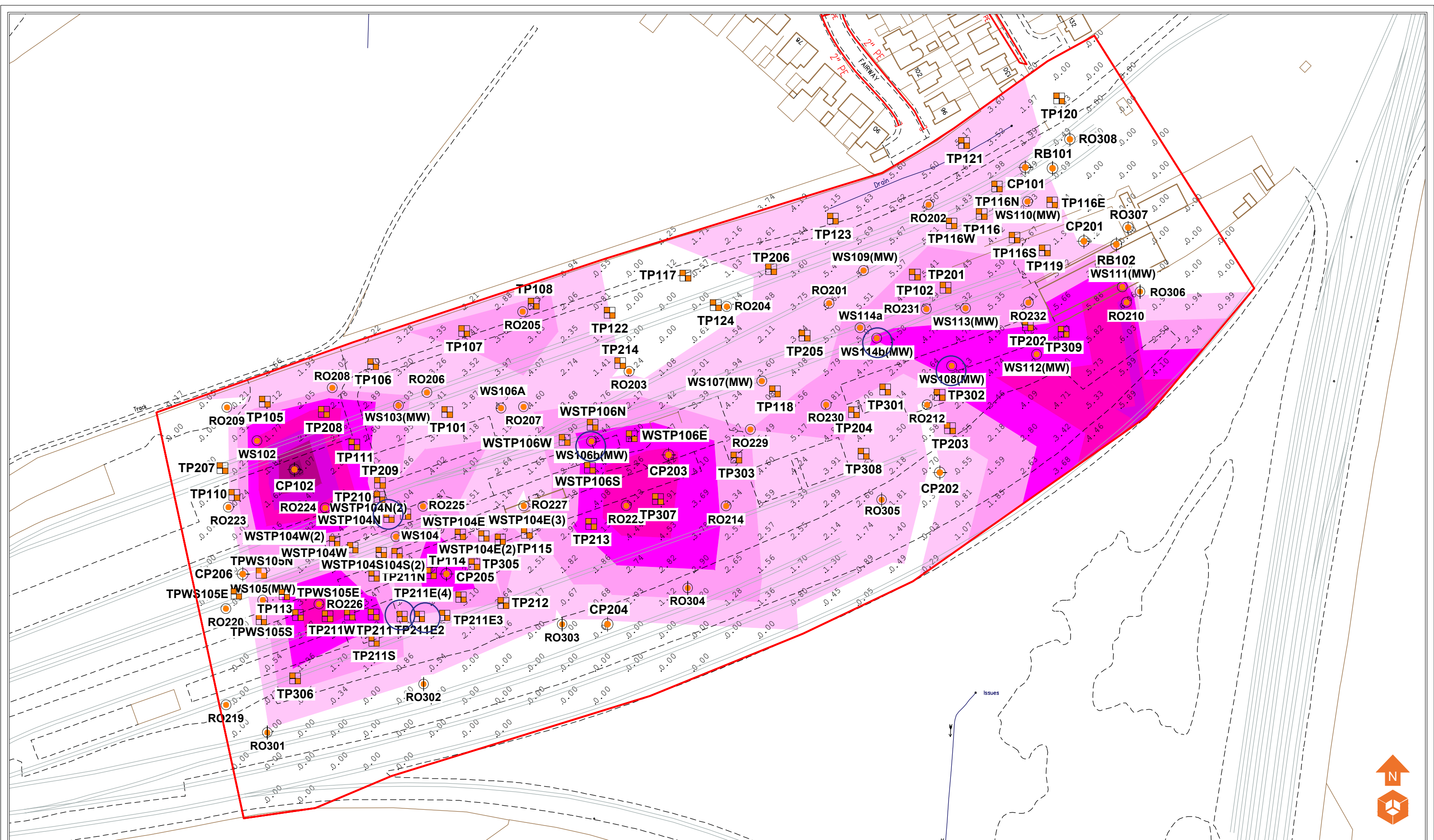
14.12.2023

Scale:

NTS @ A3

Environmental Engineering
Partnership Ltd
Taylor Road, Trafford Park
Urmston, Manchester, M41 7JQ
Tel: 0161 707 9612
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

The client must not amend any drawing, design or other intellectual property produced by E3P Ltd without permission in writing from E3P Ltd in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.



- Location Symbols**
- WS101 Approximate Window Sample Probehole Location (March 2021)
 - WS101M Approximate Window Sample Probehole Location with Install (March 2021)
 - TP101 Approximate Trial Pit Location (March 2021)
 - RO101 Approximate Rotary Borehole Location (March 2021)
 - TP101M Approximate Trial Pit Location (June 2021)
 - RO101M Approximate Rotary Borehole Location (July 2021)
 - TP101H Approximate Hand Dug Pit Location (July 2021)
 - SP101 Approximate Stockpile Sample Location (July 2021)
 - RO101R Approximate Location of Rotary Borehole

- CP101 Approximate Cable Percussive Borehole Location (March 2021)
- CP101M Approximate Cable Percussive Borehole Location (June 2023)
- Full Thickness of Peat Not Proven

- Thickness of Peat (m)**
- Thickness of Peat 0.00 - 0.39m
 - Thickness of Peat 0.40 - 0.79m
 - Thickness of Peat 0.80 - 1.19m
 - Thickness of Peat 1.20 - 1.59m
 - Thickness of Peat 1.60 - 1.99m
 - Thickness of Peat 2.00 - 2.39m
 - Thickness of Peat >2.40m
 - Recorded Depth to Peat (m BGL)

Notes:					
P1	REVG	30.08.2023	LM	JS	
P1	REVE	01.02.2023	EB	JS	
P1	REVE	31.01.2023	EB	JS	
P1	REVD	17.01.2023	HM	JS	
P1	REVC	13.12.2022	HM	EC	
P1	REVB	07.05.2021	EB	JS	
P1	REVA	01.04.2021	CB	MD	
Phase	Issue	Date	Drawn	Checked	

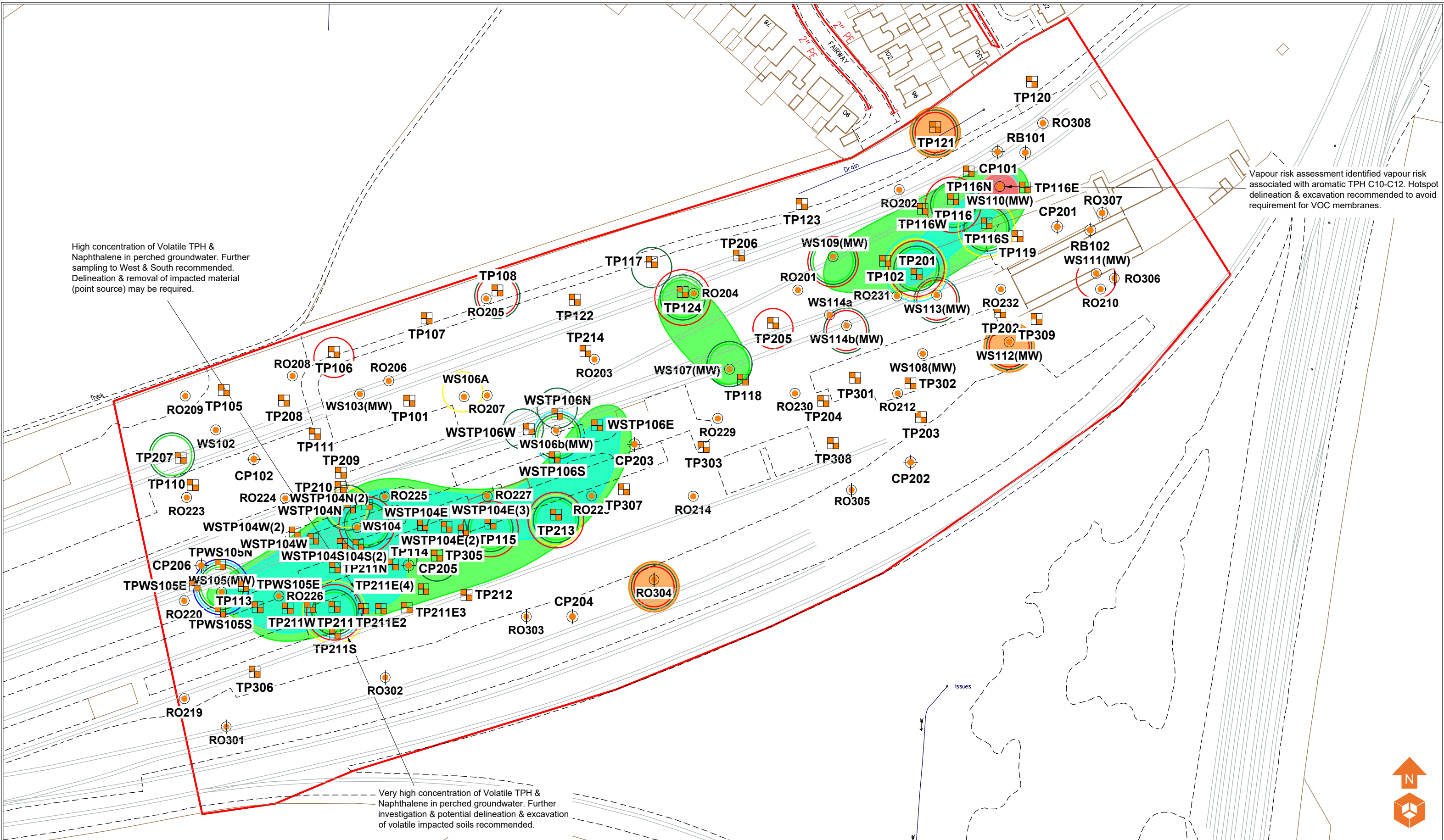
Client:		Kellen Homes	
Job Title:		Heywood Road, Castleton	

Job No:	14-768	Date:	30.08.2023
Drawing No:	107	Scale:	NTS @ A3
Drawing Title:		Depth and Thickness of Peat Plan	



Environmental Engineering Partnership Ltd
Taylor Road, Trafford Park
Urmston, Manchester, M41 7JQ
Tel: 0161 707 9612
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

The client must not amend any drawing, design or other intellectual property produced by E3P Ltd without permission in writing from E3P Ltd in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.



Location Symbols

Approximate Window Sample Probehole Location (March 2021)

Approximate Window Sample Probehole Location with Install (March 2021)

Approximate Trial Pit Location (March 2021)

Approximate Rotary Borehole Location (March 2021)

Approximate Trial Pit Location (June 2021)

Approximate Rotary Borehole Location (July 2021)

Approximate Hand Dug Pit Location (July 2021)

Approximate Stockpile Sample Location (July 2021)

Approximate Location of Rotary Borehole

Approximate Cable Percussive Borehole Location (March 2021)

Approximate Cable Percussive Borehole Location (June 2023)

Soil Contaminants

Heavy metals

Mercury (volatile)

Asbestos (chrysotile <0.001% wt/wt)

Napathalene (volatile)

Non-volatile PAH

TPH C10-C16 (volatile)

TPH C16-C21 (non-volatile)

Groundwater Contaminants

Volatile TPH & Naphthalene in Groundwater Sample.

Vapour Risk (TPH C10-C12 Aromatic)

Napathalene Impacted Soils

TPH Impacted Soils

Volatile Mercury

Notes:

Phase	Issue	Date	Drawn	Checked
P1	REVG	30.08.2023	LM	JS
P1	REVG	31.02.2023	EB	JS
P1	REVG	17.01.2023	HM	JS
P1	REVE	13.12.2022	HM	EC
P1	REVD	30.03.2022	EB	JS
P1	REVC	24.02.2022	LM	JS
P1	REVB	30.04.2021	EB	EF
P1	REVA	15.04.2021	EB	EF

Client:

Kellen Homes

Job No:

14-768

Date:

30.08.2023

Drawing No:

118

Scale:

NTS @ A3

Job Title:

Heywood Road, Castleton

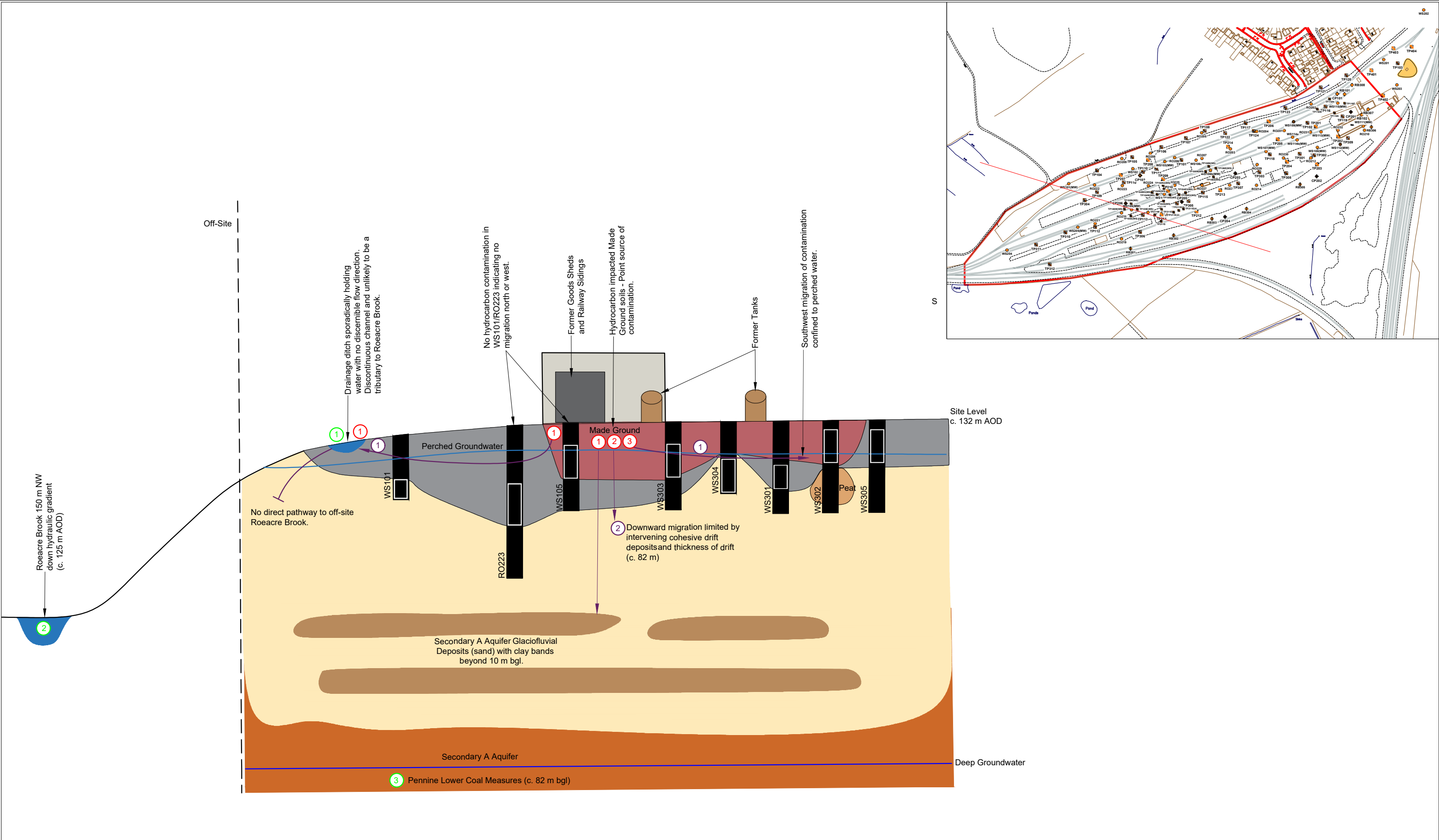
Drawing Title:

Contamination Issues Plan

e3p

Environmental Engineering Partnership Ltd
Taylor Road, Trafford Park
Urmston, Manchester, M41 7JQ
Tel: 0161 707 9612
E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

The client must not amend any drawing, design or other intellectual property produced by E3P Ltd without permission in writing from E3P Ltd in advance of any amendments being made. In the event that such written permission is not obtained in advance of the amendments being made, E3P Ltd shall not be liable for any damage and/or losses occurring as a result of the amended drawing, design or intellectual property.



Geology Key Sandstone Sand Made Ground Peat	Sources/Contaminants ① Heavy Metals ② SVOCs ③ TPH	Receptors ① Drainage Ditch (on-site) ② Roeacre Brook (off-site) ③ Deep Groundwater / Secondary A Bedrock Aquifer	Pathways ① Lateral Migration ② Vertical Migration	Notes:					Client: Kellen Homes		Job No: 14-768	Date: 26.02.2024	e3p Environmental Engineering Partnership Ltd Taylor Road, Trafford Park Urmston, Manchester, M41 7JQ Tel: 0161 707 9612 E-mail: info@e3p.co.uk Website: www.e3p.co.uk
											Drawing No: 010	Scale: 1:1000 @ A3	
				P1 REVB 26.02.2024 OW JS P1 REVA 15.05.2020 CB MD Phase Issue Date Drawn Checked					Job Title: Heywood Road, Castleton		Drawing Title: Conceptual Site Model - Controlled Waters		

STAGE 1

STAGE 1 VOLUMES : TOPO LEVELS DOWN TO BOTTOM OF PEAT LEVELS (MADE GROUND + PEAT)					
Group	Volumes (m³)			Cut / Fill Areas (m²)	
	Cut/Material	Fill/Void	Balance	Cut/Material	Fill/Void
Back Gardens	2221	1	2219	1281	26
Frontages	21484	3	21480	5752	22
Plots	24793	3	24791	10700	46
POS	4689	3	4686	1472	29
Roads	29856	0	29855	7220	18
Shared Driveways	7804	0	7804	1546	0
Total	90847	10	90836	27972	142

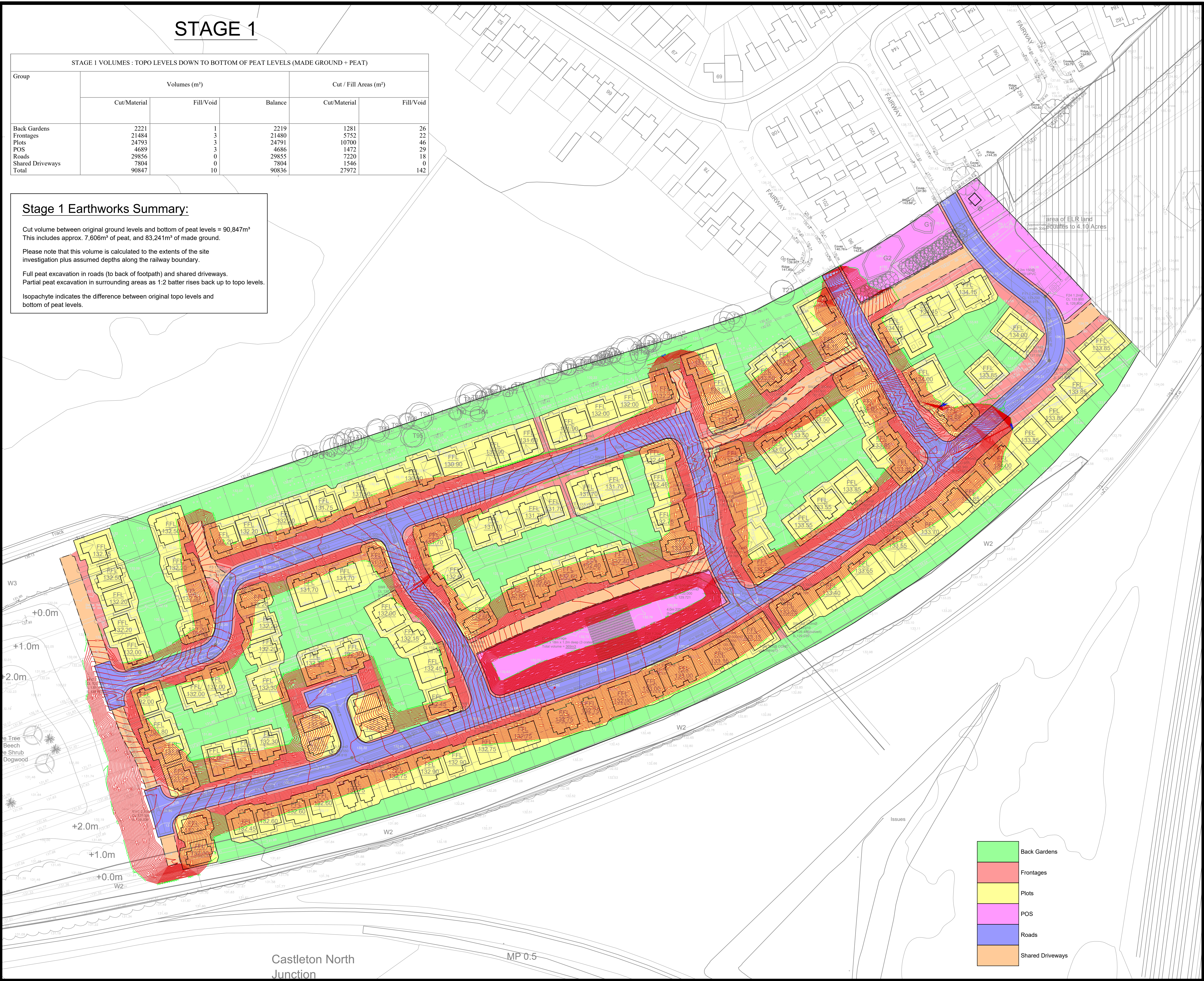
Stage 1 Earthworks Summary:

Cut volume between original ground levels and bottom of peat levels = 90,847m³
This includes approx. 7,606m³ of peat, and 83,241m³ of made ground.

Please note that this volume is calculated to the extents of the site investigation plus assumed depths along the railway boundary.

Full peat excavation in roads (to back of footpath) and shared driveways.
Partial peat excavation in surrounding areas as 1:2 batter rises back up to topo levels.

Isopachyte indicates the difference between original topo levels and bottom of peat levels.



N

Approx North

McAuliffe

THE BROWNFIELD EXPERTS

Surveying & Engineering Department

Legend

Cut

Fill

Zero

Planning levels

Topographic levels

12.345

12.345

— Drawing Revisions:

+ Rev. 01 - 24/02/2022 - Updated layout, levels and SI information.

+ Rev. 02 - 31/03/2022 - Updated layout, levels and SI information.

Title	Revision	Consultant	Date	Notes
Revised Drainage Option 1.dwg	01	Kellen Holmes	11/03/2022	Engineering layout / levels
PS-2020-TS-02.dwg	02	Paragon Surveys	26/04/2021	Topographical Survey
KELLEN Depth to peat.dwg	-	Kellen Holmes	-	Point depth isopachyte
KELLEN Thickness to peat.dwg	-	Kellen Holmes	-	Point thickness isopachyte

JOB

CASTLETON SIDINGS

ROCHDALE

DRAWING

VOLUMETRIC APPRAISAL (REV 02)

SHEET 1/2

DATE: 31/03/2022

DRAWN: JY

CHECKED: PC

SCALE: N.T.S

www.mcauliffegroup.co.uk

McAuliffe

THE BROWNFIELD EXPERTS

McAuliffe Civil Engineering Ltd.

McAuliffe House
Northcott Road
Wolverhampton
West Midlands
W V14 OTP
Tel: 01902 354400

St Baldred's Hall
239 Ashley Road
Hale
Cheshire
WA15 9NE
Tel: 0161 928 7740

DRAWING No: KELL 3703 VA 02 (1)

STAGE 2

STAGE 2 VOLUMES : BACKFILL PLUS SURROUNDING CUT/FILL TO REGRADE LEVELS			
Group	Volumes		
	Cut/Material	Fill/Void	Balance
Back Gardens	7707	3601	4105
Frontages	2240	18342	-16102
Plots	14286	19681	-5395
POS	572	5319	-4747
Roads	1827	24377	-22550
Shared Driveways	221	7444	-7223
Total	26853	78765	-51912

TRIANGLE AREAS		
Group	Plan Area	Slope Area
Back Gardens	14052	14070
Frontages	6979	7104
Plots	24247	24742
POS	3814	3816
Roads	8052	8053
Shared Driveways	2043	2050
Total	59186	59835

Stage 2 Earthworks Summary:

Roads (to back of footpath) and shared driveways have been excavated down to the underside of peat, leaving approx 1:2 batters up to surrounding topo. From here, the shortfall of material to achieve desired regrade levels (as per parameters) is now approx. 51,912m³.

Please note that some areas of the regrade model is derived from assumed finished levels due to lack of design information.

Isopachyte indicates the cut / fill required to get to regrade levels from this profile.

Earthworks Parameters:

- + Plots = -900mm FFL
- + Roads = -810mm FRL
- + Shared Driveways = -370mm FL (interpolated using nearby levels)
- + Back Gardens = -600mm FGL / -750mm nearest FFL
- + Frontages = graded between nearest features
- + POS = -300mm below nearest levels / graded to boundary

N

Approx North

McAuliffe

THE BROWNFIELD EXPERTS

Surveying & Engineering Department

Legend

- Cut
- Fill
- Zero

Planning levels

Topographic levels

12.345

12.345

- Drawing Revisions:
- Rev. 01 - 24/02/2022 - Updated layout, levels and SI information.
- Rev. 02 - 31/03/2022 - Updated layout, levels and SI information.

Title	Revision	Consultant	Date	Notes
Revised Drainage Option 1.dwg	01	Kellen Homes	11/03/2022	Engineering layout / levels
PS-2020-710-02.dwg	02	Paragon Surveys	26/04/2021	Topographical Survey
KELLEN Depth to peat.dwg	-	Kellen Homes	-	Point depth isopachyte
KELLEN Thickness to peat.dwg	-	Kellen Homes	-	Point thickness isopachyte

JOB

CASTLETON SIDINGS

ROCHDALE

DRAWING

VOLUMETRIC APPRAISAL (REV 02)

SHEET 2/2

DATE: 31/03/2022

DRAWN: JY

CHECKED: PC

SCALE: N.T.S

www.mcauliffegroup.co.uk

McAuliffe

THE BROWNFIELD EXPERTS

McAuliffe Civil Engineering Ltd.

McAuliffe House
Northcott Road
Wolverhampton
West Midlands
W V14 OTP
Tel: 01902 354400

St Baldred's Hall
239 Ashley Road
Hale
Cheshire
WA15 9NE
Tel: 0161 928 7740

DRAWING No:

KELL 3703 VA 02 (2)

