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Report

Options Appraisal and Remediation Strategy

Project: Land off Mill Moor Road, Meltham

Client: Pennine Developments Ltd

Reference: B21957 R003

Date: December 2018

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Options Appraisal and Remediation Strategy



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FOR AND ON BEHALF OF JNP GROUP

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B21957 D302

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2492-PH1-100A

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1 INTRODUCTION

- 1.1.1 **jnp group** (geo-environmental) was instructed by Pennine Developments Ltd to undertake an options appraisal and design a remediation strategy for a site known as Land off Mill Moor Road, Meltham (hereinafter referred to as 'the site'). This report is subject to the limitations presented in Appendix A.
- 1.1.2 The site is to be redeveloped for nineteen residential houses with private gardens. Currently the site is an open grassed field used for grazing. The site location is shown in Figure 1. The proposed redevelopment is shown in **jnp group** drawing D302 Remediation Plan.
- 1.1.3 All comments given are based on the understanding that the proposed redevelopment will be as detailed above.
- 1.1.4 It should be noted that if there are any changes to the proposed redevelopment, they may affect whether the remediation strategy outlined in this report is still appropriate, and hence, warrant further consideration.
- 1.1.5 Any deviation from the agreed remediation strategy may affect whether final discharge of any planning conditions pertaining to the site is granted by the Local Authority.

1.2 Objectives

- 1.2.1 The purpose of this report is to identify the Best Practicable Techniques(s) (BPT) for the remediation of the site. This has been achieved by undertaking an options appraisal of potential remediation techniques and then designing a sustainable remediation strategy including verification plan.

1.3 Methodology

- 1.3.1 This report has been compiled in accordance with the guidance given in the Environment Agency / Department of Environment, Food, and Rural Affairs (DEFRA) Contaminated Land Report 11 'Model Procedures for the Management of Land Contamination' (Environment Agency. 2004), and the Environment Agency's three reports entitled 'Guiding Principles for Land Contamination' (Environment Agency. 2010).
- 1.3.2 CLR11 outlines a three-stage process in deriving a remediation strategy:
-  Identification of Feasible Remediation Options – this considers the general and technical factors that may affect the remedial option as well as the remediation and managerial objectives and produces a short list of potential BPT;
 -  Detailed Evaluation of Options – this considers the characterisation of the short-listed remedial options and remediation costs. An evaluation of environmental attributes is undertaken to select the BPT most suitable for the site;
 -  Remediation Strategy Design – this identifies the areas of the site requiring remediation and how the works are to be phased. It outlines the verification process and plan which ensure that the remediation works are complete in line with the desired remediation and managerial objectives.
- 1.3.3 This report should be read in conjunction with the following reports:
-  **jnp group** B20516 R002 Phase 1 & 2 Geoenvironmental investigation, dated November 2017.
 -  **jnp group** B21957 R002 Phase II Ground Investigation Report, dated August 2018.

2 FEASIBLE REMEDIATION OPTIONS

2.1 Pollutant Linkages

2.1.1 From the initial phase of ground investigation and subsequent assessment undertaken at the site in November 2017, contamination was recorded within the topsoil at the site in the following locations:

 TP2 @ 0.5 m – arsenic 58 mg/kg.

2.1.2 In general, the topsoil comprised dark brown / grey sandy clay and was encountered up to 0.85 m below ground level [bgl] in this area and was generally around 0.50 m thick across the remainder of the site.

2.1.3 During the second phase of investigation (predominantly for the northern development of the wider site) carried out in August 2018, the area surrounding the previously-identified contamination was investigated further. The initial plan was to dig a series of pits within a grid area within the proposed garden in the south-west corner to test for further arsenic contamination. However, when jnp group arrived at the site, the building contractor had already removed topsoil from the area. It was estimated that at least 0.70 m of topsoil had been removed from this area. A grid of testing was still carried out approximately 0.8 m below the original ground level to identify any deeper ground contamination.

2.1.4 From the second ground investigation and subsequent assessment undertaken at the site in August 2018, contamination was recorded within the topsoil at the site in the following location, in the same south western part of the site as TP2:

 VS1 @ 0.10 m (approximately 0.80 m below the original ground level)– arsenic 52 mg/kg.

2.1.5 The removed topsoil had been stockpiled in the northern part of the site, testing was also carried out on a series of samples from this stockpile. All the stockpile soil samples thus tested were found to have arsenic contamination below 37 mg/kg (Remedial Target Value) (See Appendix E).

2.1.6 Hence remediation at the site is required in the above areas in order to break the source-pathway-receptor linkages and ensure that the site is suitable for use.

2.2 Remediation Objectives and Remedial Target Values

2.2.1 The overall general objective is to ensure that the site is suitable for use and to protect the identified receptors (future site residents).

2.2.2 The following remediation objectives specific to the contaminants apply to the site:

 To remove the risk to receptors from arsenic contaminated topsoil in all garden areas.

2.2.3 The following remediation objectives relating to the remediation option are considered applicable to the site:

 The amount of soil material going off site to hazardous landfill must be kept to a minimum.

2.2.4 The initial Remedial Target Values (RTV), given in Table 2.1 that follows, have been suggested for the remediation works. In addition, the proposed RTV has been selected to ensure that following remediation the site cannot be classified as “Contaminated Land” under Part IIA of the Environmental Protection Act 1990.

Table 2.1: RTV

Determinant	RTV (mg/kg)	Source
Arsenic	37	LQM S4UL

2.3 General Factors Affecting Remediation Options

2.3.1 Remediation is required in the area as shown on drawing B21957 D302.

2.4 Access

- 2.4.1 Good access is available to the site off Mill Moor Road for any site vehicles or plant that may be required. Any vehicle movements may have to be timetabled to ensure free flow of traffic. The access road is considered wide enough to enable standard sized vehicles to pass through single file.

2.5 Ground Conditions and Physical Features

- 2.5.1 The topography of the site is unlikely to hinder any remediation option used. However, the area requiring remediation is small and hence this is likely to restrict the use of on-site remediation treatment options.
- 2.5.2 No groundwater was encountered during the intrusive investigation. Groundwater levels can vary according to the season, as such shallow groundwater levels may have implications for any excavations.

2.6 Material Volumes

- 2.6.1 From drawing B21957 D302 the area requiring remediation is estimated to be 138m². If this had to be excavated out to a minimum thickness of 0.60 m required in garden areas, it would comprise an estimated volume of 83m³ of soil material requiring remediation.
- 2.6.2 The anticipated small volume of material requiring remediation is likely to warrant on-site treatment methods unviable at the site.

2.7 Hazardous Waste Assessment

- 2.7.1 The concentrations of contaminants recorded have been assessed in accordance with the methodology outlined in the Waste Classification: Guidance on the classification and assessment of waste publication WM3 (EA, SEPA, NIA, NRW. May 2015).
- 2.7.2 The concentrations of waste are considered to be non-hazardous.

2.8 Permits and Other Regulatory Controls

- 2.8.1 Dependent upon the remediation option(s) adopted for the site, any mobile plant utilised on site may require environmental permits or appropriate exemption to operate.
- 2.8.2 All dusts, noise, odours arising from the remediation works will be subject to control measures under Part III of the Environmental Protection Act 1990.
- 2.8.3 Planning requirements for the utilisation of remediation plant or other works required must be confirmed prior to commencement.

2.9 Services

- 2.9.1 There are no current services that cross the site.

2.10 Timescales

- 2.10.1 To meet with the redevelopment timescales, remediation methods requiring shorter treatment times and minimum amount of on-going monitoring are preferred by the client.

2.11 Technical Factors Affecting Remediation Options

- 2.11.1 Contaminant type and soil type are the two key factors that affect the choice of any remediation option being considered.
- 2.11.2 To treat gravelly clay soils contaminated with metals there are the following options:
-  Biological: slurry phase bioremediation;
 -  Physical: soil washing;
 -  Chemical: accelerated natural attenuation; surface amendments;

-  Solidification / stabilisation: cement and pozzolan based system; e-clays, vitrification;
-  Thermal: thermal desorption;
-  Other: cover containment system; disposal to landfill;
-  Other: transfer to soil treatment centre.

2.12 Design Requirements Affecting Remediation Options

- 2.12.1 There is no design requirement to raise ground elevations on-site from the original ground level. The removed topsoil is to be replaced across the site where required i.e. within garden areas. Should this requirement change then contaminated ground within the garden area in the south-west of the site will need to be over-excavated to a depth that at least 0.60 m thickness of clean topsoil can be deposited.

2.13 Management Objectives Affecting Remediation Options

- 2.13.1 The following management objectives are considered to be appropriate for the site:
-  To achieve remediation of the identified pollutant linkages to the agreed RTV with a view to demonstrating the site is “suitable for use” for its intended future end use;
 -  To reduce the amount of hazardous waste being landfilled in line with current UK waste hierarchy;
 -  To take into account any design requirements;
 -  To achieve a remediation strategy that can be agreed by all key stakeholders (client, regulators);
 -  To meet all regulatory requirements relevant to the installation or operation of remediation options;
 -  To avoid unacceptable health and safety, and adverse environmental impacts during remediation;
 -  To minimise long term liabilities;
 -  To avoid long term maintenance or monitoring obligations;
 -  To undertake remediation in accordance with good technical practice;
 -  To achieve successful remediation within a particular timescale and budget.

2.14 Shortlist of Feasible Remediation Options

- 2.14.1 Given the small volume of material requiring treatment, on-site treatment options are considered to be either not practicable or economically viable to warrant further consideration.. Therefore, the following are considered options:
-  Topsoil, has been excavated, stockpiled on-site and is to be reused as part of the redevelopment phase. The topsoil has been tested for arsenic concentrations and no exceedances of the RTV were identified. The re-used topsoil within the garden area in the south-west of the site must be at least 0.60 m thick, so that underlying soils with elevated arsenic concentrations are not readily accessible.
 -  Should the levels on-site be lowered so that less than 0.60 m of reused topsoil is deposited in the south-west corner of the site then the area will need to be over-excavated to allow such a depth of cover soils and the arisings should be disposed of off-site to landfill (incurring Landfill Tax costs; based on soil results previously obtained the soil should classify as non-hazardous) or to a soil treatment centre. Both methods would incur haulage costs.
- 2.14.2 It is considered that the most cost-effective option is to backfill with site won material that has been tested and proven uncontaminated in comparison with the RTVs.

3 DETAILED EVALUATION OF SHORTLISTED REMEDIATION OPTION

- 3.1.1 The purpose of this stage is to confirm the feasibility of the shortlisted remediation option with respect to the specific circumstances of the site.

3.2 Characterisation of Remediation Options

Applicability of technique to contaminant, soil type and volume

- 3.2.1 The method can treat the contaminant, soil type and volume.

Effectiveness to reduce contaminants to acceptable concentrations

- 3.2.2 The method is capable of treating the metal contaminant concentration to acceptable concentrations.

Timescales of treatment

- 3.2.3 The method is considered to be relatively quick and can easily be linked in to the overall development programme.

Operational requirements

- 3.2.4 Access to the site is not restricted and would not hinder plant / haulage lorry movements.

- 3.2.5 There are no services present in the area of the site that would represent a constraint to the remediation.

Commercial availability and track record in UK

- 3.2.6 The method is currently available in the UK and has been successfully used on a variety of sites within the UK.

Waste Disposal and Sustainability, should it be required

- 3.2.7 Off-site transfer to soil treatment centre does not create a waste and a useful product is obtained following treatment.

- 3.2.8 The current UK Waste Hierarchy is “reduce – re-use – recycle – recover – disposal”. This is a requirement of the revised European Waste Framework Directive (Directive 2008/98/EC) which has been transposed into UK law by the Waste (England and Wales) Regulations 2011.

- 3.2.9 Any excavated material and excess spoil should always be classified prior to removal from site as required by ‘Duty of Care’ (Environmental Protection Act 1990) legislation. This means that material has to be given a proper description and waste classification prior to removal consequently; details of the materials required for disposal, together with certificates of chemical analysis should be sent to a suitably licensed waste disposal contractor for classification and to confirm compliance with their license conditions.

- 3.2.10 The arsenic-impacted topsoil is unlikely to be classified as hazardous waste (subject to agreement by the waste receiver).

- 3.2.11 The option to excavate and dispose of material to a landfill site is considered to be the least sustainable option.

- 3.2.12 The option to excavate and transfer to a treatment centre is considered the most sustainable option as a useful product is obtained.

Health and Safety Impacts

- 3.2.13 No additional health and safety impacts are likely from the methods short-listed.

Environmental Impacts

- 3.2.14 All methods involve the use of general earthworks machinery and hence there would be dust, noise and possibly odour generation.

Long-Term Obligations

- 3.2.15 None of the above options shortlisted would entail long term monitoring obligations.

Verification

- 3.2.16 Following the placement of the uncontaminated topsoil, the minimum 0.60 m depth of the emplaced soil should be demonstrated within the garden areas in the south-western part of the site via test pit excavation and surveying of levels/measurement of thicknesses.

3.3 Costs

- 3.3.1 There are a variety of costs that need to be considered when deciding on viable remediation options. The following warrant further consideration: mobilisation, plant and labour costs, disposal to landfill (including Landfill Tax and haulage costs), and verification testing.

3.4 Best Practicable Technique

- 3.4.1 Given the small volume of material requiring remediation, the options are:

-  Re-use of site won material that has proven to be uncontaminated, ensuring that there is at least 0.60 m thickness within the garden areas in the south-western part of the site. this may have to be attained by over-excavating within the area prior to placing the topsoil.

4 REMEDIATION STRATEGY

4.1 Implementation Plan

- 4.1.1 The main works shall be undertaken by a suitably qualified earthworks Contractor and the works shall be supervised by suitably qualified geo-environmental specialist.
- 4.1.2 All works on site shall be undertaken following the guidance given in C762 Environmental Good Practice on-site (CIRIA C762) and Construction Site Safety GE700E/18 (CITB 2018).

4.2 Material Requiring Excavation

- 4.2.1 The area of ground requiring remedial action is shown on drawing B21957 D302. Should additional excavation be required, if practicable, the ground requiring excavation shall be directly excavated onto haulage lorries or if this is not achievable, stockpiled in a designated area to await disposal. All stockpiled material shall be placed on tarpaulin sheets to avoid any cross contamination.
- 4.2.2 In addition, any material excavated as a result of foundations or service trenches that is un-suitable for re-use on site, or surplus to requirements shall have to be removed from site as a waste.
- 4.2.3 WAC testing may be required for material destined for disposal at an inert or hazardous waste management facility.
- 4.2.4 The earthworks' Contractor is to keep records of any material removed off-site either for treatment and re-use or as a waste destined for a waste management facility. The Waste License and Permit Register form, as given in Appendix B, detailing the waste codes and haulier and receive details should be completed by the Contractor for any waste material generated requiring removal. In addition, any material removed of site shall be logged on the Waste Disposal Record form given in Appendix C. The completed waste management form, duty of care and consignment notes shall be provided to **jnp group** for inclusion in the verification report.

4.3 Re-use of Site Won Material

- 4.3.1 The existing topsoil has been stripped and stockpiled for re-use in gardens areas. Chemical testing (for arsenic concentrations) has confirmed this meets the testing criteria and can be re-used on-site. This chemical testing has been undertaken a rate of more than one test per 250m³.

4.4 Imported Fill

- 4.4.1 Importing of additional uncontaminated soil is not anticipated to be required.

4.5 Verification Chemical Testing – Excavation Level

- 4.5.1 Following emplacement of the site-won soils in garden areas the south-western section, the 0.60m minimum cover of uncontaminated soils will need to be verified. This should be carried out by a **jnp group** geo-environmental specialist and with evidence of survey levels (or cover thicknesses) pre and post deposition of clean topsoil.

4.6 Verification Reporting

- 4.6.1 Following the completion of the remediation works, all records of excavation and material placement (including drawings and photographs), is to be provided to **jnp group**.
- 4.6.2 Following the completion of the remediation works a verification report is to be produced by **jnp group** that details the remediation work undertaken, the verification testing undertaken, and the details of any material removed from site.
- 4.6.3 It is recommended that a copy of this report is submitted to the Regulatory Authorities for their approval.

4.7 Environmental Monitoring

4.7.1 During all remediation work, appropriate dust suppression measures shall be utilised by the earthworks' Contractor to ensure that any dust generation is kept to a minimum. The following shall be utilised at the site:

-  Sheet piling of all stockpiles kept on-site;
-  Sheet piling of vehicles transporting materials to and from the site;
-  Limiting the speed of site vehicles (not including dump trucks);
-  Applying a coarse gravel surface (or similar) along the haulage road, where considered appropriate;
-  Placing plant as far as possible from sensitive areas (eastern area is closest to existing residential development) and switching engines off when not in use;
-  Provision of wheel washing facilities and/or regular use of road sweepers at access points and on local roads (to remove mud from public highways);
-  Regular dampening down of haul roads;
-  Provision for a project weather station to record data such as wind (speed and direction), precipitation, temperature etc.

4.7.2 Given the close proximity of local residential properties, the earthworks' Contractor should arrange for a static Frisbee dust deposition gauge to be placed at each of the site boundaries in order to monitor dust on a weekly basis. Baseline dust levels should be established two weeks prior to any work commencing on site.

4.7.3 The earthworks' Contractor should produce a Construction Environmental Monitoring Plan and Method Statement for approval prior to the works commencing on site.

Odours

4.7.4 Should odours become of concern during the works then the following could be employed at the site:

-  Avoid stockpiling highly odour material close to residential properties;
-  Cover all stockpiles;
-  Use modern plant and generators and service them regularly
-  Turn off plant when not in use;
-  Provision of odour suppression system. A method statement should be provided by the Contractor for this work prior to the start of the works.

Noise

4.7.5 Prior to commencement of works, a record of current ambient noise levels should be undertaken. Noise levels are predicted to require management during the works, based upon the requirements of BS5228 – code of practice for noise and vibration control on construction and open sites. The works are close to a residential area and noise levels could cause a nuisance, as such the Contractor should include control measures when developing construction programmes and methods of work.

4.7.6 The controls should be developed on an activity-by-activity basis and should take into account the sequencing of works.

- 4.7.7 The Best Practicable Means, as defined in the 'Control of Pollution Act, 1974' should be followed as it is the most effective means of controlling noise from construction sites. However, where appropriate the following measures should be considered:
-  Noisy activities shall be restricted to certain parts of the site, and high noise generating activities shall be limited;
 -  On-site noise levels to be monitored regularly, particularly when changes in process are implemented or when regular complaints are received. Monitoring should be undertaken in accordance with Annex E of BS5228: Part 1: 1997;
 -  All pneumatic tools shall be fitted with silencers or mufflers;
 -  Any compressors brought on-site shall be silenced or sound reduced models fitted with acoustic enclosures to reduce exposure;
 -  Local hoarding, screens or barriers shall be erected as necessary to shield particularly noisy activities;
 -  Working hours would be restricted to 0800 – 1800 Monday to Friday. No construction works during weekends or public holidays unless prior written consent of the Principal Environmental Health Officer is obtained.
- 4.7.8 Noise monitoring shall be undertaken in accordance current industry practice.
- 4.8 Control of Water in Excavations**
- 4.8.1 Ponded water within excavations, arising from periods of inclement weather or groundwater inflow, likely to be in contact with contaminated soils, which may result in contaminants leaching into the water, as well as suspended solids / silts being present. Hence, arrangements need to be made for its correct disposal.
- 4.8.2 The following should be undertaken to assist with the control of ponded excavation water:
-  Work on area at a time to avoid too many deep or large excavations being open at once;
 -  On site storage of suitable materials and equipment to construct a temporary attenuation tank if required;
 -  On site storage of suitably powered pumps and sufficient lengths of hoses to enable dewatering of excavation as and when required.
- 4.8.3 Any ponded water is likely to contain dissolved and suspended contamination and suspended solids; therefore, the water is unsuitable for the following:
-  Use as dust suppression water;
 -  Direct disposal to surface water or foul sewer;
 -  Direct disposal to the adjacent watercourses.
- 4.8.4 Disposal to sewer network or adjacent watercourses would require some form of on-site treatment prior to any discharge. An Environmental Permit would be required from the Environment Agency for discharge to surface water which has associated costs and time implications. Discharge to the sewer network again would require approval from the service provider. Any mobile on-site treatment would have cost implications and would also need a designated area of the site, which may not be feasible. Due to the approaching start date for the advanced works, this option is not considered viable.
- 4.8.5 Regular site walkovers should be undertaken throughout the day to check ponding within excavations.

- 4.8.6 Should a significant amount of ponded water be encountered within the excavation, then a temporary attenuation pond should be constructed to provide localised water storage to await transfer via a tanker to a suitable waste water receiver.
- 4.8.7 Sampling and chemical testing of the water within the attenuation pond is likely to be required by the waste water receiver and, hence, this should be undertaken at regular intervals to suit the amount of water generated. Chemical testing for a gasworks suite of contaminants plus pH, suspended solids, total organic carbon, biological oxygen demand and chemical oxygen demand or to suit the requirements of the waste water receiver.
- 4.8.8 Correct duty of care procedures must be followed regarding the transfer and disposal of waste. Copies of the relevant duty of care transfer notes, haulier and waste facilities information (address and copies of Environmental Permits) shall be provided to **jnp group** for inclusion in the final Verification Report.
- 4.9 Dealing with Unexpected Contamination**
- 4.9.1 Whilst investigation works have been undertaken at the site, it remains possible that unexpected soil contamination may be encountered during the process of site clearance, excavation and / or construction.
- 4.9.2 There is the potential for areas of previously unidentified and unexpected contamination to exist at the site such as ashy soils, brightly coloured soil, significantly oily or odorous material, asbestos-impacted soils and underground tanks.
- 4.9.3 If during the works such material is encountered, then the earthworks Contractor should inform **jnp group** directly who would then advise on the best course of action. Photographic and written records should be kept by the earthworks Contractor detailing any such material.
- 4.9.4 A copy of this strategy for dealing with unexpected contamination should be made available on site and ground workers should be made aware of it.
- 4.10 Environmental Incidents**
- 4.10.1 In the event of an unforeseen environmental incident (pollution occurrence) on-site work should be stopping in that area immediately and the Environmental Agency should be contacted via their incident hotline 0800 807 060.
- 4.10.2 Emergency spill kits shall be kept on-site in strategic locations and a member of staff who is trained to use them shall be present on-site at all times.
- 4.11 Recommendations**
- 4.11.1 It is recommended that a copy of this options appraisal and remediation strategy be submitted to the Regulatory Authorities for their approval prior to any work continuing or commencing at the site.

5 REFERENCES

-  BRE 2005: Special Digest 1. Concrete in Aggressive Ground. Building Research Establishment.
-  BS 5930:1999. Code of practice for site investigations. British Standards Institution. London.
-  BS 8485. 2015. Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings. British Standards Institution. London.
-  BS 8576. 2013. Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOC). British Standards Institution. London.
-  BS 10175: 2001. Investigation of potentially contaminated sites - code of practice. British Standards Institution, London.
-  BS 3882:2015. Specification for topsoil and requirements for use. British Standards Institution. London.
-  BS 8601:2013. Specification for subsoil and requirements for use. British Standards Institution. London.
-  Card G, Wilson S, Mortimore S. 2012. A Pragmatic Approach to Ground Gas Risk Assessment. CL:AIRE Research Bulletin RB17. CL:AIRE. London.
-  CL:AIRE and Chartered Institute of Environmental Health (CIEH). 2008. Guidance on Comparing Soil Contamination Data with a Critical Concentration. CL:AIRE / CIEH. London.
-  CL:AIRE. 2013. SP1010 – Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination. CL:AIRE. London.
-  CL:AIRE. 2016. Control of Asbestos Regulations 2012- Interpretation for Managing and Working with Asbestos in Soil and Construction and Demolition Materials. Industry Guidance. CL:AIRE. London.
-  CIRIA C665. 2007. Assessing Risks Posed by Hazardous Ground Gases to Buildings. CIRIA. London.
-  CIRIA C733. 2014. Asbestos in Soil and Made Ground: A Guide to Understanding and Managing Risks. CIRIA. London.
-  DEFRA and EA (2004). Model Procedures for the Management of Land Contamination. CLR11. Environment Agency. Bristol.
-  DEFRA. 2014. SP1010 - Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document. DEFRA. London.
-  Environment Agency. 2005. The UK Approach for Evaluating Human Health Risks from Petroleum Hydrocarbons in Soils. P5-080/TR3.
-  Environment Agency. 2006. Remedial Targets Methodology. Hydrogeological Risk Assessment for Land Contamination.
-  Environment Agency. 2008. Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values. Science Report SC050021/SR7.
-  Environment Agency. 2009. Human Health Toxicological Assessment of Contaminants in Soil. Science Report SC050021/SR2. Bristol.
-  Environment Agency. 2009. Updated technical background to the CLEA model. Science Report SC050021/SR3. Bristol.
-  Environment Agency. 2009. CLEA Software (Version 1.06) - Science Report SC050021/SR4. Bristol.
-  Environment Agency. 2010. Guiding Principles for Land Contamination. GPLC1. Bristol.

-  Environment Agency. 2010. Guiding Principles for Land Contamination - FAQs, technical information, detailed advice and references. GPLC2. Bristol.
-  Environment Agency. 2010. Guiding Principles for Land Contamination – Reporting checklists. GPLC3. Bristol.
-  Environment Agency. 2010. Waste acceptance at landfills – Guidance on waste acceptance procedures and criteria. Bristol.
-  Environment Agency. 2013. Chemical Standards Database - <http://evidence.environment-agency.gov.uk/ChemicalStandards/ChemicalsByName.aspx>
-  Environment Agency. 2015. Waste Classification: Guidance on the classification and assessment of waste. First Edition. Technical Guidance WM3. Bristol.
-  Land Quality Management & Chartered Institute of Environmental Health (2015). The LQM/CIEH S4UL for Human Health Risk Assessment - LQM CIEH. Land Quality Press, Nottingham.
-  TPH Criteria Working Group: 1997: Total Petroleum Hydrocarbon Group Series. Volume 3. Selection of Representative TPH Fractions Based on Fate and Transport Considerations.
-  Wilson S, Card G and Haines S. 2008. Ground Gas Handbook. Dunbeath. Whittles Publishing.
-  Yorkshire and Humberside Pollution Advisory Council. Version 3.1 October 2014. Verification Requirements for Cover Systems. Technical Guidance for Developers, Landowners and Consultants.

Figures / Drawings



Figure 1

Project:

Land off Mill Moor Road, Meltham

Project No:

B21957

Site Location Plan



john newton & partners

jnp group

Consulting Engineers



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Scaled dimensions should be checked with the Architect.
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Trial Pit

FOR INFORMATION

Rev. A Site plan extended to suit as approved planning layout, Plots 15-19 phase 2 floor levels raised to suit drainage comments 30.05.18 SH
Revision:

acumen
designers & architects
acumenarchitects.co.uk 01484 546000
Headrow House, Old Leeds Road, Huddersfield, HD1 1SG

CLIENT:
PENNINE DEVELOPMENTS LTD

JOB TITLE:
**PROPOSED DEVELOPMENT AT
LAND OFF MILL MOOR ROAD,
MELTHAM, HOLMFIRTH**

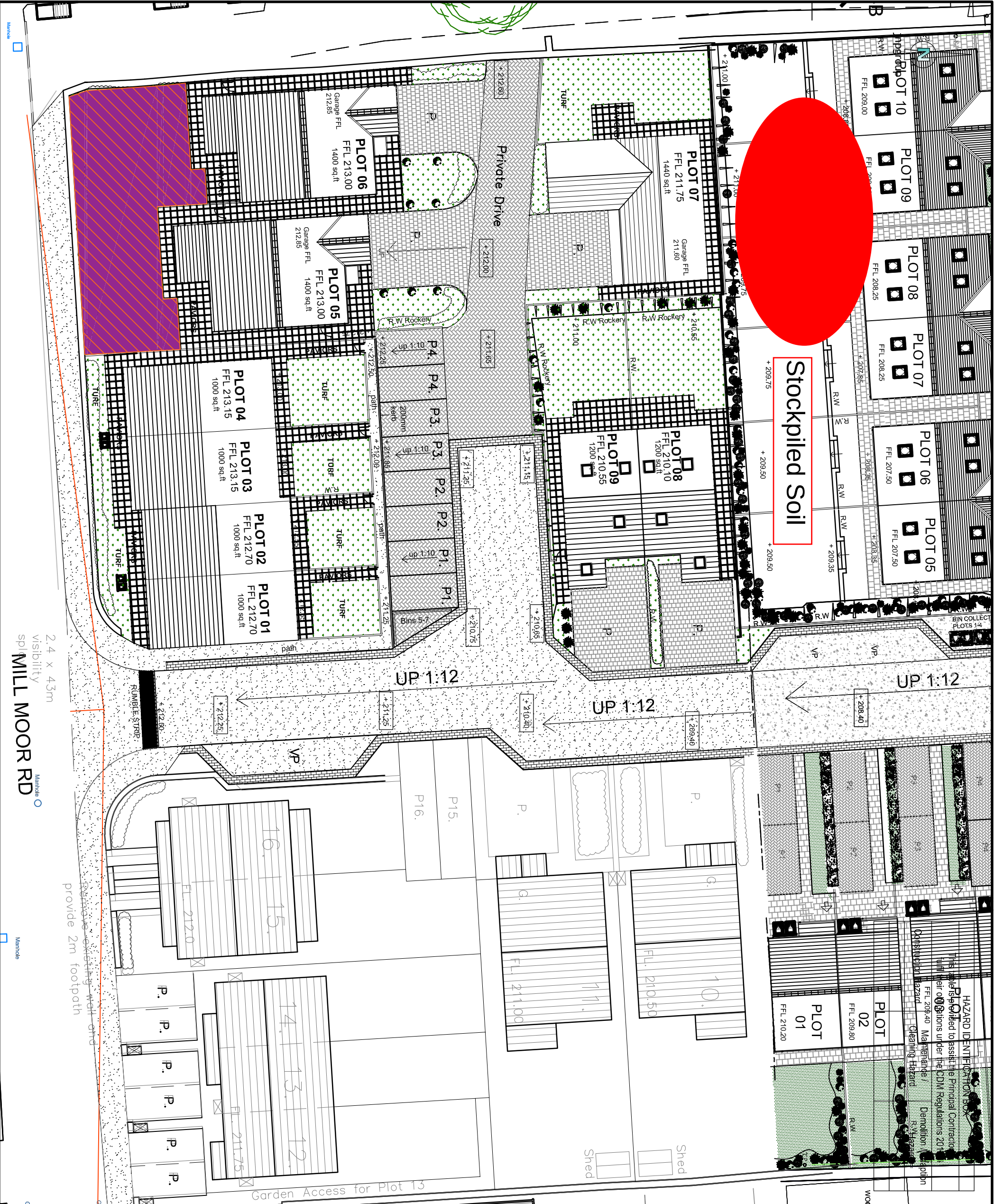
DRAWING TITLE:
PROPOSED SITE PLAN

DRAWN:	SH	DATE:	MAR 2018
CHECKED:	JC	SCALE:	1:200 @ A1
DRAWING NUMBER:	2492-PH1 - 100A		

PROPOSED SITE PLAN
SCALE 1:100

**Delineated
Area**





Health and Safety Note:
The details on this drawing have been prepared on the assumption that a competent contractor will be carrying out the works. If the contractor(s) considers that there is insufficient Health and Safety information on this drawing, this should immediately be brought to the attention of the designer.

- Notes:-**
- Where this drawing has been issued in electronic .dwg format it has been done so in good faith. jnpgroup do not take any responsibility for any inaccuracies in the electronic data, which should be checked against the paper (or .pdf) drawing issue. Any apparent discrepancies should be immediately reported to jnpgroup. The electronic .dwg file should not be assumed to be to scale and should not be used for 'overlying', setting out or checking of any third party information. All dimensions should be taken from the paper (or .pdf) version of the drawing. Electronic drawings may contain third party information. jnpgroup take no responsibility for this information, which should be checked against the originator's paper drawing(s).
 - All working dimensions to be checked on site.
 - Do not scale.
 - Any discrepancies between drawings of different scales, and between drawings and specification where appropriate to be notified to The Engineer for decision.
 - Copyright reserved. This drawing may only be used for The Client and location specified in the title block. It may not be copied or disclosed to any third party without the prior written consent of jnpgroup.
 - This drawing should only be used for construction if the drawing status is "Construction". jnpgroup take no responsibility for construction works undertaken to drawings which are not marked with this status.

Area requiring remediation

Rev.		Date	Amendment	By	Chk.
Status Preliminary					
 john newton & partners Consulting Engineers www.jnpgroup.co.uk Chesham • Briprouse • Harlepool • Leamington Spa • Sheffield Tel: 01926 889555 E-mail: leamingtonspa@jnpgroup.co.uk					
Client Penine Developments Ltd					
Job Land at Mill Moor Road, Meltham					
Title Remediation Plan					
Scale @ A3 Date 19.11.2018					
Drawn by ET		Checked by CDW		Approved by HI	
Drawing No. B21957 D302					
Rev. -					

Appendix A

Limitations



1 INTRODUCTION

- 1.1.1 This report is confidential and has been prepared solely for the benefit of the client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from **jnp group**; a charge may be levied against such approval. **jnp group** accepts no responsibility or liability for the consequences of this document being used for any purpose or project other than for which it was commissioned, and: this document to any third party with whom and agreement has not been executed.
- 1.1.2 Any comments given within this report are based on the understanding that the proposed works to be undertaken will be as described in the introduction and the information referred to and provided by others and will be assumed to be correct and will not have been checked by **jnp group** and **jnp group** will not accept any liability or responsibility for any inaccuracy in such information.
- 1.1.3 Any deviation from the recommendations or conclusions contained in this report should be referred to **jnp group** in writing for comment and **jnp group** reserve the right to reconsider their recommendations and conclusions contained within. **jnp group** will not accept any liability or responsibility for any changes or deviations from the recommendations noted in this report without prior consultation and our full approval.
- 1.1.4 The details contained within this report reflect the site conditions prevailing at the time of investigation. **jnp group** warrants the accuracy of this report up to and including that date. Additional information, improved practice or changes in legislation may necessitate this report having to be reviewed in whole or in part after that date. If necessary, this report should be referred back to **jnp group** for re-assessment and, if necessary, re-appraisal.
- 1.1.5 This report is only valid when used in its entirety. Any information or advice included in the report should not be relied upon until considered in the context of the whole report. Whilst this report and the opinion made herein are correct to the best of **jnp groups'** belief, **jnp group** cannot guarantee the accuracy or completeness of any information provided by third parties.
- 1.1.6 The report represents the finding and opinions of experience geotechnical and geoenvironmental engineers. **jnp group** does not provide legal advice and the advice of lawyers may also be required.
- 1.1.7 It should be noted that the following were not included as part of the agreed scope of works with the client: detailed ecological surveys and assessment; groundwater monitoring and sampling; geotechnical requirements etc.
- 1.1.8 **jnp group** has provided advice and made recommendations based on the findings of the work undertaken, however this is subject to the approval / acceptance by the relevant regulatory authorities.

1.2 Objectives

- 1.2.1 The work undertaken to provide the basis of this report comprised a study of available documented information from a variety of sources (including the Client), together with (where appropriate) a brief walk over inspection of the site. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only to the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, **jnp group** reserves the right to review such information and, if warranted, to modify the opinions accordingly. It should be noted that any risks identified in this report are perceived risks based on the information reviewed; actual risks can only be assessed following a physical investigation of the site.
-

1.3 Phase II Intrusive Investigations

- 1.3.1 The investigation of the site has been carried out to provide sufficient information concerning the type and degree of contamination, and ground and groundwater conditions to allow a reasonable risk assessment to be made.
- 1.3.2 Where intrusive investigations have been undertaken they have been designed to provide a reasonable level of assurance on the conditions. Given the discrete nature sampling, no investigation technique is capable of identifying all conditions present in all areas. The number of sampling points and the methods of sampling and testing do not preclude the existence of localised “hotspots” of contamination where concentrations may be significantly higher than those actually encountered. The risk assessment and opinions provided, inter alia, take into consideration currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.
- 1.3.3 The objectives of the investigation have been linked to establishing the risks associated with potential human targets, building materials, the environment (including adjacent land), and to surface and ground water. The amount of exploratory work and chemical testing undertaken has necessarily been restricted by the short timescale available, and the locations of exploratory holes have been restricted to areas unoccupied by the building(s) on the site and by buried services.
- 1.3.4 Gas and groundwater levels may vary from those reported due to seasonal, or other effects.

1.4 Remediation and Verification Reports Limitations

- 1.4.1 The risk assessment and opinions provided, inter alia, take into consideration currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.
 - 1.4.2 Where intrusive investigations have been undertaken they have been designed to provide a reasonable level of assurance on the conditions. Given the discrete nature sampling, no investigation technique is capable of identifying all conditions present in all areas. The number of sampling points and the methods of sampling and testing do not preclude the existence of localised “hotspots” of contamination where concentrations may be significantly higher than those actually encountered.
 - 1.4.3 If costs have been included in relation to the site remediation these must be confirmed by a qualified quantity surveyor. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only to the purpose for which the report was commissioned. The information reviewed from Third Party should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, **jnp group** reserves the right to review such information and, if warranted, to modify the opinions accordingly.
 - 1.4.4 Whilst this report and the opinion made herein are correct to the best of **jnp groups'** belief, **jnp group** cannot guarantee the accuracy or completeness of any information provided by third parties.
 - 1.4.5 Gas and groundwater levels may vary from those reported due to seasonal, or other effects.
-

Appendix B

Waste Licences and Permits



Waste License and Permit Register

Material Description	EWC	Origin	Material carrier			Disposal site/Treatment works	
			Name	License Number	Expiry Date	Name	License No: Exemption Ref.
Scrap Metal							
Topsoil							
Non-hazardous waste							
Asbestos impacted hazardous waste							
Hazardous waste							
Construction / demolition rubble							
Free product contamination water							

Appendix C

Waste Disposal Records



Waste Disposal Log

Waste Disposal Records

Date Removed	Waste Type	Identifying of the person removing the waste	Site the waste of being taken to and whether licensed or exempt	Waste carrier and registration number	Confirmation of delivery*

*Evidence of waste carrier registration and waste transfer or hazardous waste consignment notes for each removal of waste should be provided either as part of the plan, or filed and cross references

Appendix D

Imported Soil Documentation



IMPORTED SOIL DOCUMENTATION FORM

Stockpile Identification Reference	
Material Type	
Source Site	
Consignment Note Reference Numbers	
Volume of Stockpile (Or number of loads)	
Plots Material to be Used In	

Signed.....

Position.....

Date.....

Appendix E

Test Results





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f: 01923 237404

e: reception@i2analytical.com

e: charley.wainwright@jnpgroup.co.uk

Analytical Report Number : 18-15773

Project / Site name:	Mill Moor Road	Samples received on:	25/10/2018
Your job number:	B21957	Samples instructed on:	25/10/2018
Your order number:		Analysis completed by:	31/10/2018
Report Issue Number:	1	Report issued on:	31/10/2018
Samples Analysed:	10 soil samples		

Signed

Jordan Hill
Reporting Manager
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :	soils	- 4 weeks from reporting
	leachates	- 2 weeks from reporting
	waters	- 2 weeks from reporting
	asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Analytical Report Number: 18-15773

Project / Site name: Mill Moor Road

Lab Sample Number				1075721	1075722	1075723	1075724	1075725
Sample Reference				TBSP1	TBSP2	TBSP3	TBSP4	TBSP5
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				04/09/2018	04/09/2018	04/09/2018	04/09/2018	04/09/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	4.9	3.0	2.0	7.5	10
Total mass of sample received	kg	0.001	NONE	0.15	0.33	0.15	0.37	0.13

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	26	31	17	27	22
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Analytical Report Number: 18-15773

Project / Site name: Mill Moor Road

Lab Sample Number				1075726	1075727	1075728	1075729	1075730
Sample Reference				TBSP6	TBSP7	TBSP8	TBSP9	TBSP10
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Date Sampled				04/09/2018	04/09/2018	04/09/2018	04/09/2018	04/09/2018
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	9.9	14	7.5	11	6.3
Total mass of sample received	kg	0.001	NONE	0.37	0.14	0.37	0.14	0.38

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	22	30	30	26	20
----------------------------------	-------	---	--------	----	----	----	----	----



Analytical Report Number : 18-15773

Project / Site name: Mill Moor Road

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1075721	TBSP1	None Supplied	None Supplied	Brown loam and sand with vegetation and gravel.
1075722	TBSP2	None Supplied	None Supplied	Brown loam and clay with gravel and vegetation.
1075723	TBSP3	None Supplied	None Supplied	Brown loam and clay with gravel and vegetation.
1075724	TBSP4	None Supplied	None Supplied	Brown loam and sand with gravel and vegetation.
1075725	TBSP5	None Supplied	None Supplied	Brown loam and sand with gravel and vegetation.
1075726	TBSP6	None Supplied	None Supplied	Brown loam and sand with gravel and vegetation.
1075727	TBSP7	None Supplied	None Supplied	Brown loam and sand with gravel and vegetation.
1075728	TBSP8	None Supplied	None Supplied	Brown loam and sand with gravel and vegetation.
1075729	TBSP9	None Supplied	None Supplied	Brown loam and sand with gravel and vegetation.
1075730	TBSP10	None Supplied	None Supplied	Brown loam and sand with gravel and vegetation.



Analytical Report Number : 18-15773

Project / Site name: Mill Moor Road

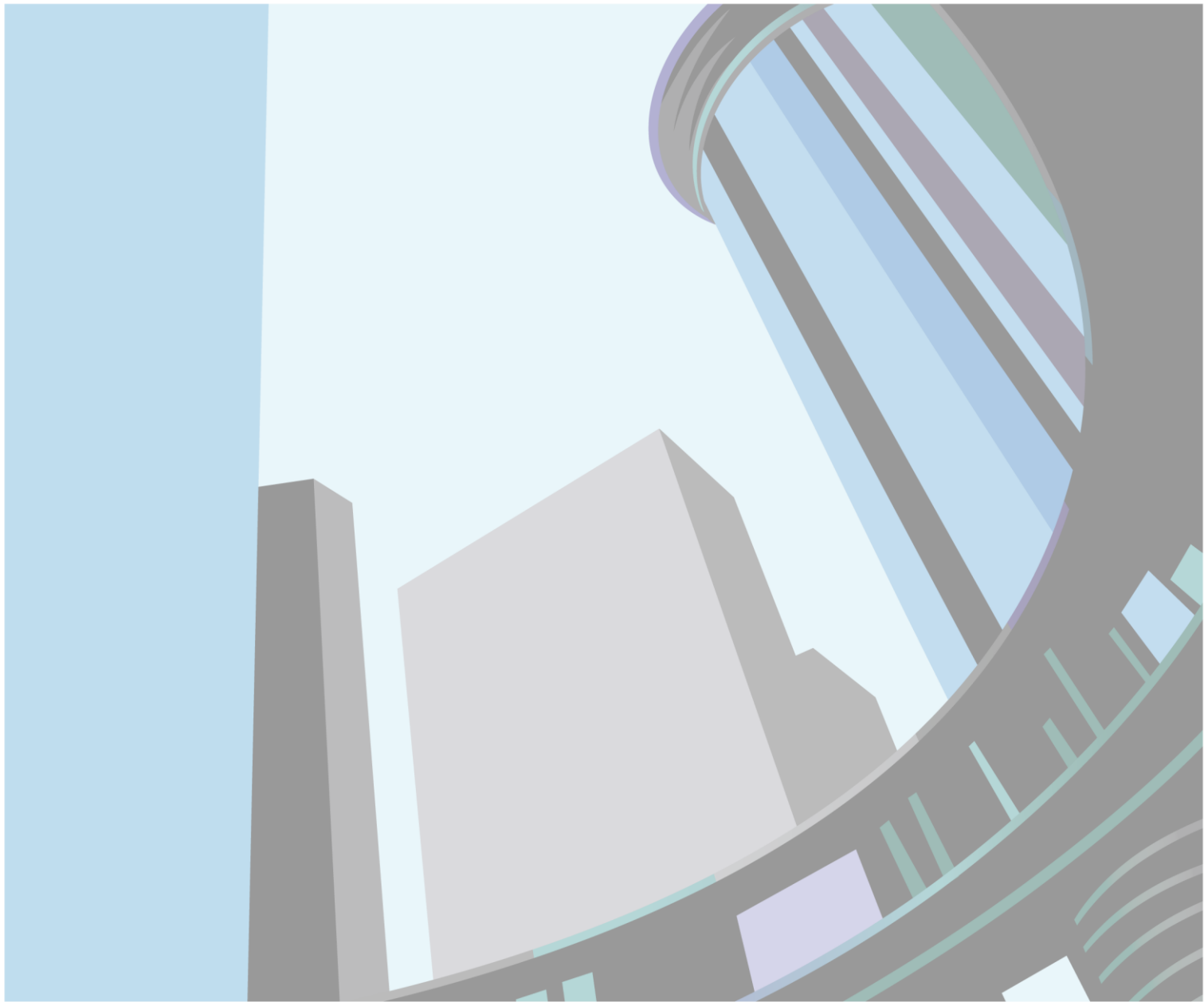
Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.

For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.



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