

Bridge College, Openshaw

Remediation Strategy

17 June 2025

Prepared For

The Together Trust, Bridge College



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Appendix A: Chemical Acceptability Criteria for Capping Soils / Growth Medium

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Remediation Strategy

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1. Introduction

Civic Earth Limited was appointed by Civic Engineers on behalf of The Together Trust, Bridge College (the Client) to produce a Remediation Strategy (RS) for the proposed redevelopment of Bridge College in Openshaw, Manchester (herein referred to as “the site”).

It is understood that the following reports have previously been produced for the site:

- Curtins (2009) Rolls Royce Crossley, Pottery Lane, Openshaw, Manchester. Phase 1 Detailed Desk Top Study. 7 January 2009. Reference 50412/GN/0018¹.
- Curtins (2009) Rolls Royce Crossley Works, Pottery Lane, Openshaw, Manchester. Geo-Environmental Appraisal. 14 April 2009. Reference 50412/DM/0107².
- GEA (2011) Manchester College Co-Location Project, Pottery Lane, Manchester. Desk Study and Ground Investigation Report. January 2011. Reference J10145³.
- Stockley (2011) Manchester College Co-Location Project, Manchester. Remediation Strategy. 15 August 2011. Reference 465-01⁴.
- Stockley (2012) The Manchester College and Bridge College Co-Location Project: Review of risks associated with additional ground contamination (oil) found under the building. 24 April 2012. Reference 465-01⁵.
- Stockley (2012) The Manchester College and Bridge College Co-Location Project: Earthworks Testing and Validation. 10 September 2012. Reference 465-01⁶.
- Civic Earth (2024) Bridge College, Manchester. Phase 1 Desk Study. 19 November 2024. Reference 51121-CE-XX-XX-R-G-1001. Revision P01⁷.
- Civic Earth (2025) Bridge College, Manchester. Site Investigate Report. 4 April 2025. Reference 51121-CE-01-XX-R-G-1001⁸.

The above reports have been used as supporting information in the preparation of this RS, and reference should be made to the reports for full details of the investigations and assessments completed for the site.

This report, which has been produced in general accordance with Environment Agency (EA) guidance⁹, provides a summary of the environmental information that has been collated for the site, and presents a remediation strategy and verification plan as well as recommendations with respect to materials management and related health and safety requirements.

This remediation strategy details the remediation requirements for the proposed redevelopment of the site, which is understood to comprise new school rooms, offices and accommodation. Should the final proposed development change then this document should be updated to reflect the change in the development.

It is recommended that this report is submitted to the Local Planning Authority to support the Planning Application for the enabling works.

The appointed Remediation Contractor(s) will produce a Remediation Implementation Plan (RIP) for the site on the basis of this RS. Following completion of the agreed remediation works for the site, a Verification Report should be prepared and issued to the Local Planning Authority.

¹ Curtins (2009) Rolls Royce Crossley, Pottery Lane, Openshaw, Manchester. Phase 1 Detailed Desk Top Study. 7 January 2009. Reference 50412/GN/0018.

² Curtins (2009) Rolls Royce Crossley Works, Pottery Lane, Openshaw, Manchester. Geo-Environmental Appraisal. 14 April 2009. Reference 50412/DM/0107.

³ GEA (2011) Manchester College Co-Location Project, Pottery Lane, Manchester. Desk Study and Ground Investigation Report. January 2011. Reference J10145.

⁴ Stockley (2011) Manchester College Co-Location Project, Manchester. Remediation Strategy. 15 August 2011. Reference 465-01.

⁵ Stockley (2012) The Manchester College and Bridge College Co-Location Project: Review of risks associated with additional ground contamination (oil) found under the building. 24 April 2012. Reference 465-01.

⁶ Stockley (2012) The Manchester College and Bridge College Co-Location Project: Earthworks Testing and Validation. 10 September 2012. Reference 465-01.

⁷ Civic Earth (2024) Bridge College, Manchester. Phase 1 Desk Study. 19 November 2024. Reference 51121-CE-XX-XX-R-G-1001. Revision P01.

⁸ Civic Earth (2025) Bridge College, Manchester. Site Investigate Report. 4 April 2025. Reference 51121-CE-01-XX-R-G-1001

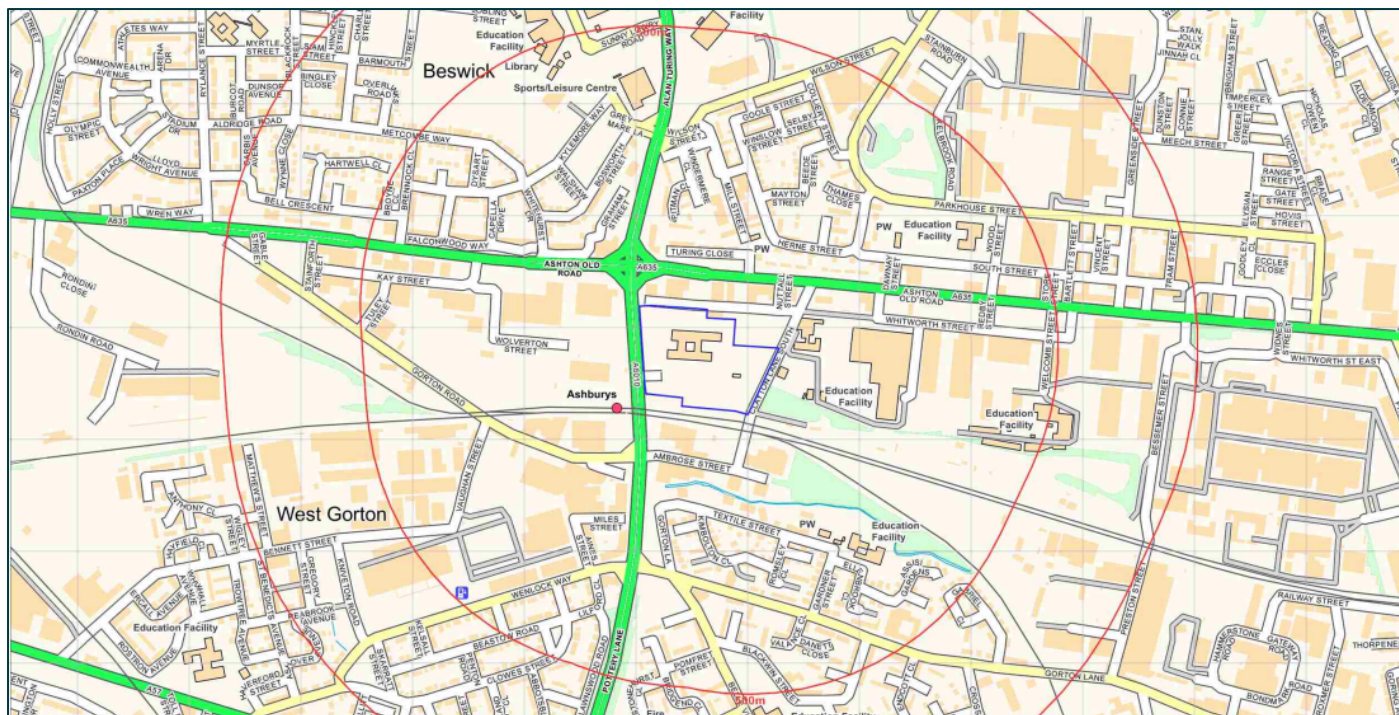
⁹ Environment Agency (2023) Land Contamination Risk Management (LCRM), Stage 3 Remediation and Verification. Accessed online 12 June 2025 (<https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm>)

2. Site Context

2.1. Site Location and Description

The site is located in Openshaw, approximately 5km east of Manchester City Centre. The postcode for the site is M11 2GR. The National Grid coordinates for the approximate centre of the site are 387320E, 397343N and the site is approximately 3.34 ha in size. The site location is illustrated by the blue line boundary in Plate 1. The site is roughly rectangular in shape and predominantly comprises open space with soft landscaping and several pedestrian footpaths, and an asphalt car park to the north of the site and a special education school towards the centre of the site. The site is bound to the north by Whitworth Street, to the southeast by Clayton Lane South, to the west by Pottery Lane and by railway lines to the south.

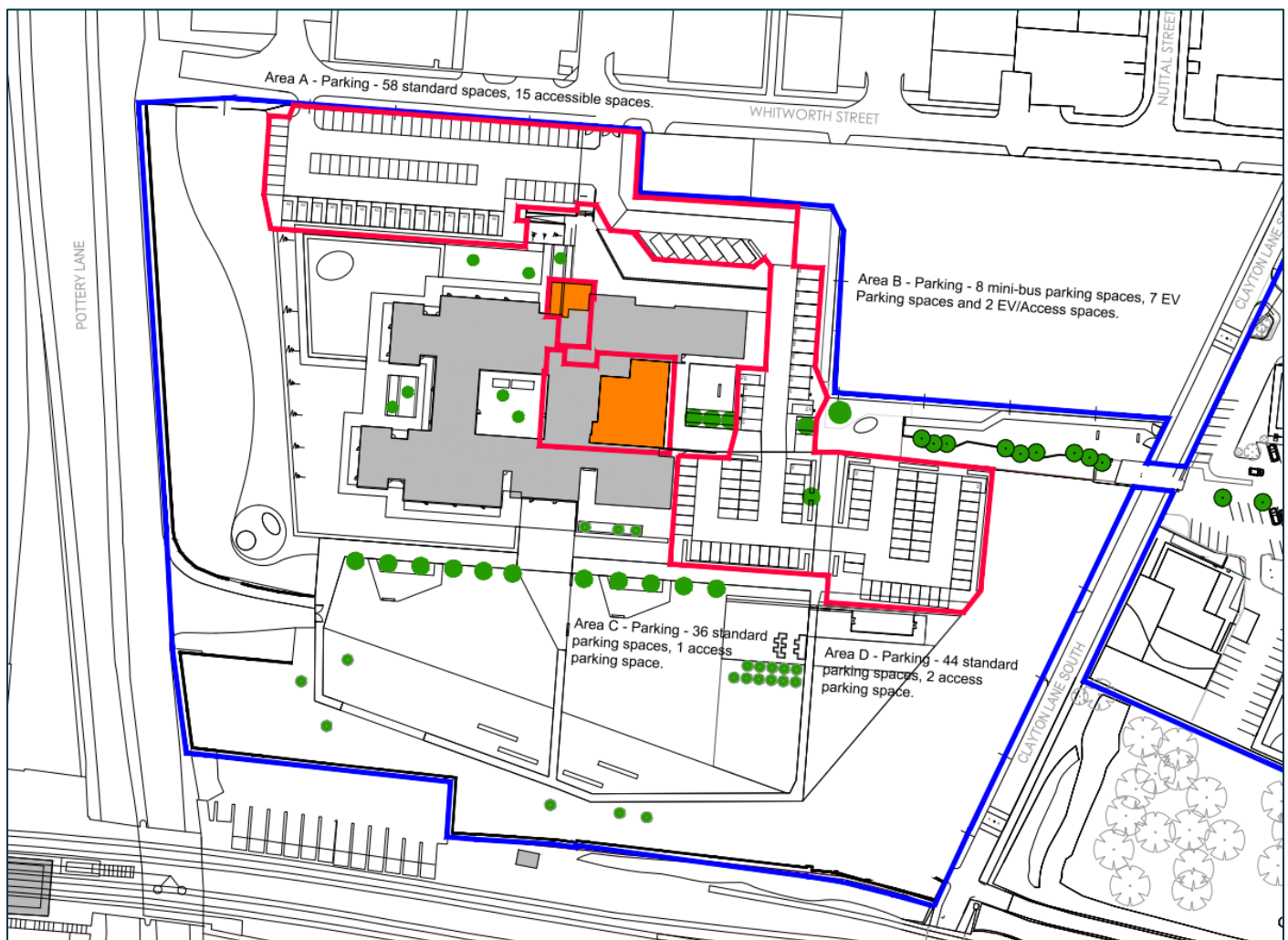
Plate 1: Approximate Site Location Plan (©OpenStreetMap Contributors)



2.2. Proposed Redevelopment

It is understood that the current development proposals for the site include new school rooms, offices and accommodation in the same style as the existing building. Additionally, four new areas labelled Area A, B, C & D (see Plate 2) will accommodate new parking spaces including standard, Electric Vehicle (EV), mini-bus and access parking spaces. The proposed development layout is illustrated in Plate 2; the locations of the proposed new structures are illustrated by the orange areas and the proposed new car parking areas within the red boundaries.

Plate 2: Proposed Development Plans (drawing from Walker Simpson Architects, 0396-WSA-ZZ-ZZ-DR-A-1501-S0-P05)



3. Summary of Conceptual Site Model

3.1. Introduction

This section provides a summary of the findings of the site investigation undertaken in 2025 and should be read in conjunction with the Civic Earth Site Investigation Report⁸ which includes a summary of the previous reports and more detailed information on the site context. A summary of the pertinent information and the conceptual site model is presented in the following sections.

3.2. Ground Conditions

The ground conditions were recorded to comprise a variable thickness of Made Ground (up to 2.30m) overlying superficial Devensian Glacial Till Deposits. The Devensian Glacial Till Deposits were proven to 5.45mbgl. A possible olfactory sign of potential hydrocarbon contamination was noted within borehole WS101 within the top of the Devensian Glacial Till Deposits between 1.40mbgl and 1.60mbgl. Boreholes WS103A, WS103B, WS106, WS106A, WS107, WS107A, WS107B, WS108 and WS108A terminated on shallow concrete obstructions. Perched water was encountered in the Made Ground and Devensian Glacial Till Deposits which was variable in level and appeared to be limited in nature, confined by surrounding cohesive deposits.

3.3. Contamination Assessment Summary

3.3.1. Risks to Human Health

A total of 12 soil samples were submitted for chemical analysis; 1 sample from the topsoil, 8 samples from the Made Ground and 3 samples from the Devensian Glacial Till Deposits. The results were compared against human health generic assessment criteria (GAC) for a “residential without home grown produce” end use based on the proposed end use of the site.

Assessment of the Made Ground results indicated that within the areas investigated the contaminant concentrations were generally below their respective assessment thresholds with the exception of arsenic, beryllium and PAHs. Statistical assessment indicated that the elevated concentrations of arsenic and beryllium (borehole WS102 at 0.90mbgl and 2.1mbgl), and PAHs (borehole WS103A at 0.40mbgl) were localised and not widespread across the site.

Given that hardstanding and/or buildings are proposed across these areas it was considered that the risk from recorded concentrations of contaminants in the underlying soils would be mitigated as the pathway between source and receptor will be broken. However, it was noted that should the development proposals change and the identified hotspot locations are within areas of soft landscaping, a clean capping layer would be required to mitigate the risks to future site users.

The results of the assessment of the topsoil and Devensian Glacial Till Deposits indicated that the contaminant concentrations recorded were below their respective GAC. One groundwater sample was analysed from the perched water within the Devensian Glacial Till Deposits; the results of the assessment indicated that the contaminants were below their respective thresholds and the potential risks to future site users from vapours from groundwater were considered to be low.

3.3.2. Risks to Controlled Waters

One groundwater sample from the superficial deposits was scheduled for chemical analysis. The results of the water assessment indicated that the concentrations are below the laboratory limit of detection with the exception of naphthalene; however, the concentration recorded was below the EQS. The risks to controlled waters from the Made Ground and perched water are considered to be low given the nearest watercourse (Corn Brook) is approximately 130m south of the site, the discontinuous nature of the perched water and cohesive nature of the Made Ground and Devensian Glacial Till Deposits beneath the site will limit lateral and vertical contaminant migration, and the proposed hardstanding and buildings across the site will limit infiltration and therefore reduce the potential for contaminant migration.

3.3.3. Risks from Ground Gases

The calculated Gas Screening Values (GSV) correlated to Characteristic Situation CS1 and therefore ground gas protection measures were not considered to be required.

Following completion of the site investigation report, the Local Authority requested further consideration of the potential risk from ground gases, particularly with respect to the number of monitoring visits undertaken. In this regard, it is noted that a total of 8 ground gas monitoring rounds have been undertaken at the site; 6 rounds over a 2 month period by Curtins as part of their 2009 investigation², and 2 rounds by Civic Earth in 2025⁸ on a fortnightly basis. CIRIA Guidance¹⁰ recommends that for a low sensitivity development (commercial) with a low generation potential of ground gases, 6 monitoring rounds over a 2 month period should be carried out. For a moderate generation potential site, 6 rounds over a 3 month period are recommended.

The Curtins' monitoring rounds were undertaken between 3 February 2009 and 25 March 2009 during atmospheric pressures ranging between 991mbar and 1016mbar. As summarised in the Civic Earth site investigation report, the Curtins' monitoring rounds did not record methane concentrations above the detection limit, with carbon dioxide concentrations recorded below 5%v/v on each occasion. The Curtins report states that a maximum carbon dioxide

¹⁰ CIRIA (2007) Assessing risks posed by hazardous ground gases to buildings. CIRIA Report C665, London.

concentration of 3.9% v/v with a flow rate of 6.4 l/hr was recorded on 3 February 2009 and a maximum carbon dioxide concentration of 4.0% v/v with a flow rate of 5.0 l/hr was recorded on 13 February 2009. Both readings were recorded within borehole BH3 which is located outside of the existing (and proposed) building footprint. It is noted however that the response zone of borehole BH3 is within the Glacial Till and top of the bedrock, which are not considered to be a ground gas generating stratum with no specific reference to organics on the borehole record. The response zone of the well is noted to extend between 20m and 14m across two strata which can result in artificial flow rates regimes being generated. Review of the Curtins monitoring records indicates that for the two response wells installed within the Made Ground (boreholes BH01 shallow and BH07 shallow, both located outside of existing (and proposed) building footprints), the calculated GSVs typically correlated to CS1. CS2 conditions were recorded in borehole BH07s on the second, third and fourth monitoring rounds but not reflected for the final two rounds which represented CS1.

The subsequent GEA 2011 assessment³ (undertaken post-enabling works at the site, prior to construction of the existing structures) further analysed the Curtins ground gas monitoring results and the trends in depleted oxygen and carbon dioxide concentrations. GEA concluded that the concentrations reduce over time, suggesting that the initial results presented soil gas trapped within the Made Ground below concrete / hardstanding, and that as the site was stripped of hardstanding and turned over (as part of the previous development), trapped gas would have vented to the atmosphere. GEA noted that borehole BH3 and BH4 did not follow this trend; however, the conceptual site model in these areas of the site (a former clay pit and raised area) did not reflect the CSM across the other areas of the site, and given no buildings were proposed in this area of the site, the risks from ground gases were considered to be low. GEA concluded that there would be no requirement for the installation of ground gas protection measures within the proposed new structures.

The results of the Civic Earth ground gas monitoring rounds confirm minimal carbon dioxide concentrations within the Made Ground which correlates with GEA's interpretation that 'trapped' soil gas within the Made Ground was released during the previous earthworks at the site, with concentrations below 1%v/v recorded in each installation on each occasion. For completeness, the monitoring wells installed within both the Made Ground and Devensian Glacial Till Deposits were monitored for ground gas and the concentrations of methane and carbon dioxide were recorded to be below 1% and 5%, respectively in both strata and the calculated GSVs correlate to CS1. A review of the Total Organic Carbon content was also carried out for the deposits of Glacial Till, which confirmed that the natural superficial deposits are considered to have a low potential for ground gas generation.

In summary, in consideration of the number of monitoring rounds completed at the site (6 historical rounds over a 2 month period plus 2 recent rounds over a 2 week period) which have indicated consistently low carbon dioxide concentrations of <5%v/v, the low ground gas generation potential of the natural deposits, and the supplementary assessment undertaken by GEA, along with the findings of the recent monitoring undertaken by Civic Earth, it is considered that sufficient ground gas monitoring data is available to assess the ground gas regime at the site and conclude CS1.

3.3.4. Risks to Plants and Vegetation

The results of the Civic Earth investigation recorded concentrations of phytotoxic contaminants within the Made Ground that present a risk to plant and vegetation growth with exceedances of copper, zinc and nickel identified. It was considered that the importation of suitable soils would be required in areas of soft landscaping (if incorporated into the scheme) to provide a suitable growth medium.

3.3.5. Preliminary Waste Characterization

A preliminary waste characterisation was undertaken, which indicated that the material tested would be characterised as non-hazardous material and therefore considered to be acceptable to an inert waste facility (subject to WAC testing) or a non-hazardous waste facility. A total of 3 WAC tests were carried out which indicated that the material tested would be acceptable for disposal at an inert waste facility, with the exception of 1 sample (WS104 at 1.40mbgl) which indicated the material would not be acceptable for disposal at an inert waste facility (due to elevated fluoride) but would be acceptable to a stable non-reactive hazardous waste facility.

4. Remediation Strategy

The following activities form the remediation strategy to address the identified contaminant linkages

- Watching brief and discovery strategy;
- Decommissioning of existing borehole monitoring wells;
- Appropriate material management of arisings associated with enabling works for re-use and/or disposal including off-site disposal to appropriately licenced waste facilities;
- Mitigation of risks to controlled waters during enabling works including appropriate management of stockpiles, controlling surface water run-off and appropriate discharge / disposal of perched groundwater;
- Provision of suitable growth medium in areas of soft landscaping.
- Provision of clean cover system in areas of soft landscaping should the proposed development be amended such that soft landscaping is required in areas where hotspots of contamination have been identified;
- Selection and installation of appropriate materials for buried water supply pipes.

4.1. Watching Brief and Discovery Strategy

A watching brief will be put in place during earthworks and construction works by the Contractor(s). Should areas of unexpected contamination, including asbestos, be encountered or suspected, a qualified geoenvironmental engineer will be informed and the risk associated with the contamination assessed. Where necessary, an appropriate remediation strategy will be devised and implemented.

The regulators should be informed of additional areas of contamination so identified and be provided with the risk assessment and proposed remediation methodology for agreement before undertaking such works. Appropriate verification works to be completed if remedial measures are required will also be identified and agreed.

The following nominal discovery strategy, in the event of unexpected contaminated being encountered, is recommended:

- Work to cease in that area.
- Notify geoenvironmental engineer to attend site and inspect the identified material, obtaining samples if appropriate and develop a remediation strategy to address the identified contamination if required.
- Notify Contaminated Land Officer at the Local Authority, as appropriate.

In the event that material requires excavation:

- Geoenvironmental engineer to supervise the excavation of contaminated material, which should be placed in a bunded area and covered to prevent rainwater infiltration.
- Soil samples should be obtained by the geoenvironmental engineer from both the excavated material and the soils in the sides and base of the excavation to demonstrate that the full area of contamination has been excavated. If appropriate, in-situ testing should be undertaken on the sides and base of the excavation to assess the presence of residual contamination in the soils.
- On receipt of chemical test results, the soils may be appropriately classified for treatment, disposal and/or reuse and dealt with accordingly.
- Detailed records, including photographs and duty of care records, of the excavations, stockpile sizes, source and location should be kept and regularly updated to allow materials to be easily tracked from excavation until disposal off site.
- Backfilling to be undertaken with material certificated as suitable for the proposed end land use.

4.2. Borehole Decommissioning

Monitoring wells installed as part of the Civic Earth site investigation will be decommissioned prior to commencement of significant earthworks. The monitoring wells will be decommissioned in accordance with EA guidance¹¹, to include removal of headworks and backfill of the monitoring well from base to top with low permeability material i.e. bentonite/cement grout. Backfilling will be carried out via tremie pipe (where wells are deeper than 3m in depth), or via funnel and compacted with a rod or similar (where wells are shallower than 3m).

4.3. Material Management

The Contractor will be responsible for the material management and waste classification. The “waste hierarchy” should be used to rank waste management options according to what is best for the environment. Top priority should be given to preventing waste in the first place, for example during pre-construction and planning stages of a new development.

¹¹ Environment Agency (2012) Good practice for decommissioning redundant boreholes and wells.

However, if waste is created, priority should be given to preparing it for re-use, then recycling, then recovery, and last of all for disposal.

4.3.1. Re-use, Recycling and Recovery

In order to minimise the volume of soil being disposed to landfill facilities, it is prudent to consider material management options prior to waste disposal.

Based on the results of the Civic Earth assessment, it is considered that the majority of the Made Ground material excavated could be re-used subject to formation and final finish levels, under the CL:AIRE protocol¹². It is noted that the material within the identified hotspots would not be acceptable for reuse below areas of soft landscaping, so if intended for reuse would need to be reused below capping or hardstanding. The CL:AIRE protocol would require a Material Management Plan (MMP) to be produced which details where materials will arise from and how they will be used within the limits of the Code of Practice. The process would require sign off by a Qualified Person in advance of works commencing and a final validation report to be produced.

It is noted that the CL:AIRE protocol is not applicable to soils that pose harm to human health or the environment and as such, should gross contamination in the Made Ground be encountered during earthworks, this material would unlikely be suitable for re-use and should be selectively excavated and disposed of from site.

Uncontaminated clean, naturally occurring arisings may be re-used within the site under the CL:AIRE protocol or re-used off-site under direct transfer under the CL:AIRE protocol. Additionally, screening of uncontaminated (inert) granular soils may permit the re-use of this material on site or off-site under the WRAP protocol¹³, where the protocol sets out end waste criteria for the production and use of aggregates from inert waste; where the criteria are met, the aggregates would typically be regarded as having been fully recovered and ceased to be waste.

If off-site disposal of excavated soils is unavoidable, the Contractor will be responsible for the appropriate classification of the waste.

4.3.2. Waste Handling

All material intended for off-site disposals should be transported and disposed in accordance with the Environmental Protection (Duty of Care) Regulations, 1991, and the Landfill (England and Wales) Regulations, 2002 (as amended). Waste legislation stipulates that hazardous and non hazardous waste should be pre-treated prior to disposal. Pre-treatment can be undertaken either at the site of origin or may be carried out at a licenced off-site facility and can include selective segregation of soils conducted on site.

4.3.3. Re-use of Site Won Material

It is envisaged that the majority of material to be excavated to achieve the formation level will require off-site disposal based on the anticipated overall 'cut' in the development areas, with some potential opportunity for re-use of material on site if levels are to be raised.

Should excavated material be re-used on site, it will need to be undertaken in compliance with a site specific earthworks specification in order to meet the requirements for engineered fill under appropriate protocols as discussed in Section 4.3.1. As set out above, material excavated from the identified hotspot areas would not be acceptable for reuse beneath soft landscaping, and therefore could only be reused beneath buildings or hard standing, or soil capping layers.

4.3.4. Material Disposal

The Contractor is responsible for characterising the waste for offsite disposal. Information to support the characterisation of the Made Ground material is provided in the Civic Earth report⁸ and should be referred to for full information. It is anticipated that further testing of material may be required to characterise the material for off-site disposal, which will be the responsibility of the Contractor.

4.3.5. Importation of Material for Bulk Earthworks

Based on the anticipated cut and fill works, the import of material for use in the bulk earthworks is not anticipated to be required. However, should importation of material be necessary, the material will be required to meet chemical acceptability screening criteria outlined in [Appendix A](#), or an alternative screening criteria that is agreed with the regulators prior to import to site. Compliance testing at a frequency of 1 per 200m³ with a minimum of 3 samples per source will apply will be required. It is noted that chemical compliance testing of imported Primary Aggregate would not be required.

4.4. Mitigation of Risks to Controlled Waters

The following measures will be put in place to mitigate the potential impact to controlled waters during groundworks, where contaminants in the underlying soils may be mobilised to a greater extent than naturally occurs:

- Appropriate management of stockpiles including stockpiling in designated areas away from drainage channels,

¹² CL:AIRE (2011). *The Definition of Waste: Development Industry Code of Practice. Version 2*

¹³ WRAP & EA (2023), *Quality Protocol: Aggregates from Inert Waste*. Accessed online (<https://www.gov.uk/government/publications/quality-protocol-production-of-aggregates-from-inert-waste>). Published October 2013.

segregation of different types of material (e.g. Made Ground and natural soils), and controlling surface water run-off with bunds, liners and coverings. Excavated soils will also be appropriately stored with preventative measures against nuisance odours to protect human health during temporary storage on site. The Contractor will document handling and storage protocols for potentially contaminated soils.

- Appropriate management and discharge/disposal of perched groundwater encountered in excavations and water used during enabling works (e.g. for dust suppression and wheel washing). Temporary drainage systems to be designed and implemented so that they capture waterborne pollution prior to entering any existing drainage systems.
- Appropriate storage of all hazardous liquids, chemicals and materials where materials are to be stored in accordance with the Control of Substances Hazardous to Health (COSHH) Regulations.

The enabling and construction works should be undertaken in accordance with CIRA 741¹⁴.

4.5. Growth Medium / Capping Layers for Areas of Soft Landscaping

Importation of a suitable growth medium may be required for proposed areas of soft landscaping due to the composition of the existing Made Ground.

In addition, it is noted that should the development proposals change and the identified contamination hotspots within the Made Ground be located within areas of soft landscaping and not below hardstanding or buildings, capping layers will be required to mitigate the potential risks to human health, which will provide a suitable growth medium for plants and vegetation. To comply with BRE 465¹⁵, capping layers for the site will need to meet the following criteria:

- 450mm imported soil with a minimum of 150mm topsoil (including 50mm turf/sod) over a geotextile membrane; or
- 600mm of imported soil with a minimum 150mm topsoil (including 50mm turf/sod).

It is noted that the thickness of the capping layer may need to be increased for trees/large shrubs where the thickness is specified by the landscape architect.

Where mature trees that are present and to be retained as part of the redevelopment of the site, it may not be feasible to install a 450mm-600mm thick capping layer. In these areas, it is considered that the tree roots themselves will restrict site occupants' exposure to soils around the tree roots and 'feathering' will be carried out such that the capping layer can be installed without damaging tree roots. Areas where capping layers require feathering will be set out in the Contractor's Remediation Implementation Plan.

The material imported to form the growth medium and capping layers will be uncontaminated soil from a known and reputable "Greenfield" or manufactured source. The capping soils will meet the chemical criteria for human health with respect to the residential (with home grown produce consumption) end use. The chemical specification is set out in [Appendix A](#). Pre-import chemical compliance testing will be undertaken with **a minimum frequency of 3 samples tested per source (and per material type)**.

In addition, imported topsoil is required to meet the requirements of BS 3882¹⁶ and imported subsoil is required to meet the requirements for BS 8601¹⁷. The material should be free from propagules of aggressive weeds, free from obvious signs of contamination e.g. staining, free phase hydrocarbon, coal, non-odorous such that it could be considered a statutory nuisance and free from unsuitable material/foreign bodies e.g. brick, glass, pipework.

Once placed, the capping soils will be sampled and chemically tested by a suitably qualified geoenvironmental engineer to confirm that the material complies with the specifications outlined in [Appendix A](#). Verification testing will be via the formation of hand pits to:

- Prove the capping soil thickness meets the minimum requirements on **a 20m grid (in large areas of landscaping such as lawns), with a minimum of 2 verification pits per individual landscaped area**. A reduction to 1 verification pit is acceptable for small (<5m²) landscaped areas.
- Obtain soil samples from each material (i.e. topsoil and subsoil) for chemical analysis at **a minimum frequency of 1 sample per 200m³**, with a minimum of 3 samples per source will apply (and per material type).

To protect the integrity of the capping layers, placement should commence after installation of foundations and drainage works.

In areas where soft landscaping is proposed at podium levels or within concrete planters, where no contact is made with the underlying Made Ground, imported topsoil/subsoil will be required to provide a suitable growth medium; however, no minimum thickness is required from a protection of human health perspective.

¹⁴ CIRIA (2015). Environmental Good Practice on Site Guide. 4th Edition.

¹⁵ BRE (2004) Cover systems for land regeneration - thickness design of cover systems for contaminated land. BRE 465.

¹⁶ British Standards (2015) Specification for Topsoil and Requirements for Use. BS3882:2015.

¹⁷ British Standards Institute (2013) Specification for Subsoil and Requirements for Use.

4.6. Buried Water Supply Pipes

It is anticipated that barrier pipes may not be required for new buried water supply pipes in the areas investigated. However, it is recommended that the requirements for new buried water supply pipes are confirmed with the local water supply company once the details of the locations and levels of new water supply pipes are confirmed, which may require reference to the results of previous investigations undertaken at the site and further testing (UKWIR suite).

Alternatively, barrier pipes could be selected by default, and then further testing is not anticipated to be required. In addition, if the PE pipework is to be placed within imported, clean backfill e.g. site won/ imported virgin material, UKWIR testing is not considered to be required.

4.7. General Requirements

Precautions will be taken to minimise exposure of workers and the general public to potentially harmful substances during earthworks. The risks to contractors will be controlled through the implementation of site safety procedures and the use of suitable personal protective equipment (PPE). Attention will also be paid to restricting possible off-site nuisance such as dust and odour emissions.

All site works will be undertaken in accordance with the guidelines prepared by the Health and Safety Executive including HSG 150¹⁸ and HSG151¹⁹, and CIRIA Reports R132D²⁰ and C811¹⁴. All site works will be carried out in accordance with the Contractor's Construction Phase Plan.

Precautions should include (but not be limited to):

- Provision of appropriate PPE and good personal hygiene, washing and changing procedures.
- Dust and vapour suppression methods, including dampening down, minimising the working face exposed and covering stockpiles, and regular cleaning of all site roads, access roads and the public highway.
- Vehicle washing carried out before vehicles leave site, with washings contained on site and suitably disposed of.
- Safe storage of fuel and other potentially polluting liquids and the provision of spill control and clean up facilities.
- Appropriate planning of excavations with regular inspections carried out by a competent person. No operatives should be permitted to enter un-shored or otherwise protected excavations identified as unstable by the competent person, however shallow they are.

Where encountered, asbestos containing materials (ACMs) and asbestos impacted soils will be managed, handled and removed / disposed of in accordance with current regulations and guidance^{21,22,23}. ACMs, if encountered, will be segregated by hand picking by a suitably qualified person utilising the appropriate PPE / respiratory protective equipment (RPE) and implementing necessary precautionary measures to minimise exposure to construction workers and general public during earthworks. The Contractor will be responsible for determining whether the works are notifiable or licensable, and for implementing the appropriate procedures.

All site operatives undertaking groundworks will be advised for the potential for ACMs including fibres to be present and will be trained in basic visual recognition of asbestos. Soils being handled should be dampened, taking care that damping is carried out at the appropriate time and with appropriate amounts of water to suppress dust, but not saturate the soils. Soil movement should be minimised and double handling avoided.

Vehicles used in moving contaminated soils will be washed and a wheel wash installed and used before vehicles leave the working area to avoid carrying potential fugitive dust into the surrounding environment. The vehicle washing will be returned to stockpiled material and not be allowed to enter public drains where drying out has the potential to release dusts.

¹⁸ HSE (2006) *Health and Safety in Construction*. 3rd Edition. HSG 150.

¹⁹ HSE (2009) *Protecting the Public*. 2nd Edition. HSG 151.

²⁰ CIRIA (1996) *A Guide for Safe Working on Contaminated Sites*. R132D.

²¹ HSE (2013) *Managing and Working with Asbestos*. Control of Asbestos Regulations 2012. 2nd Edition. L143.

²² HSE (2006) *Asbestos: The Licensed Contractors' Guide*. 1st Edition. HSG 247.

²³ HSE (2012) *Asbestos: The Survey Guide*. 2nd Edition. HSG 264.

5. Validation and Verification

5.1. Remediation Validation Requirements

This RS will require validation reports to be collated on completion of the enabling works remediation works and on completion of the construction phase remediation works, as outlined in Section 4. The verification reports should be submitted to and approved by the Local Authority.

Based on the remediation strategy outlined in Section 4, it is anticipated that the verification evidence will comprise:

- Site inspection records, photographs and laboratory testing should unexpected contamination be encountered;
- Borehole decommissioning records;
- General site inspection records and photographs during cut and fill and material re-use works;
- As-built drawings including final earthworks levels and volumes;
- Material management procedures (permits, exemptions, MMP etc.) and records detailing material re-use locations, as appropriate;
- Duty of Care records for disposal of asbestos contaminating materials and surplus arisings including WAC testing certificates, waste haulier permits, waste recipient permits and volumes of materials disposed of by each haulier / to each facility;
- United Utilities water supply pipe risk assessment, specification of water supply pipework and confirmation from United Utilities of their acceptance of the material used;
- Site inspection records, photographs and laboratory testing for capping layer and/or growth medium material importation and construction, confirming compliance with the relevant import specification;
- Confirmation that watching brief and discovery strategy were implemented, the findings and measures implemented.

5.2. Verification Plan

A Verification Plan which details the remedial requirements and verification information required to confirm that the remediation of the site is carried out in compliance with this RS is presented in [Appendix B](#).

5.3. Verification Reporting

A Verification Report will be required following completion of the construction works, which will include the information set out in Section 5 and the Verification Plan. The Verification Report(s) should be submitted to and approved by the Local Planning Authority.

Appendix A

Chemical Acceptability Criteria for Growth Medium

Table 1: Maximum Permissible Concentrations for Capping Layer Soils (6% SOM)

Determinand		Maximum Permissible Concentration ¹ (mg/kg) ²	Rationale
Arsenic		37	S4UL ³
Beryllium		1.7	S4UL ³
Boron (water soluble)		5	Lower limit for potential phytotoxic effect ⁴
Cadmium		11	S4UL ³
Chromium (III)		910	S4UL ³
Chromium (VI)		6	S4UL ³
Lead		200	C4UL ⁵
Mercury		40	S4UL ³
Selenium		250	S4UL ³
Copper		135	BS 3882:2015 Specification for Topsoil ⁶
Nickel		75	BS 3882:2015 Specification for Topsoil ⁶
Zinc		200	BS 3882:2015 Specification for Topsoil ⁶
Vanadium		410	S4UL ³
Benzo(a)pyrene		3.0	S4UL ³
Benzo(a)anthracene		13	S4UL ³
Benzo(b)fluoranthene		3.7	S4UL ³
Benzo(k)fluoranthene		100	S4UL ³
Chrysene		27	S4UL ³
Dibenzo(a,h)anthracene		0.3	S4UL ³
Indeno(1,2,3-cd)pyrene		41	S4UL ³
Naphthalene		13	S4UL ³
Total PAH		100	Based on Total PAH threshold for inert WAC
TPH aliphatic	EC5-6	160	S4UL ³
	EC>6-8	530	S4UL ³
	EC>8-10	150	S4UL ³
	EC>10-12	760	S4UL ³
	EC>12-16	1,000	Hazardous waste threshold ⁷ (N/A see sum of TPH below)
	EC>16-35	1,000	Hazardous waste threshold ⁷ (N/A see sum of TPH below)
TPH aromatic	EC5-7	300	S4UL ³
	EC>7-8	660	S4UL ³
	EC>8-10	190	S4UL ³
	EC>10-12	380	S4UL ³
	EC>12-16	660	S4UL ³
	EC>16-21	930	S4UL ³
	EC>21-35	1,000	Hazardous waste threshold ⁷ (N/A see sum of TPH below)
Sum of TPH aliphatic and aromatic C5-C10		500	Based on Mineral Oil threshold for Inert WAC
Sum of TPH aliphatic and aromatic C10+		500	Based on Mineral Oil threshold for Inert WAC
TPH		1,000	Hazardous waste threshold
pH		5-10	
Monohydric Phenols		280	S4UL ³
Free Cyanide		34	SSV ⁸
Asbestos		No detectable fibres ⁹	
SOM		>6%	If SOM <6% then lower criteria may apply for some determinands

Notes:

- These maximum permissible concentrations (MPCs) are import criteria only and may not be appropriate for human health risk assessment.
- In mg/kg dry soil except pH and asbestos.
- S4UL for residential with plant uptake land use based on 6% SOM. Copyright Land Quality Management Limited, reproduced with permission. Publication Number S4UL3892. All rights reserved.
- Nable, Banuelos and Paul. (1997). Boron Toxicity. Plant and Soil. Vol 193, pages 181-198.
- Published C4SL for lead (DEFRA, 2014).
- British Standard BS3882:2015 Specification for Topsoil and requirements for use. Table 1 based on pH 6-7.
- MPC for TPH fraction limited to 1,000mg/kg based on hazardous waste threshold.
- ATRISKsoil Soil Screening Value (SSV) stated for cyanide based on acute exposure to 0-6 year old child.
- Laboratory screen by microscopy may be required subject to source material.

Appendix B

Verification Plan

Item	Remedial Requirements	Development Phase	Site Attendance by Qualified Geoenvironmental Engineer	Supporting Documentation
General	With reference to the Civic Earth RS, the site's remediation requirements are as follows: - Watching brief and discovery strategy; - Decommissioning of existing borehole monitoring wells; - Appropriate material management of arisings associated with earthworks and construction works (i.e. foundation works) for re-use and/or disposal including off-site disposal to appropriately licenced waste facilities; and - Mitigation of risks to controlled waters during works including appropriate management of stockpiles, controlling surface water run-off and appropriate discharge / disposal of perched groundwater. - Provision of growth medium in areas of soft landscaping; - Provision of clean cover system in areas of soft landscaping should the proposed development be amended such that soft landscaping is required in areas where hotspots of contamination have been identified. - Selection and installation of appropriate materials for buried water supply pipes. Amendments will be made as appropriate to account for differing ground conditions encountered during the progress of remedial works.	Enabling Phase & Construction Phase	Watching brief to be carried out by Earthworks Contractor Attendance by Geoenvironmental Engineer should unexpected contamination be encountered	- Civic Earth Remediation Strategy - Remediation Contractor Remediation Implementation Plan - Information to be provided during / post enabling phase and construction phase: - As detailed in sections below
Watching Brief and Discovery Strategy	A watching brief should be in place during earthworks and construction works by the Contractor. Should areas of unexpected contamination, including free product and asbestos, be encountered or suspected, a qualified geoenvironmental engineer will be informed and the risk associated with the contamination assessed in accordance with the discovery strategy outlined in the Civic Earth RS.	Enabling Phase & Construction Phase	Attendance by Geoenvironmental Engineer should unexpected contamination be encountered to inspect the potential contamination and take samples for chemical laboratory analysis.	- Records of site visit and photographs. - Chemical test results. - Correspondence with and approval of revised remediation strategy with regulator, if applicable. - Duty of care records for disposal of material.
Borehole Decommissioning	The existing monitoring wells will be decommissioned in accordance with EA guidance (Good practice for decommissioning redundant boreholes and wells). Decommissioning works will include the removal of headworks and backfill of the monitoring wells from base to top with a low permeability material i.e. bentonite/cement grout. Decommissioning works will be carried out prior to commencement of significant groundworks.	Enabling Phase	Visits may be undertaken if third party supervision is required by the Client.	Records of decommissioning including photographs, specification for backfill material and well records (well condition, depth prior to backfilling, well diameter and volume of backfill used).

Item	Remedial Requirements	Development Phase	Site Attendance by Qualified Geoenvironmental Engineer	Supporting Documentation
Material Management	The Contractor will be responsible for the material management and waste classification. It is considered that the Made Ground material excavated could be re-used on site below capping or hardstanding, subject to final finish levels and the capping layer formation level, under the CL:AIRE protocol. The CL:AIRE protocol requires a Material Management Plan (MMP) to be produced which details where materials will arise from and how they will be used within the limits of the Code of Practice. The process would require sign off by a Qualified Person in advance of works commencing and a final validation report to be produced. Uncontaminated clean, naturally occurring arisings may be re-used within the site under the CL:AIRE protocol or re-used off-site under direct transfer under the CL:AIRE protocol. Additionally, screening of uncontaminated granular soils may permit the re-use of this material on site or off-site under the WRAP protocol. All material bound for disposal to landfill will require characterisation in accordance with the Hazardous Waste Regulations 2005 and disposal in accordance with the requirements of the Landfill Regulations (2002, as amended) and the Environmental Protection (Duty of Care) Regulations, 1991. Importation of material for use in the bulk earthworks is not anticipated to be required. However, should importation of material be required, the material will be required to meet POS chemical acceptability screening criteria (see Appendix A), or an alternative screening criteria that is agreed with the regulators prior to import to site. Compliance testing at a frequency of 1 per 500m³ will be required. It is noted that chemical compliance testing of imported Primary Aggregate would not be required	Enabling Phase & Construction Phase	Visits may be required should additional classification of arisings be required prior to disposal. If material imported for use in bulk earthworks that is not Primary Aggregate, sampling and verification testing at a frequency of 1 per 500m³ will be carried out.	- Duty of care records for disposal of waste, pumped perched water / groundwater and laboratory test results. - Evidence of material management procedures in place including permits, exemptions, MMP, waste haulier permits, waste facility permits. - Imported material for bulk earthworks – Appendix B import specification and site records and laboratory test results for compliance testing.
Mitigation of Risks to Controlled Waters	Appropriate management of stockpiles including stockpiling in designated areas away from drainage channels, segregation of different types of material (e.g. Made Ground and natural soils), and controlling surface water run-off with bunds, liners and coverings. Excavated soils will also be appropriately stored with preventative measures against nuisance odours to protect human health during temporary storage on site. Appropriate management and discharge/ disposal of perched groundwater encountered in excavations and water used during works (e.g. for dust suppression and wheel washing). Temporary drainage systems to be designed and implemented so that they capture waterborne pollution prior to entering any existing drainage systems.	Enabling Phase & Construction Phase	Visits may be undertaken if third party supervision is required by the Client.	- Contractor documentation of material and groundwater handling, storage and discharge protocols. - Photographs of measures put in place

Item	Remedial Requirements	Development Phase	Site Attendance by Qualified Geoenvironmental Engineer	Supporting Documentation
	Appropriate storage of all hazardous liquids, chemicals and materials where materials are to be stored in accordance with the Control of Substances Hazardous to Health (COSHH) Regulations.			
Growth Medium/Capping Layers in Soft Landscaping	The material imported to form the growth medium will be uncontaminated soil from a known and reputable "Greenfield" or manufactured source. Importation of a suitable growth medium may be required for proposed areas of soft landscaping due to the composition of the existing Made Ground. In addition, it is noted that should the development proposals change and the identified contamination hotspots within the Made Ground be located within areas of soft landscaping and not below hardstanding or buildings, capping layers will be required to mitigate the potential risks to human health. Capping layers for the site will meet the following criteria: 600mm of imported soil with a minimum 150mm topsoil (including 50mm turf/sod); or 450mm imported soil with a minimum of 150mm topsoil (including 50mm turf/sod) over a geotextile membrane. Thickness of the capping layer may be increased for trees/large shrubs where the thickness is specified by the landscape architect. Where mature trees that are present and to be retained as part of the redevelopment of the site, soil capping may be 'feathered' such that the capping layer can be installed without damaging tree roots. Areas where capping layers require feathering will be set out in the Contractor's Remediation Implementation Plan. The material imported to form the capping layers will be uncontaminated soil from a known and reputable "Greenfield" or manufactured source. The capping soils will meet the chemical criteria for human health with respect to the residential (with home grown produce consumption) end use. The chemical specification is set out in Appendix A of the Civic Earth RMS. Once placed, the capping soils will be sampled and chemically tested by a suitably qualified geoenvironmental engineer to confirm that the material complies with the specifications outlined in in Appendix A. Verification testing will be via the formation of hand pits to: - Prove the capping soil thickness meets the minimum requirements on a 20m grid (in large areas of landscaping such as lawns), with a minimum of 2 verification pits per individual landscaped area. A reduction to 1 verification pit is acceptable for small (<5m2) landscaped areas.	Construction Phase	Attendance by Geoenvironmental Engineer to: - Validate construction of capping layer with inspections pits dug to confirm the thickness meets the minimum requirements in each area of capping - Take samples of imported material for chemical analysis	- Material source certificates and pre-import chemical test data, to be provided by the Contractor. - Site visit records of verification visits including photographs. - Chemical test results. - As-built landscape layout drawings.

Item	Remedial Requirements	Development Phase	Site Attendance by Qualified Geoenvironmental Engineer	Supporting Documentation
	Obtain soil samples from each material (i.e. topsoil and subsoil) for chemical analysis at a minimum frequency of 1 sample per 200m³, with a minimum of 3 samples per source will apply (and per material type). To protect the integrity of the capping layers, placement should commence after installation of foundations and drainage works. In areas where soft landscaping is proposed at podium levels or within concrete planters, where no contact is made with the underlying Made Ground, imported topsoil/subsoil will be required to provide a suitable growth medium; however, no minimum thickness is required from a protection of human health perspective.			
Buried Water Supply Pipes	Completion of a United Utilities Risk Assessment. May require further testing (UKWIR suite) at depth and location of proposed water supply pipes will be required. Alternatively, barrier pipes could be selected by default, and then further testing is not anticipated to be required. In addition, if the PE pipework is to be placed within imported, clean backfill e.g. site won/ imported virgin material, UKWIR testing is not considered to be required	Construction Phase	Visits may be undertaken if third party supervision is required by the Client.	- United Utilities Risk Assessment. - Confirmation of pipework material choice by United Utilities. - Photographs of pipework installation. - Specification of pipework installed.

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