Remediation and Enabling Works Strategy
Dale Street, Rochdale

Reference: 11-466- R2-1
Date: January 2021

REMEDIATION AND ENABLING WORKS STRATEGY

Dale Street
Rochdale
OL16 3NJ

Prepared for:
Molloy Hale

Report Ref: 11-466-R2-1
Date Issued: 20/02/2021

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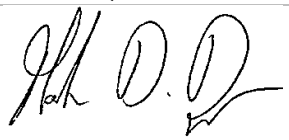
SIGNATURE			
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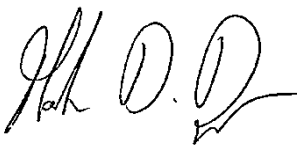
SIGNATURE			

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EXECUTIVE SUMMARY

Site Address	Land off Dale Street, Rochdale, OL16 3NJ
Grid Reference	E392847, N412622
Site Area	0.56 Hectares
Background	E3P has been instructed by Molloy Hale to develop a remediation and enabling works strategy for the proposed residential development at the site located off Dale Street in Rochdale. The E3P Remediation and Enabling Earthworks Strategy has been produced in due consideration of the geoenvironmental viability assessment and contaminated land desk assessment previously undertaken by E3P.
Proposed Development	E3P understands that Molloy Hale propose to develop the site for residential end use. The development will incorporate the refurbishment of the existing mill buildings and the construction of two new apartment buildings with ancillary driveways and service infrastructure.

CONTAMINATED LAND RISK ASSESSMENT

Human Health Risk Assessment	A tier 1 assessment was carried out by E3P (Ref: 11-466-L1, dated April 2017) based on three samples of the Made Ground across the site. These results were then compared against the LQM S4UL 2015 levels for residential end use without plant uptake. The chemical testing results identified elevated TPH C21-C35 (1200mg/kg) in TP111 at 0.2m bgl, Dibenzo(a,h)anthracene (0.70mg/kg) in TP111 at 0.2m bgl and asbestos in the form of Chrysotile loose fibres, insulation lagging and insulation board within samples TP111 at 0.20m and TP108 at 0.7m bgl. The majority of the proposed development is to be overlain by hardstanding in the form of a carpark or the proposed structure, thus breaking the pathway to those contaminants of a dermal contact and ingestion exposure pathway. However, in areas of soft landscaping, a cover system of at least 300 mm comprising 150 mm of certified sub-soil and 150 mm of topsoil will be required. Asbestos quantification should be undertaken on the samples where asbestos has been identified to further assess where these impacted soils may be placed. No visual signs of ACM were encountered during the Ground Investigation, therefore it is likely only trace fibres are present within these localised soils and as such, it is considered that these soils can be managed on-site. Additional verification testing of the soils within the location of the former identified pollution sources will be instigated within the site enabling works. Where any material is identified as being impacted by potentially volatile or soluble phase contaminant impact, a risk based assessment will be completed to ensure the instigation of suitable remediation action.
Controlled Waters Risk Assessment	The site is located within the Outer Catchment of a Groundwater Source Protection Zone and historical industrial land uses on and in the vicinity of the site are potential sources of mobile contaminants. However, the proposed hardstanding across the site and underlying low permeability Glacial Till is likely to limit the migration of mobile contaminants, if present and indicates that development of the site will not pose a significant risk to controlled waters.

Ground Gas	Former ponds, infilled reservoirs and Made Ground are present in the immediate vicinity of the site, which are potential sources hazardous ground gases such as carbon dioxide and methane. These gases are associated with asphyxiation and explosive risks respectively but these can be appropriately mitigated through the careful design of building structures. Post enabling works ground gas monitoring will be completed to ensure that no significantly elevated concentrations are hazardous ground gasses are remain post remediation. The specific mitigation measures for each dwelling will be designed in accordance with the post remediation and site enabling monitoring to be completed in accordance with the requirements of CIRIA 665 and BS8485.
Coal Mining and Historical Workings	The site is within a Coal Authority Coal Mine Reporting Area. However, data on the Coal Authority Interactive Map Viewer indicates the site is not within a Development High Risk Area, therefore no further action is required given the absence of shallow coal seams or recorded mine entries.
Potable Water Supply	The site investigation and contaminant risk assessment identified elevated concentrations of potentially volatile hydrocarbon compounds, which could permeate into the potable supply infrastructure. It will therefore be necessary to undertake appropriate remediation works with robust validation tests. An updated UKWIR assessment should be produced.

REMEDIATION AND ENABLING WORKS

Objectives	The remediation and enabling works will be delivered in a manner that will seek to ensure that the site is prepared to deliver the optimum foundation solution for the proposed structures, infrastructure and highways. The geotechnical foundation zoning plan and structural engineer's drawings should be referenced to determine the proposed foundation solution.
Remediation and Enabling Works	The site remediation and enabling works strategy provides a comprehensive specification for the regeneration of the land to negate identified pollutant linkages and construct a development platform that will be geotechnically suitable for the proposed end use. The salient features of the remediation and enabling works strategy are summarised as follows: • Controlled waters risk assessment via the installation of boreholes with monitoring well installations and subsequent groundwater sampling; • Implementing of all works in strict accordance with UK Environmental Permitting and local planning authority requirements. • Controlled removal of all trees and vegetation. • Removal and treatment of all invasive plant species (as required) in accordance with specialist contractor method statement, validation and independent certification. • Investigation, potential delineation and removal of PCB-impacted soil, validation testing of material that remains and removal of all unsuitable soils. • Decommission of all interceptors, tanks and active drainage infrastructure in accordance with contractor method statement and ensuring no environmental impact.

	• Management of all anthropogenic material impacted by trace asbestos fibre in a controlled and legislatively compliant manner. • Removal of all structures, relict foundations and buried features in their entirety. • Removal of all materials considered geotechnically deleterious. • Excavation and processing of Made Ground in a controlled manner with the sorting, processing and segregation of identified deleterious materials to geotechnical specification. • Validation sampling and leachate testing to confirm material retained on site poses no unacceptable risk to the residential end users, controlled waters or wider environ. • Importation of suitable material (if required) to achieve the required development levels. • Replacement of material in accordance with the E3P enabling specification and engineering requirements. • Post site enabling works ground gas monitoring within the locale of the new build apartment blocks and historical building to be refurbished.

BUILD PHASE REQUIREMENTS

Summary of Build-Phase Mitigation Requirements	The developer's works will also include the completion of the following additional elements: • Provision of a 300 mm cover system using certified material with appropriate validation within proposed areas of public open space and soft landscaping. • Post remediation gas monitoring or construction of specific dwellings with appropriate gas mitigation to be compliant with CS2/Amber 1 (subject to monitoring confirmation). • Construction of appropriate potable water supply infrastructure.

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1. INTRODUCTION

1.1. BACKGROUND

E3P has been instructed by Molloy Hale to develop a remediation strategy and enabling works strategy for the proposed residential development at the site known as Dale Street, Rochdale.

1.2. REPORT OBJECTIVES

The objectives of this report are to:

- Prepare overview of contaminated land remediation requirements;
- Evaluate feasible remedial technologies;
- Assess the most-appropriate earthworks solution to ensure the delivery of the optimum development platform;
- Define validation criteria to demonstrate the successful implementation of a site remediation and enabling works plan;
- Specify geotechnical engineering performance requirements; and
- Ensure the safe, cost effective and regulatory compliant redevelopment of the site.

1.3. SCOPE OF WORKS

The development of the risk management strategy for the subject site includes the following tasks:

- Identification of the relevant pollutant linkages;
- Review of site characteristics;
- Identification of geotechnical constraints;
- Development of remedial objectives;
- Selection of appropriate remedial technology; and
- Development of remedial strategy.

1.4. PREVIOUS WORKS

The following phases of geoenvironmental investigations have previously been carried out at the site:

- **E3P** – *Phase I Geo-environmental Site Assessment*. Ref: 11-466-R1, dated October 2016.
- **E3P** – *Geo-environmental Viability Assessment*. Ref: 11-466-L1, dated April 2017.

To inform the assessment of the potential risk to contaminated land within the context of the proposed residential development and to inform the preparation of the remediation strategy, the pertinent points from the above reports are summarised within Section 2.

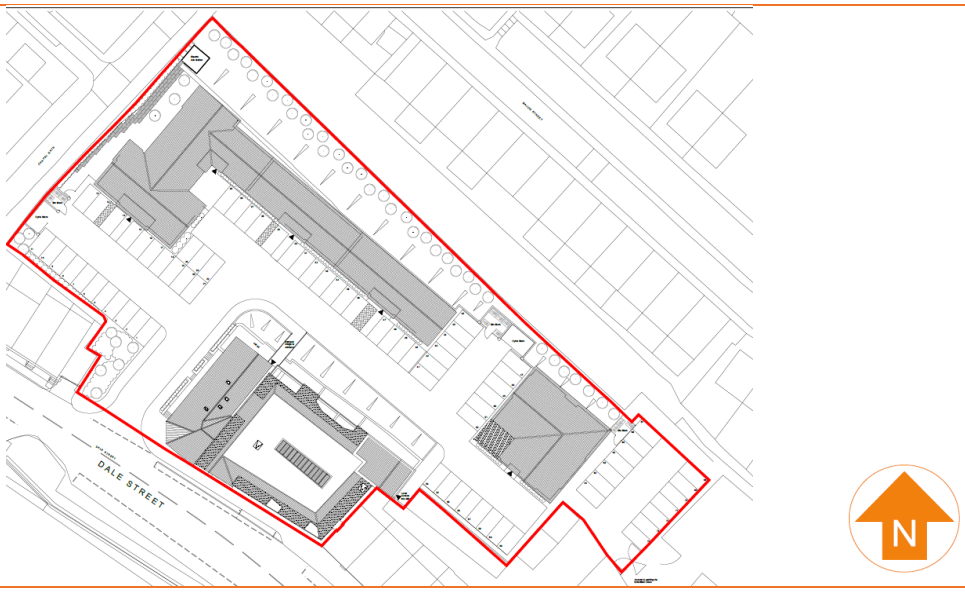
For the avoidance of any doubt, the E3P Geo-Environmental Viability Assessment should be read both as a precursor to and in conjunction with this document.

1.5. REDEVELOPMENT PLAN

Molloy Hale propose to convert Dale Mill to include the provision of front, rear and side dormer extensions and alterations to its rear elevation to provide 29 apartments. The erection of 2 three-storey apartment blocks, comprising a total of 39 apartments, together with associated car parking, landscaping and infrastructure.

E3P has been provided with a draft planning layout (ref: MH/DM/SL/01) detailing the proposed construction.

FIGURE 1.1 SNAPSHOT OF PROPOSED DEVELOPMENT



1.6. SUMMARY OF PARTIES INVOLVED

Function/interest	Name of Party
Local Planning Authority	Rochdale BC
Developer	Molloy Hale
Geoenvironmental Consultant	E3P
Main Contractor	Molloy Hale
Remediation/Enabling Works Contractor	TBC
Human Health Regulator	Rochdale BC
Controlled Waters and Waste Regulator	Environment Agency
Highways Adoption Authority	Rochdale BC

1.7. REGULATORY CORRESPONDENCE

Molloy Hale have submitted a detailed planning application to the local planning authority for the proposed redevelopment of the site. It is presumed that as part of the planning approval process, the planning authority will undertake consultation with the pertinent statutory consultees, which will include:

- Environmental health/contaminated land officer at the local authority (or external adviser); and,
- Environment Agency planning liaison.

1.8. SITE DETAILS

Site Address	Land off Dale Street, Rochdale, OL16 3NJ
National Grid Reference	E392847, N412622
Site Area	0.56 Hectares

All acronyms used within this report are defined in the glossary presented in Appendix II.

A site location plan is presented in Appendix VII as Drawing 11-466-001.

1.9. SITE SUMMARY

TABLE 1.1 SITE DESCRIPTION AND SETTING

Occupancy/Use	The subject site is an irregular shaped parcel of land in a mixed commercial and residential area of Rochdale. The site is located to the east of the junction of Dale Street and Chapel Gate. The site is currently occupied by a large, disused stone commercial building in the southern sector, adjacent to Dale Street. The site is secured with metal fencing around the perimeter. A fenced off area of hardstanding is located to the east of the main site, accessible from Schofield Close or through a gate on the eastern site boundary. At the time of the site walkover this area was in use as a skip storage area and had marking that showed it had previously been used as a car park. Hardstanding and topographical changes on site indicate the presence of Made Ground, associated with the demolition of former buildings across the site. Shrub and moss vegetation is present across the site.	
Environmental Setting	**Drift Geology**	Glacial Till – Clay Sand and Gravel
	Bedrock Geology	Milnrow Sandstone.
	Hydrogeology	Secondary A Aquifer (Bedrock Geology). The site is located within the Zone 2 Outer Catchment of a Groundwater Source Protection Zone.
	Hydrology	A culvert is 57m southwest and the River Beal is 101m southwest.
	Flood Risk	The site is not in an area prone to flooding.
	Subsidence Hazard	No hazard identified in data searches.

Site History	The site has been historically occupied by a woollen, then cotton mill. Associated buildings extended across the site, which have now been mostly demolished. An electrical substation was historically present in the southeast sector, an above The site has been historically occupied by a woollen, then cotton mill. Associated buildings extended across the site, which have now been mostly demolished. An electrical substation was historically present in the southeast sector, an above ground tank was present in the east and a coal bunker was historically present in the central sector of the site. A reservoir was shown on historical mapping adjacent to the northeast boundary that is assumed to have been infilled. Historical industrial land uses are identified in the vicinity include a gasworks approximately 50m southwest, mills 20m southwest, engineering works, 75m south and a works 20m north.
Landfill Sites and Ground Gases	No historical or current landfill sites are identified within 250 m of the site; the closest is a refuse tip 272 m northwest. Historically infilled land is identified in the immediate vicinity of the site, associated with a former reservoir on the northeast boundary, former ponds approximately 40 m south and a former sandstone quarry approximately 100 m northwest.
Radon	Unaffected – No special precaution required.

1.10. SUMMARY OF REPORTED GROUND CONDITIONS

E3P has prepared a detailed Geoenvironmental Viability Assessment (Ref: 11-466-L1, dated April 2017). The summary of reported ground conditions is given in Table 1.2.

TABLE 1.2 SUMMARY OF GROUND CONDITIONS

Made Ground	Made Ground was encountered across the entire site to a maximum depth in-excess of 2.10m in TP110, however it is likely that the depth of Made Ground could be deeper in areas such as the former coal pit which was not accessible at the time of the investigation. Where concrete hardstand was present it was subsequently underlain by a gravel sub-base to circa 0.20m bgl. In areas of soft standing a brown sandy gravelly clayey topsoil was encountered to circa 1.00m bgl. Below areas of concrete hardstand the Made Ground generally comprised a brown sandy gravel containing cobbles of brick and gravels of brick, ash and sandstone with fragments of glass to circa 1.50m bgl. Within TP101, TP102 and TP103 a soft low strength re-worked clay was encountered within the Made Ground to a max depth of 1.20m bgl. Concrete and brick obstructions were encountered within TP105 and TP111 which are indicative of former basements and relic foundations.
Drift	The underlying drift is generally variable between cohesive and granular with no obvious defined sectors of clays or sands. The clays are generally firm to stiff medium strength slightly sandy slightly gravelly CLAY. Gravel is medium to coarse sub-angular to sub-rounded of mudstone, sandstone and coal. However, very soft low strength brown very sandy gravelly CLAY was identified to a maximum proven depth of 3.10 m bgl in TP110.

	The granular deposits comprise a greyish brown gravelly fine to medium SAND. With the gravel comprising of medium to coarse sub-angular to sub-rounded mudstone. In some areas of the site the sands underlay the cohesive deposits and possibly signify the hole is not far from rockhead.
Bedrock	Bedrock was only encountered within TP104 and TP105 at 2.40 m and 1.50 m bgl, respectively. The bedrock encountered within TP104 was a weathered MUDSTONE and within TP105 a weathered SANDSTONE was encountered.
Groundwater	No significant groundwater ingress has been identified during the excavation of the exploratory locations. Water strikes were recorded at 1.10 m and 2.00 m in TP105 and TP104, respectively.

2. E3P CONTAMINATION RISK ASSESSMENT

2.1. BACKGROUND

E3P has completed a preliminary Tier 1 Qualitative Contaminated Land Risk Assessment to determine the potential risk to human health, controlled waters and the wider environ. This assessment is documented in full within the E3P Geoenvironmental Viability Assessment letter report and, for clarity, is summarised in the following sections of this document.

2.2. HUMAN HEALTH RISK SUMMARY

The E3P Tier 1 Qualitative Human Health Risk Assessment identified concentrations of the following determinants at or above the screening criteria for the assessment of no unacceptable degree of risk to human health:

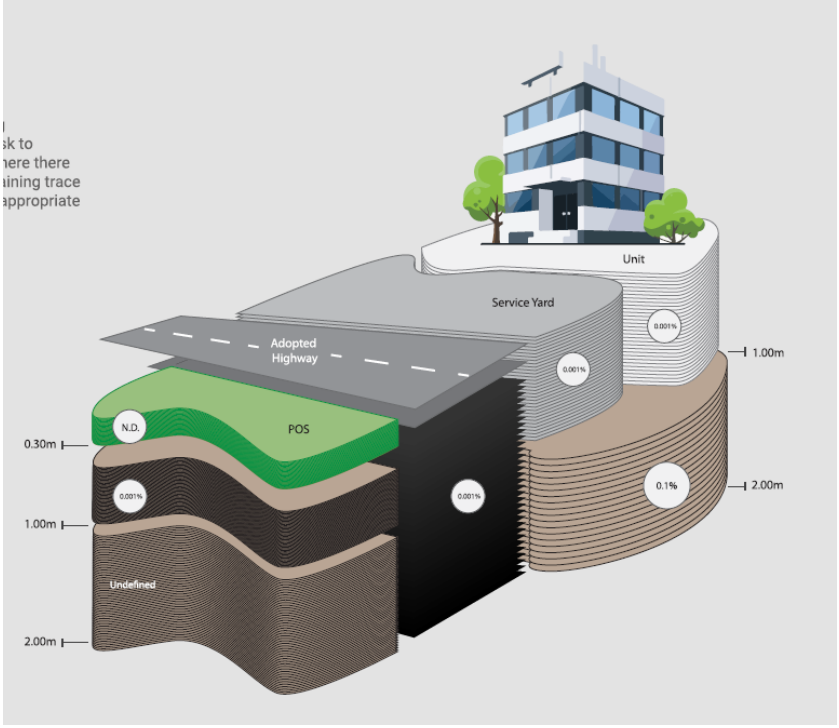
- TPH C21-C35 (1200 mg/kg)
- Dibenzo(a,h)anthracene (0.70 mg/kg)
- Chrysotile

In the case of non-volatile PAH and TPH compounds, the viable exposure pathway is associated direct contact, inhalation of particulates, consumption of homegrown vegetables and ingestion of soil. The proposed development of the site will include hard cover and the importation of certified subsoil and topsoil in areas of landscaping, thus removing this pathway.

Asbestos, in the form of chrysotile has also been identified within localised areas in shallow Made Ground deposits at TP108 and TP111. Asbestos quantification should be undertaken to further assess where these soils may be placed. No visual signs of asbestos-containing material (ACM) were encountered during the ground investigation; therefore, it is likely that only trace fibres are present within these localised soils and provision of a cover system or placement of impacted soils at depth beneath proposed apartments or POS may be undertaken to ensure they pose no unacceptable risk to future site users.

The site will have a large-scale enabling works package to achieve the development platform and to allow for the installation of clean cover within all soft landscaped areas. These works will be extended to construct “road boxes” and infrastructure corridors and as such, the material will be managed in such a way as to ensure no future exposure.

FIGURE 2.1 ASBESTOS CONCEPTUAL SITE MODEL



All proposed landscaped areas within the development are to be installed with a 300 mm chemically suitable cover system, which will ensure that future site users will be at no unacceptable risk from the identified contaminant exceedances.

It is concluded that the site will be suitable for the proposed residential end use subject to the completion of the supplementary assessments and the following build-phase mitigation items:

- Supplementary sampling upon removal of the substation to demonstrate absence of any unacceptable risk from PCB impact.
- Management of soils to ensure that all materials impacted by asbestos fibres are placed in areas of low sensitivity during the site enabling works.
- Supplementary soil sampling within the Made Ground across the site during the site remediation and enabling works to confirm the absence of any unacceptable volatile or soluble phase contaminant impact;
- Where any material is identified which is considered to represent a vapour phase intrusion pathway, the material will be delineated and removed to ensure no unacceptable degree of risk within the context of the site CSM and post enabling works conditions;
- Use of potable water supply infrastructure that will be compliant with United Kingdom Water Infrastructure Risk (UKWIR) assessment criteria;

- Post remediation and enabling works ground gas monitoring to confirm the absence of any significant concentrations of hazardous ground gasses to demonstrate compliance with CS2 or Amber 1;
- Construction of selected dwellings with ground gas mitigation measures that conform to CS2/Amber 1 requirements of BS 8485;
- Construction of a 300 mm clean cover system to all areas of soft landscaping in accordance with the detailed methodologies herein.

2.3. CONTROLLED WATERS CONTAMINATION RISK SUMMARY

A Tier 1 Controlled Water Risk Assessment has not been completed at the site.

During remediation, it is recommended that a phase of intrusive works are carried out in order to obtain groundwater samples from the site in order to perform a robust assessment with respect to controlled waters.

This is justified through the presence of a secondary A aquifer and Zone 2 SPZ classification at the site.

An assessment is required to ensure no detriment is occurring to the aquifer beneath the site.

In the event that any as yet unknown primary or secondary source of pollution impact is identified, this will be subject to delineation and removal by remediation to ensure no significant risk to controlled waters.

2.4. GROUND GAS

Ground gas has not been assessed by E3P as part of the E3P Geoenvironmental Site Assessment. The assessment must be completed through the installation of boreholes with environmental monitoring wells within them. This assessment must then be carried out in accordance with the methodology outlined with the CIRIA publication C665, utilising the results of the ground gas monitoring surveys to calculate a tentative gas screening value (GSV). As a precaution it is recommended that Amber 1 / CS2 measures are installed until a gas assessment has been completed.

2.5. POTABLE WATER SUPPLY INFRASTRUCTURE

A contaminant risk assessment has not yet been completed in accordance with the UKWIR assessment framework. Intrusive investigation identified elevated concentrations of potentially volatile/soluble hydrocarbon compounds and it will be necessary to delineate the impacted soils where present at locations that could potentially impact the potable water infrastructure should be suitable to remediation with robust validation testing.

If unacceptable concentrations remain post-remediation, then potable water infrastructure should be constructed in accordance with a suitably robust risk assessment and design compliant with UKWIR.

3. SITE REMEDIATION AND ENABLING WORKS

3.1. Determination Of Sufficiency Of Information

Prior to the commencement of the tiered assessment of remediation options, it is a requirement to assess the sufficiency of available information and validity of the risk based assessment on which the remediation options appraisal is based.

Intrusive ground Investigation works completed to date is considered limited in order to fully understand the risks to future end users, controlled waters and the wider environ. However, due to the access limitations and the site conditions, the ability to gather further detained information is considered largely unviable in certain areas.

In this instance, it is considered that there is insufficient information to inform the detailed site characterisation which has determined that the primary pollution risk is associated with the presence of Made Ground and the former mill.

A controlled waters Tier 1 assessment is required along with ground gas assessment of the site in order to fully meet the requirements of this report.

It is proposed to complete the supplementary investigations, analysis and risk based assessment in a phased manner throughout the enabling earthworks and where necessary instigate remediation actions to ensure that the site poses no unacceptable degree of risk to controlled waters and the wider environs.

3.2. CONTAMINANTS OF CONCERN (COC)

3.2.1. METALS, PAH, NON-VOLATILE HYDROCARBON (PETROLEUM RANGE) COMPOUNDS

The human health risk drivers for the carcinogenic PAHs and TPH CoC are:

- Direct contact with the soil source by future on-site residents; and
- Ingestion of impacted soils by future on-site residents.

Therefore, a cover system is considered to be an appropriate remediation technique to address these impacts, as the installation of a cover system to unsurfaced areas of the site will sever the pathway of contact for human health receptors. A cover system is not considered to be required in future hardstanding areas or beneath buildings, as it can reasonably be assumed that the presence of a hardstanding will prevent direct contact.

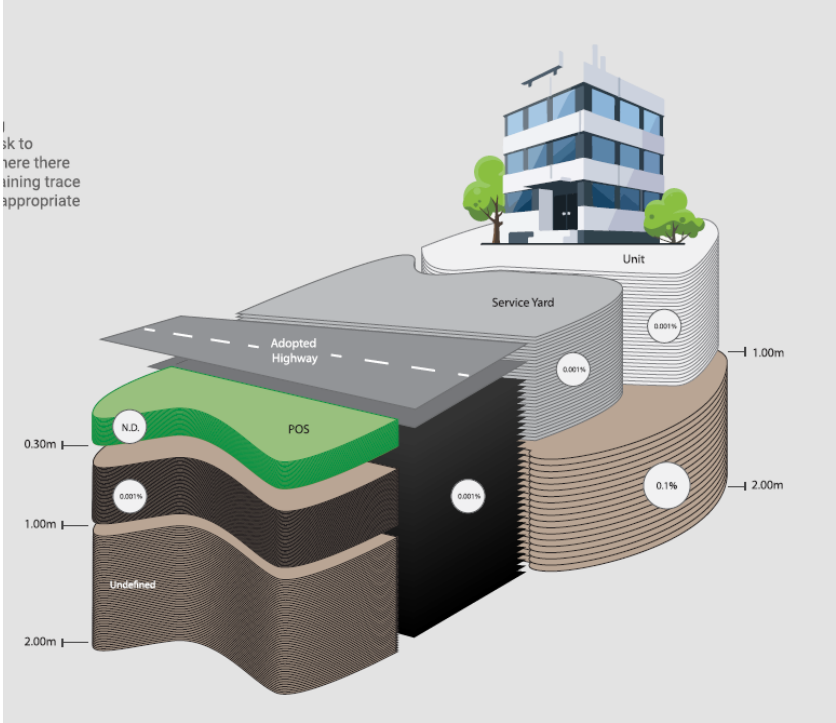
3.2.2. ASBESTOS

Asbestos has been identified in two locations, TP108 (0.70 m) and TP111 (0.20 m) in the form of chrysotile. None of the samples where asbestos has been identified have been quantified and quantification should be completed within the locations listed to determine the appropriate remedial techniques and placement of soils within the development area.

It should be assumed that asbestos fibres are present throughout the Made Ground on site. The risk to chronic human health associated with the elevated concentrations of loose chrysotile and fibres (<0.001%) can be mitigated through the installation of a suitable cover system in all proposed landscaping and hardstanding to remove any potential for direct exposure to impacted soils.

Where asbestos is identified at concentrations above <0.001%, a hotspot excavation will be required and the impacted Made Ground will require placement >1.00m beneath an area of low sensitivity such as public open space in accordance with the E3P conceptual site model (Figure 3.1).

FIGURE 3.1 ASBESTOS CONCEPTUAL SITE MODEL



Notes
ND None Detect
0.001% Soils may contain ≤ 0.001% asbestos using composite testing to ensure there is no potential risk to human health. This value is present within areas where there may be a short term low level exposure of soils containing trace asbestos fibres by construction workers where an appropriate level of asbestos management is employed (dust suppression)
0.1% Soils at a depth of >1.00m bgl may contain <0.1% asbestos using composite testing where they will not be likely to be disturbed in the future and will therefore be in an area of low sensitivity. Risk assessment completed in accordance with Asbestos JIWG risk assessment tools.
Undefined- this will be dependent upon soils encountered during earthworks, which may be placed at these depths to ensure no potential risk to human health.

All ACM-impacted soils must be managed so as to ensure no airborne fibre release during construction or placement of impacted material in such a manner as to ensure no future exposure risk.

Soils will be placed in areas of no unacceptable future risk in accordance with the E3P validation method.

If any visible pieces of asbestos-containing material are identified during the site remediation and enabling work, this material must be dealt with in strict accordance with the Control of Asbestos Regulations (CAR) 2012, UK Waste Management Legislation and the Environmental Protection Act 1994. Due to the close proximity of residential dwellings, asbestos in air monitoring in accordance with HSG248 may be required to confirm that no asbestos fibres have been generated from the enabling works activities.

Should off-site disposal be required, then additional asbestos quantification and waste classification testing should be undertaken to ensure that it is classified correctly and disposed at a suitably licensed facility.

3.3. OVERVIEW OF WORKS

Prior to the commencement of works on site, the contractor must establish all necessary plant, equipment and site welfare facilities as is necessary to complete the contract within the agreed timescales to the rationale as outlined in the following subsections.

For the avoidance of any doubt, the proposed operations as set out herein document the required performance objectives and validation sampling protocols; however, the specific methods of work deployed to ensure the remediation objectives are achieved in a compliant manner on site will be the responsibility of the appointed contractor.

RE-1 – Pre-commencement Supplementary Site Investigation

A sufficient controlled waters risk assessment has not been carried out at the site. As such, there is a requirement for groundwater sampling at the site given its presence within a SPZ Zone 2 and the presence of the underlying Secondary A aquifer.

A series of boreholes, with environmental monitoring installations, are proposed across the site. These may act as dual purpose, as ground gas monitoring is also required at the site in order to give a formal classification for the dwellings.

Water samples should be sent for chemical analysis and a direct comparison of the subsequent results to Tier 1 thresholds for Drinking Water Standards and Environmental Quality Standards in their absence should be carried out in order to form a robust assessment of the site. This information will characterise the site sufficiently and inform any further remediation steps required in order to form the residential development.

A ground gas monitoring regime is required at the site due to the presence of Made Ground and infilled features within close proximity to the site. These present a potential source for ground gas which may release gases into the air. Future site residents may be at risk from these gases through their inhalation. Thus a post remediation phase of gas monitoring is recommended in the installed boreholes at the site.

To be conservative, all new dwellings should be installed with CS2 Amber 1 measures in the absence of ground gas data until a formal classification can be given to the site.

RE-2 – Pre-commencement Regulatory Compliance

Prior to commencement of any works on site, all reports relating to the assessment of risk to contaminated land should be submitted to the regulatory authorities to gain written approval.

All relevant Standard Rules Permits should be registered with the EA.

The LAPC Part B Notification for deployment of mobile crushing plant should be implemented prior to the establishment of equipment on site.

If the proposed volume of soils to be reused (excluding crushed materials) exceeds the parameters of the Standard Rules Permit, a CL:AIRE Materials Management Plan (MMP)-qualified declaration should be made by the contractor, having obtained full written approval for the remediation strategy from the LPA and Environment Agency.

It is not anticipated that there will be any requirement to treat any materials on site (such as hydrocarbon-impacted soil or groundwater); however, should any previously unidentified contamination be encountered, the contractor must either notify E3P and, if appropriate, relevant regulators of their intention to complete a minor works operation or arrange for the deployment of the appropriate environmental permit for the specified operation.

RE-3 – Environment and Nuisance Control

Management of all works is required so as to ensure that no environmental nuisance is created through dust emissions, noise or vibration levels.

All works are to be completed in a manner so as not to create any structural risk to the adjacent highways.

Temporary works are to be implemented as necessary to support excavations throughout the duration of the works.

In the event that a complaint is made in respect of dust emissions, noise or vibration levels, remedial measures and a programme of ongoing monitoring should be agreed with the local authority and implemented on site.

RE-4 – Risk to Infrastructure

Site works should be completed in a manner that ensures no risk of disturbance to the adjacent infrastructure.

RE-5 – Identification, Isolation and Treatment of Invasive Plants

Invasive plant species have not been identified on site. The remediation contractor must satisfy themselves with respect to the extent of all species deemed invasive prior to the commencement of works on site. The contractor shall employ a suitably qualified expert to investigate the presence of invasive plant species on or adjacent to the site. Once all invasive plant species are identified, these will be treated in strict accordance with an approved method statement to be submitted to the supervising consultant for review prior to the instigation of any works.

Where invasive plant species are identified at the site boundary, a suitable barrier shall be installed to prevent any future reinfestation of the subject site.

Upon completion of the eradication of all invasive species, a validation report should be prepared documenting all identified invasive plant species, their location and the treatment methodology. Where materials are removed from site, all waste transfer notes/duty of care certificates should be included within the validation statement.

RE-6 – Site Clearance Operations

Post-demolition general site clearance and provision of welfare, offices and site security are to be determined as per the contract requirements.

The site is currently overgrown with self-seeded vegetation with extensive above- and below-ground structures; this material should be removed in a controlled manner with full compliance with any ecological mitigation measures that are required for the works. Any such measures are outside the scope of this report.

All vegetation should either be stockpiled at a pre-agreed location or alternatively removed from site in accordance with waste permitting regulations.

All root networks are to be removed in accordance with the requirements of the NHBC/LABC.

RE-7 – Delineation, Excavation and Treatment of Identified Asbestos Impact

Detectable asbestos fibres have been identified in discreet locations; however, due to the nature and age of the filled material, it must be assumed that trace fibres are present throughout the Made Ground. The E3P Developed Conceptual Site Model demonstrates a suitable method for management of soils to negate any future risk.

The contractor must ensure than all personnel working on site are trained in the identification of ACM and the risks associated with impacted soils.

Where any visual evidence of ACM is identified, these materials should be carefully segregated and removed from the soil matrices (if/where possible).

Validation sampling of the processed Made Ground should be completed to demonstrate compliance with the developed conceptual site model.

This process should be completed under strict controls to be devised and employed by the nominated contractor to ensure no potential for fibre release into ambient air.

If necessary, reassurance air testing in accordance with the requirements of HSG248 should be completed during the operation to move the soils to demonstrate the deployment of the required control procedures and safe working methods.

RE-8 – Inspection Of Soils In Area Of Former Electrical Substation for PCBs

An electrical substation was previously mapped on the site. TP102 was advanced in the vicinity of this feature but soils were not analysed for PCBs. In order to confirm their absence, it is proposed a series of trial pits be advanced across the areas with Made Ground soils chemically analysed for PCBs.

In the likely event that any as yet unidentified contaminant is identified, this will be the subject of further investigation including laboratory analysis and subsequent assessment of risk within the context of the agreed parameters. Where a theoretical risk to either human health, controlled waters or the wider environs is identified, appropriate remediation works are to be instigated.

Material deemed to be impacted through either visual or olfactory observations will be excavated and stockpiled on an impermeable membrane. The membrane will be placed upon a clay containment bund and covered to negate the risk of soils leaching.

This material will then be subject to detailed laboratory analysis to determine the suitability for reuse or the requirements for off-site disposal.

Upon completion of the delineation and excavation, the sides and base of the resulting void(s) where impacted material is present will be chemically validated to confirm that no impacted materials remain in situ.

Validation samples will be collected at 10 linear metre centres from the side and base of the excavation.

The results of this validation testing will be directly compared to the site-specific remediation targets (as defined within Appendix III of this report) to demonstrate that no unacceptable level of risk to human health, controlled waters or the wider environment remains.

The location of known electrical substation (dark blue hatching) is shown in Figure 3.2.

FIGURE 3.2 LOCATION OF ELECTRICAL SUBSTATION



RE-9 – Excavation, Breaking and Processing of All Above- and Below-Ground Structures

Obstructions, relict foundations and infrastructure (apart from live services) are to be removed from the areas of proposed residential development, to include plot footprints, private driveways, adopted highway and utilities infrastructure (road box) in their entirety.

Artificially hard materials should be broken out and crushed. Stockpiles will be made, validation testing undertaken, and site-won material reused on site where required. Materials will be processed as per the specifications provided in Section 5 using licensed plant.

The E3P drawings denote the extent of known historic features with obstructions; however, it will be the contractor's responsibility to remove all obstructions.

Obstructions encountered within the near-surface soils will be chased to their full depth and removed; if not possible, the obstruction must be surveyed with the location communicated to E3P, the client and the developer.

Where natural soils are present at a relatively shallow depth (northern sector), extreme care should be taken to ensure that the natural cohesive deposits remain undisturbed with a full reduced-level survey to be completed to map the depth of filled/processed material.

RE-10 – Investigation and Removal of Historic UST and ASTs

During the remediation and enabling works, further investigation within the areas of historically mapped tanks will be required to confirm the presence and the exact location of any underground storage tanks (USTs). The contents of any such tanks are unknown and no evidence is present to suggest decommissioning.

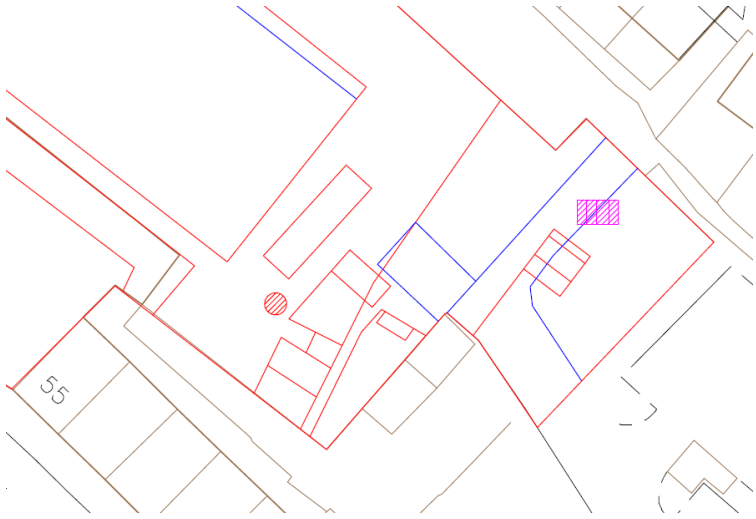
It is proposed to break out all hardstanding around the former tanks to investigate their presence or absence. If identified, an inspection into their integrity will be required. If the tank is found to be intact, hydraulic shears should be utilised to open the tank along the top and peel back the steel, thus rendering the tank an open vessel and no longer a tank form. The tanks should be checked for vapours using a lower explosive limit (LEL) meter. If they are deemed to be free of vapours, a 24-hour certificate will be issued, during which time the tanks should be rendered unusable (by cold cutting). Should the tanks contain any residual liquids, this should then be uplifted by the vacuum tanker or a surface-mounted pump (peristaltic or double-diaphragm).

Any tank backfill material will be broken up and removed from the tank structure by excavator until the tank is sufficiently light to be lifted and emptied. All oversize materials will be stockpiled and checked for hydrocarbon impact pending chemical validation analysis. It is likely the material present inside the tanks will require disposal off site, in accordance with UK waste management legislation.

The sides and bases of excavations will need to be chemically validated to ensure that soils are below the site-specific remedial validation criteria for the protection of human health and controlled waters. All waste transfer certificates will be required to be retained and included within the remediation validation report.

The location of historical USTs are shown in Figure 3.3 (red and pink hatching).

FIGURE 3.3 LOCATION OF UST



RE-11 – Cut-And-Filling of Made Ground to Development Levels

Where the proposed enabling works levels require the current landform to be cut, extreme care should be taken so as not to disturb the underlying stratum prior to the placement of the appropriate platform, in compliance with the E3P Geotechnical Specification.

Where the development levels require material to be filled, site-derived Made Ground must be sorted in a controlled manner prior to replacement, in accordance with the requirements of this specification for the intended land use.

The maximum dry density must be determined in laboratory conditions utilising UKAS-accredited testing prior to the commencement of filling and compaction works. In-situ density testing us required to demonstrate compliance with the E3P Geotechnical Performance Specification.

RE-12 – Construction of Temporary Working Platform

Where plots are to be prepared in a manner that will facilitate ground improvement by vibro-stone column, a temporary working platform will be constructed.

The specific design for such a platform should be obtained from E3P; however, as a minimum this will comprise:

- Proof rolling of the subgrade to ensure a California bearing ratio (CBR) > 3%; and
- Placement of 300 mm of certified 6F2 to be rolled and compacted to ensure a CBR > 6%.

RE-13 – Replacement of Materials, Geotechnical Engineering Requirements

Material is to be backfilled in strict compliance with the E3P Geotechnical Engineering Specification as presented in detail within Section 5 of this report, which generally requires the reinstatement and compaction criteria presented in Table 3.1.

Unless specific instruction is issued from the client, plots should be prepared for a strip foundation where the target founding stratum is identified to be present at a depth of 1.5 m below finished floor level (FFL). Consideration is to be given to the need to construct a strip foundation ~200–400 mm into the natural stratum and the contractor remediation elevations.

TABLE 3.1 GEOTECHNICAL ENGINEERING WORKS SCHEDULE

Land Use	Construction Requirement	Requirement
Footprint of Proposed Structure (2 m on All Elevations)	Pile Foundation	Backfill using general method compaction to CBR of 5%.
	Vibro-Stone Column	Particle size distribution (PSD confirmed as < 125 mm with no more than 10% fines (0.63 micron). **Or** Compaction to achieve > 95% of the laboratory determined maximum dry density (DD) with < 5% air void ratio. CBR > 6% with suitable pile mat. PSD testing of backfill material at 1 sample per 2000 m^3 to confirm.
	Traditional Spread Foundation	Ensure no disturbance of natural soil at shallow depth.
Highways	Adopted Estate Road/Drainage	Manual of Contract Documents for Highways Works (MCHW) Series 600 ensuring CBR > 5% in subgrade (engineered fill).
Driveways	Private Drives and Car Parking	Method compaction to CBR > 5%.
Public Open Space	N/A	Method compaction to ensure no settlement.

RE-14 – Importation of Bulk Fill

Where there is a net shortfall of material required to achieve the proposed ground levels, it will be necessary to import natural inert soils and aggregate as per the engineering requirements (Section 5).

Imported material must be certified as suitable for use in strict accordance with the E3P chemical and geotechnical performance criteria (See Section 5) and in conjunction with the required duty of care notes and waste transfer exemption.

If recycled aggregates are imported, then laboratory testing should be completed to demonstrate compliance with the Waste and Resources Action Programme (WRAP) protocol.

Where inert soils are imported, laboratory testing should be completed in accordance with the requirements of the pertinent environmental permit (i.e. U1 Standard Rules) or CL:AIRE MMP for the reuse of clean, naturally occurring soils.

RE-15 – Preparation of Landscaped Areas for Cover System

As part of the land remediation works, landscaping areas will be prepared in a manner that will facilitate the placement of the clean cover system during the development phase of the works. The preparation of the areas requiring clean cover is critical in ensuring delivery of the site in a manner that will ensure no risk to the proposed end users.

Where Made Ground is deemed unsuitable for retention in a landscaped area, the area will be subject to a reduced-level dig to remove unsuitable material to a minimum depth of 300 mm below finished level or verified natural stratum (whichever is the shallower).

Excavated soil will be stockpiled pending the results of the appropriate validation testing (to be completed in accordance with this specification) prior to reuse in an area of no sensitivity or, where necessary, this material will be removed from site in accordance with UK waste management legislation.

The placement of certified subsoil and topsoil will be completed as part of the developer works/build-phase mitigation plan. All areas where a cover system is required will be subject to plot-specific independent validation.

RE-16 – Provision of Subsoil

The shallow natural drift deposits (predominantly granular soils) are deemed suitable for use within the upper 300 mm of clean cover to areas of soft landscaping. It is therefore deemed viable to reuse materials that are cut as part of the wider earthworks or through a soil inversion (regulated by an MMP) to generate the required volumes of material.

The landscaped areas will require depth validation to satisfy the requirement of the Council of Mortgage Lenders (CML) in order to demonstrate that the appropriate thickness has been provided as a growing medium.

RE-17 – Provision of Topsoil

No material that would be deemed suitable for use as topsoil is present on site and as such there will be a requirement to import suitable material for use within the proposed development.

Topsoil will require testing in line with the schedule present within Section 3.5 and Table 3.2.

The landscaped areas will require depth validation to satisfy the requirements of the CML in order to demonstrate that the appropriate thickness has been provided.

RE-18 – Independent Validation: Watching Brief

Given the site history and potential contamination sources identified within the ICSM, a degree of uncertainty remains with regard to the potential for as yet unidentified contamination impact within the near-surface soils and groundwater.

It will therefore be necessary to instigate the site-wide remediation and enabling works under the supervision of a suitably qualified and independent specialist. The specialist is required to attend site as and when appropriate to monitor works, record ground conditions and fully investigate all potential sources of as yet unidentified contamination.

RE-19 – Waste Soils Surplus to Requirements

In the event that a surplus of excavation material is present on site, this, in most cases, will be deemed to be a waste in accordance with the Waste Framework Directive (Article 3(1) Waste Framework Directive 2008/98/EE). The waste producer – but ultimately, the landowner – is responsible for the compliant disposal of such materials.

A formal waste classification assessment must be undertaken, irrespective of any future options or considerations for those materials that will removed from site. Waste classification should only be made following the Environment Agency *Technical Guidance WM3 – Guidance on the Classification and Assessment of Waste*.

To remove the surplus material from site it will either need to be sent to a disposal site (landfill), to a permitted treatment facility or, dependent on the waste classification assessment, it may be suitable for use on a permitted land improvement or restoration operation.

Subject to suitability, these soils can be transferred to the receiving site, subject to an approved permit or materials management plan following guidance in the CL:AIRE *Definition of Waste: Code of Practice*.

RE-20 – Validation of Materials for Potable Water Supply Infrastructure

A contaminant risk assessment, completed in accordance with the UKWIR assessment framework identified elevated concentrations of potentially volatile/soluble hydrocarbon compounds that necessitate the use of protected water supply pipe-work.

All materials where organic hydrocarbon impact is identified at concentrations above the UKWIR assessment criteria for a polyurethane pipe within the proposed locality of potable water supply infrastructure should be delineated and removed by the remediation contractor under the supervision of the geoenvironmental consultant.

Validation sampling should be completed at 10 m chainage at depths of 0.75 m and 1.50 m within the locality of the potable supply pipes where impacted material is removed, with samples analysed for all pertinent volatile and semi-volatile hydrocarbons and, where necessary, chlorinated/halogenated compounds.

Upon successful remediation of all impacted materials, the post-remediation validation testing will be reviewed by a qualified person to inform an updated UKWIR assessment to be reviewed and approved by the statutory adoption authority.

If unacceptable concentrations remain following remediation, then potable water infrastructure should be constructed in accordance with a suitably robust risk assessment and design compliant with UKWIR.

Where imported material is required to construct the potable water infrastructure pipework, this material will need to comply the requirements of UKWIR pipework thresholds for the specified pipework. For the avoidance of doubt, the PE thresholds are presented in Section 9.3. Failure to meet the required specification may necessitate further remedial works.

RE-21 – Remedial Verification Report

Collation of information relating to site clearance, chemical testing, remedial works, remedial verification, material movements and waste transfer documentation is required, where appropriate.

Complete remedial validation is to be reported in line with regulatory guidance. This will include a detailed risk assessment. The report will be submitted to the local authority for approval following completion.

The verification report will include the following attributes related to the supplementary investigations and risk based assessment:

- Details of supplementary sampling at the identified point sources of historical impact, risk based assessment and where necessary remediation action;
- Supplementary groundwater sampling from dedicated wells, risk based assessment and where necessary details in relation to the removal of any primary or secondary pollution impact; and,
- Details of the post enabling works ground gas monitoring, risk assessment and building design to incorporate mitigation requirements within the new and refurbished structures.

3.4. VALIDATION SAMPLING PROTOCOL

In accordance with the current requirements of the regulatory authorities, validation samples will be collected from all materials that are to be subject to movement under the protocols outlined within this remediation and enabling works strategy, or for materials to be imported onto site to facilitate the proposed residential development.

Upon removal of the hotspot of unsuitable Made Ground in the northern sector, validation samples will be collected from the base (two samples) and sidewalls (four samples) of the excavation to reasonably demonstrate no residual impact to the underlying strata.

Soil samples destined for chemical analysis will be collected at regular intervals in appropriate sampling containers. All samples will subsequently be stored in cooled boxes prior to submission to a UKAS/MCERTS accredited laboratory.

All samples will be collected using appropriate personal protective equipment (PPE) and sampling equipment, which will be cleaned at each sampling location.

A detailed copy of E3P Ltd sampling methodology, QA procedures and laboratory chain of custody forms will be documented within the site records and presented with the final validation report for the site.

Where material is found to contain concentrations of potential contaminants at levels in excess of the site-specific screening criteria (as detailed within Appendix III), E3P will undertake further assessment and recommendations on the appropriate use for the material in question, which may involve the disposal of such materials off site to a suitable waste management facility.

The sampling frequency for materials to be managed under the remediation strategy is presented within Table 3.2.

TABLE 3.2 SPECIFICATION OF CHEMICAL VALIDATION LABORATORY ANALYSIS

MATERIAL USE	TESTING FREQUENCY	SUITE OF ANALYSIS
Site-Generated		
Site-Generated 6F2	1 Sample per 1000 m^3	A/B/C/D
Site-Won Made Ground General Backfill	1 Sample per 250 m^3	G
Site-Won Made Ground General Backfill	1 Sample per 1000 m^3	A/B/C/D
Site-Won Made Ground General Backfill	1 Sample per 2000 m^3	I
Site-Won Natural Backfill	1 Sample per 2000 m^3	A/B/C/D
Site-Generated Subsoil (150 mm Cover)	1 Sample per 250 m^3	A/B/C/D
Site-Generated Topsoil Cover (150 mm Cover)	1 Sample per 50 m^3	A/B/C/D
Hotspot / Point Source Investigation and Validation Samples	1 Sample per 10 m of linear excavation to base and sidewall	E/G
Imported		
6F2	1 Sample per 1000 m^3	A/B/C/D
Subsoil Greenfield Source (150 mm Cover)	1 Sample per 200 m^3	A/B/C/D
Subsoil Brownfield Source (150 mm Cover)	1 Sample per 50 m^3	A/B/C/D
Topsoil Greenfield Source (150 mm Cover)	1 Sample per 200 m^3	A/B/C/D
Topsoil Brownfield Source (150 mm Cover)	1 Sample per 50 m^3	A/B/C/D
General Engineering Fill (Class 1 and 2 Soil)	1 Sample per 1000 m^3	A/B/C/D

Notes
Suites of Analysis:

A. Speciated PAH.
B. Speciated TPH (C5-C35).
C. Asbestos (ID).
D. CLEA Inorganic Heavy Metals.
E. Speciated PAH, Banded TPH and VOCs.
F. SVOC/Speciated TPH.
G. On-Site Screening for VOC Using Calibrated PID.
H. Lechate 2:1 Speciated PAH and Banded TPH.
I. Leachate Analysis of Inorganic Heavy Metals, TPH, Sulphate and PAH.

All analysis prescribed above to be completed by UKAS-accredited laboratory.

3.5. REMEDIATION CONTRACTORS SITE MANAGEMENT AND RESPONSIBILITY

The appointed remediation contractor will take full and overarching responsibility for all methods of work required to complete the site remediation and enabling operations to ensure the delivery of the site and the completion of the objectives in a safe, legislatively compliant manner that ensures no pollution to the subject site or the wider environs.

For individual remediation operations as set out within this performance specification, the contractor will provide site-specific methods of work for individual operations pertaining to the removal and treatment of contaminated liquids and soils. For each and every operation as set out herein, the contractor will provide a written methodology of works to be supplied to the supervising geoenvironmental engineer prior to the instigation of operations on site.

The site manager will be responsible for documentation of each day's activities with a full recorded schedule of works completed and corresponding site-specific method statements that have been utilised to ensure the completion of the task to the required standard.

4. MATERIALS MANAGEMENT AND LEGISLATIVE COMPLIANCE

The processing of recycled aggregates will be completed using LAPC Part B licensed plant with the appropriate deployment notification to the local authority prior to commencement of works. All materials that are recovered as recycled aggregate will be compliant with the requirements of the WRAP protocol and the E3P validation testing requirements and as such would not be deemed to be a waste material.

A U1 Exemption will be registered for the site, which allows the reuse of up to 5000 T of prescribed material within construction, with up to 25,000 T of material permissible to be reused in the construction of roads. It should be noted that only 1000 T of material described as sand, stones or clay soil classified as waste can be reused with a U1.

A T5 Exemption, allowing for the screening and recovery of up to 5000 T of permissible material for subsequent reuse in construction will also be registered.

All materials that are recovered under the WRAP protocol, U1 or T5 exemptions must be analysed to demonstrate that they are both chemically and structurally suitable for use within the context of the development.

The relevant LAPC, U1, T5 and WRAP licences, exemptions and protocols provide the legislative framework for material compliance during the site remediation and enabling works to be completed by the specialist contractor under the supervision or E3P.

Where necessary, operations as outlined within the remediation enabling works rationale summarised in this report may be subject to regulation using the appropriate environmental permit, standard rules exemption and materials management plan, to be created in accordance with version 2 of the CL:AIRE *Definition of Waste: Code of Practice (DoW CoP)*.

It is noted that if material is to be imported utilising the CL:AIRE DoW CoP from an alternative development site, then only chemically certified, clean, naturally occurring material can be transferred.

If required, the MMP will be created with due consideration of all proposed remediation and enabling works operations prescribed within this document and will be undertaken by a qualified person with a signed declaration submitted to the EA prior to reuse of materials on the site.

The importation of material for use within the proposed construction of a development platform will be subject to the compliance with the E3P protocol for the importation of materials as set out within the specification for material import included within Appendix IV of this report.

5. ENVIRONMENTAL MONITORING AND VALIDATION

5.1. SITE MANAGEMENT

The tracking of materials will be based on the following hierarchy:

- The principal contractor will have the responsibility for setting out areas of the site on the basis of the contract specification.
- Operatives will have instructions only to excavate and to emplace materials in specified areas as assigned by the site manager/foreman.
- The site manager (employed by the principal contractor) will issue daily instructions to drivers regarding the placement of materials sourced from specific stockpiles or areas, ensuring that appropriate documentary evidence is collected that details which materials are going where and why.
- An E3P consultant, who will be in attendance as required, will:
    - Inspect the excavation areas and certify that the correct materials are being excavated;
    - Conduct spot checks on loaded vehicles to ensure compliance with this remediation strategy; and
    - Ensure that any loads that fail visual, olfactory or spot checks either remain on the vehicle or, if unloaded, are excavated and set aside. This material will be treated according to the recommendations of the E3P site engineer.
- E3P will conduct an audit of waste consignment notes. All material imported and removed from site will have duty of care/consignment notes, copies of which will be retained on site by the site manager.
- Materials directly reusable will be incorporated into the earthworks, subject to operational conditions and phasing of excavations, in which case they will be stockpiled prior to final placement.

5.2. COMPLETION

Following the completion of the remediation works, a report will be compiled by the environmental consultant detailing all site enabling works undertaken, waste consignment notes, and all site investigations, laboratory test certificates and validation testing undertaken.

A certificate of completion of earthworks should be included within the report which should then be issued to the local authority for their approval.

E3P considers that with the adoption of the above best practices the site can be safely redeveloped. The site enabling works process and presence of any residual contamination (if this is the case) should be recorded for future reference by landowners/occupiers. Future development at the site where this may result in penetration of new areas of hardstanding should be subject to no-less-stringent measures with respect to assessment and, where appropriate, monitoring, than those set out herein.

5.3. MITIGATION OF RISK FROM SOILS WITH ASBESTOS FIBRES

5.3.1. PRE-COMMENCEMENT WORKS

Prior to the commencement of works the following requirements must be satisfied:

- Induction of all people that will be involved with the proposed site works; and
- All methodologies must be agreed upon by all parties involved.

5.3.2. CONTROL, MONITORING AND REPORTING OF GENERAL AERIAL EMISSIONS FROM DUSTS AND PARTICULATES

DAMPING DOWN OF SOILS – MITIGATE PARTICULATE (DUST) EMISSION

During excavation, as outlined within the detailed working methodologies, soils will be regularly damped down using water to control the generation of dust (this may also comprise precipitation). The contractor will determine the best form of dust suppression to be used when a detailed programme has been issued.

If any previously unidentified asbestos-containing materials are identified, these should be dealt with in strict accordance with the *Control of Asbestos Regulations* (2012) and industry best practice as detailed in CIRIA 733.

GENERAL CONTROL OF DUST

The following control measures should be utilised to ensure that dust levels are kept to a minimum at all times:

- Where necessary, haul road, work areas and stockpiles will be damped down with water spray.
- The application of water to haul roads, work areas and stockpiles should be closely monitored by the resident engineer to ensure that soils are not saturated and, therefore, that the potential for water run-off is appropriately mitigated.
- Once completed, any stockpiles will be sealed by compacting at the surface.
- Vehicle speeds and movements on site will be kept to a minimum (< 5 mph) during civil excavation works to reduce the potential to generate dust.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

In accordance with the HSE *Guidance Note em6: Asbestos Essentials, Personal protective equipment (including RPE)*, E3P recommend that all site operatives present within the work area where potential asbestos-impacted soils are being excavated are supplied with the following personal protective equipment:

Overalls:

- Disposable overalls.
    - Type 5 (BS EN ISO 13982-1) are suitable.
    - Cotton overalls hold dust and need specialist laundering.
- Waterproof overalls for outdoor work.
- Use oversized overalls - this will help to prevent ripping at the seams.
- If the cuffs are loose, seal them with tape.
- Avoid wearing a long-sleeved shirt as these are difficult to cover properly.
- Wear the overall legs over footwear as tucking them in lets dust into footwear.
- Wear the hood over the RPE straps.

Failure to utilise and correctly employ PPE will result in immediate cessation of works. Works will not be permitted to recommence until the individual has undergone further training in the use of PPE or the individual is removed from the works area.

At this current time, with the levels of ACM identified within the soils, the above-listed PPE is not considered to be required for all site personnel during the entire management of these soils.

When handling asbestos-impacted soils during the enabling works, asbestos monitoring works should be conducted in accordance with, but not limited to, the following HSE legislation and guidance:

- *Health & Safety at Work Act* 1974;
- *The Control of Asbestos Regulations* 2012;
- CL:AIRE, 2016. *Control of Asbestos Regulations 2012 - Interpretation for Managing and Working with Asbestos in Soil and Construction and Demolition Materials: Industry guidance*;
- *Approved Code of Practice L143 Work with materials containing asbestos*;
- *Management of Health and Safety at Work Regulations 1999*;
- HSE *Guidance Note HSG248 Asbestos, the analysts guide to sampling and analysis*;
- HSE *Guidance Note HSG247 Asbestos: The licensed contractors' guide*; and
- *CIRIA 733 Asbestos in soil and Made Ground: a guide to understanding and managing risks.*

If required, air monitoring in accordance with HSG248 will be undertaken intermittently throughout the duration of the works at a frequency to be determined by the contractor, entirely dependent on whether asbestos-impacted soils are being handled at any given time. In general terms, during any one monitoring period, ten standard monitoring pumps will be run throughout the day, for the appropriate time period to achieve the required limit of detection. These slides will be analysed immediately by the on-site UKAS-accredited laboratory.

Once any monitoring has been analysed by the on-site UKAS-accredited laboratory, the results will be delivered to the resident engineer who will then follow the correct site procedure. The results will then be included within the verification report.

6. GEOTECHNICAL ENGINEERING SPECIFICATION

6.1. E3P GEOTECHNICAL ENGINEERING SPECIFICATION

In the event that it is not possible to prepare the site in a manner that will achieve the required foundation solution, the supervising engineer and client should be contacted at the first available opportunity.

The contractor should employ a suitably experienced engineer to be present on site during these earthwork operations to ensure soil suitability, placement, compaction and testing is undertaken in accordance with this specification and to ensure that any unforeseen circumstances, such as adverse weather, do not compromise the earthworks process.

Works should be halted during periods of intermittent or prolonged rainfall to ensure the materials are not placed in a manner that would result in softening of either the formation or the newly placed material. It will be the contractor's responsibility to determine appropriate weather conditions and determine the suitability of works.

Particular attention must be given to variable weather conditions when re-engineering clay soils as a moisture content fluctuation (± 2%) of the tolerable limit will result in an unacceptable degree of compaction loss.

6.2. LOCALLY-WON FILL MATERIAL

It is proposed to upfill and level the site with material won from the development area. From the site-specific investigations undertaken to date, it is expected that the majority of the soils won from the processing of demolition material will be granular and cohesive soil matrices.

Due to climatic weather conditions and variance in long-term differential settlement associated with even well-compacted granular soils, and the need to facilitate future re-engineering using vibro-replacement stone columns to support a shallow reinforced strip foundation, it is essential that the cut-and-fill process is well controlled and materials are placed/compacted in accordance with this specification.

Where site-won materials are to be used as fill to achieve the required development platform, they must be compacted to ensure in-situ densities that are in excess of 95% of the maximum dry density, as determined using a 4.5 kg laboratory Proctor test.

Materials should only be compacted when the actual moisture content is within 2% (±) of the optimum for the soil matrices as determined by laboratory bench testing.

6.3. CLASSIFICATION OF FILL MATERIAL

This specification should be read in conjunction with the following:

- The Manual of Contract Documents for Highway Works, Volume 1, Specification for Highway Works, Series 600, Earthworks as amended in February 2016; and
- BS 1377-1:2016 Methods of test for soils for civil engineering purposes. General requirements and sample preparation

6.3.1. GENERAL CLASSIFICATION

The contractor should ensure that all earthworks materials comply with Clause 601 of the *Specification for Highway Works and* shall fall into one of the following general classifications as defined in Table 6/1 of the *Specification for Highway Works*.

- General granular fill (Class 1);
- General cohesive fill (Class 2), excluding Class 2A and 2E; or
- Selected granular fill (Class 6).

TABLE 6.1 E3P EARTHWORKS GEOTECHNICAL COMPACTION SPECIFICATION

SOIL/MATERIAL TYPE	CLASS	DESCRIPTION	COMPACTION EQUIPMENT	LAYER THICKNESS	ROLLER PASSES
Granular Fill **(Sand and Gravel Matrices)**	1 A	Sandy Gravel with some cobbles	> 5000 kg vibrating roller	225 mm	4
	1 B	Sand or Gravel of same grading size	> 5000 kg vibrating roller	250 mm	10
	1 C	Coarse gravels with many cobbles	> 5000 kg vibrating roller	400 mm	5
Cohesive Fill **(Clay with Minor Sand and Gravel Component)**	2 A	Wet Clay	> 1000 kg vibrating tamping roller (sheep foot only)	100–225 mm	3
	2 B	Dry Clay	> 5000 kg vibrating roller or 1400 kg tamping (trench roller)	225 mm or 125 mm	4 or 12
	2 C	Gravelly Clay	> 5000 kg vibrating roller or 1400 kg tamping (trench roller)	225 mm or 125 mm	4 or 12
	2 D	Silty/Sandy Clay	> 5000 kg vibrating roller or 1400 kg tamping (trench roller)	225 mm or 125 mm	4 or 12
Recycled Aggregate Crush **(< 125 mm Well Graded)**	6F2	Any combination of inert hard materials, other colliery spoil, or rock with substantial amounts of clay-like component	> 5000 kg vibrating roller	250 mm	6



6.3.2. USE OF FILL MATERIALS

In addition to any grading requirement, the maximum particle size of any fill material shall be no more than two-thirds of the compacted layer thickness except that cobbles having an equivalent diameter of more than 150 mm shall not be deposited within the restored surface level unless directed otherwise by the engineer. Un-burnt colliery spoil, pulverised fuel ash or furnace bottom ash shall not be used as a fill material.

6.4. GENERAL REQUIREMENTS

The contractor shall employ only plant and working methods that are suited to the materials to be handled and traversed. The contractor shall be responsible for maintaining the nature of the acceptable material so that when it is placed and compacted it remains acceptable in accordance with the contract.

For the purposes of this contract, the proposed earthworks requirements have been split into distinct end use categories, with the corresponding requirements for the earthworks specification assigned to individual areas.



TABLE 6.2 COMPACTION/BACKFILL REQUIREMENTS

LAND USE REQUIREMENT	COMPACTION METHODOLOGY AND GENERAL PERFORMANCE CRITERIA
Traditional Spread Foundation	Ensure no disturbance of natural soil at shallow depth.
Re-Engineering of Soils Using Vibro-Replacement Stone Column (VRSC)	Materials to be placed in a controlled manner to facilitate the construction of vibro-replacement stone columns (VRSC). to limit differential settlement and increase net Allowable Bearing Pressure (ABP) **These works are to be completed within the building structure footprint and +2 m of all elevations.** Material must be 90% granular in composition with less than 10% fines (which are classified as materials < 0.6 microns in size). No material greater than 125 mm in size is permitted, with 90% of the soils placed conforming to grading < 90 mm. Material is to be placed when actual moisture content is within tolerable limits of the optimum, with specific attention to soils that are notably wetter than the optimum. Material to be placed in a manner so as to ensure a minimum CBR of 5% at formation to facilitate machine movement and piling mat construction. Where site-won materials are used to upfill, levels must be compacted to an "end product" performance specification where the in-situ density exceeds 95% of the maximum (determined by laboratory conditions). Where rock is present at a shallow depth, the remediation contractor will ensure the substratum is prepared to ensure that a minimum of 1000 mm of appropriately graded granular material is present to the underside of the proposed doubly reinforced concrete strip foundation. The substratum must be prepared to ensure a vibro-stone column treatment depth is not less than 80% of the immediate adjacent profile.
Piled Foundation	All plot footprint (+ 2 m) must be free of any deleterious elements, tree roots and obstructions > 150 mm. Where upfill is proposed, material is to be placed using method compaction specification to achieve a CBR as required by the developer for piling mat construction. Piling mat is to be placed and constructed in accordance with the approved geotechnical engineer's temporary works design.

Adopted Highways (+ 2 m from Back of Footpath)	*Method Compaction – MCHW Specification For Highway Works Series 600* is to be followed, with in-situ validation testing to meet requirement of adoptions authority. A CBR > 5% is required at subgrade formation (prior to placement of capping).
Estate Roads	*Method Compaction – MCHW Specification For Highway Works Series 600* is to be followed to achieve a CBR > 5%.
POS and Other External Areas	Material is to be placed in layers not exceeding 300 mm and must be rolled using dedicated plant (no earth moving equipment) and in general compliance with the requirements of *MCHW Specification For Highway Works Series 600*.

Acceptability shall be determined in accordance with Table 6/1 of the *Specification for Highway Works*.

Laboratory testing for the purposes of determining acceptability and compaction requirements will be conducted by the engineer.

Haulage of material to embankments or other areas of fill shall proceed only with sufficient spreading and compaction. Plant is operating at the place of deposition to ensure compliance with Clause 612 of the *Specification for Highway Works*.

No excavated acceptable material or unacceptable material required to be processed, other than surplus to the requirements of the contract, shall be removed from the site.

Where the excavation reveals a combination of acceptable and unacceptable materials, the contractor shall carry out the excavation in such a manner that the acceptable materials are excavated separately for use in the permanent works without contamination by the unacceptable materials. Unless otherwise described in the contract, classes of fill material required to be deposited separately shall be excavated separately without contamination by other classes of material.

The contractor shall make their own arrangements for the stockpiling of acceptable material, and unacceptable material to be processed, and for the provision of site for this purpose.

The contractor shall ensure that they do not adversely affect the stability of excavations or fills by their methods of stockpiling materials, use of plant or siting of temporary buildings or structures.

Topsoil shall, wherever practicable, be used immediately after its stripping and, if not, shall be stored in stockpiles of heights not exceeding 2 m. Topsoil shall not be stockpiled for more than two years. Topsoil shall not be unnecessarily trafficked, either before stripping or when in a stockpile. Stockpiles shall not be surcharged or otherwise loaded and multiple handling shall be kept to a minimum.

Excavations requiring backfilling shall remain open only for the minimum period necessary.

The contractor shall keep earthworks free of water, including:

- Arranging the rapid removal of water:
    - shed on to the earthworks; and
    - entering the earthworks from any source;
- Provide, where necessary, temporary watercourses, drains, pumping and the like;
- Discharge accumulated water and groundwater into the permanent outfalls of the drainage system where practicable; and
- Provide adequate means for trapping silt on temporary systems discharging into permanent drainage systems.

The contractor shall carry out and maintain groundwater lowering or other treatment as required.

Where materials are designated either Class U1B or Class U2 (according to the *Specification for Highway Works*), the contractor shall carry out any special requirements for their handling. Where such materials are encountered during the progress of the works, the contractor shall make all necessary arrangements for their safe handling and disposal after consultation with the appropriate environmental authority.

6.4.1. CONSTRUCTION OF FILLS – HIGHWAYS

All fills shall be constructed:

- In the locations as shown in the contract drawings to the lines and levels stated therein;
- Of classes of material complying with this specification;
- By deposition, as soon as practicable after excavation, in layers to meet the compaction requirements as required for each class of material as specified; and
- To the requirements of this clause and any other requirements for fill in this specification.

Before commencing work on any area of fill, the contractor shall ensure that:

- The base is sound and stable by excavating and removing any topsoil as soft subsoil;
- Base layers are not exposed until the fill layer is ready for placement; and
- Uncompacted material on the side slopes of previously backfilled zones shall be removed and benches of between 1.0 m and 1.5 m height cut in compacted fill immediately prior to deposition of the new fill to ensure that the new backfill placed against the slope is properly integrated.

Whenever fill is to be placed on surfaces inclined at 1 vertical to 7 horizontal or steeper, the surface shall be benched immediately prior to deposition of the fill in order to achieve horizontal basal surfaces. The benches shall be between 1.0 m and 1.5 m in height.

Areas of fill shall, unless otherwise permitted by the engineer, be constructed evenly over their fullest possible extent and the contractor shall carefully control and direct construction plant and other vehicular traffic uniformly over the area of compacted fill. The minimum plan dimensions of any one panel of backfilling shall be properly integrated with areas of previous backfilling. Damage by construction plant and other vehicular traffic shall be made good by the contractor with material having the same characteristics and strength as the material had before it was damaged.

Temporary slopes within compacted and uncompacted backfill shall be formed at gradients that ensure stability.

6.4.2. CONSTRUCTION OF FILLS – ADOPTED HIGHWAYS, ESTATE ROADS AND CAR PARK

The contractor shall carry out compaction upon the materials that require to be compacted, as soon as practicable after deposition.

Compaction shall be either method as required for the classes of fill in Table 6/1 that require to be compacted.

The contractor shall obtain permission from the overseeing organisation before carrying out compaction requirements as listed in Table 6/1 for the class of material being compacted.

Method compaction shall be undertaken using the plant and methods appropriate to the compaction requirements as listed in Table 6/1 for the class of material being compacted.

Earthmoving plant shall not be accepted as compaction equipment nor shall the use of a lighter category of plant to provide any preliminary compaction to assist the use of heavier plant be taken into account when assessing the amount of compaction required for any layer.

If more than one class of material is being used in such a way that it is not practicable to define the areas in which each class occurs, the contractor shall compact with plant operating as if only the material which required the greater compaction effort is being compacted.

If the results of field tests show densities that indicate the state of the compaction to be inadequate, then if this is due to failure of the contractor to comply with requirements of the contract, the contractor shall carry out such further work as is required to comply with the contract.

Refer to Clause 612/10 of the *MCHW Specification for Highway Works* for definition of plant to be used in accordance with these specified works.

The contractor will be responsible for assessing the class of fill in accordance with Table 6/1 of the *Specification for Highway Works*. Table 6/4 of the *Specification for Highway Works* should then be employed to assess the method of compaction to be employed. The test results and method statements shall be submitted to the consulting engineers for approval.

6.4.3. UNACCEPTABLE MATERIAL

The contractor is solely responsible for ensuring full and detailed analysis of all reported ground conditions and areas of risk in terms of the potential for unacceptable material to be present within the proposed earthworks. Limitations in the available information should be highlighted to the supervising engineer prior to the commencement of earthworks. The contractor is to make full and unequivocal arrangements to investigate the potential presence for unsuitable materials within the earthworks and construction of highway fill. All unsuitable materials are to be identified for removal in accordance with this specification.

Unacceptable material Class U1A shall be:

Material which does not comply with the permitted constituents and material properties of MCHW Table 6/1 and contract specific Appendix 6/1 for acceptable material; and;

Material, or constituents of materials, composed of the following unless otherwise described in contract specific Appendix 6/1:

- Peat, materials from swamps, marshes and bogs;
- Logs, stumps and perishable material;
- Materials in a frozen condition;
- Clay having a liquid limit determined in accordance with BS 1377: Part 2, exceeding 90 or plasticity index determined in accordance with BS 1377: Part 2, exceeding 65; and,
- Material susceptible to spontaneous combustion except unburnt colliery spoil complying with sub-Clause 15 of this Clause;(ii)unacceptable material

Unacceptable material Class U1B shall be:

Contaminated materials, including controlled wastes (as defined in the Environmental Protection Act 1990 Part IIA) whose level of contamination is above that given either in contract specific Appendix 6/14 or in contract specific Appendix 6/15, but excluding all hazardous wastes (as Volume 1 Series 600 Specification for Highway Works Earthworks W2 Amendment – February 2016 defined in the Hazardous Waste (England and Wales) Regulations 2005) and radioactive wastes (as defined in the Radioactive Substances Act 1993).3(02/16).

Unacceptable material Class U2 shall be:(i) hazardous waste (as defined in the Hazardous Waste (England and Wales) Regulations 2005) and radioactive waste (as defined in the Radioactive Substances Act 1993).4(02/16).

Where required in contract, unacceptable material (other than Class U2) shall be processed by mechanical, chemical or other means to render the material acceptable for use in the permanent works in accordance with the requirements of Table 6/1 and contract specific MCHW Appendix 6/1.

6.5. EARTHWORKS MATERIAL TESTS

Prior testing of the potential sources of fill shall be undertaken by the contractor and submitted to the consulting engineers for approval. This testing shall include, but not necessarily be limited to, the compaction and backfill requirements detailed in Table 6.3.

TABLE 6.3 COMPACTION/BACKFILL REQUIREMENTS

<table>
<tr><th>LAND USE</th><th>COMPACTION METHODOLOGY and GENERAL PERFORMANCE CRITERIA</th></tr>
<tr><td>Liquid and Plastic Limits</td><td>BS 1377: Part 2</td></tr>
<tr><td>Grading</td><td>BS 1377: Part 2</td></tr>
<tr><td>Uniformity Coefficient</td><td>Calculated from grading curve</td></tr>
<tr><td>Moisture Content
Multi-point moisture condition value (MCV) (to assess optimum moisture content).</td><td>BS 1377: Part 2</td></tr>
<tr><td>Organic Matter (Maximum 2.5% Total Organic Content)</td><td>BS 1377: Part 3</td></tr>
<tr><td>Water Soluble Sulphate</td><td>TRL Report 447 Test No 1</td></tr>
<tr><td>Total Sulphate Content</td><td>TRL Report 447 Test No 4</td></tr>
<tr><td>Earthwork In-situ Tests
Subsequent to the filling and compaction of the material, a series of in-situ tests shall be undertaken to confirm the success of the compaction process. This testing shall include, but necessarily be limited to, the following:
<table><tr><th>Test</th><th>Test Method</th></tr><tr><td>Plate Load Tests (Equivalent CBR of 5%)</td><td>BS 1377: Part 9</td></tr></table>Disposal of Materials
The contractor shall be responsible for the safe disposal of any excess of unsuitable material found on the site.</td><td>Clause 632 (BS 1377: Part 4)</td></tr>
<tr><td>Proctor Compaction Testing</td><td>BS 1377: Part 4</td></tr>
</table>

6.6. SPECIFICATION FOR GROUND IMPROVEMENT BY VIBRO-STONE COLUMN

The over-arching method and specification for the placement and compaction of non-compliant material where the fine constituent (< 0.63 micron) exceeds the standard requirements for ground improvement by VSC is given in Table 6.4 & 6.5.

TABLE 6.4 OVERVIEW OF WORKS OPERATIONS

Step 1	Carefully segregate materials excavated during civil engineering works (on site and import) into the following soil types: • Sand/granular soils; • Dry sandy clay; • Wet clay soil; and • Silt. Ensure all stockpiles are sealed to minimise water ingress in approved locations.
Step 2	Analyse bulk sample from each (site-won or imported) soil matrix as per the requirements of the E3P specification for: • Dry density/optimum moisture content (Procter); and • Particle size grading coefficient.
Step 3	On-site observations in conjunction with particle size distribution (PSD) grading will confirm the classification of material and thus the corresponding method for compaction.
Step 4	The dry density/moisture content testing should be used to ensure that the material is within ± 3% of the optimum to ensure compaction can be achieved.
Step 5	The classified material should be placed and compacted in accordance with the corresponding method for the material under conditions where the moisture content is within the tolerable limits.
Step 6	Once placed and compacted, the required validation testing should be completed at formation to demonstrate compliance. The testing will include: • In-situ density and air void ratio; • Moisture condition value; and • Undrained shear strength.

TABLE 6.5 COMPACTION AND VALIDATION OF NON-STANDARD MATERIAL BACKFILL TO VSC

REQUIRED PARAMETERS	**THE COMPACTION MUST ACHIEVE THE FOLLOWING MATERIAL PARAMETERS:**	
Verification Testing and Report	**Bulk Density (ρ)**	95% of the maximum dry density and must be within 3% of the optimum moisture content.
	All materials used for upfilling must be durable and inert.	
	In order to verify that the aforementioned material parameters have been attained, representative sampling and testing must be undertaken. All testing will be in accordance with BS EN ISO 17892-1:2014 and BS EN ISO 17892-2:2014. All testing is to be undertaken by a laboratory with the relevant UKAS accreditation. The following tests are required:	
	In-situ Density (ρ)	Approved methods of in-situ testing (i.e. calibrated nuclear density probe (NDP), sand replacement test).
	Moisture Content	Moisture content test.
	In-situ density testing on every 500 m^3 and in each layer of upfill well-spread over site within and around the proposed structures' footprint. Testing must be from a range of depths throughout the treated fill. A minimum of six samples must be taken and tested. A drawing depicting the location of each sample and test point must be provided along with a list of each point and the relevant test/sample depth. A list of all geotechnical testing results for each sample and test must be provided along with the relevant test certificates. If the soils are not suitable, due to the moisture content being higher than the optimum moisture content, then lime modification may also be required. The above is given strictly on the basis that it does not conflict with other elements of the project-specific requirements.	

6.7. CURRENT AND PROPOSED SITE TOPOGRAPHY AND SLOPE INTERACTION

The current and proposed site topography, changes in elevation and any existing or new slopes are beyond the scope of this specification. Where any earth slopes exceed a design gradient of 1(v) in 3(h) either on site or within the conjectured zone of structural influence, extreme care should be taken with a full and detailed geotechnical slope analysis to inform the retained design solution.

7. RECORD-KEEPING AND VERIFICATION

7.1. RECORD-KEEPING

During the course of the remediation and site enabling works, the on-site E3P consultant will undertake the following record-keeping protocols:

- Detailed daily site diary including material movements;
- Sampling register, testing results, photographs, details of locations of hydrocarbon-impacted soils (drawings), details of hotspot removals, details of consignment notes of any hydrocarbon-impacted material that is required to be disposed of off site; and
- Detailed surveys (volumes).

Record-keeping on site, in particular movements and analysis of specific material types, will be in the form of site diaries and a remediation excavation record. This record will remain on site and will be completed by the E3P on-site engineer during the course of the remediation and site enabling works.

7.2. VERIFICATION

The records listed above will then be compiled into a validation report produced by E3P on completion of the remediation and site enabling works, clearly referencing the origin of the materials used and testing carried out to confirm its suitability for use, where required. E3P will also prepare an as-built development drawing clearly detailing the materials present on site to be cross referenced with the supporting validation documentation.

The validation report will include the following:

- Remediation strategy (including copies of confirmation from regulatory authorities agreeing criteria);
- Detailed surveys of all excavations and production of as-built drawings for the earthworks;
- Copy of consignment notes relating to the movement of wastes to a licensed waste management facility;
- Detailed drawings showing all sampling locations for both chemical and geotechnical testing;
- Chemical test results;
- Geotechnical test results;
- Details of qualified persons signed declaration; and
- Monitoring results if undertaken (e.g. asbestos in air, gas water).

8. CONTINGENCY PLAN

8.1. PREVIOUSLY UNIDENTIFIED CONTAMINANTS

Should significantly impacted material be encountered during the development, then it will be excavated and stockpiled on an impermeable material and sampled and tested for an appropriate range of determinants.

Once the laboratory analysis of the material is available, an assessment will be undertaken to determine whether it can be retained on site as part of the material management plan or whether it should be disposed of off site.

Depending on the nature of any such impact, it may be necessary to undertake validation testing of the excavation faces in order to demonstrate that no such materials are left in situ.

9. SECOND PHASE MITIGATION AND MANAGEMENT – BUILD PHASE

This document details the construction works that are required to ensure full compliance with the remediation Strategy, Regulatory Authorities, Building Control & Warranty Providers;

- The following should be implemented during the build phase of the development:
- Laboratory testing of the imported topsoil;
- Chemical validation of any additional subsoil imported for use within landscaped areas;
- Placement and validation of sub-soil (clean material) in a 450mm layer within any plots where the material was not placed during the Remediation & Enabling works;
- Placement and chemical validation of imported topsoil within all landscaping areas; and,
- Installation and validation of ground gas protection measures.

The validation protocols are presented within the E3P Remediation and Enabling Works Strategy and are presented below.

9.1. PLACEMENT OF COVER SYSTEM

The Remediation and Enabling Works Strategy for the site, with respect to human health of the future site users includes the provision of a chemically suitable clean material to be installed in all landscaped areas; the construction of the clean cover / placement of clean material shall consist of:

- 150mm subsoil; and,
- 150mm topsoil.

In accordance with the current requirements of the regulatory authorities, validation samples will be collected from all materials that are to be imported or re-used on site to confirm the proposed development will pose no unacceptable risk to human health or the wider environ.

Subsoil and topsoil shall be free of any deleterious materials, such as buildings materials, timber, plastics etc and conform to the requirements of BS 3882:2007.

Initial testing of site won sub-soil to classify its re-use on site has been completed as part of the remediation works undertaken. Therefore, further analysis of sub-soil will be required to achieve the testing frequencies outlined within the remediation strategy and in the event of importation of additional material during construction.

Testing requirements for top-soil and sub-soil are presented in Table 9.1.

TABLE 9.1 SPECIFICATION FOR SOIL TESTING

MATERIAL USE	TESTING FREQUENCY	SUITE OF ANALYSIS
Subsoil Greenfield Source (150 mm Cover)`	1 Sample per 200 m^3	A/B/C/D
Subsoil Brownfield Source (150 mm Cover)	1 Sample per 50 m^3	A/B/C/D
Topsoil Greenfield Source (150 mm Cover)	1 Sample per 200 m^3	A/B/C/D
Topsoil Brownfield Source (150 mm Cover)	1 Sample per 50 m^3	A/B/C/D
General Engineering Fill (Class 1 and 2 Soil)	1 Sample per 1000 m^3	A/B/C/D

Notes
Suites of Analysis:
A. Speciated PAH.
B. Speciated TPH (C5-C35).
C. Asbestos (ID).
D. CLEA Inorganic Heavy Metals.

9.1.1. PROCEDURE FOR PLACEMENT OF CHEMICALLY SUITABLE COVER SYSTEM

Landscaped areas need to be backfilled with 150mm chemically validated subsoil, with 150mm topsoil overlaying this. Topsoil is required to be confirmed as chemically suitable prior to placement. Where sub-soil is not placed during Remediation & Enabling works, E3P will be required to return to site and undertake independent validation of the correct placement of sub-soil.

The placement of 300mm of clean material will be undertaken during the build phase works of the project.

The placement of subsoil and corresponding validation will be documented within the Cover System Validation Letters (to be issued on completion of the contractor's works).

If proposed utilities are to be placed within the cover system, the clean cover should be placed prior to installation of these utilities.

If natural drift deposits are encountered, excavation can cease here.

E3P will collect photographic evidence of the placement of 150mm of certified topsoil and 450mm of subsoil on completion of construction works. This element will also be checked by the Building Control Officer as part of the site completion prior to issuing of a CML certificate.

The Cover System validation procedure is detailed in Table 9.2.



TABLE 9.2 COVER SYSTEM VALIDATION PROCEEDURE

PROCEDURE	METHOD
Chemical Validation	Imported sub-soils and topsoil will need to be chemically analysed to confirm suitability for use with the proposed cover system prior to installation and completion of the cover systems. E3P will issue an email to the appropriate party with an assessment of the chemical suitability of both sub soils and topsoils. If acceptable the materials can be installed to the required depth at which time the plot will be deemed complete following a validation procedure by a suitability qualified E3P engineer.
Trial Holes	Trial holes are deemed necessary for all landscaped areas given that the 300mm cover system will need to be placed on each area during the build phase.
Validation	Photographic evidence will be taken by E3P of the topsoil placement demonstrating the depth of topsoil and practical completion of works are required for each and every plot. For plots where sub-soil depths require validation by E3P during the build phase, photographs will be taken and collated by E3P.
Validation Certificate	Once the photographs of the placement of topsoil (over the clean material) have been provided, E3P will issue a plot specific validation certificate to demonstrate that the required subsoil and topsoil has been placed in the required landscaped areas along with the chemical analysis.
Completion Report	Upon completion of all landscaped areas within the development, a Completion Report will be issued providing the confirmation that all remediation requirements have been achieved.

Plate 1 provides examples of validation photographs that will be required for each plot.

PLATE 1 EXAMPLE PLOT COVER SYSTEM VALIDATION

Plot No: 4 (Car Park Landscaping)		
Depth of Strata (m bgl)	0.00-0.30	Validated TOPSOIL

Depth of Cover System Materials



Depth of Cover System Materials



Depth of Cover System at Ground Level and in Relation to Unit / Structure



9.2. GROUND GAS PROTECTION MEASURES

Ground gas monitoring has not been completed at the site to date. As such this will require monitoring and assessing. As a precaution, it is recommended that Characteristic Situation 2 / Amber measures be applied. This classification requires specialist mitigation measures to be constructed in accordance with BS8485 (2015)+A1(2019).

The validation inspection is to include the items that are detailed within Table 9.3.

TABLE 9.3 GROUND GAS MITIGATION MEASURES VALIDATION ITEMS

INSPECTION	METHOD
Product Verification	Confirmation that suitable products have been installed to consist of photographs of product types, labels on packaging and delivery tickets.
Wall Cavity Inspection	Confirmation that gas membrane spans the external wall cavity above the periscopic vents.
General Condition	The membrane is to be inspected to ensure there are no tears, punctures or rips.
Jointing	The engineer is to check the overlaps between membranes are correctly sealed with sufficient overlaps.
Service Entry Points	Verification of the presence of preformed tophats sealed to the pipe and membrane as per the construction detail.
Passive Venting Systems	The engineer should verify the presence of vents at 2m centres on at least 3 of the external walls. Verification of the stone venting layer and presence of pipes to be supplied by photographic records from site.

Examples of gas membrane verification photographs provided in Plate 2.

It should be noted that these are for illustrative purposes only as each site will have a site-specific gas membrane specification.

PLATE 2 EXAMPLE GAS MEMBRANE VERIFICATION

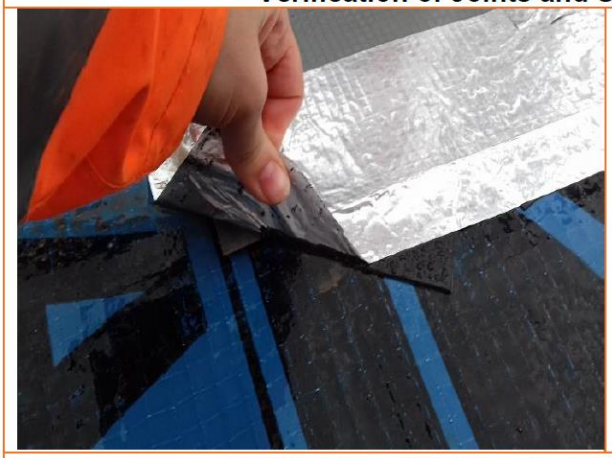
Plot – 236

General Condition of Membrane-Good Condition





Verification of Joints and Seals-Good Condition





Verification of Service Penetrations-Good Condition





9.3. POTABLE WATER SUPPLY – CONTAMINANT ASSESSMENT CRITERIA

Table 9.4 provides a summary of the threshold concentrations that must not be exceeded within remediated ground at pipeline depth in order to PE pipe works to be acceptable for the proposed development.

TABLE 9.4 PIPELINE SELECTION PE THRESHOLD CONCENTRATIONS

Contaminant Group	PE-threshold
Total VOC	0.5
Total BTEX And MTBE	0.1
Total SVOCs (Excluding PAH and those substances marked with an *)	2
EC5-EC10 Aliphatic and Aromatic Hydrocarbons	2
EC10-EC16- Aliphatic and Aromatic Hydrocarbons	10
EC16-EC40 Aliphatic and Aromatic Hydrocarbons	500
Phenols (From SVOC Analysis)*	2
Cresols and Chlorinated Phenols (From SVOC Analysis)	2
Ethers*	0.5
Nitrobenzene*	0.5
Ketones*	0.5
Aldehydes*	0.5
Amines	Fail

Upon completion of the remedial works a full UKWIR Risk Assessment should be undertaken.

END OF REPORT

APPENDIX I
LIMITATIONS

1. This report and its findings should be considered in relation to the terms of reference and objectives agreed between E3P and the Client as indicated in Section 1.2.

2. For the work, reliance has been placed on publicly available data obtained from the sources identified. The information is not necessarily exhaustive and further information relevant to the site may be available from other sources. When using the information it has been assumed it is correct. No attempt has been made to verify the information.

3. This report has been produced in accordance with current UK policy and legislative requirements for land and groundwater contamination which are enforced by the local authority and the Environment Agency. Liabilities associated with land contamination are complex and requires advice from legal professionals.

4. During the site walkover, reasonable effort has been made to obtain an overview of the site conditions. However, during the site walkover, no attempt has been made to enter areas of the site that are unsafe or present a risk to health and safety, are locked, barricaded, overgrown, or the location of the area has not been made known or accessible.

5. Access considerations, the presence of services and the activities being carried out on the site limited the locations where sampling locations could be installed and the techniques that could be used.

6. Site sensitivity assessments have been made based on available information at the time of writing and are ultimately for the decision of the regulatory authorities.

7. 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 do not constitute or replace full and proper surveys.

8. The executive summary, conclusions and recommendations sections of the report provide an overview and guidance only and should not be specifically relied upon without considering the context of the report in full.

9. E3P cannot be held responsible for any use of the report or its contents for any purpose other than that for which it was prepared. The copyright in this report and other plans and documents prepared by E3P is owned by them and no such plans or documents may be reproduced, published or adapted without written consent. Complete copies of this may, however, be made and distributed by the client as is expected in dealing with matters related to its commission. Should the client pass copies of the report to other parties for information, the whole report should be copied, but no professional liability or warranties shall be extended to other parties by E3P in this connection without their explicit written agreement there to by E3P.

10. New information, revised practices or changes in legislation may necessitate the re-interpretation of the report, in whole or in part.

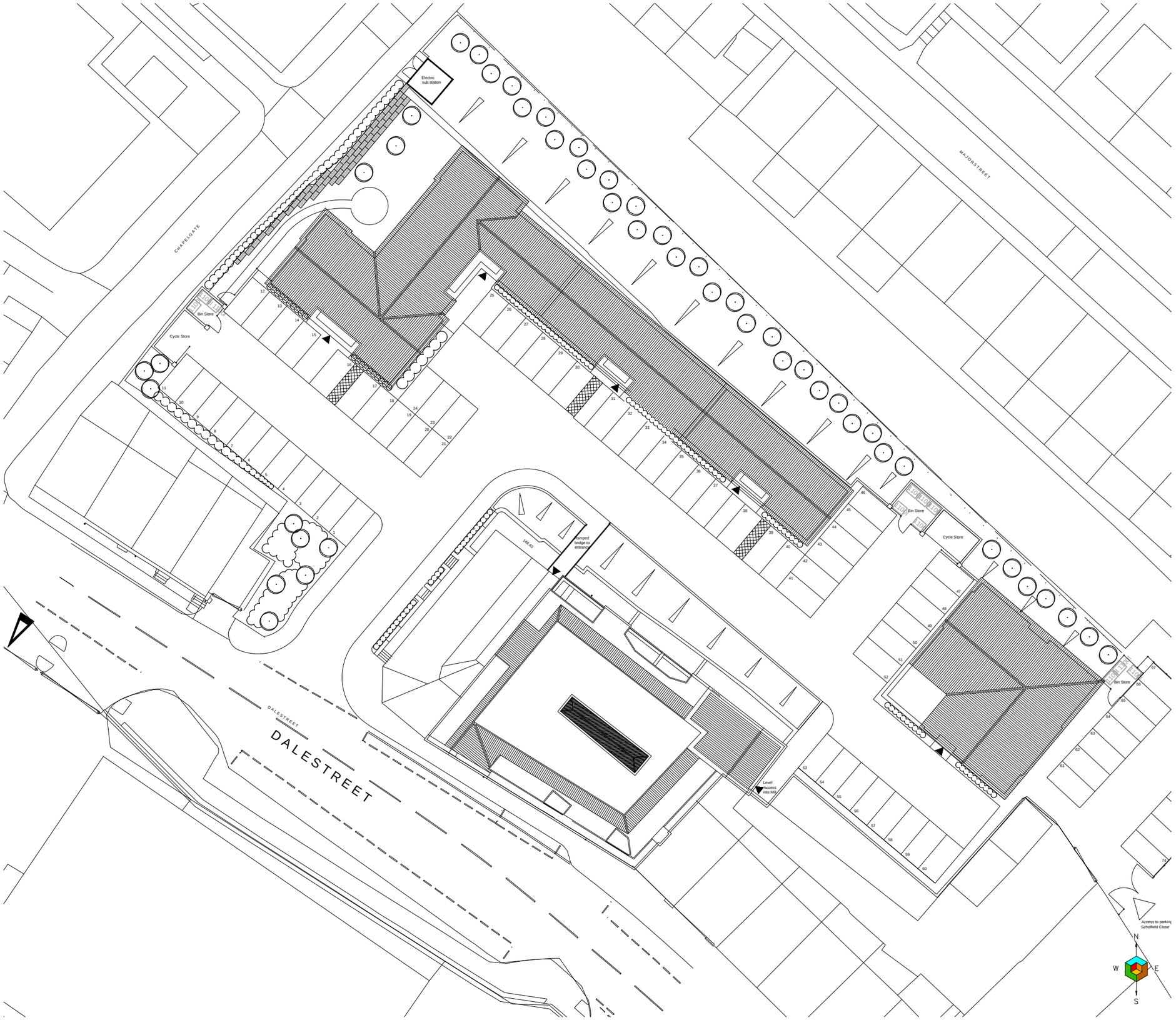
APPENDIX II
GLOSSARY

TERMS

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

km	Kilometres	**mg/m^3**	Milligram per metre cubed
% v/v	Percent volume in air	**m bgl bgl**	Metres below ground level
mb	Millibars (atmospheric pressure)	**m bcl**	Metre below cover level
l/hr	Litres per hour	**mAOD**	Metres above ordnance datum (sea level)
µg/l	Micrograms per litre (parts per billion)	**kN/m^2**	Kilonewtons per metre squared
ppb	Parts per billion	**µm**	Micrometre
mg/kg	Milligrams per kilogram (parts per million)	**SSRT**	Site Specific Remediation Target
PSD	Particle Size Distribution	**DD**	Dry Density
CL:AIRE	Contaminated Land: Applications in Real Environments	**Mc**	Moisture Content
ρ	Bulk Density	**GPR**	Ground Penetrating Radar
NDP	Nuclear Density Probe	**FFL**	Finished Floor Level
LEL	Lower Explosive Limit	**UKWIR**	UK Water Industry Research
CIRIA	Construction Industry Research and Information Association	**LOD**	Limit of Detection

APPENDIX III
DRAWINGS



Key:

Notes:

Phase	Revision	Date	Issue	Drawn	Authorised
P1	-	05-10-2016	DRAFT	JN	MD

Client: Molloy Hale	Job No: 11-466	Date: 05-10-2016
	Drawing No: 002	Scale: NTS @ A3
Job Title: Dale Mill, Milnrow	Drawing Title: Proposed Development Plan	

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City Heliport & Business Centre
Eccles, Manchester, M30 7RU
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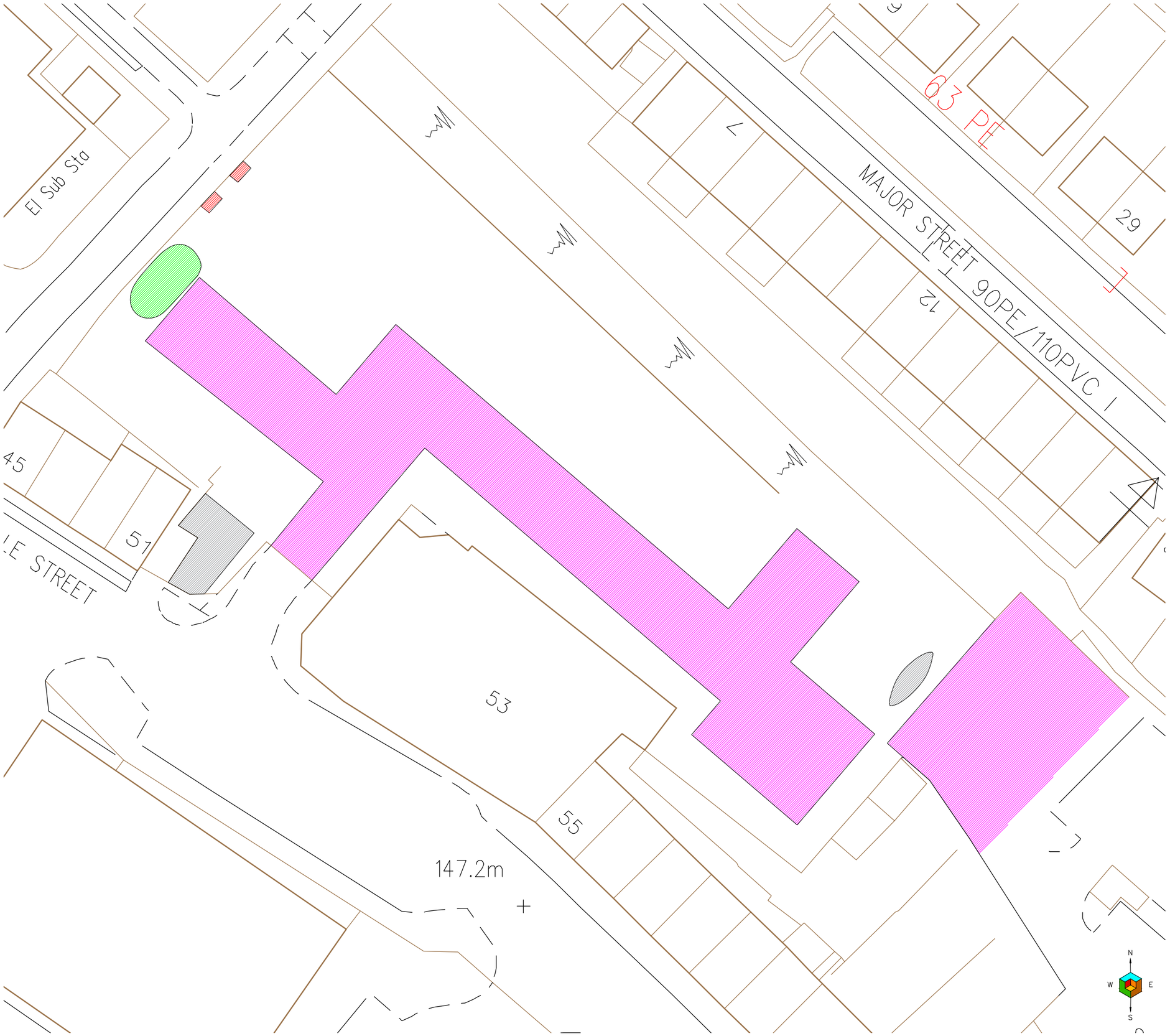

Key:

Site Features

- Retaining Wall
- Areas of Hardstanding
- Area of Possible Japanese Knottweed
- Electricity Substations
- Area of Bunds

Notes:

Phase	Revision	Date	Issue	Drawn	Authorised
P1	-	05-10-2016	DRAFT	JN	MD

Client: Molloy Hale

Job No: 11-466

Date: 05-10-2016

Drawing No: 003

Scale: NTS @ A3

Job Title: Dale Mill, Milnrow

Drawing Title: Site Features Plan

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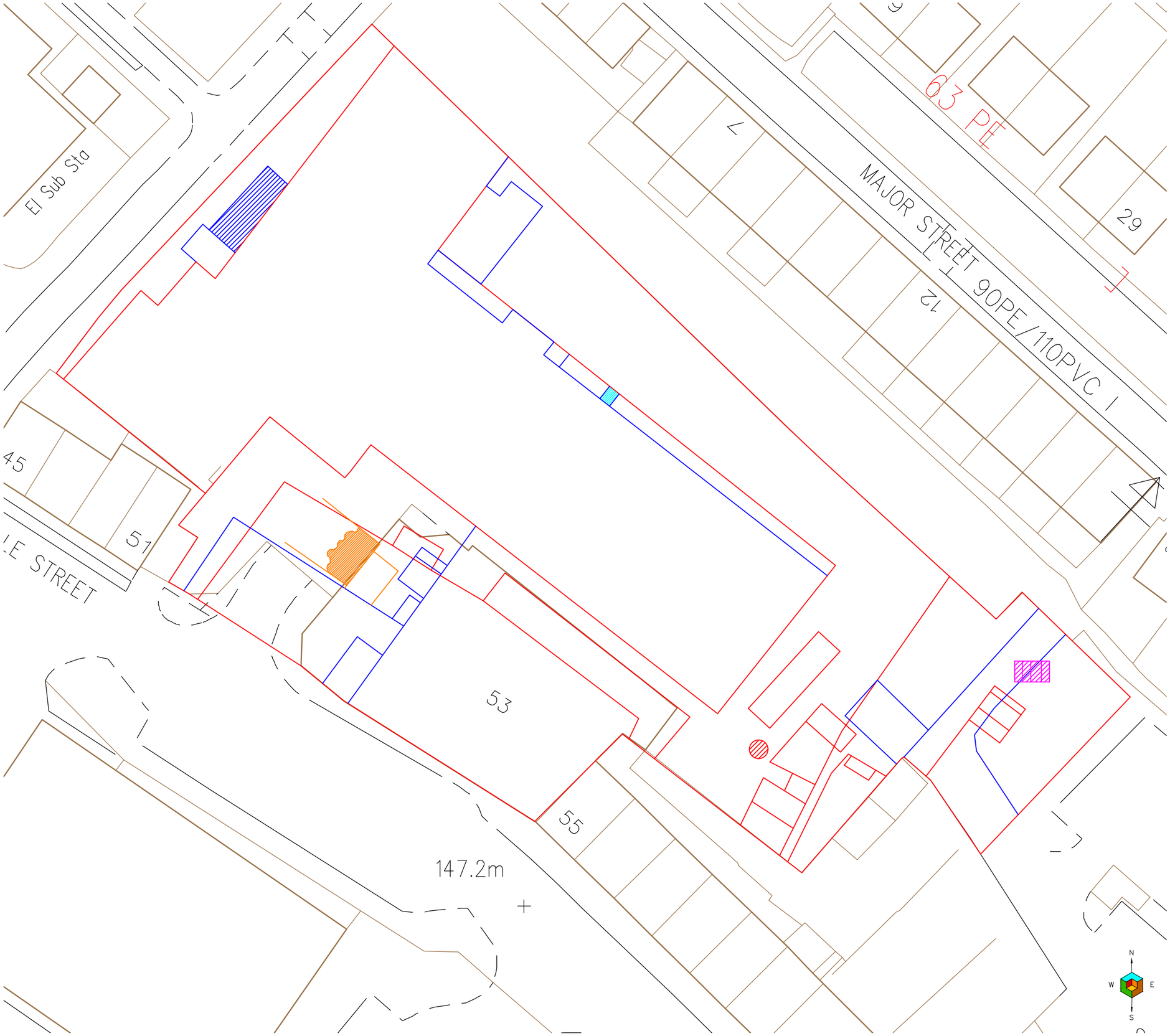

Key:

Historical Features

- Former Cotton Mill With Outbuildings (Pre 1891 - Pre 1930)
- Former Tank (Pre 1891 - Pre 1930)
- Former Cotton Mill Building Extensions (Pre 1955 - Pre 1988)
- Former Coal Bunker (Pre 1955 - Pre 1988)
- Former Electricity Sub-station (Pre 1955 - Pre 1988)
- Former Ventilator (Pre 1955 - Pre 1988)
- Former Tanks (Pre 1910 - Pre 1930)

Notes:

Phase	Revision	Date	Issue	Drawn	Authorised
P1	-	13-10-2016	DRAFT	JN	MD

Client: Molloy Hale

Job No: 11-466

Date: 13-10-2016

Drawing No: 004

Scale: NTS @ A3

Job Title: Dale Mill, Milnrow

Drawing Title: Historical Features Plan

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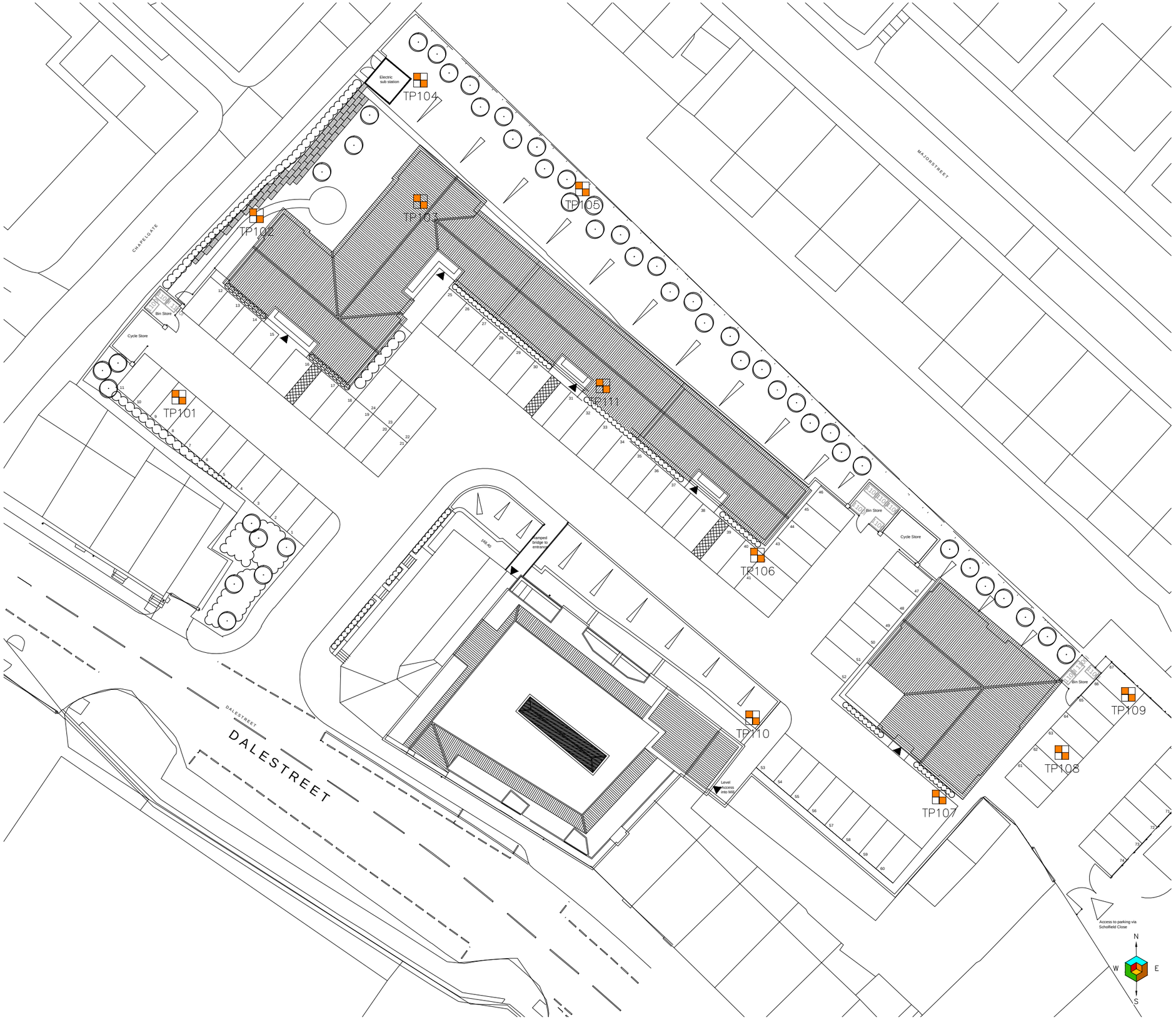

Key:

Location Symbols

TP101 Approximate Trial Pit Location

Notes:

P1	-	18-10-2016	DRAFT	JN	MD
Phase	Revision	Date	Issue	Drawn	Authorised

Client: Molloy Hale

Job No: 11-466

Date: 18-10-2016

Drawing No: 005

Scale: NTS @ A3

Job Title: Dale Mill, Milnrow

Drawing Title: Exploratory Hole Location Plan

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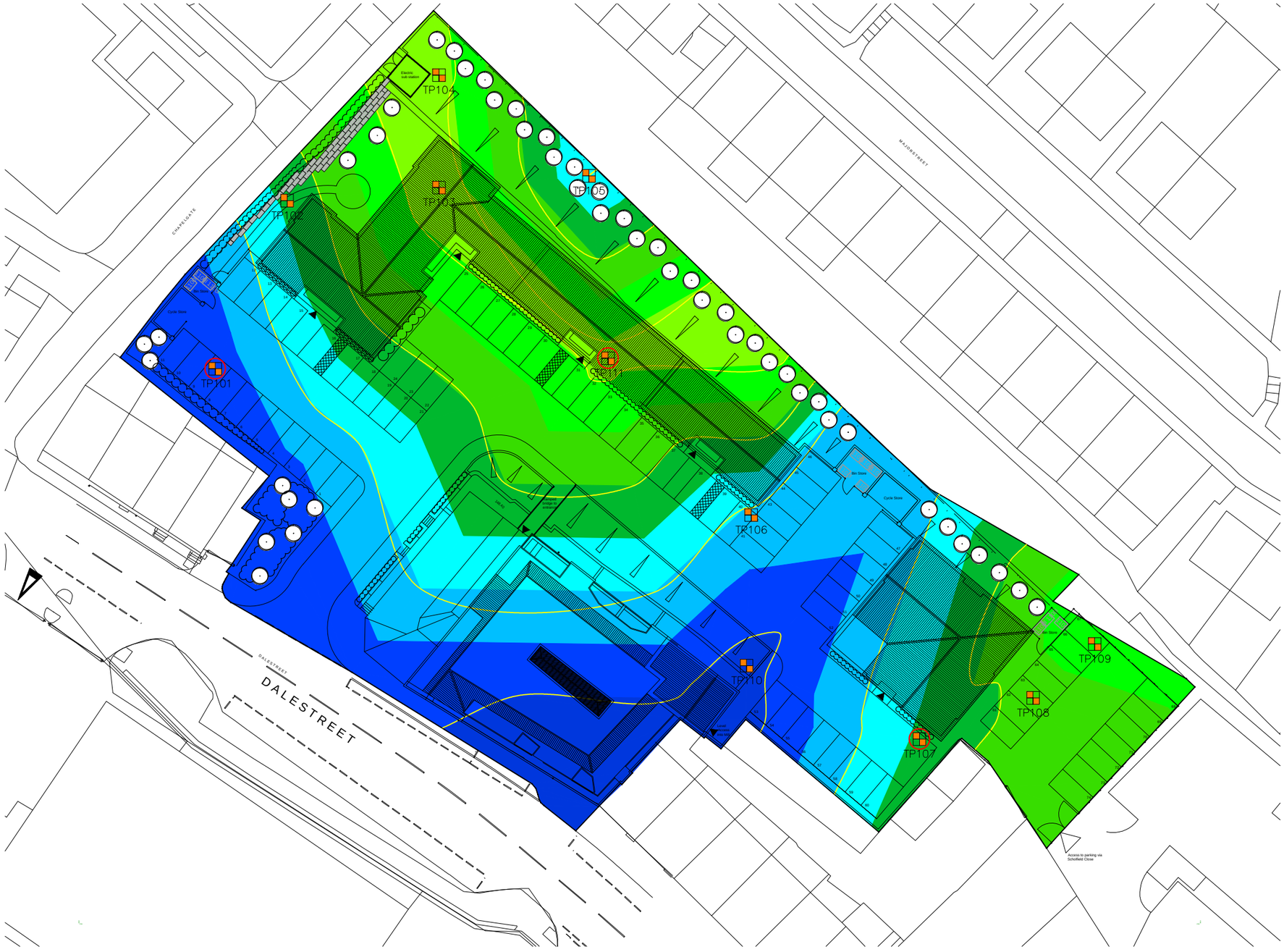

Key:

Location Symbols

TP101 Approximate Trial Pit Location

Made Ground Depth (m)

- Depth of Made Ground Between 0.00 - 0.24m
- Depth of Made Ground Between 0.25 - 0.49m
- Depth of Made Ground Between 0.50 - 0.74m
- Depth of Made Ground Between 0.75 - 0.99m
- Depth of Made Ground Between 1.00 - 1.24m
- Depth of Made Ground Between 1.25 - 1.49m
- Depth of Made Ground Between 1.50 - 1.74m
- Depth of Made Ground Between 1.75 - 1.99m
- Depth of Made Ground Between 2.00 - 2.24m
- Depth of Made Ground Between 2.25 - 2.49m
- Depth of Made Ground Between 2.50 - 2.74m
- Depth of Made Ground Between 2.75 - 2.99m
- Made Ground ion Excess of 3.00m
- Base of Made Ground Not Encountered

Notes:

Phase	Revision	Date	Issue	Drawn	Authorised
P1	-	26-10-2016	DRAFT	JN	MD

Client: Molloy Hale	Job No: 11-466	Date: 26-10-2016
	Drawing No: 006	Scale: 1:500 @ A3
Job Title: Dale Mill, Milnrow	Drawing Title: Depth of Made Ground Plan	

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APPENDIX IV
E3P REMEDIATION/ VALIDATION CRITERIA

HUMAN HEALTH REMEDIATION TARGETS –RESIDENTIAL END USE WITHOUT PLANT UPTAKE

DETERMINAND	UNITS	WITHIN 300 mm LANDSCAPE COVER SYSTEM	HARD STANDING AND >600 mm OF COVER	PUBLIC OPEN SPACE 300 mm COVER	PUBLIC OPEN SPACE > 300 mm	PATH-WAY
Arsenic	mg/kg	40	40[ii]	79[iii]	640[iv]	1
Cadmium	mg/kg	85	85[ii]	120[iii]	532[iv]	1
Chromium (Hexavalent)	mg/kg	6	6[ii]	7.7[iii]	220[iv]	1
Lead	mg/kg	200	330[vii]	760[viii]	760[viii]	1
Elemental Mercury	mg/kg	1.2	1.2[ii]	16[iii]	30[iv]	2
Nickel	mg/kg	180	180[ii]	230[iii]	3400[iv]	1
Selenium	mg/kg	430	430[ii]	1100[iii]	1800[iv]	1
Copper	mg/kg	7100	7100[ii]	12,000[iii]	44,000[iv]	1
Zinc	mg/kg	40000	40,000[ii]	81,000[iii]	170,000[iv]	1
Phenol	mg/kg	791	280[xiv][xi]	760[iii][xi]	760[iv][xi]	2
Naphthalene	mg/kg	210	2.3[xiv][xi]	1200[iv][xi]	1200[iv][xi]	2
Acenaphthylene	mg/kg	NFD	500[v]	15,000[iii][xi]	29,000[iv][xi]	3
Acenaphthene	mg/kg	2.3	500[v]	15,000[iii][xi]	29,000[iv][xi]	1
Fluorene	mg/kg	2900	500[v]	9900[iii][xi]	20,000[iv][xi]	1
Phenanthrene	mg/kg	3000	500[v]	3100[iii][xi]	6200[iv][xi]	3
Anthracene	mg/kg	2800	500[v]	74,000[iii][xi]	150,000[iv][xi]	3
Fluoranthene	mg/kg	1300	500[v]	3100[iii][xi]	6300[iv][xi]	3
Pyrene	mg/kg	31000	500[v]	7400[iii][xi]	15,000[iv][xi]	3
Benzo(a)Anthracene	mg/kg	1500	11[ii][xi]	29[iii][xi]	49[iv][xi]	3
Chrysene	mg/kg	3700	30[ii][xi]	57[iii][xi]	93[iv][xi]	3
Benzo(b)Fluoranthene	mg/kg	11	3.9[ii][xi]	7.1[iii][xi]	13[iv][xi]	3
Benzo(k)Fluoranthene	mg/kg	30	110[ii][xi]	190[iii][xi]	370[iv][xi]	3
Benzo(a)Pyrene	mg/kg	3.9	3.2[ii][xi]	5.7[iii][xi]	11[iv][xi]	3
Indeno(123-cd)Pyrene	mg/kg	110	45[ii][xi]	82[iii][xi]	150[iv][xi]	3
Dibenzo(a,h)Anthracene	mg/kg	3.2	0.31[ii][xi]	0.57[iii][xi]	1.1[iv][xi]	3
Benzo(ghi)Perylene	mg/kg	45	360[ii][xi]	640[iii][xi]	1400[iv][xi]	3
TPH C_5-C_6 (aliphatic)	mg/kg	42[i][xi]	42[ii][xi]	42[ii][xi]	10,000[xiv][xi]	2
TPH C_6-C_8 (aliphatic)	mg/kg	100[i][xi]	100[ii][xi]	100[ii][xi]	10,000[xiv][xi]	2
TPH C_8-C_{10} (aliphatic)	mg/kg	27[i][xi]	27[ii][xi]	27[ii][xi]	10,000[xiv][xi]	2
TPH C_{10}-C_{12} (aliphatic)	mg/kg	250	130[ii][xi]	130[ii][xi]	10,000[xiv][xi]	2
TPH C_{12}-C_{16} (aliphatic)	mg/kg	1800	1000[xiv][xi]	1000[xiv][xi]	10,000[xiv][xi]	1
TPH C_{16}-C_{21} (aliphatic)	mg/kg	1900	1000[xiv][xi]	1000[xiv][xi]	10,000[xiv][xi]	1
TPH C_{21}-C_{35} (aliphatic)	mg/kg					1
TPH C_5-C_7 (aromatic)	mg/kg	370	370[ii][xi]	370[ii][xi]	10,000[xiv][xi]	2
TPH C_7-C_8 (aromatic)	mg/kg	860	860[ii][xi]	860[ii][xi]	10,000[xiv][xi]	2
TPH C_8-C_{10} (aromatic)	mg/kg	47	47[ii][xi]	47[ii][xi]	10,000[xiv][xi]	2
TPH C_{10}-C_{12} (aromatic)	mg/kg	250	250[ii][xi]	250[ii][xi]	10,000[xiv][xi]	2

TPH C_{12}-C_{16} (aromatic)	mg/kg	1800	1800[(ii)(xi)]	1800[(ii)(xi)]	10,000[(xiv)(xi)]	1
TPH C_{16}-C_{21} (aromatic)	mg/kg	1900	1900[(ii)(xi)]	1900[(ii)(xi)]	10,000[(xiv)(xi)]	1
TPH C_{21}-C_{35} (aromatic)	mg/kg	1900	1900[(ii)(xi)]	1900[(ii)(xi)]	10,000[(xiv)(xi)]	1
Asbestos	Fibres Volume Weight (%)	NFD	0.001%	NFD	0.001	4

Notes 1

NFD = No Fibres Detected

Asbestos will be screened visually on site by a qualified environmental consultant and where potential ACM is identified, representative samples will be subject to quantitative analysis of % volume by weight.

Should any ACM be identified within the soil matrices, further detailed % assessment would be required when the reported laboratory result exceeds the limit of detection for the analytical method at 0.01% by volume (weight).

Notes 2
Excludes matrices where free product is observed.

No viable exposure pathway beneath hardstanding and cover system.

Notes 3
Main exposure pathways: 1 = soil ingestion, 2 = vapour inhalation (indoor), 3 = dermal contact and ingestion, 4 = dust inhalation.

Abbreviations: GAC = general assessment criteria, n = number of samples, MC = maximum concentration, N/A = Not Applicable (no exceedance of assessment criteria), Loc of MC = location of exceedances.

i. Value derived from LQM Suitable 4 Use Levels (S4ULs) for residential end use with plant uptake.
ii. Value derived from LQM Suitable 4 Use Levels (S4ULs) for residential end use without plant uptake – these levels used below 300 mm cover system within landscaping areas as soils will be present within a residential setting yet soils will not be disturbed and plants will not reach these soils.
iii. Value derived from LQM Suitable 4 Use Levels (S4ULs) for public open space (POS) residential.
iv. Value derived from LQM Suitable 4 Use Levels (S4ULs) for public open space (POS) park – these levels used below 300 mm POS cover system as soils will not be disturbed by any future site users and exposure to these soils will be similar to a park end use.
v. Value derived from LQM Suitable 4 Use Levels (S4ULs) alongside assessment with WM3 to ensure that materials remaining on site do not exceed the WM3 toxicity criteria for hazardous waste.
vi. Value derived from Category 4 Screening Levels (C4SL) for residential land use with homegrown produce.
vii. Value derived from Category 4 Screening Levels (C4SL) for residential land use without homegrown produce.
viii. Value derived from Category 4 Screening Levels (C4SL) for public open space (POS) residential.
ix. Value derived from Category 4 Screening Levels (C4SL) for public open space (POS) park.
x. Mercury – based on elemental mercury.
xi. PAH and TPH levels used are for 1% SOM.
xii. Xylenes based on p-xylene (o-xylene 2600 mg/kg, m-xylene 3500 mg/kg) and is capped by its solubility.
xiii. Value derived from LQM Suitable 4 Use Levels (S4ULs) for residential end use with plant uptake due to the volatilisation risk.
xiv. BTEX is not SOM-related due to inhalation pathway.

REMEDIATION TARGETS – COMPARISON OF GROUNDWATER / LEACHATE ANALYSIS WITH TIER 1 SCREENING LEVELS

DETERMINAND	UNIT	EQS SCREENING VALUE[1, 2, 3]		DWS [3,4,5]
		AA	MAC	
Arsenic	µg/l	50	–	10
Cadmium	µg/l	0.08-0.25	0.45-1.5	5
Chromium (VI)	µg/l	3.4	–	–
Chromium (III)	µg/l	4.7	–	50
Copper	µg/l	1	–	2000
Total Cyanide	µg/l	1	–	50
Lead	µg/l	1.2	14	10
Mercury	µg/l	–	0.07	1.0
Nickel	µg/l	4	34	20
Selenium	µg/l	–	–	10
Zinc	µg/l	10.9	–	–
pH	6–9			
Naphthalene	µg/l	2	130	10*
Anthracene	µg/l	0.1	0.1	
Benzo[b]fluoranthene	µg/l	0.00017*	0.017	
Benzo[k]fluoranthene	µg/l	0.00017*	0.017	
Benzo(a)pyrene	µg/l	0.00017*	0.27	
Indeno(123-cd)pyrene	µg/l	0.00017*	5*	
Benzo(ghi)pyrene	µg/l	0.00017*	5*	
Fluoranthene	µg/l	0.0063	0.12	
Benzo(ghi)perylene	µg/l	1.7–4	8.2–3	
TPH C5-C6 (benzene)	µg/l	10	50	1
TPH C6-C8 (toluene)	µg/l	74	–	700
TPH C8-C10 (ethyl benzene)	µg/l	20	–	300
TPH C10-C12 (xylene)	µg/l	30	–	500
TPH C12-C16	µg/l	2	130	90[5]
TPH C16-C35	µg/l	50#	50#	90[5]
TPH C5-C6	µg/l	–	–	15000
TPH C6-C8	µg/l	–	–	15000
TPH C8-C10	µg/l	–	–	300
TPH C10-C12	µg/l	–	–	300
TPH C12-C16	µg/l	–	–	300

DETERMINAND	UNIT	EQS SCREENING VALUE[1, 2, 3]		DWS [3,4,5]
		AA	MAC	
TPH C16 – C21	µg/l	–	–	300**
TPH C21-C35	µg/l	–	–	300**
Tetrachloroethylene	µg/l	0.4	–	10
Trichloroethylene	µg/l	10	–	10
Trichlorobenzene	µg/l	0.4	–	–
Trichloromethane	µg/l	2.5	–	–
Dichloromethane	µg/l	20	–	200
Carbon Tetrachloride	µg/l	12	–	3
Vinyl Chloride	µg/l	–	–	0.3

Notes
Solubility <0.01µg/l
AA – Annual Average
MAC- Maximum Admissible Concentration
* Polyaromatic hydrocarbons (PAH) - Benzo(a)pyrene (BaP), Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(g,h,i)-perylene and Indeno(1,2,3-cd)-pyrene. Benzo(a)pyrene can be considered as a marker for the other PAHs, hence only benzo(a)pyrene needs to be monitored for comparison with the biota EQS or the corresponding AA-EQS in water
** There are no WHO Guideline Values for aliphatic fractions C16-C21 and C21-C35, therefore the guideline value for aliphatic fractions inclusive of C8-C16 (300µg/l) has been applied.
1. The Water Environment (Water Framework Directive) (England and Wales) (Amendment) Regulations (2015)
2. Directive establishing a framework for Community action in the field of water policy (Water Framework Directive)
3. Council Directive on pollution caused by certain dangerous substances discharged into the aquatic environment of the Community (Dangerous Substances Directive) - List II substances
4. Council Directive on the quality of water intended for human consumption (Drinking Water Directive)
5. WHO Guidelines for Drinking Water Quality. Third edition (2004)

APPENDIX V
E3P MATERIAL IMPORT CRITERIA

SITE OF IMPORTATION ADDRESS		**E3P** HELIPORT BUSINESS PARK, LIVERPOOL ROAD, ECCLES, MANCHESTER, M30 7RU +44 (0) 161 707 9612 info@e3p.co.uk
Client		
Main Contractor		
Earthworks Contractor		
Haulier		
Date of Planned Import		

Overview of Planned Material Import	
Material Source (Site of Origin) and Postcode	
Site Investigation Report	**Report Title and Reference:** **Date:** **Information Supplied By:**
Reason for Generation of Excess Material at Site of Origin	
Chemical Test Results for Stockpile at Site of Origin	**Date:** **Laboratory Certificate Ref:** **Organisation Responsible for Stockpile Sampling:**
Geotechnical Material Classification and Testing	**Delete as Appropriate:** Class 1 / Class 2 / Class 6 / Topsoil
Pictures of Material Stockpile Pending Transportation	**Delete as Appropriate:** Yes / No
Person or Organisation Responsible for Ensuring Quality Control at Site of Origin	
Quantity of Material to Be Imported (m^3)	
Proposed Area of Deposition (Site of Reuse)	
Waste Exemption/Permit or CL:AIRE MMP	**Delete as Appropriate:** U1 Standard Rules / CL:AIRE MMP (Direct Transfer) / Bespoke

APPENDIX VI
CONTRACTOR PRE-COMMENCEMENT CHECK SHEET

GEOTECHNICAL ENABLING WORKS PRE-START FORM

Prior to the commencement of any site remediation or enabling works, this form will be completed by E3P, in the presence of the appointed contractor, to ensure that all pertinent remediation and enabling works activities are fully discussed and understood.

Activity	Testing Responsibility	Contractors Method Statement Required (Y/N)	Comment/Action
Deployment of Environmental Permit			Ref No:
Deployment of LAPC Part B – Mobile Plant Permit			Ref No:
CL:AIRE MMP and Qualified Person Declaration			Ref No:
Identification of All Invasive Plant Species and Production of Eradication Plan with Appropriate Supervision by Specialist			Appointed specialist:
Removal of All Vegetation			Note disposal location:
Removal of All Root Bulbs and Root Networks			Note disposal location:
Identification of Contamination Hotpots, Removal of Material and Stockpile			Rationale:
Legislatively Compliant Procedure to Deal with Contamination Excavated from Hotspot			Rationale:
Processing and Recycling of Aggregate with Geotechnical and Chemical Validation Testing			Note stockpile location and anticipated volume:
Stockpiling of Subsoil and Certification of Suitability for Reuse			Stockpile location:
Decommission of All Redundant Drainage Infrastructure			
Decommission of All Former Interceptors			
Decommission of All Former Above- and Below-Ground Tanks			
Removal of All Asbestos to a Licensed Facility			
Engineering of Plots for Shallow Spread Foundation in Accordance with E3P Geotechnical Specification			Plot Numbers

Activity	Testing Responsibility	Contractors Method Statement Required (Y/N)	Comment/Action
Engineering of Plots for VSC in Accordance with E3P Geotechnical Specification			Plot Numbers.
Engineering of Plots for Pile Foundation in Accordance with E3P Geotechnical Specification			Plot Numbers
Engineering of Plots for Raft Foundation in Accordance with E3P Geotechnical Specification			Plot Numbers
Stockpiling of Topsoil and Certification of Suitability for Reuse			Stockpile location
Engineering of Highways Bulk Upfill in Accordance with E3P Specification with Compliant Validation Testing			Upfill specification
Engineering of Highways Subgrade in Accordance with E3P Specification with Compliant Validation Testing			Upfill specification
Engineering of Highways Capping in Accordance with E3P Specification with Compliant Validation Testing			Upfill specification
Cut-and-Fill the Development Site to Clients' Required Elevation with As-Built Survey			Required formation elevations

APPENDIX VI
CONTRACTOR COMPLETION CHECK SHEET

GEOTECHNICAL ENABLING WORKS COMPLETION FORM

Upon completion of all site remediation and enabling works, this form will be completed by E3P, in the presence of the appointed contractor, to ensure that all pertinent geotechnical enabling works activities are complete or, where a deviation from the specification has occurred, all future limitations and issues are documented for the client's records.

Activity	Complete			Signature
	Yes	No	N/A	(initial)
Eradication of all invasive plant species				
Removal of all vegetation				
Removal of all root bulbs and root networks				
Stockpiling of topsoil and certification of suitability for reuse				
Stockpiling of subsoil and certification of suitability for reuse				
Stockpile all recycled aggregate with geotechnical and chemical validation testing				
Removal of all relict foundations and infrastructure in their entirety				
Decommission of all redundant drainage infrastructure				
Decommission of all former interceptors				
Decommission of all former above- and below-ground tanks				
Removal of all waste materials to a licensed facility				
Removal of all asbestos to a licensed facility				
Engineering of all plots for shallow spread foundation in accordance with E3P Geotechnical Specification				
Engineering of all plots for VSC in accordance with E3P Geotechnical Specification				
Engineering of all plots for pile foundation in accordance with E3P Geotechnical Specification				
Engineering of all plots for raft foundation in accordance with E3P Geotechnical Specification				
Engineering of highways bulk upfill in accordance with E3P Specification with compliant validation testing				
Engineering of highways subgrade in accordance with E3P Specification with compliant validation testing				
Engineering of highways capping in accordance with E3P Specification with compliant validation testing				
Cut-and-fill the development site to client's required elevation with as-built survey				

POST-REMEDIATION AND ENABLING LIMITATIONS

All and every deviation from the approved specification for works should be documented by the remediation and enabling works contractor below.