11.4. Environmental Risks

Groundwater contamination was not present and there are no perceived risks to either groundwater or surface water receptors in the area.

There are risks to on site planting in the west of the site where landscaping is proposed.

There is no evidence of any contamination associated with the former petrol/filling station on adjoining land to the southeast.

11.5. Liability Issues

Under current UK legislation in relation to contaminated land it is the polluter, or if the polluter cannot be found, the current landowner who is responsible for remediation of a site designated as contaminated land under the new regime.

Responsibilities for clean up could however, be transferred to future developers or site owners/occupiers on the basis of 'sold with information'.

Based on the information and assessments to date, we consider that the site is unlikely be classified as contaminated land under Part IIa of the EPA 1990 by the local authority following a change in use to residential and continued occupation of college buildings, provided the remedial measures set out in this report are included within the Remediation Strategy Document and are adhered to.

11.6. Construction Costs

Off site disposal of soil will have cost implications irrespective of the level of compounds present in relation to human health or risks to the environment.

All material removed to facilitate construction or reduce site levels, will be subject to the landfill tax. However, material removed as part of remediation will be tax exempt. Early discussions with HM Customs and Excise and the Environment Agency are recommended to confirm the class of material.

Protected services attract a greater construction cost than water supply pipes laid in uncontaminated land.

Waste classification tests were performed and identified the presence of non-hazardous waste types, which attract a greater disposal cost than inert waste.

From October 2007, both hazardous and non-hazardous waste will require pre-treatment prior to off site disposal with a proportionate increase in cost.

Provision should be made in contractor's costs for the use of personal protective equipment with regard to potential soil, gas and vapour contamination.

11.7. Deleterious Effects on Construction Materials

Hydrocarbon compounds were identified in soil at levels which can attack or permeate certain plastics. Water supply pipes, in particular, may be impacted and guidance given in Water Regulation Advisory Scheme Guidance Note 9-04-03 should be referred to.

12. RISK REDUCTION AND MANAGEMENT

12.1. General

This assessment has identified potential hazards at the site with proven or possible SPR linkages and which represent potentially unacceptable risks to human health as follows:

- Organic compounds and metals in Made Ground in the west of the site.

Remediation of the site is recommended and should involve clean soil capping layers in areas of open space, upgraded water supply pipes and clean services corridors.

Remediation of the site is not required below areas covered by buildings and hardstanding.

The following provides guidance only based on the findings to date. The recommendations of this report will be incorporated into a separate Remediation Strategy Document for the design and validation of remediation works for the proposed site redevelopment.

12.2. Soil Remediation

Based on the investigations undertaken, remediation of the site, involving creation of barriers to remove pathways between site users and the underlying soils, is recommended.

- Clean soil capping is required in landscaped areas in the west of the site.
- The clean soil capping should comprise a minimum of 450mm clean imported fill excluding topsoil.

Upgrading Water Supply Pipes

- Hydrocarbons are present in soils which require potable water supply pipes to be upgraded.

Clean Service Corridors

- The bedding, backfill and surround to all services constructed at the site must be clean imported materials such that future maintenance of buried services is in clean soil.

12.3. Groundwater Remediation

Sampling and testing of groundwater indicates that there is no groundwater contamination and, on the basis of these results, groundwater remediation is not required.

12.4. Gas/Vapour Protection

Site monitoring indicates that gas/vapour contamination is not present and protective measures in building construction are not required.

12.5. Construction Health and Safety

The following is provided for guidance only.

It is recommended that construction workers at the site adopt appropriate personal hygiene precautions at the site, particularly wearing of gloves and avoidance of hand to mouth contact when dealing with Made Ground and any soil containing compounds above guideline values.

Handling of soil and water should be minimised, and dust suppression measures should be implemented, particularly during any excavation through the Made Ground.

Soils should be watered down during excavation to limit dust and handling and lorries suitably sheeted.

These precautions are considered to be industry standard when developing sites of this nature, and reference can be made to CIRIA Report 132 – A Guide for Safe Working on Contaminated Sites, for further information.

12.6. Remediation and Validation Documentation

Where remediation of the site is needed, Environment Agency and local authority requirements are for the production of remediation strategy documents/design and for independent validation of the remediation process. These are normally prepared by suitably qualified geoenvironmental consultants.

13. SUMMARY AND CONCLUSIONS

- Additional investigation and QRA has been undertaken at the Westminster Kingsway College site on Sidmouth Street, London.
- Through previous desk study and investigation, no previous on site contaminating activities have been identified. However, the desk study did identify that a filling station operated on adjoining land to the southeast.
- The purpose of this investigation was to (a) determine if contamination has migrated from the filling station, (b) further characterise ground and gas contamination across the site, (c) carry out QRA and (d) confirm the remedial measures that are required to support the development.
- The investigation has revealed broadly similar ground conditions to those encountered in previous a investigation, that is Made Ground over London Clay.
- The results of testing on soil samples confirm the presence of arsenic, lead and PAH contamination that present risks to residential occupants in the west of the site should contaminated soil be exposed in areas of landscaping.
- There are no risks through exposure to contaminated soils beneath the eastern college site due to the cover of buildings. Landscaping, where present, is to be contained within raised planters.
- Levels of PAH and TPH present a risk to on site water supply pipes.
- Groundwater contamination was not present.
- Gas/vapour contamination was not present.
- For the purpose of developing a Remediation Strategy for the site, the following issues will require attention:
    - Clean soil capping is required in landscaped areas in the west of the site, which is planned for residential use.
    - Site workers involved in construction or services maintenance should observe a good standard of site hygiene and appropriate PPE and health and safety procedures used.
    - Protected services are required to protect water supply pipework and run in clean corridors to reduce risks to future services maintenance workers.
    - Off site disposal of hydrocarbon contaminated soil will mainly qualify mainly as non-hazardous waste. Natural soils, such as the London Clay, for off site disposal will qualify as inert waste. If construction commences after October 2007, all materials will require pre-treatment prior to off site disposal.

14. REFERENCES

1. The London County Council Bomb Damage Maps 1939 – 1945. London Topographical Society 2005.

2. British Standards Institution (1999): BS5930: Code of Practice for Site Investigation, London: British Standards Institution.

3. The Contaminated Land Exposure Assessment Model (CLEA). CLR10 March 2002, including accompanying CLR, TOX and SGV reports.

4. Defra Contaminated Land Advice Note, CLAN 6/06 November 2006. Assessing risks from Land Contamination- a proportionate approach. Soil Guideline Values: the way forward.

5. British Standards Institute BS PAS 100:2002. Publicly Available Specification for Composted Materials.

6. Water supply (Water Quality) Regulations 2000.

7. Water Regulations Advisory Scheme. Information and Guidance Note 9-04-03, October 2002. The selection of materials for water supply pipes to be laid in contaminated land.

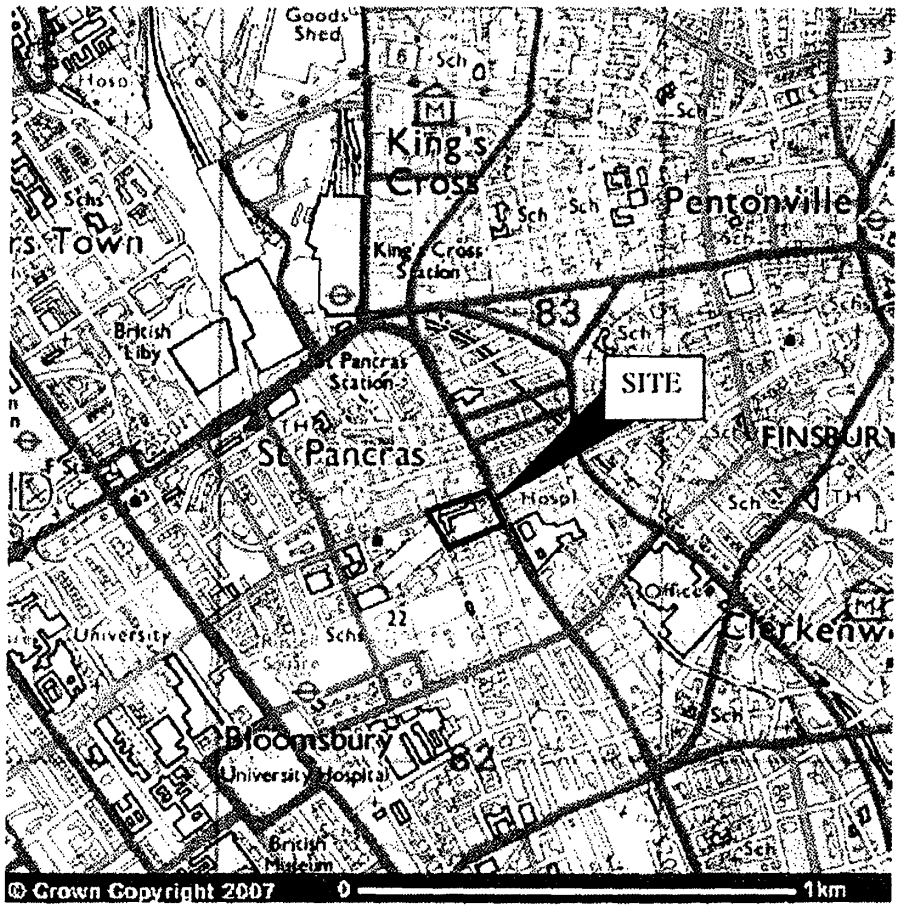
8. Waste Acceptance Requirements of the Landfill (England and Wales) Regulations 2002 (as amended).

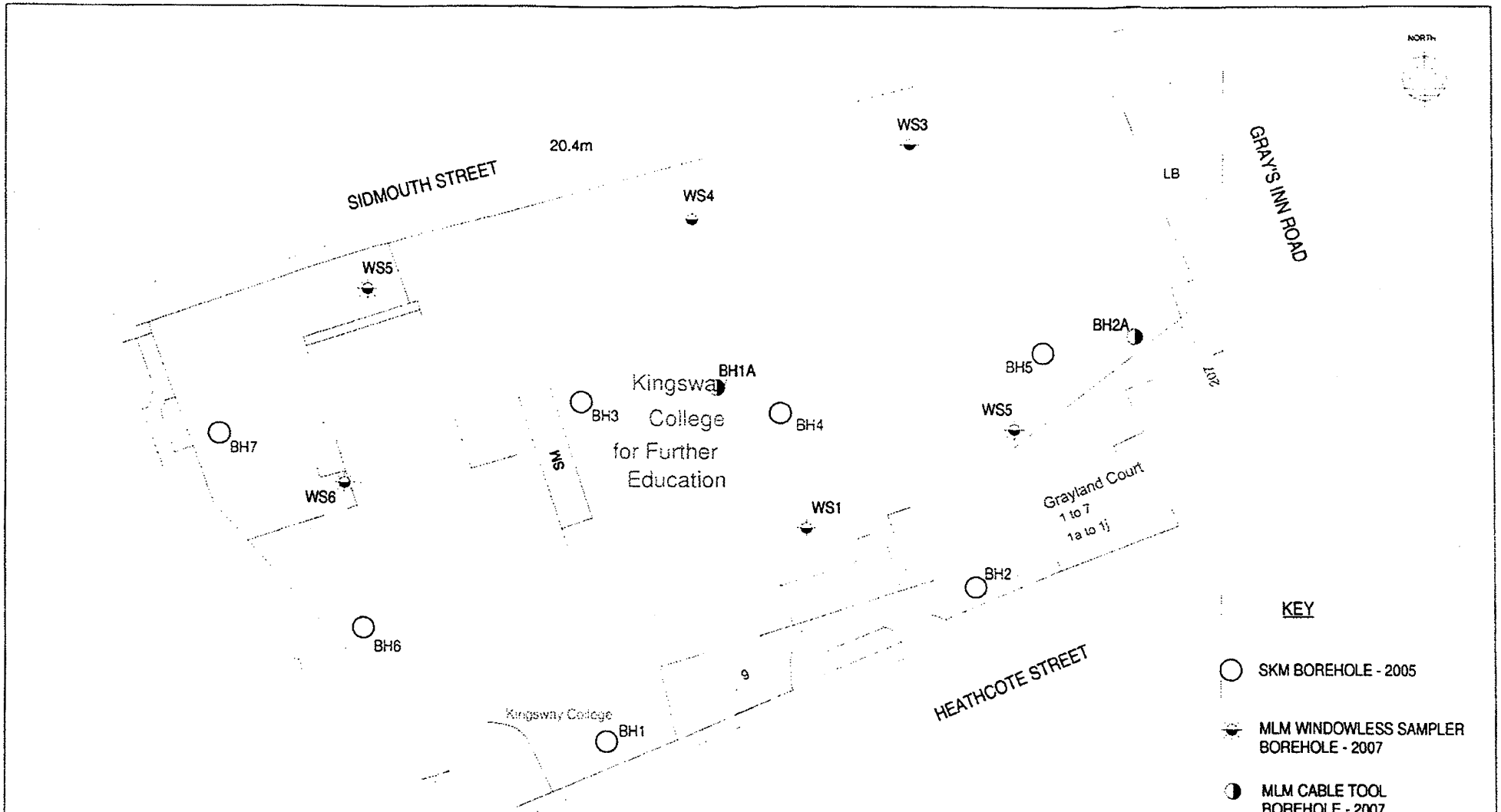
FIGURES

Figure 1: Site Location Plan
Figure 2: Exploratory Hole Location Plan

Project	Made MCH	Job No.	MLM ENVIRONMENTAL
WESTMINSTER KINGSWAY COLLEGE, SIDMOUTH STREET, LONDON	Date 08.03.07	721543	
Drawing Title	Checked	Drg. No	
SITE LOCATION PLAN	Approved	FIGURE 1.	
Status of Drawing		Scale NTS	

Rev.	Date	Description	Made	Checked





Environmental, Geotechnical & Waste Management Consultants

Ipswich	Tel: 01473 231100
Cambridge	Tel: 01223 235525
Chelmsford	Tel: 01245 359911
London	Tel: 020 7247 0026
Norwich	Tel: 01603 504340
Ashford	Tel: 01233 502255

Client: KIER LONDON LTD

Project: WESTMINSTER KINGSWAY COLLEGE, SIDMOUTH STREET LONDON

Drawing Title: EXPLORATORY HOLE LOCATION PLAN

Rev	Date	Description	Made	Ch'd

Status of Drawing:

Drawn	Ch'd	Approved	Scales	Drawing No.
MCH				FIGURE 2

Date: 09.03.07

APPENDICES

Appendix A

Cable Tool Borehole Logs

Project: Westminster Kingsway College
Location: London

Client: Kier Group
Engineer: Marius Carr
Logged by: RB

BOREHOLE NO. BH1A
Drilling Method: Cable Percussion
Date of Boring: Start Date: 11/01/2007
Finish Date:11/01/2007
Ground Level: -
Coords: -

MLM ENVIRONMENTAL

IN SITU TESTS/SAMPLING | STRATA

Depth (m)	Sample Ref	Test Type	SPT Results	Shear Strength	Level (mAOD)	Thickness (m)	Depth (m)	Installation Details	Legend	Description of Strata	Water (m)
0.20	D1					0.10	0.10	0.00		TARMAC.	
0.30	B1					0.60		0.60		MADE GROUND. Loose red and grey ash, brick and cobble sized granite gravel.	
0.70	W1						0.90				0
0.90	D2					0.30				MADE GROUND. Firm dark brown and grey gravelly clay. Gravel is predominantly brick.	1.00
1.20	D3						1.20				
	B3									Stiff dark brown and grey CLAY.	
	D4										
2.20	D5										
3.20	D6										
3.80	D7										
4.00	B4										
4.80	D8										
						8.80					
5.80	D9										
6.80	D10										
7.80	D11										
8.80	D12										
10.0	D13						10.00	10.00		End of Borehole at 10.00 m	

Borehole Diameter (mm): Well Diameter (mm): -
Chiselling Remarks:

Remarks: 1. Standpipe installed to 10m bgl.

Checked | Report No 721543

- ▽ Water Strike
- ▼ Water Standing
- S Standard Penetration Test - Split Spoon Method
- C Standard Penetration Test - Solid Cone Method
- N=17 SPT 'N' Value with number of blows per 75mm in brackets
- 55/25 55 blows to achieve 25mm
- D Small Disturbed Sample
- U Undisturbed Samples
- B Bulk Sample
- J Jar Sample
- W Water Sample

Shear Strength recorded in cohesive deposits using Pilcon Hand Shear Vane

Well Installation Legend:
- Bentonite backfill
- Filter Gravel
- Arisings

Slotted Pipe | Plain Casing | Pezometer Tip

Project:	Westminster Kingsway College	BOREHOLE NO.	BH2A
Location:	London	Drilling Method:	Cable Percussion
		Date of Boring:	Start Date: 12/01/2007
			Finish Date:12/01/2007
Client:	Kier Group		
Engineer:	Marius Carr	Ground Level:	-
Logged by:	RB	Coords:	-

MLM ENVIRONMENTAL

IN SITU TESTS/SAMPLING | STRATA

Depth (m)	Sample Ref	Test Type	SPT Results	Shear Strength	Level (mAOD)	Thickness (m)	Depth (m)	Installation Details	Legend	Description of Strata	Water (m)
0.20	B 1 D					0.20	0.20	0.00 0.80		TOPSOIL.	
0.80	D 2									MADE GROUND. Soft dark brown and black gravelly clay. Gravel is predominantly brick and ash	Dry
1.80	D 3					3.20					
2.70 2.80	D 4 B 2										
3.40	D 5						3.40			Firm to stiff light brown and grey CLAY.	
3.60	B 3										
4.40	D 6					3.60					
7.00	D 7						7.00			Stiff dark grey CLAY.	
						3.00					
							10.00	10.00		*End of Borehole at 10.00 m*	

Borehole Diameter (mm):

Well Diameter (mm): -

Chiselling Remarks:

Remarks: 1. Standpipe installed to 10m bgl.

Checked

Report No. 721543

▽	Water Strike
▼	Water Standing
S	Standard Penetration Test - Split Spoon Method
C	Standard Penetration Test - Solid Cone Method
N=17	SPT 'N' Value with number of blows per 75mm in brackets
55/25	55 blows to achieve 25mm
D	Small Disturbed Sample
U	Undisturbed Samples
B	Bulk Sample
J	Jar Sample
W	Water Sample

Shear Strength recorded in cohesive deposits using Pilcon Hand Shear Vane

Well Installation Legend:

Bentonite backfill

Filter Gravel

Arisings

Slotted Pipe | Plain Casing | Piezometer Tip

Appendix B

Windowless Sample Borehole Logs

Project:	Westminster Kingsway College
Location:	London
Client:	Kier Group
Engineer:	Marius Carr
Logged by:	MCC

BOREHOLE NO. WS1

Drilling Method:	Window Sampler
Date of Boring:	Start Date: 10/01/2007
	Finish Date:10/01/2007
Ground Level:	-
Coords:	-

MLM ENVIRONMENTAL

IN SITU TESTS/SAMPLING | STRATA

Depth (m)	Sample Ref	Test Type	SPT Results	Shear Strength	Level (mAOD)	Thickness (m)	Depth (m)	Installation Details	Legend	Description of Strata	Water (m)
						0.10	0.10			Grass and TOPSOIL.	
0.50	J 1					0.60				MADE GROUND. Loose brown clayey sand and gravel. Gravel is predominantly brick. (PID=0ppm)	Dry
						0.20	0.70			CONCRETE.	
1.00	J 2					0.50	0.90			MADE GROUND. Firm brown slightly sandy gravelly clay. Gravel is predominantly brick, slate and flint. (PID=0ppm)	
						0.10	1.40			MADE GROUND. Brick.	
							1.50			Firm to stiff brown CLAY. (PID=0ppm)	
2.00	J 3										
						2.50					
3.00	J 4										
4.00	J 5						4.00			*End of Borehole at 4.00 m*	

Borehole Diameter (mm):

Well Diameter (mm):

Chiselling Remarks:

Remarks: 1. Hole backfilled with arisings

Checked

Report No. 721543

▽	Water Strike
▼	Water Standing
S	Standard Penetration Test - Split Spoon Method
C	Standard Penetration Test - Solid Cone Method
N=17	SPT 'N' Value with number of blows per 75mm in brackets
55/25	55 blows to achieve 25mm
D	Small Disturbed Sample
U	Undisturbed Samples
B	Bulk Sample
J	Jar Sample
W	Water Sample

Shear Strength recorded in cohesive deposits using Pilcon Hand Shear Vane

Well Installation Legend:

- Bentonite backfill
- Filter Gravel
- Arisings

Slotted Pipe | Plain Casing | Piezometer Tip