GIP Ltd.
Ground Investigation & Piling Limited

Mr Paul Wilshaw
6 The Bridge
Breach Lane
Tean
Staffordshire
ST10 4EP

26th July 2017
DAP/25890/B

For the attention of Mr Paul Wilshaw

Dear Sir

Re: Remedial Strategy and Verification Plan For A Proposed Residential Scheme at Teanford Mill, Breach Lane, Upper Tean, Staffordshire.

Remediation Strategy - Residential Scheme

Remediation Objectives

The testing carried out as part of the 2017 investigation suggests there are concentrations of lead, arsenic and asbestos fibres present within the shallow made ground soils across the site, which pose a risk to Human Health. In order to break the Source – Pathway – Receptor pollutant linkage, it is recommended that a remedial scheme is adopted to protect Human Health. Such a remedial scheme would comprise the importation of clean cover or topsoil in all front and rear garden areas to provide a growing medium. Further comments upon this remedial option are discussed below.

Importation of Clean Cover or Topsoil

Remediation will be undertaken such that the site is suitable for the proposed end use which will comprise the construction of single dwelling with associated gardens and parking areas. The remediation will be achieved by the construction of a capping layer in the areas where gardens and landscaping associated with the new domestic property is to be are to be created.

Capping Layers

As described above, elevated concentrations of lead, arsenic and asbestos fibres are present in the shallow made ground which poses an unacceptable risk to Human Health and remediation is required to allow the development of the site for the planned residential scheme. The risk posed to Human health from contamination in the shallow soils can be negated by the placement of a Capping Layer. It is recommended that the depth / thickness of the capping layer is 600mm in gardens and landscaped areas.

Hard Dig Capillary Break Layer / Geotextile Membrane

The installation of a hard dig capillary layer or geotextile membrane **beneath** the imported clean cover / topsoil is recommended.

Reporting of Unexpected Ground Conditions / Contaminants

A watching brief should be kept by site staff and ground workers with regards to unexpected contamination during development works. Unexpected contamination may occur in the form of petroleum hydrocarbons (usually associated with dark grey / black discoloured soil and a hydrocarbon odour), dyes, ashy materials or asbestos containing materials. Upon identification of any area of unexpected contamination, GIP should be notified (01902 459558) to determine a revised Remedial Strategy, if required. It is also recommended that photographic evidence is obtained of the ground conditions during demolition/construction works to demonstrate that nothing of undue concern was present.

Dust Suppression

As a matter of good practise, construction and site development personnel should follow the guidance stated in HSG 66 'Protection of Workers and the General Public during Redevelopment of Contaminated Land' during site operations. An adequate standard of Personal Protective Equipment (PPE) and the implementation of basic hygiene measures will be necessary. This includes the management of potential dust inhalation by construction workers during site works. Additional measures should also be adopted for working with asbestos which should include the wearing of appropriate masks, overalls and the wetting down of made ground soils during dry periods.

Verification

Capping Layers

The Capping Layer used shall be to the thickness / depth as detailed above and shall include a minimum of 150mm of topsoil. All subsoil and topsoil proposed for use shall be pre-validated prior to import and / or placement. The imported soils should be tested at a minimum frequency of 1 sample per 40m^3 and a minimum of 3 samples per source. The samples should be tested for metals, asbestos, cyanide, phenols, petroleum hydrocarbons and poly aromatic hydrocarbons. The results of the testing should not exceed the criteria detailed in Table 1 below.

Table 1: Applicable Threshold Values for Imported Soils (Soil Screening Values, Soil Guideline Values, Category 4 Screening Levels and Suitable Usage Levels - Residential End Use).

Contaminant	Threshold Level (mg/kg)
Copper	2400
Vanadium	410
Zinc	3700
Arsenic	37
Cadmium	22
Lead	200
Mercury	40
Nickel	180
Selenium	250
Cyanide	34
Phenols	420
Acenapthene	200
Anthracene	2300
Benzo(a)anthracene	7.5
Benzo(a)pyrene	2.2
Benzo(b)flouranthene	2.6
Benzo(ghi)perylene	315
Benzo(k)flouranthene	77
Chrysene	15
Dibenzo(ah)anthracene	0.24
Flouranthene	280
Flourene	165
Indeno(123-cd) pyrene	27
Naphthalene	1
Pyrene	620

Contaminant	Threshold Level (mg/kg)
Aliphatic C5-C6	259
Aliphatic C6-C8	14,700
Aliphatic C8-C10	144
Aliphatic C10-C12	4140
Aliphatic C12-C16	5260
Aliphatic C16-C35	145,000
Aromatic C5-C7	0.33
Aromatic C7-C8	610
Aromatic C8-C10	177
Aromatic C10-C12	389
Aromatic C12-C16	687
Aromatic C16-C21	804
Aromatic C21-C35	1220

Asbestos Containing Materials	No asbestos fibres to be present

Imported soils should be from a licensed source and be accompanied with appropriate documentation to confirm the soils are not waste or have a waste exemption. Agreement on the source of the imported materials would ideally be made with the appropriate Statutory Authorities before importation. The topsoil part of the Capping Layer should conform to the requirements of British Standards 3882: 2007 'Specification of Topsoil and requirements for use'. Topsoil and subsoil will be free of deleterious fragments such as concrete, brick, glass, wire, and metal or other potentially hazardous fragments which could cause injury. In addition, all imported materials must be free from invasive plant species (e.g. Japanese Knotweed).

Verification Methodology

All remediation works should be supervised by the Principal Contractor and monitored by a suitably qualified and experienced Geo-Environmental Engineer on a visiting basis. The verification works should be carried out in guidance with the methodologies and guidelines detailed below:

- The thickness of the capping layer should be verified at a an appropriate frequency which give the small nature of the site, 2 or 3 tests would appear applicable.

- The pits should extend through the full thickness of the specified capping layer and be verified on site by the Geo-Environmental Engineer.

- Each hand pit should be photographed with a measured scale to be incorporated into the final verification reports.

- Samples of the imported clean cover material should be obtained and tested for the contaminants outlined above in Table 1.

- A verification report detailing the plot number, depth of clean cover encountered, results of laboratory testing and photographic evidence should be provided for each plot tested. This should be provided in a letter report style format for each plot.

- Copies of these reports should be submitted to the Local Authority and NHBC for approval, with a copy also kept in the site office at all times for inspection as required.

Approval of this Remediation Strategy Report should be sought from the appropriate regulatory bodies prior to the adoption of any remedial strategies.

Re-Use of Excavated Materials

It is recommended that any excess spoil generated during development works are not re-used without prior chemical analysis and soils earmarked for removal from site should be disposed of at an appropriate landfill. The following measures should be carried out with regards to spoil removal from site:

- The loading of soils directly onto the haulage vehicles in order to avoid and potential cross contamination of underlying soils.

- Any stockpiled soils will be placed upon impermeable plastic sheeting to prevent any potential contamination of the underlying soils.

- Contact will be made will the designated landfill operators prior to the removal of soils from site in order to satisfy any testing requirements such operators may have.

- The waste transfer tickets should be retained.

Ground Gases

Recommendations for Remediation

In accordance with CIRIA document C665 and British Standards 8485 the highest recorded carbon dioxide levels and gas flow rate give the site a Characteristic Gas Situation of '1' defined as a 'very low' Hazard Potential, however the site has been upgraded to Gas Characteristic 2 on the basis of carbon dioxide levels in excess of 5% and the presence of a cover of made ground across the site.

Such a Situation will require the construction of some precautionary measures within the proposed residential structure (which would typically be classified as a 'Type A Building' in accordance with BS8485). The measures outlined below will need to be agreed with the Environmental Health Officer at Staffordshire Moorlands District Council & High Peak Borough Council:

► Suspended ground floor slabs will be reinforced to help reduce cracking with limited service penetrations and water bars around all service penetrations and at joints.

► Passive sub-floor venting will be installed using gravel or drains in hardcore.

► A proprietary gas resistant membrane will be installed, which should be installed to reasonable levels of workmanship / in line with current good practise under Construction Quality Assurance (CQA) and verified in accordance with NHBC guidelines for CS2 gas regime sites. The membrane is commonly laid on the floor, beneath the surface screed and extended across cavity walls. A plan is included within the appendix of this report containing details of the membrane installation.

If you have any queries, please do not hesitate to contact us.

Yours faithfully,
For: GIP Limited

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