PILE & PENETRATIVE FOUNDATION RISK ASSESSMENT

Site:	Riverpark Road, Manchester
References:	17-246-R5-2
Date:	23 April 2026
Client:	Kellen Homes



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QUALITY ASSURANCE

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1. INTRODUCTION

1.1. BACKGROUND

E3P has been instructed by Kellen Homes to undertake a Piling and Penetrative Foundation risk assessment for penetrative foundation systems, which is referred to as a Contamination Piling Risk Assessment, for the proposed residential development at Riverpark Trading Estate, Manchester.

1.2. SCOPE OF WORKS

E3P has prepared this Contamination Piling Risk Assessment to demonstrate that the proposed construction works will not present any unacceptable risk to controlled waters of the wider environment.

This assessment has been written with due consideration to the CL:AIRE guidance document Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention. March 2025.

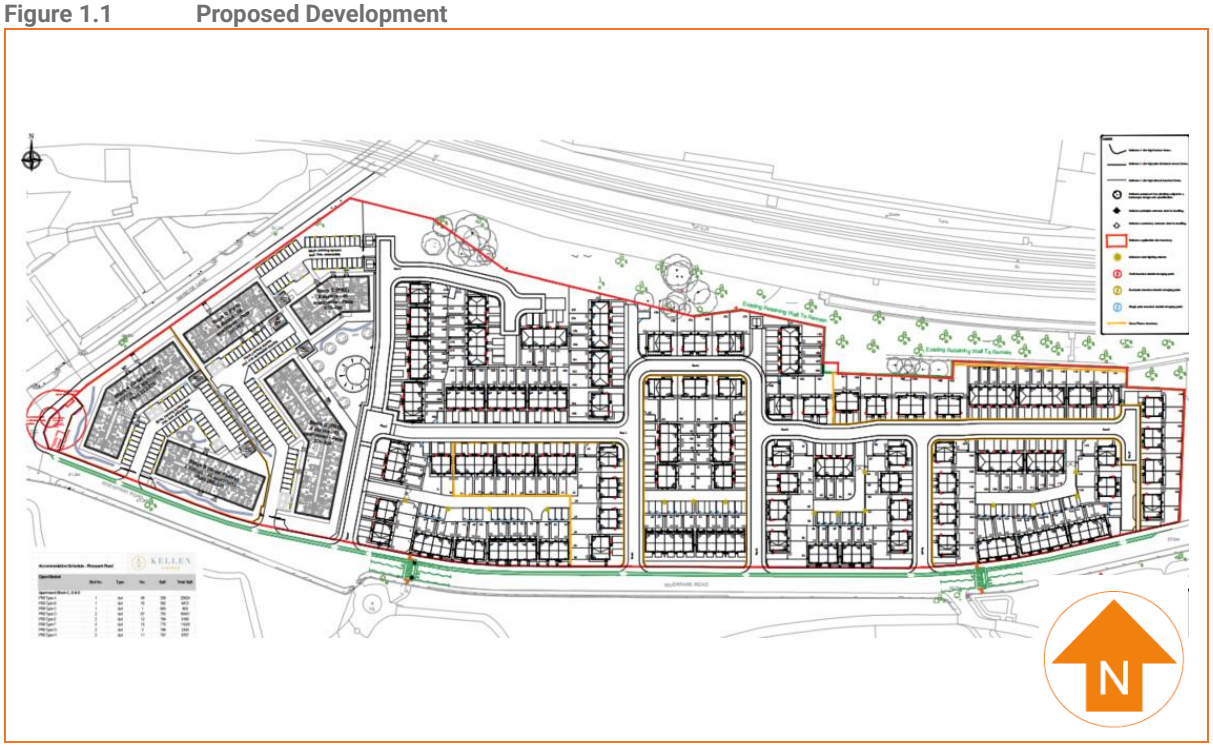
1.3. PROPOSED DEVELOPMENT

Kellen Homes have secured planning consent for a residential development under consent reference: 142464/FO/2025, the proposed residential development will comprise a total of 221 low rise residential dwellings and 277 apartments across five buildings ranging from 4 to 6 storeys in height with associated gardens, estate roads and infrastructure.

Kellen Homes Drawing KH012-Q (APPENDIX II) identifies the proposed development layout.

A snapshot of the proposed development layout is indicated in Figure 1.1.

Figure 1.1 Proposed Development



1.4. PREVIOUS WORKS

Table 1.1 summarises the phases of geoenvironmental assessment that have previously been carried out at the site.

Table 1.1 Summary of Previous Work

ORGANISATION	TITLE	DATE	REFERENCE	PREPARED FOR
E3P	Phase 1 Geoenvironmental Site Assessment	February 2025	17-246-R1-4	Kellen Homes
E3P	Phase 2 Geoenvironmental Site Assessment	October 2025	17-246-R2-6	Kellen Homes
E3P	Remediation and Enabling Works Stratergy	March 2026	17-246-R3-8	Kellen Homes

The above listed documents have been fundamental in understanding ground conditions at the subject site and is recommended to read them in conjunction with this report.

1.5. LIMITATIONS

The limitations of this report are presented in Appendix I.

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.

2. SITE SETTINGS

2.1. SITE DETAILS

Site Address	Riverpark Road, Manchester, M40 2XP
National Grid Reference	E 387308, N 399470
Site Area	7.43 Ha

2.2. CONTAMINATION RISK ASSESSMENT

2.2.1. GROUND CONDITIONS

MADE GROUND

Made Ground deposits were encountered within all exploratory hole locations to depths of between from ground level to an unproven depth of 5.45 m bgl (WS112), although, in general, Made Ground was encountered to a depth of less than 1.00 m bgl.

During the 2019 investigation, the full depth of Made Ground could not be proven within eleven locations across the site (TP104, TP111, WS104-WS105, WS107, WS110, WS112-WS113, WS115-WS116 and WS120), the majority of these within the window sample probeholes due to the presence of obstructions of brick cobbles loose Made Ground falling in underneath the borehole casing.

During the 2024 investigation, the full depth of Made Ground was not proven within TP203, TP204 and TP206 located in the east and centre of the site respectively due to terminated pits due to water ingress. TP205 was terminated in Made Ground due to the presence of a potential underground service with pea gravel noted, however, WS105 adjacent to this location identified natural strata from 2.30m bgl. Furthermore, Made Ground could not be proven within TP216 located in the west of the site due to the limit of the excavator and in the centre of the site WS206 was terminated due to an obstruction, likely associated with the former footbridge stanchion.

Generally, the Made Ground deposits on site comprised asphalt across the majority of the site, with concrete identified in the east within the warehouse and surrounding the building to a depth of 0.15m bgl. This was underlain by a black gravelly fine to medium sand with gravel of sandstone, mudstone and brick with fragments of concrete, clinker and ash inclusions. In eastern areas, a subbase MOT gravel was encountered underlying the asphalt and concrete which comprised of a yellowish grey sandy gravel of sandstone, mudstone and brick to a depth of 0.60m bgl.

Below this a brown reworked clay was encountered to a maximum unproven depth of 5.45 m bgl (WS112) was encountered, more generally, this reworked clay is encountered to depths between 1.00 m and 2.00 m bgl. The reworked clay comprised of a soft to firm slightly gravelly sandy clay, with gravel of sandstone, mudstone, brick and fragments of timber and clinker.

Deeper made ground deposits were encountered within the southwest of the site, which is currently used as a lorry park. Made Ground within this area comprised of a reworked clay of soft to firm light grey mottled brown slightly sandy gravelly clay of sandstone, mudstone, coal and brick with fragments of timber and clinker, to a proven depth of 4.30m bgl within CP202 and unproven depth of 5.45 m bgl within WS112. This correlates with the information from the Phase 1 Desk Study, which identified former ponds and deeper areas of clay extraction to the west of the brickworks.

Within TP215 Made Ground, it is comprised of a black gravelly clayey fine to medium sand with gravel of sandstone and brick, with frequent fragments of plastic and calcareous shells.

Made Ground across the site was noted to contain ash and occasional clinker, indicative of incinerated waste backfill, a common source of material used to raise levels in the mid 20th century when the site was levelled for the abattoir.

A Depth of Made Ground Plan is presented as Drawing 17-246-003 in APPENDIX II.

SUPERFICIAL GEOLOGY

Drift deposits were encountered within the majority of exploratory locations with the exception of locations where the full depth of Made Ground could not be proven. The drift deposits are generally uniform across the site, comprising a stiff to very stiff, high to very high strength, brown, slightly gravelly sandy CLAY with gravel of sandstone, mudstone and rare coal.

During the 2019 investigation, rare sand bands were encountered within TP109, CP103, and CP105, as dense brown medium SAND with occasional gravel of sandstone, which was 0.20 – 1.40 m thick.

SOLID GEOLOGY

The solid bedrock geology was encountered between 5.50m and 40.00m bgl.

Generally, the solid geology comprised a light / dark grey weathered MUDSTONE with SANDSTONE bands. Red brown SANDSTONE was also encountered at CP104 and CP105.

Top of bedrock varied from 5.50 m bgl in the east of the site (CP105) to 17.20 m bgl in the north of the site (RB202). Generally top of bedrock was encountered between 9.00 m bgl and 13.00 m bgl across the majority of the site, with localised areas of deeper drift cover noted in the south west and central northern sectors.

The varying depth to bedrock across the site is likely due to the Bradford Fault present across the centre of the site with a downthrow to the north east.

Coal was encountered as intact at RB102 between 12.70m and 13.00m bgl.

A depth to bedrock plan is provided as Drawing 17-246-012 in APPENDIX II.

Review of this plan shows that the top of bedrock falls gently northeast to southwest, with a fall of circa 10 m across the site (circa 550 m). This is a slope of circa 1:55. No highwall associated with the Bradford Fault has been encountered.

GROUNDWATER

Groundwater strikes were varied across the site, encountered between 0.40 m bgl to 4.30 m bgl.

A consistent groundwater table was not encountered during either phase of intrusive works. No true groundwater body was identified, and we all logged the groundwater strikes as perched and discontinuous.

The depth of the water strikes is summarised in Table 2.1.

Table 2.1 Summary of Groundwater Strikes

LOCATION	DEPTH TO STRIKE (M)	NOTES
TP101	0.70	Perched - slow ingress
TP103	0.50	Perched - slow ingress
TP104	0.40	Slow ingress

LOCATION	DEPTH TO STRIKE (M)	NOTES
TP105	0.60	Perched - slow ingress
TP106	0.40	Perched - slow ingress
TP107	0.70	Perched - slow ingress
WS112	2.10	Slow ingress
WS122	1.00	Perched - slow ingress
WS124	0.70	Perched - slow ingress
CP/RB201	0.70	Perched in Made Ground
CP/RB201	4.30	Groundwater strike
CP202	0.60	Perched in Made Ground
TP203	0.60	Fast ingress
TP204	1.30	Moderate ingress
TP205	1.40	Seepage
TP206	1.00	Perched in Made Ground
TP206	1.70	Fast ingress
TP215	2.00	Peached in Made Ground
TP216	1.20	Perched in Made Ground
WS203	1.60	Perched in Made Ground

2.3. TIER 2 HUMAN HEALTH RISK ASSESSMENT

The Tier 2 human health risk assessment completed by E3P (Ref 17-246-R2-6 – October 2025) concluded that the majority of the identified elevated concentrations have primary exposure pathways related to dermal contact and ingestion, soil ingestion and consumption of homegrown produce. However, isolated areas of short chain hydrocarbons (C12-16) have been identified that present a potential volatilisation to indoor air risk. During earthworks, the remediation contractor will delineate, excavated and remove potentially volatile impacted soils from site, removing this risk prior to construction works.

In consideration of this report, the site workers are most likely to be the significant receptor with dermal contact and ingestion of soil being possible pathways. However, where normal washing and hygiene practise is adopted on site there is perceived to be a low risk.

Soils will be excavated and removed early into the earthworks and so exposure will be limited.

2.4. TIER 2 CONTROLLED WATERS RISK ASSESSMENT

The site sensitivity with respect to controlled waters is summarised within Table 2.2.

Table 2.2 Controlled Water Sensitivity Profile

RISK PROFILE	DISCUSSION	SENSITIVITY RATING
Groundwater Source Protection Zone or Drinking Water Safeguard Zone	The site is not located within a groundwater source protection zone or a drinking water safeguard zone.	Low
Distance to the Closest Groundwater Abstraction Point	The nearest groundwater abstraction point is located 555m W, used for construction by Hanson Quarry Products Europe Limited.	Low
Aquifer Classification in Superficial Drift Deposits	Secondary Undifferentiated.	Moderate

RISK PROFILE	DISCUSSION	SENSITIVITY RATING
Aquifer Classification in Bedrock	Principal and Secondary A	High
Viability for Anthropogenic Soil in Direct Contact with Aquifer (Drift or Bedrock)	The underlying superficial deposits are likely to comprise of stiff CLAY identified within the previous site investigation completed by E3P to depths in excess of 10m. The low permeability strata will offer protection to the underlying bedrock aquifer.	Low
Is the Site Located Within 50 m of a Surface Watercourse?	The nearest surface water course, the River Medlock is located 56m south east of the site. Additionally, a cemetery is present between the site and watercourse.	Low
Sensitive Land Uses/ Sensitive Ecological Receptors	An area of adopted green belt and local nature reserve is located 103m east and 196m south east of the site respectively, named as Clayton Vale. The site is also located within a SSSI impact risk zone.	Moderate
OVERALL SITE ENVIRONMENTAL SENSITIVITY		**Moderate**

2.4.1. TIER 2 ASSESSMENT SUMMARY

SVOC analysis from the groundwater samples identified aniline, 2-Methylnaphthalene, Dibenzofuran, Carbazole and Anthraquinone above the laboratory LOD, within DBH209 located on the southern boundary of the site, however, no significant quantities of SVOC were identified (maximum 1.9 ug/l aniline).

The Tier 2 assessment shows there is a leachable potential within the shallow Made Ground soils at the site for a range of contaminants including heavy metals and PAHs. This is indicated by leachate sampling and several rounds of groundwater monitoring at the site with samples from wells installed within the Made Ground.

It should be noted that leaching tests were undertaken alongside groundwater testing. The leachate test is aggressive (de-ionised water) and is not in aqueous equilibrium (steady state) within the solid sample. This can cause rapid dissolution and overestimation of the aqueous phase concentrations compared to groundwater in contact with contaminated soils. Although dissolution can be reduced for highly hydrophobic contaminants, such as B(a)P it is likely that the initial leaching will remove the most readily available hydrocarbons and subsequent flushing would reduce the leachable concentrations.

The ICSM developed within the context of the site setting has only identified a single viable pollutant pathway, which would be the downward migration of potentially mobile phase-soluble contaminants towards the underlying principal aquifer in the east of the site. As such, a comparison of leachate and groundwater results against DWS exceedances has been made.

Contaminants have the theoretical potential to migrate vertically through the granular Made Ground if mobilised by perched groundwater. Marginally elevated heavy metals (arsenic, cyanide and selenium) have been identified in the perched groundwater. All of the aforementioned heavy metals are considered to be associated with perched water confined within the Made Ground. Additionally, elevated lead concentrations in comparison to DWS were noted within leachate samples but not present within perched groundwater samples. The elevated concentrations of inorganic heavy metals is deemed to be associated with the historical site use as a brick works and the infilling of clay pits with incinerated (ashy) Made Ground to create a development platform.

2.4.2. DISCUSSION OF CONTROLLED WATERS RISK ASSESSMENT

Historically, the site has been subjected to extensive groundworks from the clay pit and several of industrial uses including a brick works, tramway and abattoir. Chemical by-products of manufacturing processes and compounds within the Made Ground is likely to have subsequently leached down into underlying ground and contaminated groundwater both within Made Ground and natural drift deposits.

During both phases of investigation no consistent groundwater table was encountered, however, high groundwater levels were encountered during the monitoring period, likely associated with pooling of surface water/perched groundwater within monitoring wells.

Heavy metal impact (cyanide, selenium and arsenic) above DWS has been recorded within the perched groundwater across the site, typically encountered at the base of Made Ground. Inorganic determinants identified above DWS are of a general low solubility and therefore low mobility, suggesting that the potential for migration towards a controlled water receptor is reduced.

The ground investigation has proven in excess of 10.00 m of firm medium strength to very stiff, very high-strength, low-permeability/impermeable CLAY soils underlying the Made Ground across the majority of the site where the impacted perched groundwater has been identified. However, in the east of the site top of bedrock is encountered from 5.50 m bgl with circa 3.00 m of low permeability clay cover present. The presence of >3.00 m (more widely >10.00 m) of low permeability clay cover will inhibit/impede the lateral and vertical migration of perched waters with potential dissolved phase impact, therefore offering protection to the underlying aquifer. Where granular deposits have been encountered (CP103 and CP105), granular high permeability deposits were encountered directly overlying the top of bedrock below sufficient clay cover.

Furthermore, the presence of hardstanding cover and surface drainage infrastructure across the site will reduce the amount of rainwater infiltration. This will result in fewer contaminants being mobilised and reduce the risk further to the underlying aquifer.

Given the lack of active groundwater abstraction recorded within 500m of the site, low permeability of the overlying drift limiting vertical migration and low solubilities and concentrations of heavy metals recorded, there is considered to be no unacceptable risk to controlled waters.

Based on the above, there is considered to be no significant level of risk to the controlled water receptors. However, due to the presence of heavy metals in the perched Made Ground, careful consideration as to the risks to site operatives and the possible requirement to pre-treat the water will be required.

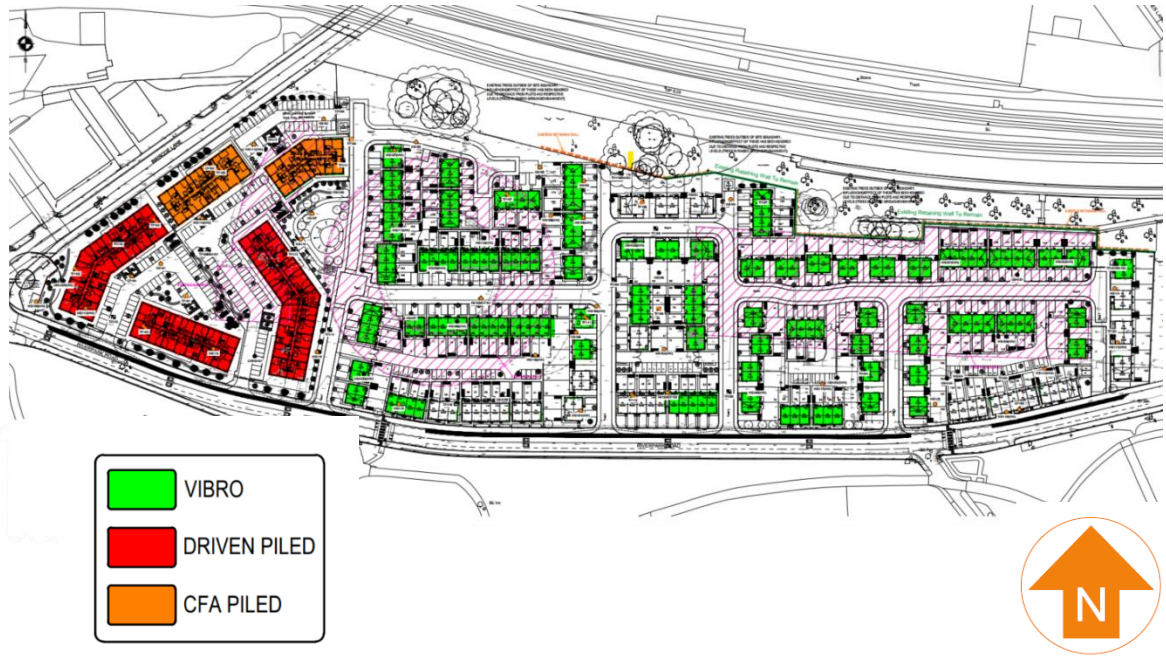
3. PILE DESIGN CONTAMINATION RISK ASSESSMENT

3.1. PILE DESIGN

The scheme is to be constructed using a combination of Continuous Flight Auger Piles (CFA), precast driven piles and vibro-stone columns (VSC) in accordance with AJP Consulting Engineers Drawing RPM-AJP-XX-00-DR-S-2000-P04, dated May 2025 (APPENDIX II).

A snapshot of the proposed foundation plan is provided as Figure 3.1.

Figure 2.1 Foundation Zoning Plan



3.2. CONTAMINATION RISK ASSESSMENT

The 2025 CL:AIRE guidance considers seven pollution scenarios based on the site setting, ground investigation findings and the type of piling method used. Based on the information obtained for the site, E3P has assessed these and the findings are summarised in Table 3.1.

Table 3.1 Piling Pollution Scenarios and Risk Assessment

POLLUTION SCENARIO	RISK	S-P-R CONSIDERATIONS
1 Creation of preferential pathways, through a low permeability layer (e.g. an aquitard that transmits water at slower rates than an aquifer), to allow potential contamination of an underlying aquifer	LOW	**Continuous Flight Auger** CFA piling involves the advancement of a continuous auger into the ground to the required depth, during which soil is removed to form a bore. Upon reaching the design depth, concrete is pumped through the hollow stem of the

POLLUTION SCENARIO	RISK	S-P-R CONSIDERATIONS
		auger as the auger is gradually withdrawn, allowing the bore to be filled from the base upwards. The formation of the bore has the potential to create a temporary vertical preferential pathway within the ground. This could arise particularly where issues such as inadequate concrete pressure, overbreak, ground relaxation, or necking occur during installation. In such circumstances, there is a theoretical potential for a pathway to be created within the upper strata through which soluble-phase contaminants could migrate. However, the overall potential for such a pathway to persist is considered limited. The CFA installation method involves the continuous pumping of concrete from the base of the pile upwards as the auger is withdrawn. This process maintains positive pressure within the bore and promotes full displacement and replacement of the excavated material, thereby substantially mitigating the likelihood of a continuous preferential pathway being formed or remaining open within the surrounding strata.
	LOW	**Driven Piles** Piles may extend through the cohesive (aquitard) superficial deposits into bedrock, however, given the impervious nature of the driven pile, a preferential pathway to the bedrock along the pile will not be created. Where granular drift is present, given the potentially moderate 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. Drive piles displace soils horizontally, thus increasing the density of the surrounding soils in turn reducing soil permeability. This process of full displacement promotes full displacement and provision of a tight seal around the pile substantially mitigates the likelihood of a continuous preferential pathway being formed or remaining open within the surrounding strata. As such, no new preferential pathway will be created between perched aquifers and controlled water receptors.
	LOW	**Vibro Stone Columns** VSC may create a granular permeable layer that has the potential to create a pathway within the upper stratum for soluble phase compounds to migrate vertically towards underlying secondary A aquifers.

POLLUTION SCENARIO	RISK	S-P-R CONSIDERATIONS
		However, given the relatively shallow depth to underlying natural clays, it is not anticipated that stone columns will be advanced to top of bedrock. Where columns terminate within cohesive deposits, the low permeability of cohesive deposits will inhibit vertical migration of potential mobile phase contamination towards underlying aquifers, acting as an aquitard. As such, no new preferential pathway will be opened. Where stone columns terminate within granular drift, given the potentially moderate 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. As such, no new preferential pathway will be created between perched aquifers and controlled water receptors.
2 The driving of solid contaminants down into an aquifer during pile driving	**LOW**	**Continuous Flight Auger** During CFA piling, soil is excavated and conveyed upward along the auger flights to the surface. Concrete is then pumped through the hollow stem of the auger during its gradual withdrawal from the ground. Given that the CFA process transports excavated material to the surface via the auger flights, there is limited potential for soils to be displaced or driven downward during installation.
	LOW	**Driven Piles and Vibro Stone Columns** VSC and driven piles are displacement methods, 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, prior to piling works, the proposed remediation of the site will include delineation, excavation and removal of contaminated soils in the upper 2m (removal of primary point source) and pumping of contaminated groundwater – if encountered (removal of secondary point source). These land remediation works will significantly reduce the overall risk to controlled waters.
3 Contamination of groundwater and subsequently surface waters by turbidity,	**LOW**	**Continuous Flight Auger** The concrete specified for use in the CFA piles is designed and classified in accordance with relevant

POLLUTION SCENARIO	RISK	S-P-R CONSIDERATIONS
support fluids, concrete, cement paste or grout		construction standards for structural and geotechnical applications. The constituents of the concrete—typically cement, aggregates, water, and approved admixtures—are inert once cured and do not contain substances that would reasonably be expected to leach harmful contaminants into the surrounding soil or groundwater.
	LOW	**Driven Piles and Vibro Stone Columns** Both VSC and precast driven pile methods do not utilise liquid cement or grout.
4 Direct contact with contaminated soil or leachate causing degradation of pile materials	**LOW**	**Continuous Flight Auger and Driven Piles** The concrete used in CFA and precast driven piles will be specified to a recognised standard according to the pH and sulphate concentrations recorded in the E3P site investigation.
	LOW	**Vibro Stone Columns** The VSC stone will be imported and used within the columns, all stone will be chemically validated to ensure no risk.
5 Creation of preferential pathways through a low permeability surface layer to allow upward migration of gas or contaminant vapours to the surface	**LOW**	The site is classified as Characteristic Situation 1 (CS1), reflecting the absence of significant gas-generating materials within the subsurface. As a result, ground gas is unlikely to be generated at concentrations or volumes that could present a risk to human health. Accordingly, the site is considered to pose a low ground gas risk, and specialist gas protection measures are not required. Areas with elevated concentrations of volatile TPHs have been identified. The proposed remediation of the site will include delineation, excavation and off-site removal of volatile soils (removal of primary point source) and pumping of contaminated groundwater – if encountered (removal of secondary point source). These land remediation works will remove the risk from vapours.
6 Causing off site migration of ground gas or increased vertical emissions as a result of vibration or other effects from the pile installation process	**LOW**	Given that no potentially significant concentrations or volumes of hazardous ground gas were recorded within the monitoring standpipes during the monitoring period, the risk of off-site gas migration is considered to be low. Additionally, where VSC and driven piling methods are adopted, localised densification of the surrounding soils is likely to reduce permeability, which will further limit the potential for gas migration.

POLLUTION SCENARIO	RISK	S-P-R CONSIDERATIONS
7 Direct contact with contaminated soil arisings that have been brought to the surface	**LOW**	**Continuous Flight Auger** CFA piling will generate arisings at the surface; however, the ground conditions have been sufficiently characterised by the site investigation, and the nature and extent of contamination is considered to be understood. Volatile and other contamination will have been delineated and addressed through remediation prior to piling, reducing the risk of encountering significant contamination. Short-term risks to construction workers from handling arisings will be mitigated through appropriate PPE and site-specific toolbox talks. All arisings should be managed in accordance with the MMP, with procedures in place to address any unexpected contamination.
	LOW	**Driven Piles and Vibro Stone Columns** The use of driven piles and VSC will not generate any return materials to the surface.

4. CONCLUSION

The Pile Design Contamination Risk Assessment has been completed with reference to current guidance, including that published by CL:AIRE (2025), to evaluate the potential risks associated with penetrative foundation methods at the Riverpark Road site.

The findings indicate that the site is underlain by Made Ground containing variable contamination, with perched groundwater present in places. This is underlain by predominantly low permeability cohesive deposits which act to limit vertical migration. Although some marginal exceedances of heavy metals have been identified within perched groundwater, these are considered to be of low mobility and are largely contained within the Made Ground.

The Tier 2 assessments demonstrate that risks to human health are low, provided that appropriate remediation and standard construction phase controls are implemented. Similarly, the risk to controlled waters is not considered significant due to the absence of a continuous groundwater body, the limited mobility of contaminants, and the protective nature of the underlying clay strata.

The assessment of piling related pollution scenarios indicates that the proposed use of continuous flight auger piles, driven precast piles and vibro stone columns presents a low risk to controlled waters and the wider environment. These methods are not expected to create new pollutant pathways or materially increase the potential for contaminant migration when undertaken in accordance with good practice.

The proposed remediation strategy, including the removal of contaminated shallow soils and the management of impacted groundwater where encountered, will reduce the contaminant source prior to the commencement of foundation works. As a result, residual risks associated with piling are expected to be minimal.

It is therefore concluded that the proposed piling methods are suitable for the ground conditions encountered at the site and will not result in an unacceptable risk to the underlying Secondary A aquifer or other controlled water receptors.

Materials generated during piling works, including arisings from continuous flight auger methods, are anticipated to be suitable for reuse on site subject to verification testing and compliance with the approved remediation strategy.

Overall, the proposed development can be undertaken in a manner that is protective of human health, controlled waters and the wider environment.

Appendix I: Limitations

GENERAL

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.

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.

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.

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

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; **Pile Design Contaminated Land Risk Assessment,** Construction Environmental Management Plan; and Site Water Management Plan.

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.

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.

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.

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.

E3P does not warrant work/data undertaken/provided by others.

Appendix II: Drawings



Accommodation Schedule - Riverpark Road

KELLEN HOMES

Open Market	Bed No.	Type	No.	Sqft	Total Sqft
Apartment Block C, D & E					
PRS Type A	1	Apt	48	538	25824
PRS Type B	1	Apt	16	592	9472
PRS Type C	1	Apt	1	603	603
PRS Type D	2	Apt	67	753	50451
PRS Type E	2	Apt	12	764	9168
PRS Type F	2	Apt	15	775	11625
PRS Type G	2	Apt	3	786	2358
PRS Type H	2	Apt	11	797	8767
		Total	**173**		**118268**
House Types					
Hickory (end)	2	End/ Semi	20	771	15420
Hickory (mid)	2	Mews	8	768	6144
Olive	2	Semi/ Mews	4	771	3084
Acacia	3	Semi/ Mews	4	940	3760
Cedar (end)	3	End/ Semi	14	940	13160
Cedar (mid)	3	Mews	5	938	4690
Spruce (end)	3	End/ Semi	25	1187	29675
Spruce (mid)	3	Mews	13	1183	15379
Foxglove	3	End/ Semi	1	1187	1187
Larch (end)	4	End/ Semi	8	1262	10096
Larch (mid)	4	Mews	9	1257	11313
		Total	**111**		**113908**
		TOTAL OM	**284**		**232176**

Affordable Homes	Bed No.	Type	No.	Sqft	Total Sqft
Apartment Block A					
Type A	1	Apt	48	538	25824
Type B	1	Apt	4	592	2368
Type C	1	Apt	9	603	5427
Type D	2	Apt	3	753	2259
Type E	2	Apt	4	794	3056
Type F	2	Apt	32	775	24800
Type G	2	Apt	4	786	3144
		Total	**104**		**66878**
House Types					
Hickory (end)	2	End/ Semi	24	771	18504
Hickory (mid)	2	Mews	5	768	3840
Olive	2	Semi/ Mews	4	771	3084
ADU-2B	2	Semi/ Mews	2	969	1938
ADU-4B	3	Semi/ Mews	2	1117	2234
Acacia	3	Semi/ Mews	2	940	1880
Linden	3	End/ Semi	3	966	2898
Cedar (end)	3	End/ Semi	10	940	9400
Cedar (mid)	3	Mews	2	938	1876
Aspen (end)	3	End/ Semi	11	966	10626
Aspen (mid)	3	Mews	2	963	1926
Spruce (end)	3	End/ Semi	15	1187	17805
Spruce (mid)	3	Mews	17	1183	20111
Foxglove	3	End/ Semi	1	1187	1187
Larch (end)	4	End/ Semi	4	1262	5048
Larch (mid)	4	Mews	6	1257	7542
		Total	**110**		**109899**
		TOTAL AH	**214**		**176777**
		SITE TOTAL	**498**		**408953**

0 2.5 5 10 15 25 m
SCALE BAR 1:500

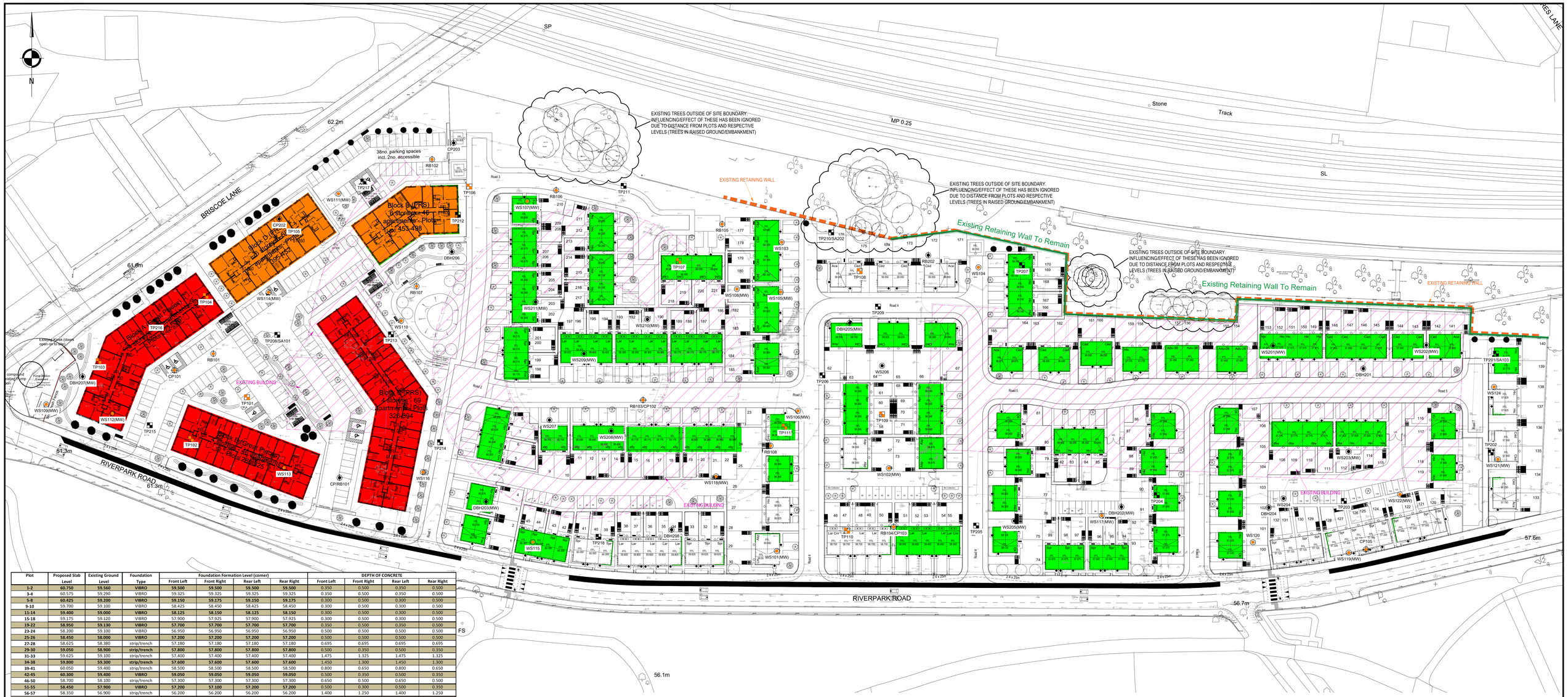
Revision	Date	Amendment	Initials
Q	25.03.2025	Bike stores added to rear gardens	TW
P	14.03.2025	Apartment block label corrected	TW
O	13.03.2025	Plots 62-67 outlined for Cedars & Acacias & accommodation schedule updated to match Blossom renamed to Foxglove Gates to accesses off Riverpark Road added Hatch removed from apartment blocks	TW
N	12.03.2025	Plots 8, 196 & 210 subbed to Blossoms Cycle bins updated	TW
M	11.03.2025	Guelder corner turner renamed to Blossom Hedge, gates, benches and bins added to POS area Bin storage areas removed	TW
L	10.03.2025	Guelder corner turner type added and accommodation schedule updated	TW
K	07.03.2025	Spruce corner turner and updated ADU type footprints added Apartment block bin accesses updated and ped. gates added	TW
J	06.03.2025	Road 7 reduced to turning head and shared private drive added Apartment handing and access updated	TW
I	04.03.2025	Cycle bins added Rain gardens and SuDS pond added and boundary treatments updated Approved Part S Car charging clear zone areas added	TW
H	24.02.2025	Apartment floor plates added and accommodation schedules added	TW
G	21.02.2025	Apartment accommodation schedule updated	TW
F	21.02.2025	Apartment accommodation schedule added	TW
E	20.02.2025	- Electric charging points added - Various plots handed correctly - Various plots' house types re-aligned - Key updated	TW
D	20.02.2025	- Apartment sizes and surrounding area updated - Sub station locations updated	TW
C	17.02.2025	- Affordable housing tenure split accommodation schedule updated - Existing retaining wall updated	TW
B	07.01.2025	Apartment blocks & accommodation schedules updated	TW
A	07.01.2025	GP legal boundaries changed plots 182 and 183.	RGC

Development
Riverpark Road
Location
Manchester
Marketing Name
-
Drawing Title
Detailed Site Layout

Job No.	Drawing No.
KH012	**A-100**
Revision **Q**	Scale @ A0 1:500
Drawn By TW	Date 03.02.25
Checked by -	Date Checked -

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KELLEN HOMES

Z:\012 Riverpark, Manchester\01. Architects\02. Drawings\100 - Layout\Planning Layout\Riverpark Road - Planning Layout.dwg



Plot	Proposed Slab Level	Existing Ground Level	Foundation Type	Foundation Formation Level (corner)				DEPTH OF CONCRETE			
				Front Left	Front Right	Rear Left	Rear Right	Front Left	Front Right	Rear Left	Rear Right
1-2	**60.750**	**59.560**	**VIBRO**	**59.500**	**59.500**	**59.500**	**59.500**	0.350	0.500	0.350	0.500
3-4	60.575	59.290	VIBRO	59.325	59.325	59.325	59.325	0.350	0.500	0.350	0.500
5-8	**60.425**	**59.200**	**VIBRO**	**59.150**	**59.175**	**59.150**	**59.175**	0.300	0.500	0.300	0.500
9-10	59.700	59.100	VIBRO	58.425	58.450	58.425	58.450	0.300	0.500	0.300	0.500
11-14	**59.400**	**59.000**	**VIBRO**	**58.125**	**58.150**	**58.125**	**58.150**	0.300	0.500	0.300	0.500
15-18	59.175	59.120	VIBRO	57.900	57.925	57.900	57.925	0.300	0.500	0.300	0.500
19-22	**58.950**	**59.130**	**VIBRO**	**57.700**	**57.700**	**57.700**	**57.700**	0.350	0.500	0.350	0.500
23-24	58.200	59.100	VIBRO	56.950	56.950	56.950	56.950	0.500	0.500	0.500	0.500
25-26	**58.450**	**58.000**	**VIBRO**	**57.200**	**57.200**	**57.200**	**57.200**	0.500	0.500	0.500	0.500
27-28	58.625	58.380	strip/trench	57.180	57.180	57.180	57.180	0.695	0.695	0.695	0.695
29-30	**59.050**	**58.900**	**strip/trench**	**57.800**	**57.800**	**57.800**	**57.800**	0.500	0.350	0.500	0.350
31-33	59.625	59.100	strip/trench	57.400	57.400	57.400	57.400	1.475	1.325	1.475	1.325
34-38	**59.800**	**59.300**	**strip/trench**	**57.600**	**57.600**	**57.600**	**57.600**	1.450	1.300	1.450	1.300
39-41	60.050	59.400	strip/trench	58.500	58.500	58.500	58.500	0.800	0.650	0.800	0.650
42-45	**60.300**	**59.400**	**VIBRO**	**59.050**	**59.050**	**59.050**	**59.050**	0.500	0.350	0.500	0.350
46-50	58.700	58.100	strip/trench	57.300	57.300	57.300	57.300	0.650	0.500	0.650	0.500
51-55	**58.450**	**57.900**	**VIBRO**	**57.200**	**57.100**	**57.200**	**57.200**	0.500	0.300	0.500	0.350
56-57	58.350	56.900	strip/trench	56.200	56.200	56.200	56.200	1.400	1.250	1.400	1.250
58-61	**58.350**	**56.100**	**VIBRO**	**57.100**	**57.100**	**57.100**	**57.100**	0.500	0.500	0.500	0.500
62-63	58.700	55.800	VIBRO	57.450	57.450	57.450	57.350	0.500	0.500	0.500	0.300
64-65	**59.025**	**56.380**	**VIBRO**	**57.775**	**57.775**	**57.775**	**57.775**	0.500	0.500	0.500	0.500
66-67	59.050	56.600	VIBRO	57.800	57.800	57.800	57.800	0.500	0.500	0.500	0.500
68-71	**58.650**	**56.600**	**VIBRO**	**57.400**	**57.400**	**57.400**	**57.400**	0.350	0.500	0.350	0.500
72-73	58.475	56.600	VIBRO	57.225	57.225	57.200	57.225	0.350	0.500	0.300	0.500
74-75	**58.125**	**57.700**	**VIBRO**	**56.875**	**56.875**	**56.875**	**56.875**	0.500	0.500	0.500	0.500
76-77	58.325	58.150	VIBRO	57.075	57.075	57.075	57.075	0.500	0.500	0.500	0.500
78-79	**58.500**	**58.000**	**VIBRO**	**57.250**	**57.250**	**57.250**	**57.250**	0.500	0.500	0.500	0.500
80-81	58.500	58.000	VIBRO	57.250	57.250	57.250	57.250	0.500	0.500	0.500	0.500
82-85	**58.050**	**57.500**	**VIBRO**	**56.800**	**56.800**	**56.800**	**56.800**	0.500	0.500	0.500	0.500
86-87	57.350	57.000	VIBRO	56.100	56.100	56.100	56.100	0.500	0.500	0.500	0.500
88-89	**57.450**	**56.800**	**VIBRO**	**56.200**	**56.200**	**56.200**	**56.200**	0.500	0.500	0.500	0.500
90-91	57.450	56.750	VIBRO	56.200	56.200	56.200	56.200	0.500	0.500	0.500	0.500
92-93	**57.375**	**56.700**	**VIBRO**	**56.125**	**56.125**	**56.125**	**56.125**	0.500	0.500	0.500	0.500
94-96	57.550	56.775	VIBRO	56.300	56.300	56.300	56.300	0.500	0.500	0.500	0.500
97-99	**57.675**	**57.700**	**VIBRO**	**56.425**	**56.425**	**56.425**	**56.425**	0.500	0.350	0.500	0.350
100-101	57.425	56.800	VIBRO	56.175	56.175	56.175	56.175	0.500	0.500	0.500	0.500
102-103	**57.450**	**56.760**	**VIBRO**	**56.200**	**56.200**	**56.200**	**56.200**	0.500	0.500	0.500	0.500
104-105	57.375	56.750	VIBRO	56.125	56.125	56.125	56.125	0.500	0.500	0.500	0.500
106-107	**57.350**	**56.750**	**VIBRO**	**56.100**	**56.100**	**56.100**	**56.100**	0.500	0.500	0.500	0.500
108-111	57.775	56.800	VIBRO	56.525	56.525	56.525	56.525	0.500	0.500	0.500	0.500
112-115	**57.825**	**56.800**	**VIBRO**	**56.575**	**56.575**	**56.575**	**56.575**	0.500	0.350	0.500	0.350
116-117	57.600	57.100	VIBRO	56.325	56.350	56.325	56.350	0.300	0.500	0.300	0.500
118-119	**57.400**	**57.200**	**VIBRO**	**56.150**	**56.150**	**56.150**	**56.150**	0.500	0.500	0.500	0.500
120-123	57.500	56.700	strip/trench	55.700	55.700	55.700	55.700	0.900	1.050	0.900	1.050
124-128	**57.325**	**56.900**	**strip/trench**	**55.600**	**55.600**	**55.600**	**55.600**	0.825	0.975	0.825	0.975
129-132	57.125	56.800	strip/trench	54.800	54.800	54.800	54.800	1.575	1.575	1.575	1.575
133-134	**57.750**	**56.500**	**strip/trench**	**55.700**	**55.700**	**55.700**	**55.700**	1.150	1.300	1.300	1.300
135-136	57.350	56.500	strip/trench	55.700	55.700	55.700	55.700	0.900	0.900	0.900	0.900
137-138	**57.625**	**56.500**	**strip/trench**	**55.600**	**55.600**	**55.600**	**55.600**	1.275	1.125	1.275	1.275
139-140	57.775	56.400	VIBRO	56.525	56.525	56.525	56.525	0.500	0.500	0.500	0.500
141-142	**57.850**	**56.900**	**VIBRO**	**56.600**	**56.600**	**56.600**	**56.600**	0.500	0.500	0.500	0.500
143-144	57.850	57.000	VIBRO	56.600	56.600	56.600	56.600	0.500	0.500	0.500	0.500
145-148	**57.850**	**57.400**	**VIBRO**	**56.575**	**56.600**	**56.575**	**56.600**	0.300	0.500	0.300	0.500
149-153	57.675	57.700	VIBRO	56.425	56.425	56.425	56.425	0.500	0.500	0.500	0.500
154-155	**57.450**	**57.700**	**VIBRO**	**56.200**	**56.200**	**56.200**	**56.200**	0.500	0.500	0.500	0.500
156-157	57.450	57.700	VIBRO	56.200	56.200	56.200	56.200	0.500	0.500	0.500	0.500
158-159	**57.725**	**58.000**	**VIBRO**	**56.475**	**56.475**	**56.475**	**56.475**	0.500	0.500	0.500	0.500
160-161	58.050	58.000	VIBRO	56.800	56.800	56.800	56.800	0.500	0.350	0.500	0.350
162-163	**58.400**	**58.000**	**VIBRO**	**57.150**	**57.150**	**57.150**	**57.150**	0.500	0.350	0.500	0.350
164-165	58.875	58.000	VIBRO	57.625	57.450	57.625	57.625	0.500	0.300	0.500	0.350
166-170	**59.150**	**58.500**	**VIBRO**	**57.900**	**57.900**	**57.900**	**57.900**	0.500	0.500	0.500	0.500
171-172	59.050	58.850	strip/trench	57.150	57.150	57.150	57.150	1.150	1.150	1.150	1.150
173-174	**59.050**	**58.250**	**strip/trench**	**56.850**	**56.850**	**56.850**	**56.850**	1.450	1.450	1.450	1.450
175-176	58.900	57.900	strip/trench	56.900	56.900	56.900	56.900	1.250	1.250	1.250	1.250
177-180	**59.100**	**58.000**	**VIBRO**	**57.850**	**57.850**	**57.850**	**57.850**	0.350	0.500	0.350	0.500
181-183	58.925	59.270	VIBRO	57.675	57.675	57.675	57.675	0.350	0.500	0.350	0.500
184-185	**58.500**	**54.500**	**VIBRO**	**57.250**	**57.250**	**57.250**	**57.250**	0.500	0.500	0.500	0.500
186-189	59.175	55.000	VIBRO	57.925	57.925	57.925	57.925	0.500	0.350	0.500	0.350
190-193	**59.300**	**57.000**	**VIBRO**	**58.050**	**58.050**	**58.050**	**58.050**	0.500	0.350	0.500	0.350
194-197	59.425	58.450	VIBRO	58.175	58.175	58.175	58.175	0.500	0.350	0.500	0.350
198-201	**60.175**	**59.000**	**VIBRO**	**58.925**	**58.925**	**58.925**	**58.900**	0.500	0.350	0.500	0.300
202-205	60.300	59.100	VIBRO	59.050	59.050	59.050	59.050	0.500	0.350	0.500	0.350
206-208	**60.475**	**59.100**	**VIBRO**	**59.225**	**59.225**	**59.225**	**59.225**	0.500	0.350	0.500	0.350
209-210	60.600	59.200	VIBRO	59.350	59.350	59.350	59.350	0.350	0.350	0.350	0.350
211-213	**60.200**	**59.200**	**VIBRO**	**58.950**	**58.950**	**58.950**	**58.950**	0.350	0.500	0.350	0.500
214-217	60.150	59.000	VIBRO	58.900	58.900	58.900	58.900	0.350	0.500	0.350	0.500
218-221	**60.050**	**59.100**	**VIBRO**	**58.800**	**58.775**	**58.800**	**58.775**	0.350	0.300	0.350	0.300
BLOCK A	61.750	61.200	PILED	60.500	60.500	60.500	60.500	0.500	0.500	0.500	0.500
BLOCK B	**61.500**	**60.000**	**PILED**	**60.250**	**60.250**	**60.250**	**60.250**	0.500	0.500	0.500	0.500
BLOCK C	61.050	59.800	PILED	59.800	59.800	59.800	59.800	0.500	0.500	0.500	0.500
BLOCK D	**61.850**	**60.000**	**PILED**	**60.600**	**60.600**	**60.600**	**60.600**	0.500	0.500	0.500	0.500
BLOCK E	61.800	59.800	PILED	60.550	60.550	60.550	60.550	0.500	0.500	0.500	0.500

VIBRO
DRIVEN PILED
CFA PILED

MINIMUM FOUNDATION DEPTHS

SOIL PLASTICITY	MINIMUM FOUNDATION DEPTH TO ALLOW FOR NEW TREE PLANTING
High	• 1.50m
Medium	• 1.25m
Low	• 1.0m

MINIMUM VOID DIMENSION TO ALLOW FOR POTENTIAL GROUND MOVEMENT

SOIL PLASTICITY	VOID DIMENSION AGAINST SIDE OF FOUNDATION AND GROUND BEAM	VOID DIMENSION UNDER GROUND BEAMS & INSITU CONCRETE FLOOR SLABS	VOID DIMENSION BENEATH PRE-CAST CONCRETE & TIMBER FLOORS
High	35mm	150mm	300mm
Medium	25mm	100mm	250mm
Low	0mm	50mm	200mm

GENERAL NOTES

THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ENGINEERS, ARCHITECTS AND SPECIALISTS DRAWINGS AND SPECIFICATIONS.

ALL RELEVANT DIMENSIONS TO BE OBTAINED/CHECKED AGAINST ARCHITECT'S DRAWINGS AND BY SITE MEASUREMENT PRIOR TO THE COMMENCEMENT OF WORKS OR ORDERING OF MATERIALS. DISCREPANCIES BETWEEN THE DRAWINGS AND SITE CONDITIONS TO BE NOTIFIED TO THE ENGINEER.

DO NOT SCALE FROM THIS DRAWING.

FOUNDATION DESIGN TYPICAL

ALL PLOTS TO BE FOUNDED ON VIBRO STONE REPLACEMENT COLUMNS TO PROVIDE A MINIMUM GROUND BEARING CAPACITY OF 150KN/M².

REV	DATE	DESCRIPTION	BY	CHK	APP
P04	13-01-2026	DRIVEN PILED HOUSE PLOTS SWITCHED TO VIBRO	EG	KOB	KOB
P03	16-10-2025	PRELIMINARY ISSUE	EG	KOB	KOB
P02	08-09-2025	PILING METHOD TO APARTMENT BLOCKS UPDATED	EG	KOB	KOB
P01	21-05-2025	PRELIMINARY ISSUE	EG	KOB	KOB

DRAWING STATUS: **PRELIMINARY**

CLIENT: KELLEN HOMES

ARCHITECT: KELLEN HOMES

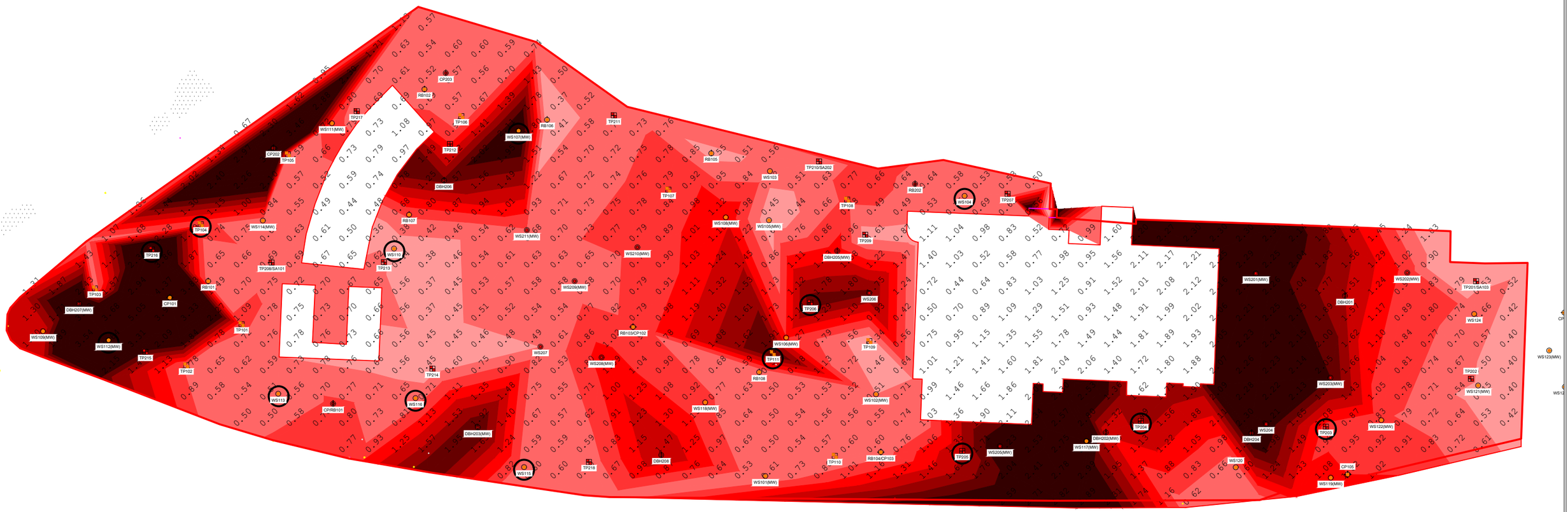
PROJECT: RIVERPARK ROAD MANCHESTER

TITLE: FOUNDATION ZONING PLAN MASTERPLAN

STATUS:	PROJECT No.	PROJECT	ORIGINATOR	VOL/SYS	LEVEL	TYPE	ROLE	DRAWING No.	REV:
S2	224-165	RPM	AJP	XX	00	DR	-	**S - 2000**	**P04**

SCALE @ A0:	DESIGNED:	DRAWN:	CHECKED:	APPROVED:	DATE:
1:500	EG	EG	KOB	KOB	MAY 2025

AJP consulting engineers
0151 227 1462 info@ajpltd.co.uk 01 Dale Street, Liverpool, L2 2ET



Location Symbols

- Approximate Window Sample Probehole Location (E3P November 2019)
- Approximate Window Sample Probehole Location with Install (E3P November 2019)
- Approximate Trial Pit Location (E3P November 2019)
- Approximate Cable Percussive Borehole Location (E3P November 2019)
- Approximate Rotary Borehole Location (E3P November 2019)
- Approximate Window Sample Probehole Location with Install (E3P January 2024)
- Approximate Trial Pit Location (E3P January 2024)
- Approximate Soakaway Test Location (E3P January 2024)
- Approximate Cable Percussive Borehole Location (E3P January 2024)
- Approximate Window Sample Probehole Location (E3P January 2024)

Made Ground Depth (m)

- Depth of Made Ground 0.25 - 0.49m
- Depth of Made Ground 0.50 - 0.74m
- Depth of Made Ground 0.75 - 0.99m
- Depth of Made Ground 1.00 - 1.24m
- Depth of Made Ground 1.25 - 1.49m
- Depth of Made Ground 1.50 - 1.74m
- Depth of Made Ground 1.75 - 1.99m
- Depth of Made Ground >2.00m
- Base of Made Ground Not Encountered

Notes:

Phase	Issue	Date	Drawn	Checked	PM
P1	REVD	26.02.2025	TG	MD	MD
P1	REVC	21.11.2024	TG	MD	MD
P1	REVB	14.02.2024	EB	MD	MD
P1	REVA	12.02.2024	EB	MD	MD

Client: Kellen

Job No: 17-246

Date: 21.11.2024

Drawing No: 006

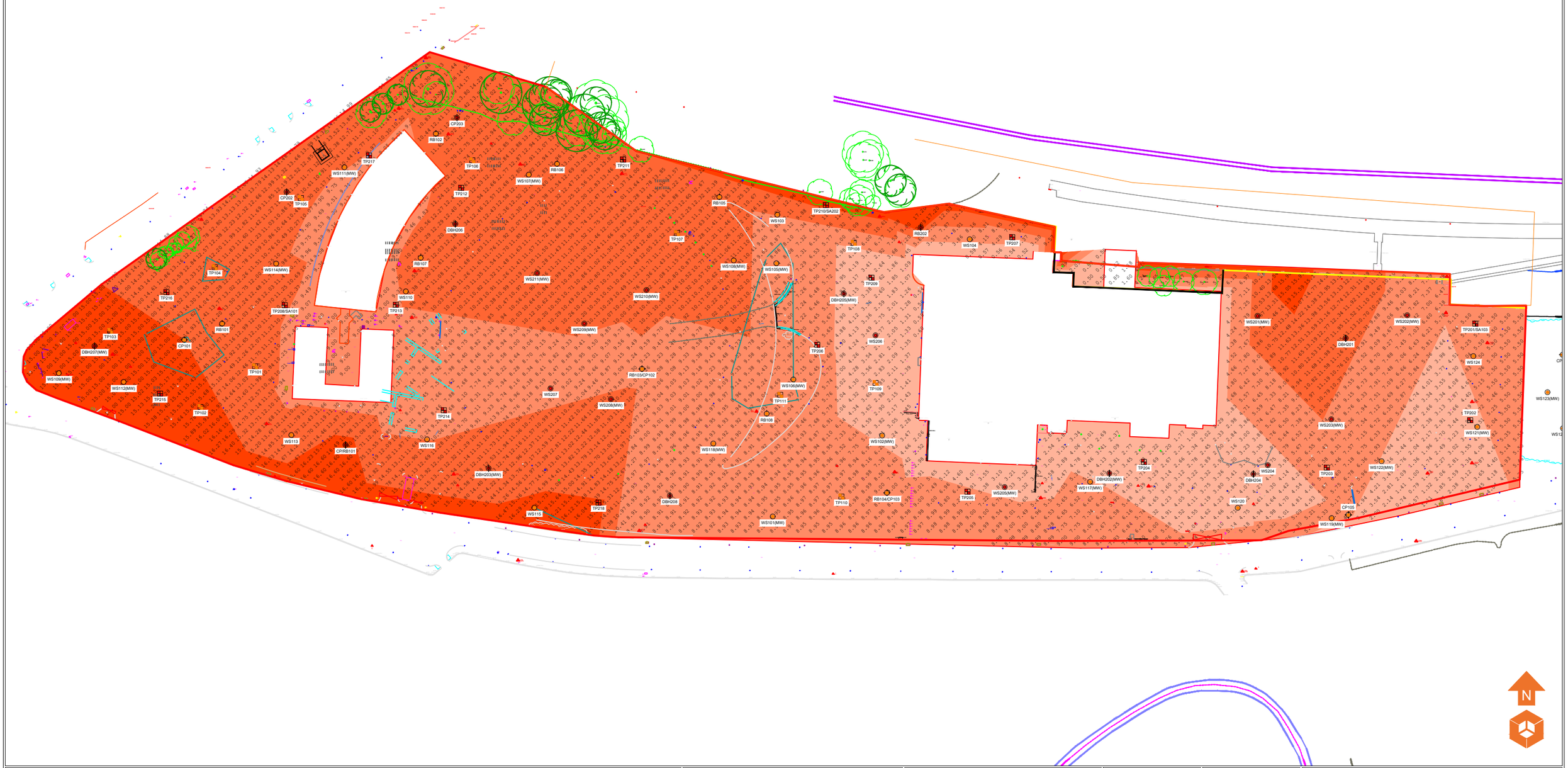
Scale: NTS @ A3

Job Title: Riverpark

Drawing Title: Depth of Made Ground Plan

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E-mail: info@e3p.co.uk
Website: www.e3p.co.uk

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Location Symbols

- Approximate Window Sample Probehole Location (E3P November 2019)
- Approximate Window Sample Probehole Location with Install (E3P November 2019)
- Approximate Trial Pit Location (E3P November 2019)
- Approximate Cable Percussive Borehole Location (E3P November 2019)
- Approximate Rotary Borehole Location (E3P November 2019)
- Approximate Window Sample Probehole Location with Install (E3P January 2024)
- Approximate Trial Pit Location (E3P January 2024)
- Approximate Soakaway Test Location (E3P January 2024)
- Approximate Cable Percussive Borehole Location (E3P January 2024)
- Approximate Cable Percussive Borehole Location (E3P January 2024)
- Approximate Window Sample Probehole Location (E3P January 2024)

Bedrock Depth (m)

- Depth to Bedrock 0.00 - 4.99M
- Depth to Bedrock 5.00 - 9.99M
- Depth to Bedrock 10.00 - 14.99M
- Depth to Bedrock <15.00M

Notes:

Phase	Issue	Date	Drawn	Checked	PM
P1	REVB	23.03.2026	TG	GC	MD
P1	REVA	12.02.2024	EB	MD	MD

Client: Kellen

Job Title: Riverpark

Job No: 17-246

Drawing No: 012

Date: 23.03.2026

Scale: NTS @ A3

Drawing Title: Depth to Bedrock Plan

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