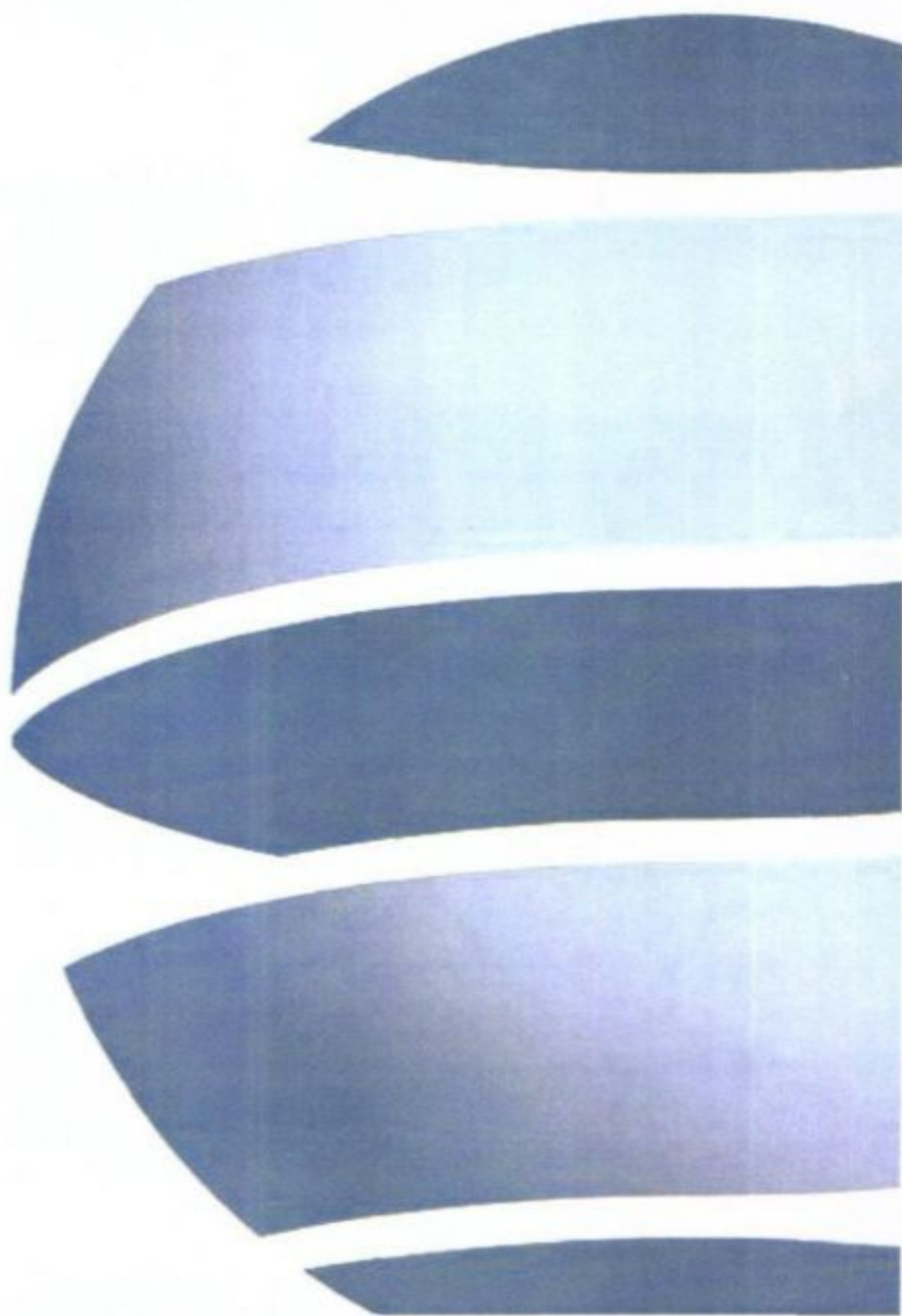




Geo-Environmental

DEVELOPMENT PLAN
for the site at
LAND OFF NEW ROAD, HAVANT
on behalf of
WOODFIELD BUILDERS (WATERLOOVILLE) LTD





Report: DEVELOPMENT PLAN
Site: LAND OFF NEW ROAD, HAVANT
Client: WOODFIELD BUILDERS (WATERLOOVILLE) LTD
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1.0 INTRODUCTION

1.1 General

Following consultation with Havant Borough Council and the Environment Agency, Geo-Environmental Services Limited was instructed by Robert Bern and Associates Ltd on behalf of Woodfield Builders (Waterlooville) Ltd to prepare a Development Plan for the proposed residential development located at the Land off New Road, Havant, Hampshire (see Figure 1).

1.2 Objectives

Investigation of the subject site has identified the presence of hydrocarbon contamination within the groundwater beneath the site, attributable to an offsite source. Whilst the site has been granted planning permission, and in doing so the regulators, have accepted the principle of the development, concerns have now been raised by the regulators regarding a potential requirement for remediation of groundwater. This Development Plan sets out the proposed action prior to, during and following the permitted development in order to demonstrate that development works have not resulted in a detrimental impact to the environment and to ensure that groundwater remediation, should it be required at a later date is achievable and not hindered by the development.

1.3 Planning Permission

The following planning conditions relating to contamination and development have been imposed on the planning permission granted (ref. 06/66809/001) for the site:

18) Prior to the commencement of development (including any site clearance) approved by this Planning Permission (or such other date or stage in development as may be agreed in writing with the Local Planning Authority), a scheme to deal with the risks associated with contamination of the site shall be submitted to and approved, in writing, by the Local Planning Authority. That scheme shall include all of the following elements unless specifically excluded, in writing, by the Local Planning Authority:

- 1. A desk study identifying:
 - All previous uses
 - Potential contaminants associated with those uses
 - A conceptual site model of the site indicating sources, pathways and receptors
 - Potentially unacceptable risks arising from contamination at the site.*
- 2. A site investigation scheme, based on (1) to provide information for an assessment of the risk to all receptors that may be affected, including those off site.*
- 3. The results of the site investigation and risk assessment (2) and a method statement based on those results giving full details of the remediation measures required and how they are to be undertaken.*
- 4. A verification report on completion of the works set out in (3) by a competent consultant, independent of the company which has undertaken the approved remediation works, confirming the remediation measures that have been undertaken*



in accordance with the method statement and setting out measures for maintenance, further monitoring and reporting.

Any changes to these agreed elements require the express consent of the Local Planning Authority.

Reason – To protect future site users and the minor aquifer beneath the site and the surface waters to the west of the site. The site is likely to be affected by contamination due to the sites previous use as a petrol filling station which may pose a risk to controlled waters. Risk to groundwater and surface water has not yet been fully established at the site and having due regard to policies and proposal E2 of the Hampshire County Structure Plan 1996-2011 (Review) and PC3 of the Havant Borough District Wide Local Plan 1996-2011.

19) If, during development, contamination not previously identified is found to be present at the site then no further development (unless otherwise agreed in writing with the Local Planning Authority) shall be carried out until the developer has submitted and obtained written approval from the Local Planning Authority for an amendment to the method Statement detailing how this unsuspected contamination shall be dealt with.

Reason – To protect future site users and the minor aquifer beneath the site or the surface waters to the west of the site. There may be areas of the site, which cannot be fully characterised by a site investigation and unexpected contamination may be identified and having due regard to policies E2 of the Hampshire County Structure Plan 1996-2011 (Review) and PC3 of the Havant Borough District Wide Local Plan 1996-2011.



2.0 BACKGROUND

This Development Plan has been developed following a ground investigation as reported by Geo-Environmental (Ref. GE5529 Ground Investigation Report, July 2007) together with subsequent discussions with the Local Authority Environmental Health Department and Environment Agency. Whilst a summary of the previous report is presented below, reference should be made to this report for further details.

A review of a previous desk study undertaken by Dig-Geotech Limited in February 2006 was undertaken as part of the 2007 investigation by Geo-Environmental, ref.GE5529. The findings of the desk study and investigation undertaken by Geo-Environmental are summarised in the Ground Investigation Report referred to above.

2.1 Former site use

The site was historically part of a larger site encompassing the now Kwik Fit site and was owned/operated by Hendy Ford for car servicing, probably sales and as a petrol filling station (PFS). A review of the historical layout indicated the PFS forecourt to be located within the Kwik Fit site, with only an access/egress spur crossing the north-western tip of the subject site.

Underground storage tanks (USTs) were installed, in the 1960s, 5m and 16m to the north of the subject site. As part of the redevelopment works on the 'Kwik Fit' site in 1990, seven of the USTs were reportedly degassed and infilled with concrete (associated pipe-work left insitu). Replacement fuel USTs were installed within the 'Kwik Fit' site (stated 11m to the north of the subject site). The records indicate that since the 1960s at least nine USTs, with a combined capacity in excess of 30,000 gallons, have been installed and operated on the 'Kwik Fit' site (the USTs being within 20m of the subject site). These USTs comprise a potential source of significant mobile contamination which could migrate (assuming local groundwater flow is generally towards the south) on to the subject site.

2.2 Proposed site use

The proposed development comprises the construction of two/three storey housing with private gardens, car parking and communal soft landscaping, access road and associated infrastructure.

2.3 Approach for Remediation, Monitoring and Validation

Remediation works are proposed to remove areas of contaminated soils, where they have been identified as part of the site investigation works undertaken to fall within garden areas and potentially where un-identified contamination is encountered. As such the contamination that has been identified as most likely to pose a current/future risk to human health and controlled waters will be removed, reducing the risk. Where material is excavated and validated (subject to analysis) as suitable



for re-use, material will be retained on site, thereby avoiding the removal of excessive volumes to landfill.

Contaminated water where encountered will be disposed of following appropriate duty of care. Given the depth of groundwater encountered during investigations and subsequent monitoring on site and given the proposed shallow foundation design for development it is considered unlikely that groundwater will be encountered during or the groundwater flow regime altered by the development.

Where the investigation works undertaken have identified that a risk exists from gas/vapours present on site, appropriate gas and vapour membranes will be installed.

The aim of the remediation is not to remove all contamination identified on site but to reduce the identified risk to an acceptable level with respect to human health, the built environment and controlled waters. Remediation of groundwater is not considered necessary at this time however, it has been agreed with the regulators that the proposed development will be undertaken in such a manner that it will not be prohibitive should it be demonstrated that groundwater remediation is required in due course.

2.4 Conceptual Site Model

The conceptual site model (CSM) developed following the investigation works reported (as referenced in Section 2.0) identified an offsite hazard in the form of mobile hydrocarbons from the Kwik Fit Site migrating within groundwater onto and beneath the subject site. As such it was considered that further works were required prior to, during and following the permitted development in order to demonstrate that development works have not resulted in a detrimental impact to the environment and to ensure that groundwater remediation, should it be required at a later date is achievable and not hindered by the development, in order to mitigate the risk/potential risk of harm.

3.0 GROUND GAS AND VAPOURS

In line with current CIRIA and NHBC guidance, ground gas monitoring has been undertaken within monitoring wells installed on the subject site. Gas monitoring wells were installed initially within 3No. monitoring wells. These positions were monitored for methane, carbon dioxide, volatile organic compound (VOC) concentration and oxygen over a total period from May 2007 to June 2007. A further monitoring visit was then undertaken in May 2008. VOC monitoring was undertaken with a Photo-Ionisation Detector.

3.1 Ground Gas Assessment

The ground gas and vapour assessment presented in the Ground Investigation Report (GE5529, July 2007) identified the site's gassing regime to be representative of Characteristic Situation 1 (CIRIA) or Green-Amber 1 (NHBC).

In addition to general ground gas, the investigations undertaken on this site have also considered the potential vapour exposure hazard. On the basis of the investigations reported on this site it is considered that protection measures would be required for protection against hydrocarbon vapours.

3.2 Gas Protection Design Measures

The following gas protection measures are proposed to protect the development and end users thereof:

- Suspended ground floor slabs with passively ventilated sub-floor.
- Minimum penetration of the floor slab by services;
- The provision of a gas membrane (suitable for protection against hydrocarbon and VOC vapours) across the floor slab and walls;
- All membrane joints and penetrations sealed into the membrane.

It should be noted that despite action being undertaken to remediate hydrocarbon contaminated soil or groundwater, the above gas/vapour protection measures should still be incorporated within the development in order to prevent any potential risk from residual contamination that could remain on site.

Gas protection measures will be installed in line with guidance set out in CIRIA C659, NHBC 10627-R01(04), BRE414 and BS8485:2007. The specification for gas protection measures is provided in Appendix C. Validation of gas protection measures will be undertaken by the Environmental Consultant or other appropriate independent party, such as the membrane manufacturer. Plot by plot inspection is proposed.

4.0 SOILS

The ground conditions encountered comprised a mantle of Made Ground overlying a general succession of Brickearth, Head Gravel and London Clay Formation. The junction between the Head Gravel and the underlying London Clay Formation varied across the site, i.e. ranging from 0.17m AOD to 3.28m AOD (Where established) and could indicate the presence of a terrace step or shallow buried channels extending into the London Clay Formation.

Visual and olfactory (odour) evidence of hydrocarbon impact was observed on soils at depth within the Head Gravels within boreholes WS1; WS3; WS4 and WS10. In each case, the zone of impacted soils was approximately coincident with groundwater levels.

Groundwater was encountered within the majority of the window sample boreholes at varying depths. Standing water levels equated to approximately 3m AOD in the short term. Impact to groundwater from hydrocarbons was noted beneath the site.

Soil leachate tests were undertaken on samples of near surface soils, with results compared against Tier 1 screening criteria for the protection of controlled waters. The specific criteria used were Environmental Quality Standards for surface water and, in the absence of any specific guidance for the protection of groundwater per se, drinking water standards [The Water Supply (Water Quality) Regulations] were used. It should be noted that the use of drinking water standards is a highly conservative approach as they set out maximum permissible concentrations at consumers' taps and thus do not account for any processes such as dilution, attenuation or post abstraction processing.

For the general suites analysed, no concentrations of concern were identified with regards either to surface water or groundwater. However, leachate testing was also undertaken on samples of hydrocarbon impacted soils from WS10 and WS4. Whilst no individual concentrations of concern were identified in the sample from WS4, the sample from WS10 was found to exhibit TPH (C10-C21 aliphatic) exceeding the drinking water standard.

The test results are considered to indicate that whilst soils beneath the site at groundwater level have been impacted to some degree by hydrocarbons, the general quality of soil beneath the site is not the source of the impact and as such remedial action is not considered to be required to improve general soil quality beneath the site in order to prevent further impact to controlled waters.

Groundwater levels indicate a probable hydraulic gradient falling towards the south west or south-south-west, i.e. in the general direction of flow within the Hermitage Stream. In addition, the USTs associated with the former PFS use on the Kwik Fit site are located upstream with regards to hydraulic gradient and thus contaminated groundwater could flow from the tank farm(s) on to the subject site.



4.1 Site Workers

Laboratory testing has indicated the presence of elevated concentrations of some determinands, principally TPH and PAH. It is recommended that a full COSHH assessment be prepared in order to provide a robust assessment of safe working practices on the site. Any such assessment should account for the results of the laboratory testing and also for substances known to be present or used on site.

Guideline concentrations for contamination with respect to the health of site workers are cited under HSE guidance document HSG66 entitled Protection of Workers and the General Public during the Development of Contaminated Land. However, it remains the responsibility of the main contractor and their appointed sub-contractors to prepare their own further risk assessments in accordance with Health and Safety legislation in order to protect persons in their employ. Special consideration should be given to the provisions of the Construction (Design & Management) Regulations 2007, Health and Safety at Work Act and the Control of Substances Hazardous to Human Health regulations in order to protect the safety of persons in their employ. Additional guidance can be sought from the CIRIA publication entitled "A Guide for Safe Working on Contaminated Sites".

In line with the general ERIC (eliminate-reduce-inform-control) principle of risk management, wherever possible exposure of site workers to contaminated soil should be eliminated for example by excavation and placement of materials directly into wagons for removal from site, or the use of construction techniques or methods to avoid exposure. Where it is not possible to fully mitigate potential risk of harm to site workers, a system should be put into place by the Site Manager to inform all site personnel of general and specific hazards on site, i.e. at the Site Induction or follow up briefings, with the provision of personal protective equipment (PPE) supplied to and used by all site workers as a precaution. As a minimum, all site personnel should wear a hard hat, safety footwear, gloves, eye protection and a hi-visibility jacket or waistcoat as appropriate. The provision and use of specific PPE should be determined by the Client and Site Manager on a task specific basis. Any potentially hazardous operations should also be undertaken in line with a task specific method statement.

All site personnel shall benefit from on-site hygiene facilities including wash area, toilets and drying room. In addition, a separate canteen area will be provided. Smoking anywhere within this construction site is not permitted in line with UK legislation. All eating and drinking should be restricted to the canteen area and only once site personnel have removed outer PPE and washed exposed skin.

In the event of dry spells, or where the exposed surface becomes dry, the surface of the site will require to be regularly damped down to prevent the release of soil dust which could impact on site operatives or migrate off-site and thereby mitigate both off-site exposure and nuisance for neighbours.

4.2 End Users

Non-targeted analysis was undertaken on a series of soil samples collected from shallow depth (0-1m bgl) across the site. In addition, specific soil samples were also



targeted for analysis, e.g. where organoleptic evidence of hydrocarbon impact was recorded.

With regards to the non-targeted analysis, statistical outliers were identified for several PAH compounds from WS3 at 0.2m bgl and WS6 at 0.2m bgl. In both cases the concentrations reported were very low, i.e. just above detection limit and did not exceed relevant their SGV or GAC value where applicable. As such these outliers are not considered reflective of a contamination hazard. Statistical outliers for zinc were also identified in several near surface samples together with a statistical outlier for lead in the sample from WS8 at 0.2m. The outlier concentrations did not exceed the respective SGVs and thus do not warrant further consideration or remedial action.

In addition to the above, several statistical outliers were identified for TPH, as TPH C10-C40. No organoleptic evidence of hydrocarbons was identified in these samples during logging and sampling and it is possible that the concentrations (126-286mg/kg) reflect the presence of lighter end PAH compounds or other naturally occurring organic materials. The concentrations detected are not considered representative of gross contamination, nor would they reflect the source of the hydrocarbon impact at depth (as further supported by leachate test results). It would though be considered prudent to allow for localised removal of these soils from garden areas unless further more detailed analysis of samples from proposed garden areas is undertaken to demonstrate the absence of a hazard.

The mean value test did not identify any contaminants exhibiting upper bound values (Us_{95}) exceeding their relevant SGV or GAC value. As such, it is considered that no remedial action is required to protect end users from near surface soils. However, it is recommended as a matter of course for a minimum of 500mm of certified clean topsoil to be placed in all garden areas.

In communal soft landscaping and public open space, the actual opportunities for exposure to occur are limited. Nonetheless, it is recommended that contaminated soils are excavated and replaced with suitable clean subsoil and Topsoil. In private garden areas it is recommended that contaminated soils are excavated for off-site disposal, with the excavations backfilled with certified clean subsoil and Topsoil. The final depth of excavation in each area will reflect the depth at which the concentration of concern was encountered. Validation sampling will be required in all excavation areas to confirm the removal of the impacted soils.

In addition to the requirement for remedial action as described above, other works will also be required during the development of the site. These works would include:

- Removal of areas of grossly contaminated soil if encountered around the former AST, highlighted by Havant Borough Council, Environmental Health Department.

4.3 Built Environment

Buried plastics laid in contact with contaminated soils may be susceptible to attack by aggressive chemicals; therefore, potable water supplies may potentially become



contaminated or tainted. With respect to the Water Regulation Advisory Scheme (WRAS) guidance entitled The Selection of Materials for Water Supply Pipes to be laid in Contaminated Land, concentrations of arsenic, PAH and TPH within some of the investigative positions exceeded the standards.

Given the contamination identified on site a barrier pipe is recommended (subject to Local Water Utility Undertaker confirmation) throughout the development to protect potable water supplies. As a matter of good practice and to maximise the protection to future maintenance workers, clean, granular backfill will be used in service runs and marker tapes will be used for all buried services.



5.0 CONTROLLED WATERS

Groundwater was encountered within the majority of window sample boreholes at varying depths across the site. Standing water levels equated to approximately 3m AOD in the short term. Groundwater was encountered within the 3 No monitoring wells (WS1, WS6 and WS9) during return gas and groundwater monitoring visits following a period to allow equilibrium to be re-established beneath the site, with the standing levels approximately 1.22-2.70m bgl (3.74-3.18m AOD).

Groundwater samples were analysed from WS1, WS6 and WS9 which were located to provide coverage to aid triangulation and groundwater flow estimations, whilst also allowing some targeting following initial observations made during borehole construction, e.g. hydrocarbons in WS1.

There are no set standards for permissible concentrations within groundwater in the UK and as such consideration is given to most probable receptors for screening guidance. Thus, groundwater results have been compared against Environmental Quality Standards (EQS) and Drinking Water Standards (DWS) guideline concentrations.

The Tier 1 screening assessment did not identify any specific concentrations of concern with regards to EQS although it should be noted that there is no guidance on TPH within EQS. With regards to DWS, concentrations of concern for a range of determinands were identified within the samples from WS1 and WS9 as listed below:

- WS1 - PAH (sum of 4); benzo(a)pyrene; TPH (C8-C10 and C16-C35).
- WS9 - PAH (sum of 4); benzo(a)pyrene; TPH (C12-C35, mainly C16-C35).

In addition, concentrations of VOCs (ethylbenzene; m & o xylene; trimethylbenzene; and 1,2,4trimethylbenzene) were detected in the sample from WS1. These VOCs were at generally very low concentration but are associated with the breakdown of TPH contamination.

The desk study did not identify any specific potential source for hydrocarbon contamination on the site, but did identify that UST tank farms were located within c.20m of the northern site boundary, i.e. associated with a former PFS. Information presented within the desk study suggested that there may be two separate tank farms associated with the former PFS, now 'Kwik Fit' site. The subject site is underlain by London Clay Formation, a minor aquifer, and is not situated within a Source Protection Zone for groundwater abstraction. The ground investigation identified the presence of hydrocarbon impacted soils at various locations across the site. The spatial distribution of the impacted soils does not lend itself to a readily identifiable plume, although the variation in elevation of the junction between the Head Gravel and underlying London Clay Formation could complicate plume shape and flow.

Initial groundwater flow modelling respective to Ordnance Datum has indicated a probable groundwater flow direction towards the south-west or south-south-west, i.e. in a similar direction to surface water flow within Hermitage Stream. It should also



be noted that this places the off-site UST tank farms up hydraulic gradient of the subject site.

The findings of the intrusive investigation combined with the analytical results indicate the presence of a plume of hydrocarbon contaminated groundwater, is present beneath the subject site. The most probable source of this contamination is from an up-gradient former PFS, as demonstrated with the highest TPH concentrations being recorded in WS1 which was down gradient and within approximately 20m of the off-site tank farm. A surface water course is located adjacent to and cross/partially down-gradient of the subject site.

Following the initial investigations and discussions with the Environmental Health Department and Environment Agency a further round of groundwater monitoring was undertaken (Results presented in Appendix E), in order to compare current groundwater contaminant concentrations with those identified 12 months ago. The results from the further monitoring undertaken in May 2008 demonstrate a significant reduction in contaminant concentrations identified. A summary is presented in Table 1 below.

Location	Contaminant	July 2007	May 2008
WS1	TPH	119132 ug/l	2133 ug/l
	PAH	36.28 ug/l	<0.01ug/l
	Benzo(a)pyrene	1.99 ug/l	<0.01ug/l
WS6	TPH	132 ug/l	Located under a container
	PAH	<0.01 ug/l	
	Benzo(a)pyrene	<0.01 ug/l	
WS9	TPH	15079 ug/l	2444 ug/l
	PAH	1.85 ug/l	<0.01 ug/l
	Benzo(a)pyrene	0.09 ug/l	<0.01 ug/l

Table 1 – Contaminant Concentrations in Groundwater

Groundwater levels were also recorded during the monitoring visits undertaken in May 2008 and are presented in Table 2 below:

Location	Date	Standing Depth (m bgl)	Standing Level (m AOD)
WS1	25/5/07	1.73	3.24
	08/06/07	1.74	3.23
	22/6/07	1.57	3.40
	13/5/08	1.77	3.28
WS6	25/5/07	2.65	3.23
	08/06/07	2.63	3.25
	22/6/07	2.70	3.18
	13/5/08	2.70	3.18
WS9	25/5/07	1.52	3.44
	08/06/07	1.52	3.44
	22/6/07	1.22	3.74
	13/5/08	1.56	3.40

Table 2 - Groundwater Levels

It can be seen from Table 2 that the groundwater levels from May 2007 are very similar to May 2008.

Whilst it is acknowledged that groundwater beneath the subject site is impacted by hydrocarbon contamination, it is considered that any action taken on the part of the owner/developer of the subject site to mitigate the impact on groundwater beneath the subject site will ultimately be unviable without remedial action being taken on the up-gradient source, which is located off-site under third party land.

Thus following discussions with the regulators it was agreed that the developer should take measures to protect the development and associated receptors from any hazard associated with contaminated groundwater, during the development whilst the Environment Agency Liaise with the 'Kwik Fit' site in order to remediate the actual source of contamination on the neighbouring site. However the proposed development must not hinder remediation of groundwater should it be demonstrated that it is required is due course.

5.1 Proposed Further Works/Monitoring/Remediation

Given discussion and an agreement in principle that the development could proceed on site providing it did not hinder the potential for groundwater remediation should it be required in due course the following works and monitoring programme will be undertaken.

Currently 3 No monitoring wells are located on site, WS1, WS6 and WS9, following removal of the former buildings from site it was noted that the pipework within WS9 had been bent slightly, in addition WS6 was temporarily located under a container, although has since been demonstrated to be in a good state of repair. It was initially proposed that these three wells would be monitored on a further three occasions in order to demonstrate that contaminative status of the groundwater and in order to confirm the groundwater flow regime beneath the site matches that reported in the 2007 investigation. Further correspondence from the Environment Agency has however raised concerns over how well the groundwater flow regime and contaminant plume status can be characterised based on these three wells alone. As such it is recommended that the following be undertaken:

- Window sampling to install up to six further groundwater and gas monitoring wells across the site, to a provisional depth of 3m bgl, (this may be revised subject to the depth in which groundwater is encountered). These wells will be located to provide coverage of the site, but will be targeted to locations that will remain accessible during and following the development should groundwater remediation be required in due course. In addition should wells be destroyed as part of development works they will be reinstated unless agreed in writing with the regulators that they are no longer required.
- Two further gas and groundwater monitoring visits. Water samples will be collected from WS1, WS3, WS9 in addition to the new installations, to provide background levels across the site prior to development and to confirm groundwater levels beneath the site.



Subject to the results being in line with the information currently available it is requested that the prior to commencement, sections of the site investigation condition be discharged to allow development works to commence on site, in conjunction with a longer term monitoring plan.

The foundations for the development have been designed to be shallow strip foundations, in order to ensure that they do not intercept groundwater nor interfere with the groundwater flow regime and would not prevent groundwater remediation works should they be required. A sketch of the proposed foundations is presented within Appendix D.

During and following the development the following monitoring plan is proposed as presented in Table 3 below:

Locations	Frequency	Suite of analysis	Phase
All	Monthly	Speciated PAH, Speciated TPH, BTEX, MTBE, Groundwater Level.	Initial 6 month
All	Bi monthly	Speciated PAH, Speciated TPH, BTEX, MTBE, Groundwater Level.	6-12 months
All	Quarterly	Speciated PAH, Speciated TPH, BTEX, MTBE, Groundwater Level.	12-24 months

Table 3 – Groundwater Monitoring Programme

Groundwater monitoring will be carried out within installations during and/or after the remediation works and development works in order to demonstrate that the works undertaken have not resulted in a detrimental impact to controlled waters.

The monitoring will continue to check for the presence (and thickness) of free product. Should free product be encountered then it is acknowledged that it would need to be removed.

The results of the initial water monitoring will be provided within the validation report. Any ongoing water monitoring, e.g. due diligence, would be presented within an addendum validation document to be submitted and agreed with the regulators. Should it be demonstrated following the Environment Agency's liaison with 'Kwik Fit' (and ideally source removal from their site) that further works are required to be undertaken with respect to groundwater beneath the site to reduce the risk to receptors then a risk assessment will be undertaken, which will form the basis of these further works.

An update with respect to the results of monitoring and groundwater flow regime will be provided to the regulators at six monthly intervals, or following any significant increases in contaminant concentrations being detected.



5.2 Further Considerations during Remediation/Development Works

Although the investigation established that there was no significant risk of harm with respect to controlled waters from soil contamination identified on the subject site, groundwater contamination attributable to an offsite source was noted to be present. Whilst there is little benefit in undertaking groundwater remediation until the source of the contamination has been dealt with, the development must not further mobilise any contamination. In order to prevent creation of pathways as a result of development works on the site removal of isolated pockets of contamination will be undertaken as detailed above. In addition, in line with Environment Agency (EA) consultations, the following will be also be considered with respect to this development in order to ensure no further contamination migration occurs as a result of the works.

- Soakaways and piling will not be utilised on this site due to the potential for creation of further migration pathways for contamination.
- If localised dewatering is used as part of the development works e.g. around any shallow obstructions encountered, the EA should be notified of estimated volume, pump rate and disposal route for the pumped water. Written agreement from the EA may be required for these works. The proposed works should not require dewatering given that development is proposed above the water table.
- Any excavation to remove contaminated materials will need to be validated in line with best practice. Imported materials will require validation to demonstrate they do not introduce a contamination hazard.
- If excavated materials are stockpiled on site, the stockpile will need to be underlain by an impervious membrane and to prevent run-off impacting surrounding ground or groundwater. The stockpile would also be covered to prevent rainfall ingress.



6.0 WASTE

6.1 Waste Classification and Segregation

Waste may be defined as any substance or object in Annex 1 of the Waste Framework Directive which the holder discards, intends to discard, or is required to discard. The holder of waste is anyone in possession of waste or generates it and therefore both the contractor and ultimately the developer are responsible for safe disposal of waste.

Given the concentrations reported to date it is envisaged unlikely that spoil, subject to confirmation by WAC testing, would fall into the Hazardous Waste category. Where contaminated soils are excavated, they will be stored on site within a bunded area to enable sampling and waste classification to be undertaken prior to determination of fate. Storage proposals are discussed in Section 7.0.

In the event of dry spells, or where the exposed surface becomes dry, it is recommended that the surface of the site is regularly damped down to prevent the release of soil dust which could migrate off-site and thereby mitigate both off-site exposure and nuisance for neighbours.

Current Environment Agency guidance suggests that Inert waste soils may be re-used on site where there is no risk of pollution, it is undertaken in accordance with a planning permission, suitable for that use without further treatment and that only the necessary quantity is used. Excess arisings may be placed within building voids or as engineering fill subject to geotechnical constraints in order to reduce the volume of materials disposed of to landfill. Materials exhibiting hydrocarbon contamination or strong odours will not be re-used on site but disposed of to landfill.

7.0 EXCAVATION AND STOCKPILING OF MATERIAL

7.1 Excavation Process

For each area, excavation works shall commence where the highest contaminant concentrations were encountered with the excavation progressing laterally to uncontaminated faces. Once lateral removal has been completed, the excavation shall be progressed vertically. This approach will minimise the potential for cross contamination or the creation of migration pathways.

Where validation analysis indicates that concentrations of concern remain, the failure sample location shall be subject to further excavation and re-validation.

Excavation would also be limited where it is not reasonably practicable to do so in a safe manner, such as:

- Instability adjacent to roadways, buildings, walls or site boundaries;
- Close proximity of adjacent services, particularly foul sewers and high voltage cables.
- Ingress of water that cannot be dealt with by normal pumping equipment.

7.2 Stockpiling of Soils

All soil stored on site will be covered under a Paragraph 41 Waste Management License Exemption. All soil stockpiles shall be no larger than 250m³ and no higher than 1.8m. Stockpiles shall be placed on stable and level ground, with a perimeter bund overlain by a polythene liner for run-off control. The liner will extend across the full base area of the stockpile. The stockpile shall also be covered by a second polythene or similar sheet to prevent the ingress of rainfall into the stockpile and the emission of odours from the stockpile. This upper sheet shall be weighted down or otherwise secured to the stockpile.

Prior to placement of material the bund will be inspected to ensure that it is impermeable and as such will be sufficient to retain surface runoff during the period of storage. Should water be noted to be building up within the bund it will be pumped out of the bund and disposed of under the appropriate duty of care.

Should it be required an area will be designated for the stockpile on site. This will be located on an area of hardstanding, be bunded and underlain and covered by an impermeable membrane. Full details of the location of any stockpiles required and evidence of construction will be provided within the validation report.

Following the removal of any stockpile the exposed ground will be inspected to confirm/validate that no leakage occurred from the stockpile. Any such new impact would be dealt with under the Discovery Strategy set out in Section 8 of this report.

7.3 Confirmatory Sampling of Stockpiles

Soils are to be excavated as part of the site remediation works only where the Ground Investigation has identified that a pollutant linkage exists which warrants action to eliminate or reduce to acceptable levels, or through employment of the Discovery Strategy. As such, soils will only be placed in stockpiles where their chemical composition is such that they represent a potential hazard to end users. Therefore, materials placed in stockpiles will not be reused in gardens elsewhere on site but will be removed to an appropriately licensed disposal facility.

Stockpiled soils will be sampled for Waste Acceptance Criteria (WAC) analysis to determine whether the materials represent Inert, Non-Hazardous or Hazardous waste in order for them to be disposed of at an appropriate facility. In general, stockpile sampling shall be such that a minimum of 3 No. Samples shall be taken each of approximately 2kg weight for WAC analysis. Where stockpiles do not exceed 50m³, a single sample may be taken. Sampling shall be undertaken by Geo-Environmental's Site Representative in such a manner, as determined on site, in order that the sample is representative of the stockpile mass.

7.4 Validation Sampling from Excavations

Where contamination by hydrocarbons has been identified, on site screening shall be undertaken using organoleptic evidence of contamination, although as odour sensitivity reduces over time exposed; this will be supported on site by the use of a Photo Ionisation Detector calibrated to a standard isobutylene 100ppm gas. On site screening shall be undertaken as required by the specific conditions encountered. On completion of the excavation works, validation samples shall be taken from the excavation faces and bases.

Validation sampling shall be undertaken in relation to the area excavated. As a guide, for small areas, a sample shall be taken from each face and two from the base, whilst for larger areas; sampling shall be undertaken every 10m of exposed face and on a 10m grid across the excavation base. Sampling frequency may be varied by Geo-Environmental's Site Representative to account for variation in the soils exposed.

7.5 Backfilling

On completion and validation, excavations shall be backfilled with clean subsoil, either site won or imported. In garden areas this shall be completed with certified clean Topsoil and given the lack of Topsoil on site, it is anticipated that this will be imported to site. At this stage it is unknown whether Topsoil will be imported from a natural or manufactured source.

Subsoil and Topsoil shall not be imported to site without prior acceptance of provenance and chemical suitability. (Import Validation criteria presented in Appendix A) Where materials are to be imported on to the site for use as subsoil



and Topsoil, these shall be derived from one of two sources, i.e. natural or processed. Where natural sourcing is proposed, the provenance of the material shall be determined by confirmation of the source site's history to confirm no previous potentially contaminative use, coupled with analysis of soils at a minimum rate of 3No. Samples per source site and 1 sample per 250m³ thereafter. Where Topsoil or subsoil are derived from a manufactured source, testing would be undertaken at a rate of 1 sample per 50m³. With regards to physical and nutritional composition and minimum testing regime of 1 sample per 250m³ is recommended for either source.

Subsoil shall be placed with nominal compaction provided from excavator movement in garden and soft landscaped areas.

8.0 DISCOVERY STRATEGY

The site has undergone extensive investigation and as such it is considered unlikely that undetected gross contamination would be encountered during the process of clearance and construction.

Examples may include oily pockets at groundwater level and in the vicinity of the above ground storage tank and hydrocarbon odours

Should previously undiscovered contamination be encountered during construction, this should be reported to the Site Manager immediately in order that any necessary inspection may be made.

A watching brief approach is to be adopted during the various phases of the site's development such that in the event of suspicious conditions or materials being encountered, the Environmental Consultant can attend site to inspect the 'discovery'.

Records should be kept and samples submitted for analysis where conditions encountered are not as anticipated. The results of any such testing should be sent to the Local Authority for consultation.

Depending on the type, nature and extent of any such 'discovery', it may be necessary to halt works in that location until such time as the assessment has been completed. This should be reviewed on a 'discovery' specific basis and in conjunction with regulatory consultation.

As a general guide, where such unexpected conditions are encountered the following approach is recommended:

- All discoveries are to be reported to the Site Manager immediately and works at that location are to halt until further notice;
- The Site Manager is to report any such discoveries to the Client and the Environmental Consultant;
- Following notification from the Site Manager, the Environmental Consultant shall discuss the discovery with the Local Authority and if considered necessary, arrange to meet an Officer on site to view the discovery;
- The Environmental Consultant shall attend the site to record the location, extent and nature of the discovery and implement an appropriate sampling and analysis regime, taking due account of the type and nature of the discovery, known and probable land uses in that area of the site;
- Where remedial action is required, regulatory consultation and approval will be sought;
- A record will be produced by the Environmental Consultant and held on site (with copies held by the Environmental Consultant, Client and Local Authority), detailing the discovery, assessment works undertaken, findings thereof, confirmation either of no action required or detailing the remedial action taken and validation thereof.

The process is shown overleaf.

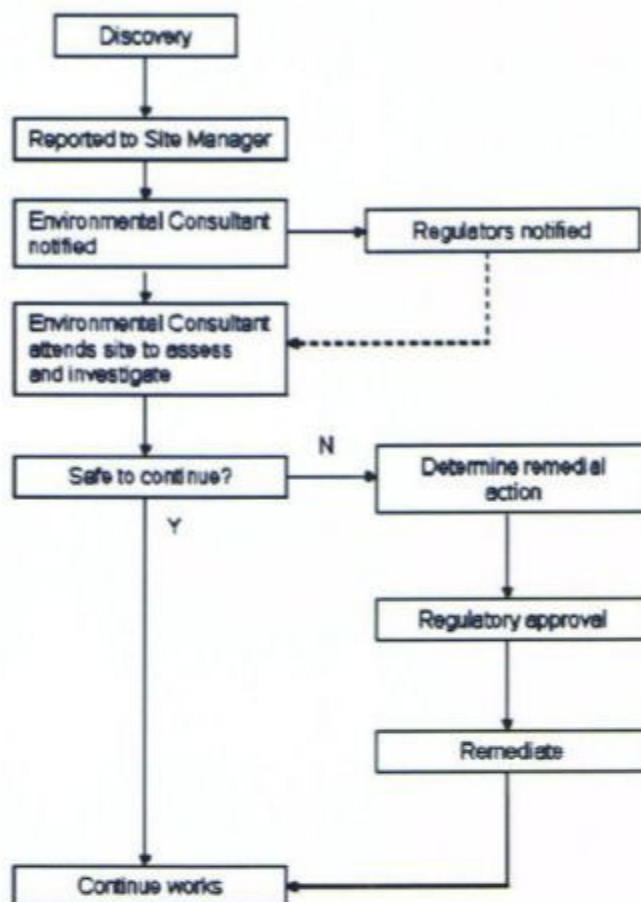


Chart 1 Discovery Strategy Process

A copy of the discovery strategy will be lodged on site and provisions made to ensure that all workers are made aware of their responsibility to observe, report and act on any potentially suspicious or contaminated materials they may encounter.



9.0 VALIDATION

On completion of the development, a validation report will be prepared for the remedial and monitoring works undertaken. The report will be submitted to the Client, Environment Agency and to Havant Borough Council for formal approval in line with planning conditions. The report will also detail any further groundwater remediation works that may be required following completion of the development and monitoring, subject to the outcome of the Environment Agency's discussions with Kwik Fit, an appropriate risk assessment.

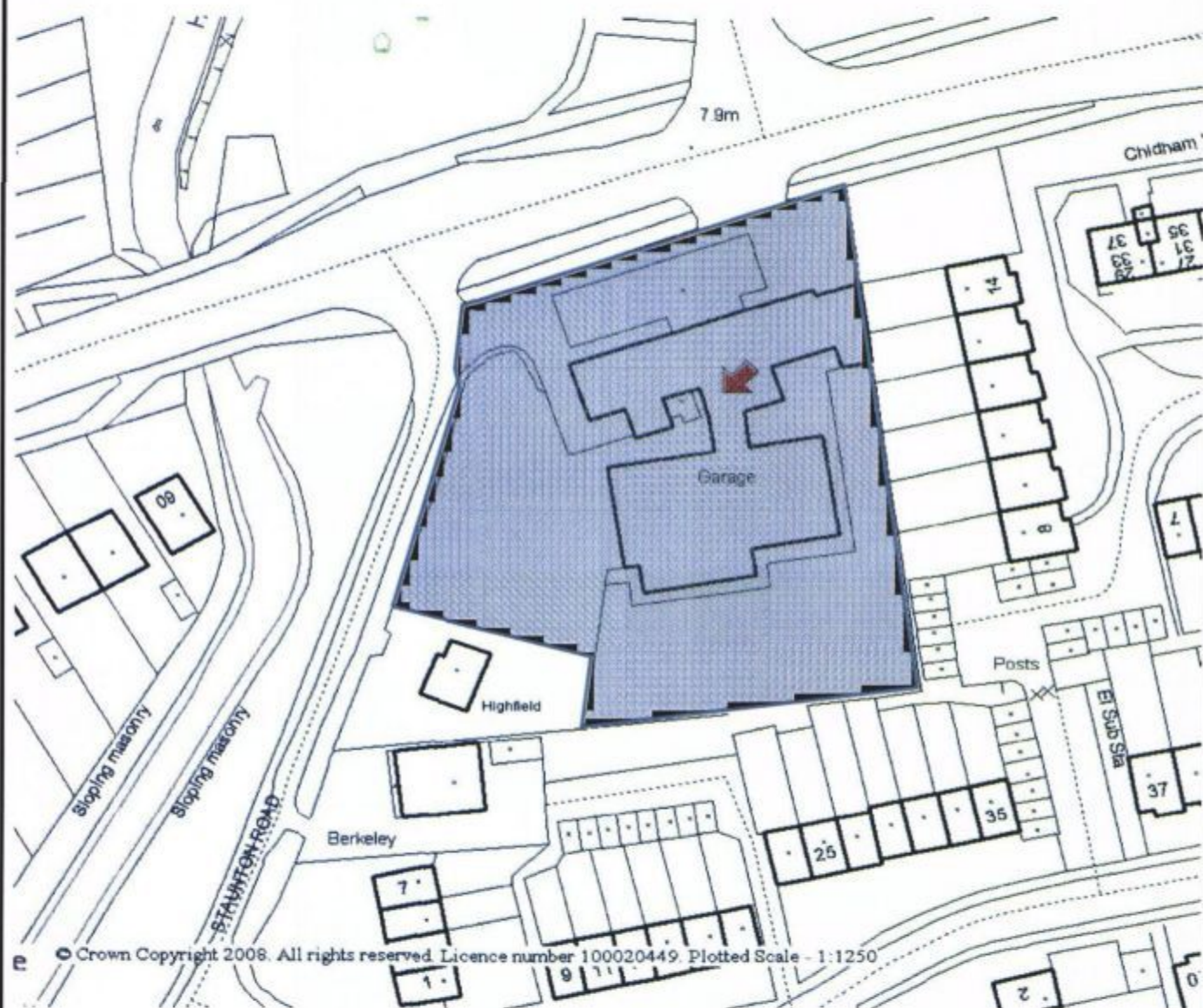
The Validation Report will refer to the works as set out within the Development Plan and include relevant site based information such as records from site inspections, photographs of specific remedial or waste handling measures, material datasheets, QA certification (where relevant) and an audit trail for imported subsoil and topsoil, including source, provenance, analytical results, placement location and thickness.

In addition the validation report will include (where required), but not be limited to, the following:

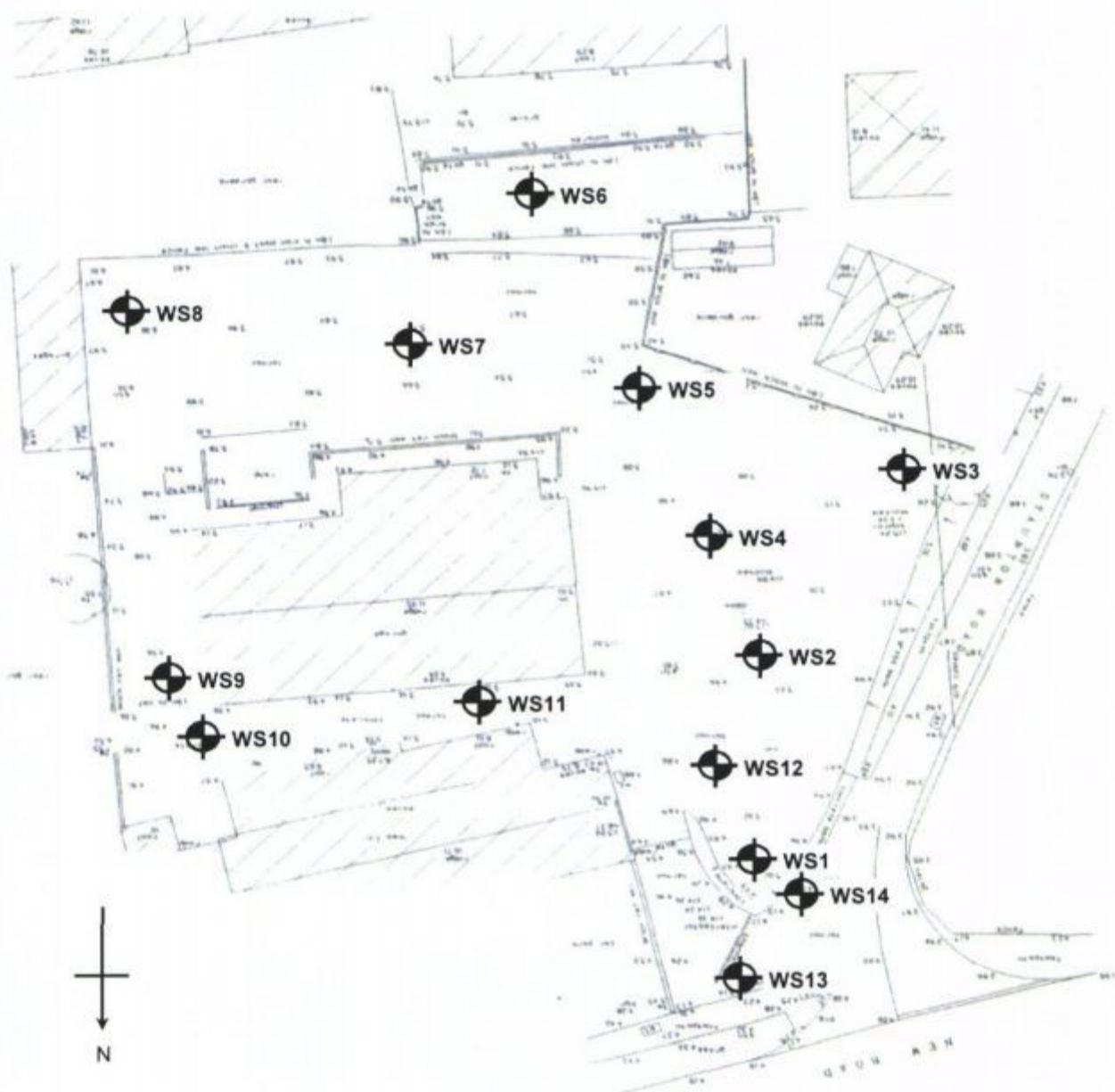
- Details of all hot spot areas excavated where required, including soil volumes disposed of off-site and contamination content.
- The location and results for validation samples collected from the base and sides of excavations and submitted for laboratory analysis.
- The location and results for validation samples from proposed residential garden areas.
- The location and results of bulk samples taken from stockpiled material to identify the materials suitability for re-use/disposal.
- Final elevations following completion of soil excavations
- Perched water volumes and contaminant concentrations for water removed from excavations by dewatering.
- Land gas concentrations prior to, during and following remediation works.
- Groundwater monitoring results

The remedial works and monitoring works will be inspected, carried out and validated by the Environmental Consultant (Geo-Environmental).

FIGURES



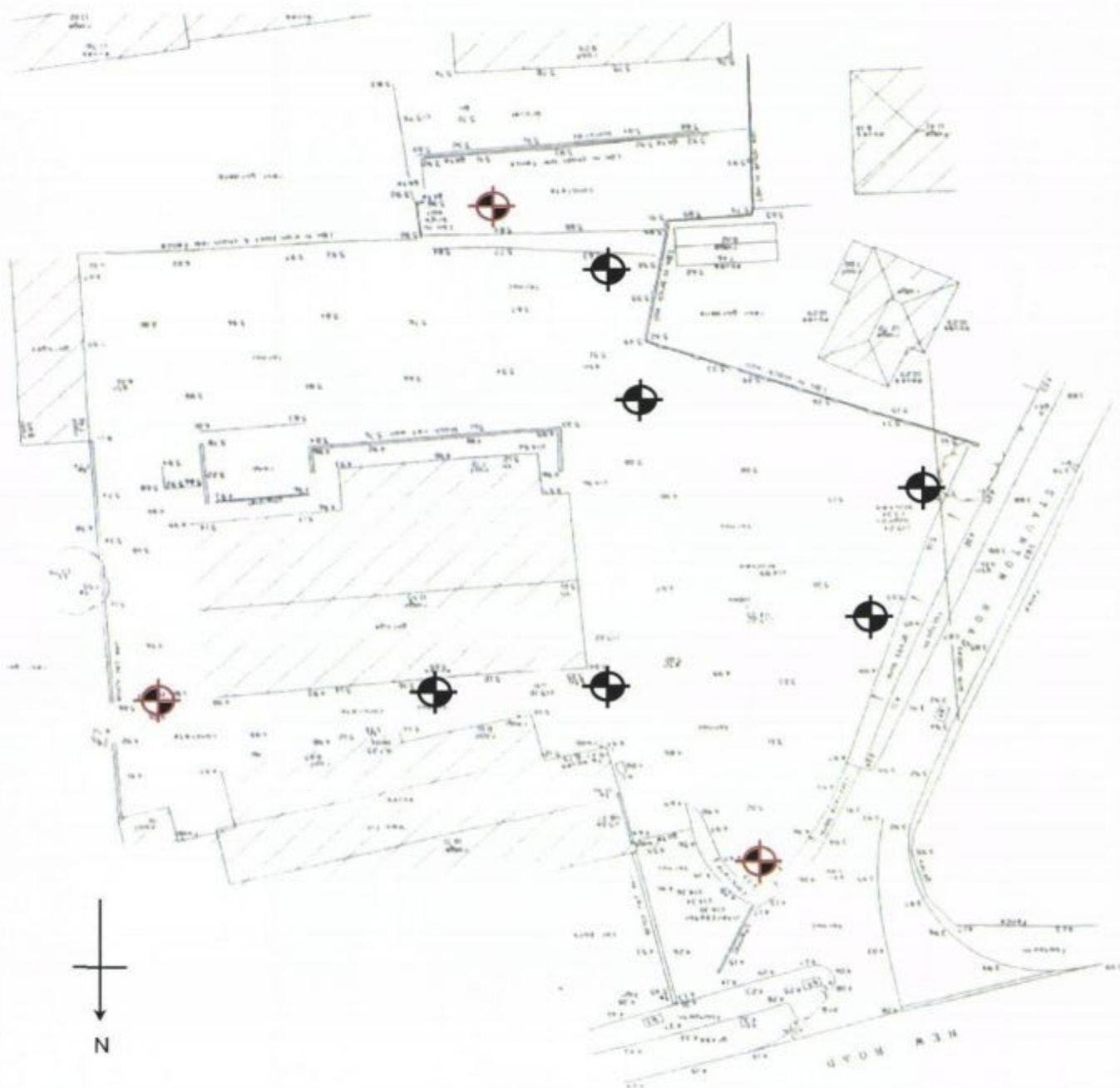
Project:	Land of New Road, Havant PO9 1DE		Title	Site Location
Client:	Woodfield Builders (Waterlooville) Ltd		Geo-Environmental Services Ltd	
Ref No:	GE6175	Revision:	0	
Drawn:	LP	Date:	10th March 2008	
Figure:	1	Scale:	Not To Scale	
			28 Crescent Road, Brighton, BN2 3RP	
			T: 01273 699 399 F: 01273 699 388	
			E: mail@gesl.net W: www.gesl.net	



Note: Positions are indicative unless surveyed

Project: New Road, Havant		Title: Existing Borehole Plan	
Client: Woodfield Builders (Waterlooville) Limited		Geo-Environmental Services Ltd 28 Crescent Road, Brighton, BN2 3RP T: 01273 699 399 F: 01273 699 388 E: mail@gesl.net W: www.gesl.net	
Ref No: GE6175	Revision: V1		
Drawn: GR	Date: 09/04/2008		
Figure: 2	Scale: Not To Scale		





Existing



Proposed Locations subject to change depending on access

Note: Positions are indicative unless surveyed

Project: New Road, Havant				Title	Proposed Draft BH Locations
Client: Woodfield Builders (Waterlooville) Limited				Geo-Environmental Services Ltd 28 Crescent Road, Brighton, BN2 3RP T: 01273 699 399 F: 01273 699 388 E: mail@gesl.net W: www.gesl.net	
Ref No: GE6175		Revision: V1			
Drawn: LP		Date: 15/05/2008			
Figure: 3		Scale: Not To Scale			


Geo-Environmental

APPENDIX A

Import Criteria

Imported Soils Specification

1.0	Introduction.....	1
2.0	Chemical Composition.....	2
3.0	Nutritional Composition	7
4.0	Physical Composition	8
5.0	Source Requirements.....	9
6.0	Testing Rates	10

1.0 Introduction

This documents sets out the requirements for cover systems and imported materials for any project undergoing redevelopment or other works where capping work is required.

Within the specification reference has been made to topsoil and subsoil. Topsoil relates to the top layer of natural soil that can support healthy vegetation growth. Subsoil relates to the layer of soil immediately below the topsoil to the depth of the underlying broken rock or geological parent material.

The specification considers the chemical, nutritional and physical properties of soil that are to be imported onto site, in order to ensure materials use are suitable for their intended use and do not introduce any new hazard or pollutant linkage on to the site.

2.0 Chemical Composition

The chemical criteria listed below are based on published CLEA Soil Guideline Values, generic assessment criteria calculated using CLEA UK or by reference to current guidance and best practice.

2.1 Method of Analysis

Samples should be analysed using UKAS or MCerts accredited laboratories. For TPH analysis sample preparation must not include air drying.

2.1.1 Poly Aromatic Hydrocarbon (PAH)

The PAH analysis must include the EPA priority 16.

2.1.2 Total Petroleum Hydrocarbons (TPH)

The analysis for TPH should be undertaken on the 'as received' sample and not be subject to any pre-treatment and include aliphatic and aromatic carbon banding split.

2.2 Topsoil (0-300mm depth)

Table 1 provides a list of the maximum acceptable concentrations for imported topsoil.

Parameter	Maximum concentration (mg/kg)
Inorganic	
Arsenic (total)	<20
Boron (water soluble)	<3
Cadmium (total)	pH6 = <1 pH7 = <2 pH8 = <8
Chromium (total)	<130
Copper (total)	<130
Cyanide (total)	<250
Lead (total)	<450
Mercury (total inorganic)	<8
Nickel (total)	<50
pH	5.5 – 7.8
Selenium (total)	<35
Sulphate (total)	<2000
Zinc (total)	<330
Organic	
Soil Organic Matter (SOM)	
Phenols (total)	*SOM 1% = 78 *SOM 2.5% = 150 *SOM 5% = 280
Poly Aromatic Hydrocarbon (total EPA 16)	<50
Benzo(a)pyrene	1.1
Naphthalene	*SOM 1% = 3.47 *SOM 2.5% = 8.47 *SOM 5% = 17
Total Petroleum Hydrocarbon (speciated)	See Table 1a

Table 1: Chemical Specification for Topsoil

	Maximum Concentration (mg/kg)		
	1% SOM	2.5% SOM	5% SOM
Aliphatic			
EC 5-6	2.11	3.72	6.38
EC >6-8	5.37	11.9	22.7
EC >8-10	1.46	3.55	7.0
EC >10-12	8.53	20.8	40.1
EC >12-16	40.7	93.4	163
EC >16-35	16400	16400	16300
EC >35-44	16400	16400	16300
Aromatic			
EC 5-7 (benzene)	0.575	1.33	2.57
EC >7-8 (toluene)	0.624	1.46	2.85
EC >8-10	1.09	2.67	5.30
EC >10-12	1.94	4.76	9.44
EC >12-16	2.19	5.39	10.7
EC >16-21	115	132	133
EC >21-35	157	161	157
EC >35-44	157	161	157
Aliphatic and Aromatic			
EC >44-70	174	179	174

Table 1a: Topsoil Specification for Speciated TPH

2.3 Subsoil (300-1000mm depth)

Table 2 provides a list of the maximum acceptable concentrations for imported subsoil.

Parameter	Maximum concentration for RESIDENTIAL use (mg/kg)	Maximum concentration for COMMERCIAL use (mg/kg)
Inorganic		
Arsenic (total)	<20	<500
Boron (water soluble)	<3	<3
Cadmium (total)	pH6 = <1 pH7 = <2 pH8 = <8	1400
Chromium (total)	<130	<5000
Copper (total)	<130	<130
Cyanide (total)	<250	<250
Lead (total)	<450	<750
Mercury (total inorganic)	<8	<480
Nickel (total)	<50	<5000
pH	5.5 to 8.2	5.0 to 8.2
Selenium (total)	<35	<35
Sulphate (total)	<2000	<2000
Zinc (total)	<330	<300
Organic		
Phenols (total)	*SOM 1% = 78 *SOM 2.5% = 150 *SOM 5% = 280	*SOM 1% = 21900 *SOM 2.5% = 43000 *SOM 5% = 78100
Poly Aromatic Hydrocarbon (total EPA 16)	<50	<50
Benzo(a)pyrene	1.1	30
Naphthalene	*SOM = 3.47 *SOM = 8.47 *SOM = 17	*SOM 1% = 290 *SOM 2.5% = 720 *SOM 5% = 1440
Total Petroleum Hydrocarbon (speciated)	See Table 2a	See Table 2b

Table 2: Chemical Specification for Subsoil

	Maximum Concentration (mg/kg)		
	1% SOM	2.5% SOM	5% SOM
Aliphatic			
EC 5-6	2.11	3.72	6.38
EC >6-8	5.37	11.9	22.7
EC >8-10	1.46	3.55	7.0
EC >10-12	8.53	20.8	40.1
EC >12-16	40.7	93.4	163
EC >16-35	16400	16400	16300
EC >35-44	16400	16400	16300
Aromatic			
EC 5-7 (benzene)	0.575	1.33	2.57
EC >7-8 (toluene)	0.624	1.46	2.85
EC >8-10	1.09	2.67	5.30
EC >10-12	1.94	4.76	9.44
EC >12-16	2.19	5.39	10.7
EC >16-21	115	132	133
EC >21-35	157	161	157
EC >35-44	157	161	157
Aliphatic and Aromatic			
EC >44-70	174	179	174

Table 2a: Residential Subsoil Specification for Speciated TPH

	Maximum Concentration (mg/kg)		
	1% SOM	2.5% SOM	5% SOM
Aliphatic			
EC 5-6	95.3	168	288
EC >6-8	242	535	1020
EC >8-10	65.9	160	317
EC >10-12	29900	30600	30400
EC >12-16	29900	30600	30400
EC >16-35	617000	631000	627000
EC >35-44	617000	631000	627000
Aromatic			
EC 5-7 (benzene)	26.9	62.1	121
EC >7-8 (toluene)	30.4	71.1	139
EC >8-10	107	263	513
EC >10-12	625	1450	2600
EC >12-16	12200	12500	12400
EC >16-21	9190	9400	9350
EC >21-35	9250	9460	9410
EC >35-44	9250	9460	9410
Aliphatic and Aromatic			
EC >44-70	9250	9460	9410

Table 2b: Commercial / Industrial Subsoil Specification for Speciated TPH

3.0 Nutritional Composition

The nutritional criteria listed below are based on BS 3882:1994 Specification for Topsoil. In the absence of published criteria, current guidance and best practice has been applied to derive appropriate criteria.

3.1 Topsoil & Subsoil

Table 3 details the minimum acceptable concentrations for imported topsoil and subsoil.

Topsoil/Subsoil	Parameter	Min Concentration
Topsoil	Phosphorous	16 mg/l
	Potassium	120 mg/l
	Magnesium	26 mg/l
	Nitrogen	0.2 %
Subsoil	Phosphorous	16 mg/l
	Potassium	120 mg/l
	Magnesium	26 mg/l
	Nitrogen	0.2 %

Table 3: Nutritional Specification for Topsoil and Subsoil

4.0 Physical Composition

The physical criteria listed below are based on BS 3882:1994 Specification for Topsoil. In the absence of published criteria, current guidance and best practice has been applied to derive appropriate criteria.

4.1 Topsoil

Table 4 details requirements for imported topsoil and subsoil.

Topsoil/Subsoil	Parameter	Specification requirements
Topsoil	Textural Classification	Sandy clay loam, sandy loam, loamy sand, sandy silt loam (as defined in BS 3882, Figure 1)
	Loss on Ignition	5-50%
	Maximum Stone content:	>2mm = 30%
		>20mm = 10%
Subsoil		>50mm = 0%
	Textural Classification	N/A
	Loss on Ignition	2-50%
	Maximum Stone content:	>2mm = 65%
		>20mm = 60%
		>50mm = 40%

NB: Subsoil must be free from glass, brick fragments etc.

Table 4: Physical Specification for Topsoil & Subsoil

5.0 Source Requirements

5.1 Topsoil and Subsoil

The following will be provided with all soils imported to site:

- Location of site which is clean and has no history of potentially contaminative uses.
- A site plan detailing the location and address of the source site.

5.2 Manufactured soils

Where natural soils are unavailable manufactured soils may be utilised the following should be provided:

- Details of the soil manufacturing process, including criteria for received soils, quality control procedure and validation protocol.
- Soils should be tested at a minimum ratio of one sample per 50m³.

6.0 Testing Rates

6.1 Topsoil

Where the source of the material is known validation sampling should be undertaken at a minimum rate of 1 sample per source, or for larger sources 1 sample per 250m³ of soil to be used on site.

Where the source of the material is not known the validation sampling should be undertaken at a minimum of 1 sample per 50m³.

6.1 Subsoil

Where the source of the material is known validation sampling should be undertaken at a minimum rate of 1 sample per source, or for larger sources 1 sample per 500m³ of soil to be used on site.

Where the source of the material is not known the validation sampling should be undertaken at a minimum of 1 sample per 50m³.

6.2 Manufactured soils

Soils should be tested at a minimum ratio of one sample per 50m³.

6.3 Sample failure

In the event that a sample fails to meet the specified criteria for any parameter the Local Authority should be contacted for advice on the suitability of the materials.

Further testing may be required to provide reassurance that the exceedances are not representative of the soil.

Where failures relate to manufactured soils details of the source, the source will be rejected.

APPENDIX B

Method Statements

APPENDIX B METHOD STATEMENTS

METHOD STATEMENT REGISTER FOR REMEDIATION WORKS

DESCRIPTION	REFERENCE	REVISION
SITE ESTABLISHMENT	01	0
DISPOSAL OF WATER	02	0
CONTROL OF NOISE, DUST AND ODOUR	03	0
CONTAMINATED SOIL REMOVAL BY OFF SITE DISPOSAL	04	0
BACKFILLING WITH CLEAN MATERIAL	05	0
SCREENING MATERIAL	06	0
EXCAVATION OF HOT-SPOTS	07	0

PROJECT: LAND OFF NEW ROAD, HAVANT
REF: GE6175

METHOD STATEMENT No. 01
REVISION 0

SUBJECT SITE ESTABLISHMENT

Site set up:

Office accommodation and welfare facilities are established on site as part of the main development works. Woodfield Builders are responsible for the provision and management of these facilities.

First aid provisions are established within the site welfare and accommodation facilities. PPE appropriate to the works will be provided by Geo-Environmental for their on site employees. PPE for Woodfield Builders and Construction personnel are to be provided by the relevant employer.

The designated 'Clean' area of the site will be the site accommodation and welfare facilities. The 'Dirty' area of the site is defined as any area where excavation and/or stockpiling of contaminated soils is being undertaken. Given that contamination has been identified as localised 'hot spots' these area will be remediated in separation from each other. Any Dirty area being remediated will be fenced off using mesh fencing, e.g. orange Netlon. Only personnel authorised by the Site Manager and with approval of Geo-Environmental's Site Representative will be permitted to access these areas. PPE must be removed prior to entering a Clean area from a Dirty area.

Health and Safety

All personnel working on the remediation works will be required to attend a Site Induction provided by Woodfield Builders and, in line with current legislation, must hold a valid and appropriate CSCS Card. Prior to commencing any remediation works in any given Dirty area, the remediation personnel will attend a location specific briefing provided by Geo-Environmental. Site Induction records will be held by Woodfield Builders (Waterlooville) Ltd. Location specific briefing records will be held by Geo-Environmental with copies provided to Woodfield Builders (Waterlooville) Ltd for the site Health and Safety File. Site personnel will be issued, by their employers, with appropriate PPE and will be required to wear/use it correctly at all times on the site.

Approved by:		Date:	
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PROJECT: LAND OFF NEW ROAD, HAVANT
REF: GE6175

METHOD STATEMENT No. 02
REVISION 0

SUBJECT DISPOSAL OF WATER

Water encountered within excavations will be controlled by means of submersible pumps. The water will be pumped to holding/settlement tanks or directly to road tanker for disposal at an appropriate off-site facility tailored to suit the specific conditions.

If water is treated on site, e.g. by means of settlement tanks, carbon filters etc. a discharge consent will be obtained from the local water agency to permit discharge to the sewerage network. Alternatively, water will be removed directly from site to a licensed disposal facility.

Approved by:		Date:	
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PROJECT: LAND OFF NEW ROAD, HAVANT
REF: GE6175

METHOD STATEMENT No. 03
REVISION 0

SUBJECT CONTROL OF NOISE, DUST AND ODOUR

Dust and odours will be monitored throughout the remediation works at pre-agreed boundary locations to suit prevailing wind conditions, the specific site operations being undertaken at any given time and nature of adjacent land uses.

Noise

All plant will be operated on site and will be in accordance with relevant codes of practice and statutory requirements. Any noise monitoring would be undertaken as part of the main groundworks and construction works, rather than specifically to the remediation works.

Dust

Mobile dust suppression units will be utilised to reduce the generation of and/or release of dust during on site operations as required by the prevailing conditions.

Odour

All stockpiles will be covered when not being worked, i.e. placed or removed for disposal, in order to minimise the potential for odour to be released to atmosphere. During excavation, the working face of any odorous excavation will be minimised wherever possible and excavation works undertaken expeditiously so as not to exacerbate the situation.

Approved by:		Date:	
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PROJECT: LAND OFF NEW ROAD, HAVANT
REF: GE6175

METHOD STATEMENT No. 04
REVISION 0

SUBJECT CONTAMINATED SOIL REMOVAL BY OFF-SITE DISPOSAL

Excavation works will be carried out using a tracked 360 excavator, with excavated material placed into site wagons for transit to stockpiles or directly into wagons for off-site disposal at a suitably licensed facility. Where materials are placed in stockpiles, the stockpiles will reflect the specific contaminants identified. Mixing of wastes will not be permitted. Individual stockpile volumes will not exceed 250m³. Stockpiling of material on site will be covered under a Paragraph 41 Waste Management License Exemption.

Where materials are placed into stockpiles, these shall be formed by the placement of a basal polythene membrane lapped over a bund wall, e.g. created by sand, sand bags, or the like. A second membrane shall be placed over the membrane and weighted down or otherwise secured to prevent the release of dust or odour, or the ingress of rainwater to the stockpile. Prior to off-site disposal, representative samples shall be taken from the stockpile at an approximate rate of one sample per 150m³ of material within the stockpile, or a minimum of one sample per stockpile, if the stockpile is less than this volume.

Where materials are placed directly into road wagons, the wagon will be sheeted and exit the site via a wheel washing facility. All wagons will be checked for cleanliness prior to leaving the site.

In order to prevent cross contamination, wagons carrying contaminated soils from site shall not be used for the importation of clean fill on to site.

Road wagons will exit the site in accordance with site specific transport management plans.

Approved by:		Date:	
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PROJECT: LAND OFF NEW ROAD, HAVANT
REF: GE6175

METHOD STATEMENT No. 05
REVISION 0

SUBJECT BACKFILLING WITH CLEAN MATERIAL

Excavations which have been validated will be backfilled with certified clean material which has either been derived from uncontaminated areas elsewhere on site, or have been imported onto site for use as subsoil or Topsoil.

Subsoil derived from on-site shall be transported to the excavation by dump truck and placed with nominal compaction by excavation plant crossing the placed subsoil. Imported materials will be brought onto site in road wagons with the materials either placed into designated clean stockpiles or placed directly into excavations.

Where materials are to be imported on to the site for use as subsoil and Topsoil, these shall be derived from one of two sources, i.e. natural or processed. Where natural sourcing is proposed, the provenance of the material shall be determined by confirmation of the source site's history to confirm no previous potentially contaminative use, coupled with analysis of soils at a minimum rate of 3 samples per source site and 1 sample per 250m³ thereafter. Where Topsoil or subsoil are derived from a manufactured source testing would be undertaken at a rate of 1 sample per 50m³. With regards to physical and nutritional composition and minimum testing regime of 1 sample per 250m³ is recommended for either source.

A minimum of 5m will be left from any face or excavation base that has not been validated to ensure that cross contamination does not arise.

Road wagons will enter and exit the site in accordance with site specific transport management plans.

Approved by:		Date:	
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PROJECT: LAND OFF NEW ROAD, HAVANT
REF: GE6175

METHOD STATEMENT No. 06
REVISION 0

SUBJECT SCREENING OPERATIONS

No screening works are proposed as part of the remediation works on this site.

However, crushed concrete has been screened and stockpiled on site from the demolition of the former buildings and concrete slabs. This was undertaken as part of the site demolition works. Where concrete has been encountered in former petrol, diesel or oil tanks it was processed and crushed as an entirely separate batch, with the crushed material stockpiled in line with the method for stockpiling contaminated soils.

Approved by:		Date:	
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PROJECT: LAND OFF NEW ROAD, HAVANT
REF: GE6175

METHOD STATEMENT No. 07
REVISION 0

SUBJECT EXCAVATION OF HOT SPOTS

Hot spot excavation will be undertaken using a tracked 360 excavator.

The hot spot locations are as determined from the Ground Investigation Report and presented in the Remedial Strategy. Hot spot areas will be determined on site by the Geo-Environmental Site Representative.

The Groundworkers will be made aware, through specific briefings given by Geo-Environmental, of the nature of the material that is to be excavated at each location in order that it can be stockpiled or removed directly from site.

If it is to be stockpiled, the excavated soil will be transported directly across the site from the excavation to the pre-defined stockpiling area. Dumpers will carry limited volumes in any given transit in order to prevent the loss of contaminated soil onto uncontaminated areas of the site. Where possible and practicable a single haul route will be used for material transit to stockpile. The use of a single dumper will prevent vehicle congestion.

Approved by:		Date:	
--------------	--	-------	--

APPENDIX C

Specification for Gas Protection Measures

Visqueen GX Geomembrane (hydrocarbon)

- Suitable for use on hydrocarbon contaminated sites
- High Puncture & Tear Resistance
- Excellent Chemical Resistance
- Excellent Welding Properties
- Low Permeability to Hydrocarbon Gases

Description

Visqueen GX Geomembrane is a high quality single layer HDPE membrane and is suitable for use as a barrier membrane on brownfield sites that require protection from dangerous contaminants such as hydrocarbons and methane, together with excellent damp proofing characteristics.

Application

Visqueen GX Geomembrane has a proven track record as a barrier membrane on gas contaminated and hydrocarbon contaminated brownfield sites. Refer to the GX Geomembrane Chemical Compatibility Chart for use as a guide for material suitability on VisqueenBuilding.co.uk.

Visqueen GX Geomembrane combines strength with flexibility enabling high levels of stress/crack resistance to be achieved together with excellent bi-axial load absorption characteristics. Due to its high puncture and impact resistance GX Geomembrane generally requires no protective screed or boarding when laying reinforced concrete above it.

Visqueen GX Geomembrane has a proven track record as a barrier membrane on gas contaminated and hydrocarbon contaminated brownfield sites. Refer to the GX Geomembrane Chemical Compatibility Chart for use as a guide for material suitability on VisqueenBuilding.co.uk.

Visqueen GX Geomembrane combines strength with flexibility enabling high levels of stress/crack resistance to be achieved together with excellent bi-axial load absorption characteristics. Due to its high puncture and impact resistance GX Geomembrane generally requires no protective screed or boarding when laying reinforced concrete above it.

Visqueen GX Geomembrane has been designed to exhibit superior welding properties when compared to conventional materials. High quality welding can be performed in a wide range of climate conditions. The material can be welded with one of three principal systems:

- * Hot Edge Welding
- * Air Welding
- * Extrusion Welding

Material Specification

Visqueen GX Geomembrane can be manufactured in a range of sizes to suit individual applications; standard rolls are also available and the membrane can also be prefabricated into panels prior to installation. Visqueen strongly advise the use of the following components when installing the membrane:

t. 01685 840672
f. 01685 842580
enquiries@visqueenbuilding.co.uk
www.visqueenbuilding.co.uk
Document last updated: 25/07/2006

VISQUEEN
BUILDING PRODUCTS

Visqueen GX Geomembrane (hydrocarbon)

GX Geomembrane: 1.5mm x 2.95m x 25m (73.75m²) Standard Roll

GX Jointing System: Two part jointing System

GX Geocomposite Venting System: 12 & 25mm void formers

Pre-formed Top Hat Units: For sealing around service pipe penetrations

GX DPC: 645mm / 970mm x 30m Roll A flexible reinforced Elvaloy DPC designed to prevent the transmission of hydrocarbon gases through the cavity

Pre-formed DPC Internal & External Corner Units To form an effective seal at corners.

Installation

Installation Details

Visqueen GX Geomembrane is designed to exhibit superior welding properties therefore we recommend factory welding or on-site welding methods of jointing when the membrane is to be installed below a ground floor construction.

In certain applications where the membrane is to be installed above a suspended in-situ concrete slab or block and beam suspended floor, the sealing of laps can be achieved using the GX Jointing Tape system. In these instances Visqueen GX Jointing Tape should be applied approximately 50mm from the edge. The next width of Visqueen GX Geomembrane should then be overlapped. For effective protection all laps must be a minimum of 150mm and the joint should be secured with Visqueen GX Girth Jointing Tape, a single sided tape which provides added security against any potential leakage paths. Always ensure that the membrane is clean, dust free and dry at the time of jointing.

Visqueen GX Geomembrane and ancillary components must be installed in accordance with the recommendations of Building Research establishment BRE 414 "Protective measures for housing on gas contaminated land", Ciria Report 149 "Protecting development from methane", together with codes of practice CP102 and BS 8102.

Visqueen GX Membrane should be installed on a blinded or smooth surface allowing adequate overlap for jointing between the sheets and avoiding bridging i.e. areas of unsupported membrane. A final floor covering should be installed above it and care should be taken to ensure the membrane is not damaged prior to this.

To avoid slip or shear planes it is not recommended to take membranes through the wall. In order to provide a continuous barrier across the cavity Visqueen GX DPC should be sealed to the membrane, taken through the blockwork, up the wall and incorporated below the damp proof course on the outer leaf.

Visqueen GX DPC should be installed in accordance with BS 8215: 1991, BS 8000: Part 3, 1989 and BS 5628: Part 3: 1985. All horizontal DPCs must be bedded on both sides with fresh mortar. All DPCs must project through the full width of the wall, including any externally applied rendering and project 5mm beyond the finished external face.

Venting

Open voids beneath the ground floor with cross ventilation through the external walls will normally be required. Visqueen GX Geocomposite void formers or block & beam suspended floors supported on load bearing walls will dilute and disperse gases.

t. 01685 840672
f. 01685 842580
enquiries@visqueenbuilding.co.uk
www.visqueenbuilding.co.uk
Document last updated: 25/07/2006

VISQUEEN
BUILDING PRODUCTS

Visqueen GX Geomembrane (hydrocarbon)

Please contact the Visqueen Technical Support Team for more information.

Technical Support

Due to the wide variety of hydrocarbon contaminants found, we strongly recommend the use of the Visqueen Building Products Technical Support Team at an early design stage so that the most appropriate detailing and material specification are adopted.

Typical Properties	
Density (ASTM D1505)	1mm: 941kg/m ³ +/- 1% / 1.5mm: 941kg/m ³ +/- 1%
Thickness (BS2782-630A Av.across roll width)	1mm: +/- 5% 1.5mm: +/- 5%
Melt Flow Index (ASTM D1238)	1mm: <0.5gm/ 10 minutes 1.5mm: <0.5gm/ 10 minutes
Unaged Tensile (MPa)	1mm: 31.2 1.5mm: 29.3
Unaged Elongation (%)	1mm: 860 1.5mm: 845
Unaged Instrument Impact(N)	1mm: 2220.1 1.5mm: 3357.5
Tear Strength (N/mm)	1mm: 156.8/145.6 1.5mm: 149.1/156.5
Petrol Permeability (g/m ² /hr)	1mm: 7.0 1.5mm: 3.8
Diesel Permeability (g/m ² /hr)	1mm: 14.8 1.5mm: 1.7
Aged (Petrol) Tensile Strength (MPa)	1mm: 31.6 1.5mm: 26.4
Aged (Petrol) Elongation @ break (%)	1mm: 925 1.5mm: 805
Aged (Diesel) Tensile Strength (MPa)	1mm: 29.2 1.5mm: 30.4
Aged (Diesel) Elongation @ break (%)	1mm: 780 1.5mm: 835
Methane Permeability (m ² /sec/Pa)	1mm: 8.61 x 10 ⁻¹⁸ 1.5mm: 7.96 x 10 ⁻¹⁸
Methane Permeability (cc/m ² /day/bar)	1mm: 76.2 1.5mm: 46.0
Methane Permeability (cc/m ² /hr)	1mm: 3.2 1.5mm: 1.95

APPENDIX D

Sketch of Proposed Foundations

**RUSHBY BREWSTER**

CONSULTING CIVIL AND STRUCTURAL ENGINEERS

The Town House, St George's Square, Bishops Waltham, Southampton, Hampshire SO32 1AF
E: admin@rushbybrewster.co.uk W: www.rushbybrewster.co.uk
T: 01489 890004 F: 01489 890005

FACSIMILE TRANSMISSION

Job Title: LAND BEHIND KWIK FIT HANTRY.	Job No: RBA678
FAO: NICK HEDDEN	Company: RBA.
Copies:	Fax: 02392 8199910.
From: A RUSHBY	Fax:
Date: 18-04-08	No. of Pages: 4.

NICK

FURTHER TO OUR TELEPHONE CONVERSATION
PLEASE FIND ATTACHED ROUGH SKETCHES OF
FOUNDATION PROPOSALS FOR EACH BLOCK.

FOR THE APARTMENTS I SUGGEST WE USE
2 BLOCK COURSES BELOW BEAM & BLOCK FLOOR.
TO TOP OF FOUNDATION (450mm). THIS
WILL KEEP BOTTOM OF FOOTING ABOVE
THE RECORDED WATER TABLE.

SUGGEST OTHER BLOCKS USE 3 COURSES BELOW
B/BLOCK FLOOR - (BETTER FOR DRAIN RUNS
OUT OF BUILDING)

REGARDS.

AUL



CALCULATIONS

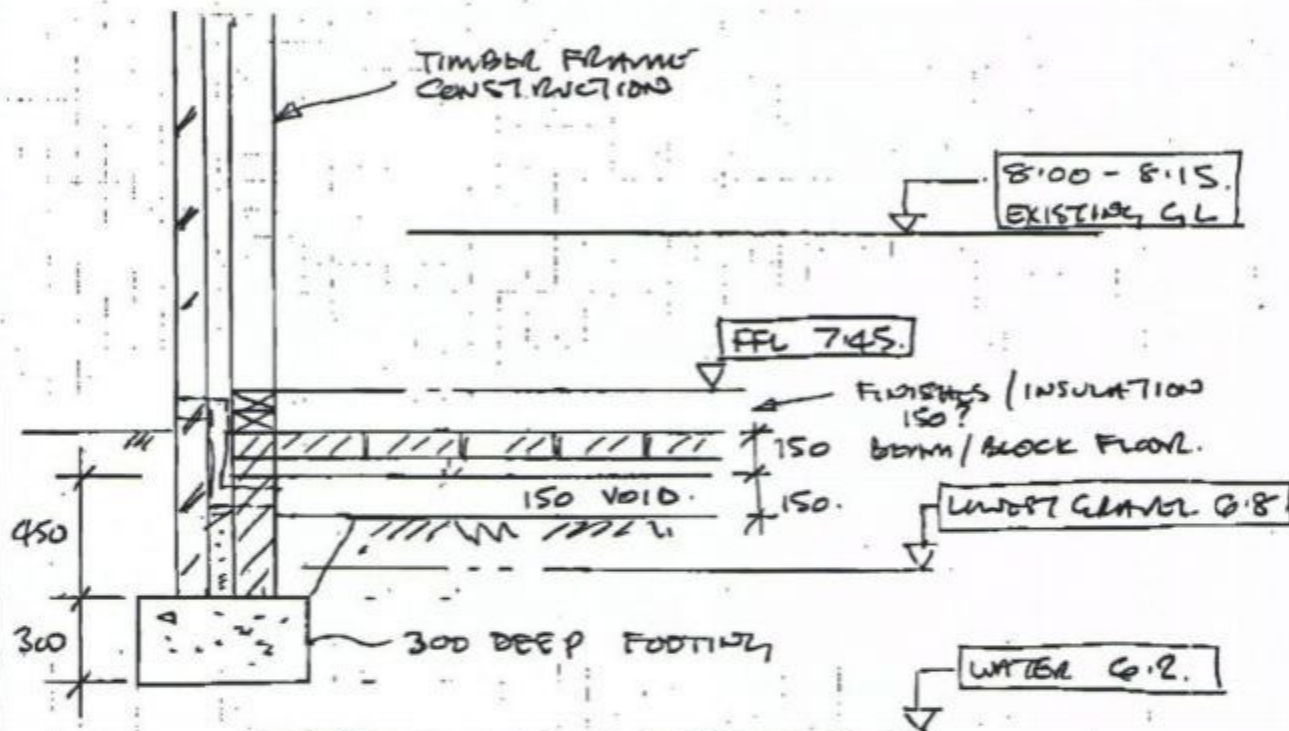
RUSHBY BREWSTER

CONSULTING CIVIL AND STRUCTURAL ENGINEERS

The Town House
St George's Square
Bishops Waltham
Southampton SO32 1AF
T: 01489 890004
F: 01489 890005

Job Title	LAND ATTACHED KITCHEN NEW ROUN HOUSE	Job No.	KAH 078	Shl. No.	SK 21
Element	FOUNDATIONS	Prepared	PN	Date	04-08
		Checked			

APARTMENTS 1-3



TYPICAL SECTION DETAIL 1:2.5



CALCULATIONS

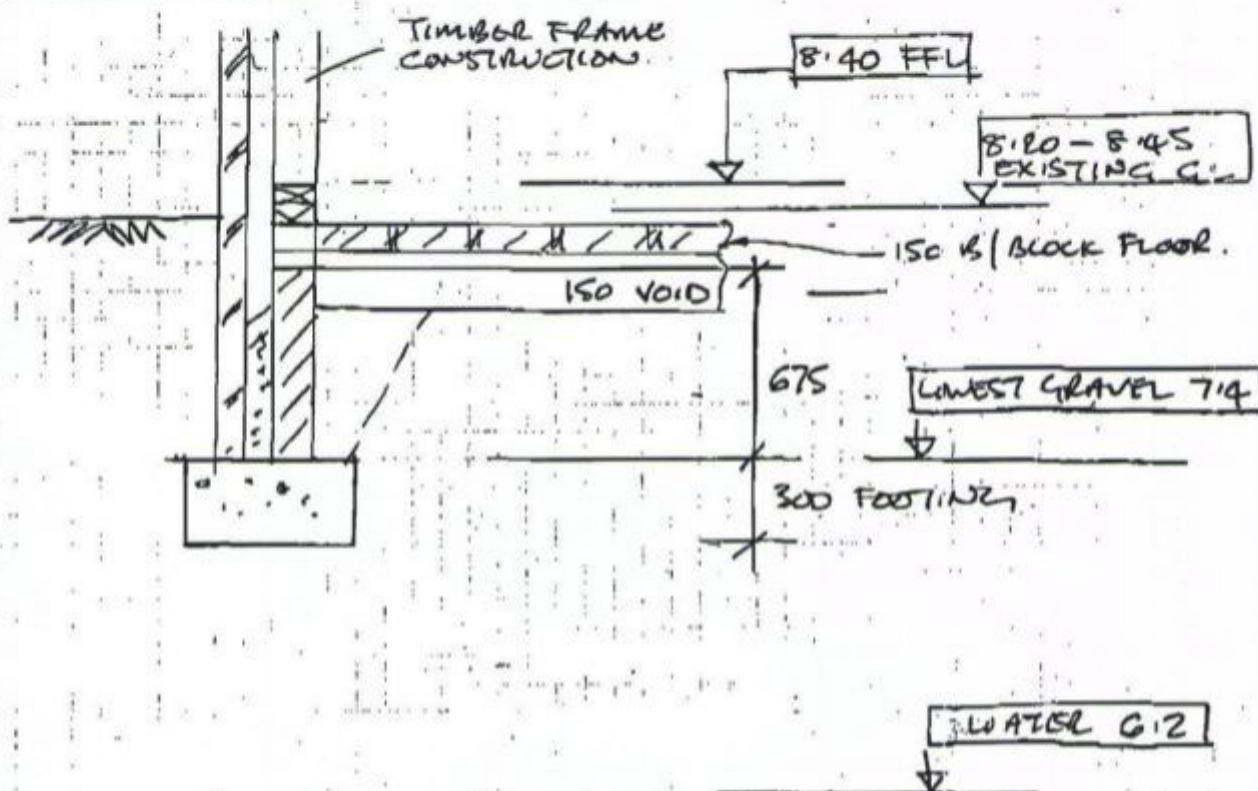
RUSHBY BREWSTER

CONSULTING CIVIL AND STRUCTURAL ENGINEERS

The Town House
St George's Square
Bishops Waltham
Southampton SO32 1AF
T: 01489 890004
F: 01489 890005

Job Title	LAND BEHIND KWIK FIT. NEW ROAD LAYOUT	Job No.	RBA 078	Shl. No.	SK 22
Element	FOUNDATIONS	Prepared	VR	Date	04 08
		Checked		Date	

HOUSES 1 & 2



TYPICAL SECTION DETAIL 1/25

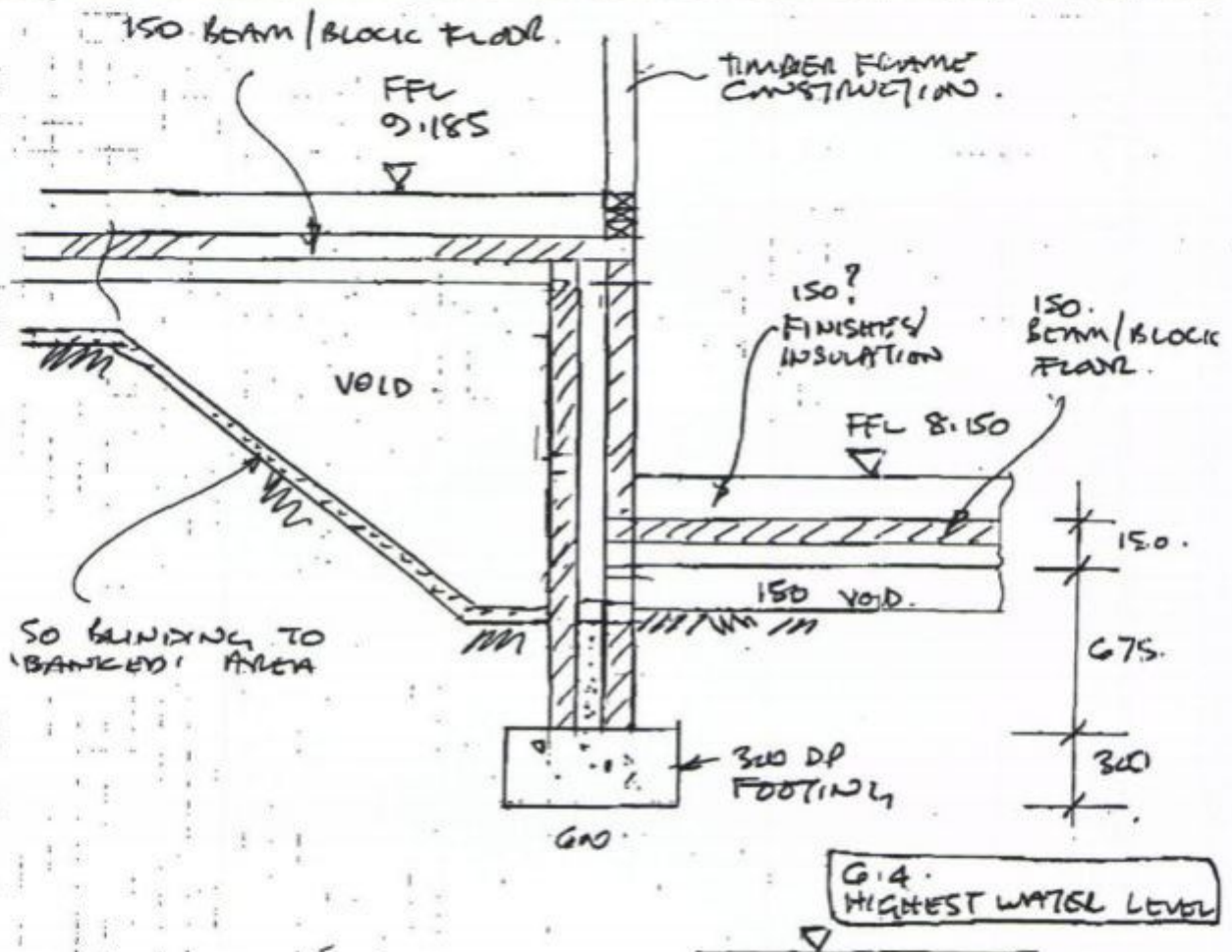


CALCULATIONS

RUSHBY BREWSTER
 CONSULTING CIVIL AND STRUCTURAL ENGINEERS

 The Town House
 St George's Square
 Bishops Waltham
 Southampton SO32 1AF
 T: 01489 890004
 F: 01489 890005

Job Title	Job No.	Sht. No.
NEW ROAD HAVANT	LSM 678	SK 23
Element	Prepared	Date
FOUNDATIONS	BR	04-08
	Checked	Date



TYPICAL SECTION AT CHANGE IN FLOOR LEVELS
HOUSES 3-10. 1125.

APPENDIX E

May 2008 Groundwater Analysis



The Harley Reed Building
Unit C, Drury Lane
Ponswood Industrial Estate
St Leonards on Sea
East Sussex
TN38 9BA
Telephone (01424) 718618
Facsimile (01424) 729911

THE ENVIRONMENTAL LABORATORY LTD

F.A.O. Laura Probert
Geo-Environmental Services Ltd
28 Crescent Road
Brighton
East Sussex, BN2 3RP

Reporting Date: 13/05/2008

ANALYTICAL REPORT No. AR14559

Samples Received By:-	Laboratory Courier
Samples Received:-	28/04/08
Your Order No:	GE6175
Site Location:-	New Road Havant
No Samples Received:-	2

Report Checked By:-

Steve Knight
Laboratory Manager

Authorised By:-

Cliff P.V. Knight BSc, EurChem, CChem FRSC
Managing Director

Any comments, opinions, or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683)



2683

THE ENVIRONMENTAL LABORATORY LTD

The Harley Reed Building, Unit C, Drury Lane, Ponswood Industrial Estate, St Leonards-on-Sea, East Sussex, TN38 9BA

Tel: 01424 718618 Fax: 01424 729911

ANALYTICAL REPORT No. AR14559

Location: New Road Havant

F.A.O. Laura Probert
Geo-Environmental Services Ltd
28 Crescent Road
Brighton
East Sussex BN2 3RP



Your Order No:

GE6175

Reporting Date: 13/05/2008

Waters

	TP/BH Our ref	WS1 80930	WS9 80931
Arsenic*	(µg/l)	10	<5
Cadmium*	(µg/l)	<1	<1
Chromium*	(µg/l)	<5	<5
Lead*	(µg/l)	<5	<5
Nickel*	(µg/l)	5	<1
Copper*	(µg/l)	24	20
Zinc*	(µg/l)	24	26
Mercury*	(µg/l)	<0.1	<0.1
Selenium*	(µg/l)	<5	<5
Boron	(µg/l)	121	79
Barium*	(µg/l)	50	78
Beryllium*	(µg/l)	<5	<5
Vanadium	(µg/l)	<5	<5
pH Value*	(Units)	8.4	8.1
Sulphate*	(mg/l)	14	81
Chloride*	(mg/l)	30	27
Total Cyanide*	(µg/l)	<5	<5
Sulphide	(mg/l)	<0.1	<0.1
Total Phenols	(µg/l)	<0.5	<0.5
Hexavalent Chromium	(µg/l)	<20	<20
Elemental Sulphur	(mg/l)	<0.1	<0.1

THE ENVIRONMENTAL LABORATORY LTD

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ANALYTICAL REPORT No. AR14559

Location: New Road Havant

F.A.O. Laura Probert
Geo-Environmental Services Ltd
28 Crescent Road
Brighton
East Sussex, BN2 3RP



Your Order No: GE6175

Reporting Date: 13/05/2008

Waters

	TP/BH	WS1	WS9
	Our ref	80930	80931
Naphthalene	(µg/l)	<0.01	<0.01
Acenaphthylene	(µg/l)	<0.01	<0.01
Acenaphthene	(µg/l)	<0.01	<0.01
Fluorene	(µg/l)	<0.01	<0.01
Phenanthrene	(µg/l)	<0.01	<0.01
Anthracene	(µg/l)	<0.01	<0.01
Fluoranthene	(µg/l)	<0.01	<0.01
Pyrene	(µg/l)	<0.01	<0.01
Benz(a)anthracene	(µg/l)	<0.01	<0.01
Chrysene	(µg/l)	<0.01	<0.01
Benzo(b)fluoranthene	(µg/l)	<0.01	<0.01
Benzo(k)fluoranthene	(µg/l)	<0.01	<0.01
Benzo(a)pyrene	(µg/l)	<0.01	<0.01
Indeno(1,2,3-cd)pyrene	(µg/l)	<0.01	<0.01
Dibenz(ah)anthracene	(µg/l)	<0.01	<0.01
Benzo(ghi)perylene	(µg/l)	<0.01	<0.01
Total PAH	(µg/l)	<0.01	<0.01

THE ENVIRONMENTAL LABORATORY LTD

The Harley Reed Building, Unit C, Drury Lane, Ponswood Industrial Estate, St Leonard's on Sea, East Sussex, TN38 9BA
Tel: 01424 718618 Fax: 01424 729911



ANALYTICAL REPORT No. AR14559

Location: New Road Havant

Your Order No: GE6175
Reporting Date: 13/05/08

F.A.O. Laura Probert
Geo-Environmental Services Ltd
28 Crescent Road
Brighton
East Sussex, BN2 3RP

IPH CWG - WATERS

	TP/BH Our ref	WS1 80930	WS9 80931
<u>Aromatic</u>			
>C ₅ -C ₇	(µg/l)	<10	<10
>C ₇ -C ₈	(µg/l)	<10	<10
>C ₈ -C ₁₀	(µg/l)	<10	<10
>C ₁₀ -C ₁₂	(µg/l)	<10	<10
>C ₁₂ -C ₁₆	(µg/l)	<10	<10
>C ₁₆ -C ₂₁	(µg/l)	<10	<10
>C ₂₁ -C ₃₅	(µg/l)	41	28
<u>Aliphatic</u>			
>C ₅ -C ₈	(µg/l)	<10	<10
>C ₈ -C ₁₀	(µg/l)	<10	<10
>C ₁₀ -C ₁₂	(µg/l)	65	<10
>C ₁₂ -C ₁₆	(µg/l)	268	39
>C ₁₆ -C ₂₁	(µg/l)	651	254
>C ₂₁ -C ₃₅	(µg/l)	827	461
TPH (C ₆ - C ₄₀)	(µg/l)	281	1662
		2133	2444
Benzene	(µg/l)	<1	<1
Toluene	(µg/l)	<1	<1
Ethyl Benzene	(µg/l)	<1	<1
Xylenes	(µg/l)	<1	<1
MTBE	(µg/l)	<1	<1



The Harley Reed Building
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East Sussex
TN38 9BA
Telephone (01424) 718618
Facsimile (01424) 729911

THE ENVIRONMENTAL LABORATORY LTD

WATER SAMPLE RECEIPT AND TEST DATES

Our Analytical Report Number AR14559
Your Ref No: GE6175
Sample Receipt Date: 28/04/08
Reporting Date: 13/05/08

Registered: 28/04/08
Prepared: 29/04/08
Analysis complete: 13/05/08

WATER TEST METHOD SUMMARY

PARAMETER	Method Number	Technique
Arsenic*	101	ICPMS
Cadmium*	101	ICPMS
Chromium*	101	ICPMS
Lead*	101	ICPMS
Nickel*	101	ICPMS
Copper*	101	ICPMS
Zinc*	101	ICPMS
Mercury*	101	ICPMS
Selenium*	101	ICPMS
Boron	203	Colorimetry
pH Value*	113	Electrometric
Sulphate*	131	Ion Chromatography
Chloride*	131	Ion Chromatography
Total Cyanide*	130	Colorimetry
Sulphide	134	Colorimetry
Total Phenols	121	HPLC
Hexavalent Chromium	110	Colorimetry
Elemental Sulphur	122	HPLC
Speciated PAH	135	GCMS
Carbon Banding (TPH)	117	Gas chromatography

* = UKAS Accredited test

Any comments, opinions, or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683)