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Geotechnical and Geo-environmental Consultants

Our Ref: 1183/131205/L1/2
Your Ref:

13th February 2014

Baz Patel
BRP Associates
Unit 2, Bigods Hall
Bigods Lane
Great Dunmow
Essex
CM6 3BE

Dear Baz

Re: Site 4, Royston Road, Baldock

Find attached the revised re-appraisal of the contaminated land site investigation report that was previously prepared for the site.

Yours sincerely
For and on behalf of Brown 2 Green Associates Ltd



Philip Miles
Director

UPDATE OF CONTAMINATED LAND SITE ASSESSMENT

SITE: Site 4

ADDRESS: Royston Road, Baldock, Hertfordshire

NATIONAL GRID: 525720 234300

The site location is presented in Figure 1.

1.0 Introduction

This report presents a re-appraisal of previous geo-environmental site investigation information that was generated for the site. The reappraisal is based on the following information:

- Report prepared by Soil Consultants Ltd, titled Preliminary Site Investigation Report, Royston Road, Baldock, Hertfordshire; dated 19th November 2004; ref: 3813/SCW/KB.
- Drawing prepared by Vincent Gorbling, titled Site 4 Reserve School Site Clothall Common: Illustrative Masterplan - Option A: dated July 2008; Ref 4444 405b.

The objective of the report is to provide an up-date to the report in respect to the land use of the site since the preparation of the report and to prepare a revised contaminated land risk assessment based on current practice for the assessment of contaminated land.

A summary of the findings of the previous investigation work has been provided. During the reading of this report reference should be made to the previous reports and documents detailed above.

2.0 Site Observations

In 2004 the site consisted of rough grassland with a few small trees and saplings. Indiscriminate fly tipping of building materials was observed in the eastern portion of the site.

A site walk-over was completed by Brown 2 Green Associates on 5th December 2013. No changes in the land use were observed.

3.0 Site History

Historically the site has always been open land and has not been developed. Since the previous site investigation no changes in the land use have occurred.

4.0 Environmental Setting

The published geological map indicates the site is underlain by the Holywell Nodular Chalk Formation and New Pit Chalk Formation (undifferentiated). No superficial deposits are indicated to be present on site, but Head Deposits consisting of clay, silt, sand and gravel are indicated to be present along the eastern boundary and Alluvial Fan Deposits consisting of sand and silt are indicated to the south. The site investigation completed by Soil Consultants Ltd indicated the presence of an average top soil thickness of 0.5m overlying light brown and off white chalk and flint gravels in a matrix of comminuted sand, silt and chalk material.

The chalk was identified at between 1.4m and 1.95m below ground level.

The chalk is classified as a Principal Aquifer. The site is not located in the source protection zone. During the investigation groundwater was not identified.

5.0 Industrial Setting

The report prepared by Soil Consultants Ltd did not identify any industrial sites that would results in contamination of the site. No landfill site was identified within 250m radius.

A review of the Environment Agency website by Brown 2 Green Associates Ltd did not identify any new lists for sites that hold an IPPC authorisation, landfill sites or pollution incidents.

6.0 Conceptual Model

Brown 2 Green Associates Ltd has developed a conceptual model to identify potential sources, migration pathways and receptors within the study area. The conceptual model is based on the assumption that the site will be developed as residential with private gardens. Assuming there is an active pollution pathway linkage between the source and receptor an assessment has been made of the level of risk. The level of risk is a consideration of both:

- the likelihood of an event (probability) [takes into account both the presence of the hazard and receptor and the integrity of the pathway]; and

- the severity of the potential consequence [takes into account both the potential severity of the hazard and the sensitivity of the receptor].

The risk classifications are based on CIRIA C552 2001.

Potential Sources of Contamination

The following potential sources of contamination have been identified.

- General quality of made ground.
- Fly tipper materials.

Potential Pathways

Possible pathways identified for each contaminant are presented in the initial conceptual model detailed overleaf.

Potential Receptors

Brown 2 Green Associates Ltd has identified the following possible receptors:

- Future residents of the site (principal receptor – female child aged between 0 and 6 years;
- Controlled water (Chalk aquifer - Principal);
- Construction materials (chemical attack on concrete and water supply pipework;
- Future planting.

Potential pollution linkages identified are presented in the initial conceptual model.

Potential Contaminant	*Potential migration pathway*	*Potential Receptors*	*Risk Classification*
Made ground			
Metals (As, Cd, Cr, Pb, Hg, Se, Ni)	Ingestion of contaminated soils by direct contact and soil attached to home grown vegetables. Inhalation of dust (indoor and outdoor). Contact with contaminated soils.	Future site users	Low
	Ingestion of contaminated soils by direct. Inhalation of dust (indoor and outdoor).	Construction workers	Very low
Metals (Bo, Cu, Ni, Zn)	Uptake by plants	Planting and soft landscape areas	Low
Polycyclic aromatic hydrocarbons	Ingestion of contaminated soils by direct contact and soil attached to home grown vegetables. Inhalation of dust (indoor and outdoor). Contact with contaminated soils.	Future site users	Low
	Ingestion of contaminated soils by direct contact. Inhalation of dust (indoor and outdoor). Contact with contaminated soils.	Construction Workers	Very low
	Contact with contaminated soil	Construction materials (Water Supply Pipework)	Very low
Acids in soil	Contact with contaminated soil	Construction materials (Concrete)	Very low
Fly tipped Construction Materials			
Asbestos	Inhalation of dust	Future site users and construction workers	Medium

7.0 Risk Assessment

Human Health

Brown 2 Green Associates has undertaken a revised Tier 1 human health risk assessment using the chemical data obtained from the previous site investigation. At a Tier 1 stage the long term (chronic) human health toxicity of the soil has been assessed with reference to EA Contaminated Land Exposure Assessment (CLEA) Soil Guideline Values (SGV) and General Assessment Criteria (GAC) detailed in Charter Institute of Environmental Health/Land Quality Management Ltd (CIEH/LQM) *Generic Assessment Criteria for Human Health Risk Assessment* 2nd Edition. If no generic SGV or GAC (CIEH/LQM) are available GAC have been determined by Brown 2 Green Associates using CLEA 1.06. For the results of analysis for total petroleum hydrocarbons as no breakdown of the hydrocarbons into their carbon chain lengths has been provided a conservative approach has been adopted by assuming all the concentrations have a carbon chain length with the lowest Tier 1 screening level. It has been assumed all hydrocarbons are aromatic hydrocarbons with an equivalent carbon chain length of between C_5 – C_7. Tier 1 human health screening criteria for residential with plant uptake end use have been adopted.

For determinants that exceed the adopted Tier 1 screening levels, in accordance with the CIEH (2008) Guidance on Comparing Soil Contamination Data with Critical Concentration the 95%ile upper confidence level of the measured mean has been compared to the relevant

SGV and GAC, or Tier 1 threshold, to determine whether the degree of contamination detected is statistically significant.

Determinant	Units	GAC	n	MC	Locations above GAC	Pathway	Assessment
Arsenic	mg/kg	32	10	18.4	-	1	No Further Action
Cadmium	mg/kg	10	10	1.0	-	1	No Further Action
Chromium (III)	mg/kg	3000	10	33	-	1	No Further Action
Copper	mg/kg	2330	10	21	-	1	No Further Action
Mercury (Inorganic)	mg/kg	170	10	<0.5	-	2	No Further Action
Nickel	mg/kg	130	10	27	-	1	No Further Action
Lead	mg/kg	280	10	51	-	1	No Further Action
Selenium	mg/kg	350	10	<0.5	-	1	No Further Action
Zinc	mg/kg	3750	10	81	-	1	No Further Action
Boron	mg/kg	291	10	0.7	-	1	No Further Action
Cyanide	mg/kg	791	10	<1	-	1	No Further Action
Phenols – Total.	mg/kg	210	10	<2	-	1	No Further Action
Total Petroleum Hydrocarbons	mg/kg	65	10	<5	-	2	No Further Action

Notes
Main Exposure Pathways: 1 = Soil Ingestion, 2 = Vapour Inhalation (indoor), 3 = Dermal Contact & Ingestion, 4 = Dust Inhalation.
Abbreviations: GAC = General Assessment Criteria, n = number of samples, MC = Maximum Concentration.
Based on 1% SOM

All determinants are below their respective Tier 1 GAC.

Controlled Water

To assess risk to controlled waters from the leaching of determinants from soil, a qualitative risk assessment has been made based on the concentrations identified within the soil samples and site conditions. From the results it is considered that concentrations will not be leached at levels that would pose a significant risk.

Planting

The assessment of risk from potentially phytotoxic metal compounds has been completed by the comparison of the results with levels defined in BS3882:2007.

Comparison of the results of soils tested with the relevant guidance criteria show that the concentrations of copper, nickel and zinc are all below the relevant guideline values. On this basis, there is assessed to be no potential risk to plant life from these contaminants in these soils.

Construction Materials

The assessment of the risk to concrete from the concentrations of sulphate and the pH in the soil has been made using BRE guidance Special Digest 1:2005 Concrete in Aggressive Ground. Sulphate concentrations of between <10mg/l and 20mg/l and pH values of 7.6 to 8.7 were recorded in the soils. Following the guidance set out in the Digest the characteristic sulphate content is 20mg/l and the characteristic pH is 7.3 in the soil, the Design Sulphate class for the site is DS-1 and the Aggressive Environment for Concrete Class is AC-1.

Water Supply Pipe

The assessment of risk to pipe work used in the potable water supply has been made using UK Water Industry Research (UKWIR) "Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites" (Ref 10/WM/03/21)" January 2011. The results from samples of made ground (through which any new water supply pipes are likely to pass) have been compared with the threshold values listed in the UKWIR guidance. It should be noted that the threshold values are for use by designers in the selection of appropriate pipe materials. Exceedance of a threshold value indicates only that there could be a 'water quality issue'. Threshold values are generally protective of taste and odour quality of water in plastic water pipes. Local water companies may have their own requirements with regards to the protection of workers.

All concentrations are below their relevant threshold values and this it is considered there will not be a risk to the integrity of the water supply pipework.

8.0 Conclusions

From the results of the up-dated risk assessment the following conclusions have been made:

The Tier 1 Human Health Risk Assessment has determined that there are no unacceptable concentrations of potential contaminants within the underlying soils that would pose a potential risk to human health of future site occupants.

The Tier 1 Controlled Water Risk Assessment has determined that there are no unacceptable concentrations of potential contaminants within the underlying soils that would pose a potential risk to controlled waters.

The risk assessment in respect to future planting identified that the determinants at the site would not pose a potential risk.

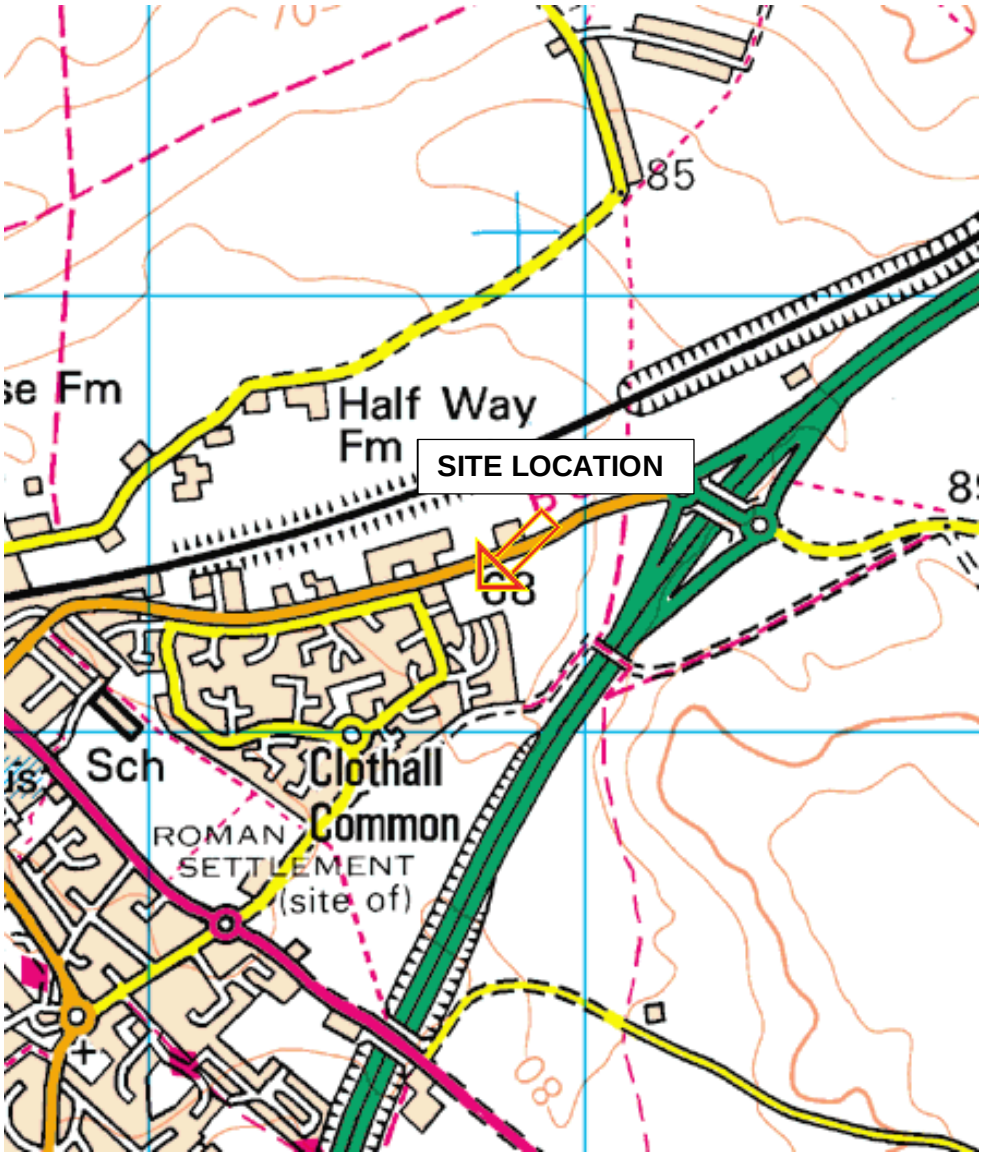
The risk assessment in respect to water supply infrastructure identified that the determinants at the site would not pose a potential risk to the integrity of PE or PVC pipework.

9.0 Recommendations

From the results the reappraisal the following recommendations have been made:

During the previous site investigation, only one sample of the top soil from the centre of the site was analysed for polycyclic aromatic hydrocarbons. No speciation to determine the concentrations of individual polycyclic aromatic hydrocarbons was completed. Polycyclic aromatic hydrocarbons are often found within top soil and made ground and results from the presence of combustion products such are ash, charcoal and clinker. It is recommended that further site investigation is completed prior to construction of the site to assess the concentrations present within the top soil to ensure it is suitable for re-use.

Prior to construction of the site, soil samples should be obtained from adjacent too and beneath the construction materials and analysed for asbestos fibres.



Project Number: 1183	Project: Site 4, Royston Road, Baldock	Scale: NTS
Figure 1	**Site Location Plan**	Brown2Green