CONSTRUCTION PHASE HEALTH AND SAFETY PLAN

FOR THE CONSTRUCTION

OF

8 No. DETACHED FAMILY HOUSES

AT

STARROCK ROAD
COULSDEN
SURREY
CR5 3EH

FOR

SAFRAN HOMES

Safran Homes Limited
1 Magellan Terrace
Gatwick Road
Crawley
West Sussex
RH10 9PJ
Tel: 01293 734 630
Contact: Robert Coughlan

DATE May 2010

INTENT AND PURPOSE OF THE CONSTRUCTION PHASE PLAN

This plan sets out to achieve compliance with Appendix 3 of the CDM Regulations 2007 "Approved Code of Practice" (ACoP) and follows the headings set out therein. All information within the pre-construction health and safety information (PCHSI) has been considered, together with drawings, surveys, etc supplied to SD Shopfitting Contractors Ltd

The Health and Safety Plan describes the way in which general and specific areas of the works will be prepared for and executed. All personnel employed directly by or sub-contracted by SD Shopfitting Contractors Ltd will comply with the specific rules and regulations set out in this document, along with those applicable to their works but not listed herein.

In line with the regulations, this plan is aimed at improving and integrating health and safety into the management of the project and to encourage everyone involved to work together to improve the planning and management of projects from the start; to identify hazards early on, so they can be eliminated or reduced at the design or planning stage and the remaining risks can be managed properly; to target efforts where it can do the most good in terms of health and safety.

Health and Safety on site will be monitored and results reviewed at regular H & S meetings.

The following is a signature from the Principal Contractor prior to the project starting:

Signed:…….. Position:…….. Date:……..

REVIEW / REVISIONS TO DOCUMENT

This Site Specific Construction Phase Health and Safety Plan has been reviewed and if necessary revised as indicated below

Rev. No.	Date	Description	Prepared	Checked	Approved

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Distribution:

ORIGINAL TO BE RETAINED IN SITE OFFICE.

1.0 DESCRIPTION OF THE PROJECT

(A) *PROJECT DESCRIPTION AND PROGRAMME DETAILS*

(i) Nature of the works to be carried out:

(ii) Construction of 8 no Detached Family Homes

(ii) Major Risks identified during Pre-Construction Phase

- Excavations
- Scaffolding
- Site transport
- Falling from height
- Manual handling/mechanical lifting
- Cutting mineral fibre – sharp knives and loose fibres
- Use of solvents
- Brazing and use of nitrogen in pipework joints
- Refrigerant release in pipe testing
- Electric shock
- Slips trips and falls
- Falling objects
- Dealing with services
- Accommodation adjacent land use
- Working with near fragile materials
- Control of lifting operations
- Dust
- Noise and vibration in confined areas

(iii) Location of the Site:

The site is located in Starrock Road, Coulsden, Surrey, CR5 3EH.


Coulsdon, CR5 3EH, UK
©2010 Europa Technologies
©2010 Tele Atlas
Image ©2010 Bluesky
©2009 Google
Imagery Date: Mar 5, 2008
51°18'21.99" N 0°09'04.93" W elev 138 m
Eye alt 448 m


MARLFIELD SHAW
HILL ROAD
PORTNALLS
HOLLYMEOAK ROAD
CHELWOOD CL
ROAD
PET. CL
WOODFIELD
STARROCK
LAVEN-DER CL
WOOD CL
HILL
GRASSFIELD CL
A23
RIGHTON
ASHBOURNE CL
CHAR. GDNS
WOODPLACE CL
WOODPLACE
THE NETHERLANDS
WILHELMINA AV
CR5

(iv) Project Timescale or Programme

The works are scheduled to commence on 12th April

Duration of the contract is provisionally scheduled as 70 weeks

Agreed hours of work are: 07.30 – 18.00 Monday to Friday and 08.00 – 13.00 Saturday. No work on Sunday or Bank holidays

Restrictions: Limited parking to be determined by site conditions and activities

The full programme is attached in **Appendix A** and shall be updated throughout the project.

(v) Notification:

The project is notifiable under CDM Regulations 2007, a copy of Form 10 (notification of project) was submitted by the CDM-Coordinator on 19.03.10 and will be plastic encapsulated and displayed on site in accordance with the regulations **(copy in Appendix J/K)**.

(vi) Phasing of the works:

The works are to be phased so that not all of the houses will be brought up at the same time.

(vii) Personal protective Equipment (PPE) required:

Safety footwear
Hi-vi vest
Hard Hat

Additional PPE may be required for some particular tasks. Specific method statements will be referred to in order to ensure that all required PPE is provided and worn.

(B) DIRECTORY OF PROJECT PRINCIPALS

Project directory			
Name	***Address***	***Contact details***	
Client.	*Safran Homes Limited* *1 Magellan Terrace* *Gatwick Road* *Crawley* *West Sussex* *RH10 9PJ*	*Tel:* *Mob:* *Fax:* *Email:* *Name:*	*01293 734 630* *info@safranhomes.co.uk* *Robert Coughlan*
Principal Contractor	*Safran Homes Limited* *1 Magellan Terrace* *Gatwick Road* *Crawley* *West Sussex* *RH10 9PJ*	*Tel:* *Mob:* *Fax:* *Email:* *Name:*	*01293 734 630* *info@safranhomes.co.uk* *Robert Coughlan*
CDM Coordinator	*Bernard Sims Associates* *York House* *38-42 Chertsey Street* *Guildford* *Surrey GU1 4HD*	*Tel:* *Mob:* *Fax:* *Email:* *Name:*	*01483 467270* *michael.t@bsims.co.uk* *Michael Tuck*
Design Architect	*Architectus* *Capella House* *4 Railway Approach* *Worthing* *West Sussex* *BN11 1UR*	*Tel:* *Mob:* *Fax:* *Email:* *Name:*	*01903 821001* *01903 821711* *designoffice@architectus.co.uk*
HSE Office	*Phoenix House* *23-25 Cantelupe Road,* *East Grinstead,* *West Sussex* *RH19 3BE*	*Tel:* *Mob:* *Fax:* *Email:* *Name:*	*0845 345 0055* *01342 334222*
Structural Engineer	*Dixon Hurst Kemp* *Unit 5, Geneses Business Centre* *Redkin Way* *Horsham Sussex* *RH13 5QH*	*Tel:* *Mob:* *Fax:* *Email:* *Name:*	*01403 261999*
M & E Consultant	*NRT Electrical & Mechanical Ltd.* *Old Bank House 1 Beeches* *Avenue Carshalton Beeches.* *Surrey. SM5 3LB*	*Tel:* *Mob:* *Fax:* *Email:* *Name:*	*020 8773 5950* *020 8773 2333*
Mechanical Contractor	*Dixon Hurst Kemp* *Unit 5, Geneses Business Centre* *Redkin Way* *Horsham Sussex* *RH13 5QH*	*Tel:* *Mob:* *Fax:* *Email:* *Name:*	*01403 261999*
Electrical Contractor		*Tel:* *Mob:* *Fax:* *Email:* *Name:*	
Engineer		*Tel:* *Mob:* *Fax:* *Email:* *Name:*	

Quantity Surveyor		*Tel:* *Mob:* *Fax:* *Email:* *Name:*	
Project Manager		*Tel:* *Mob:* *Fax:* *Email:* *Name:*	
Soil Survey Consultants	*Soils Limited* *Newton House* *Cross Road* *Tadworth* *Surrey KT20 5SR*	*Tel:* *Mob:* *Fax:* *Email:* *Name:*	*01737 814221* *01737 812557*
		Tel: *Mob:* *Fax:* *Email:* *Name:*	

(C) EXISTING PLANS RECORDS AND ENVIRONMENT

(i) Environmental.

The site is situated between houses bounded on the west, north and east with Starrock Road on the south. An existing plot is being utilised augmented with the purchase of addition plots. All roadways around the proposed site are used extensively by the public.

(ii) Site Investigation.

Soil Investigation Report – see Appendix O

(iii) Surrounding land use and related restrictions.

The site is situated between houses bounded on the west, north and east with Starrock Road on the south

(iv) Existing Structure(s)

None

(v) Existing Services.

None

(vi) Existing drawings (The design).

The works to be carried out together with its location and materials to be used have been considered with regards to the hazards present and the risks that may arise have been reduced. Notwithstanding this; Safran Homes will bear in mind the foregoing and incorporate these findings into its own hazard identification and risk assessment procedure for the construction phase.

Noting that the underlying principle of design is to eliminate the hazards (so far as is reasonably practicable), and then to reduce the risks associated with those hazards that remain, information about The residual risks involved in the design will be communicated from the design team to the principal contractor via the CDM-C.

(vii) Designers risk assessments.

Design risk assessments will be made available at the start of construction. Any design work undertaken immediately prior to the commencement or during construction period should be notified to the Client and the CDM-C; allowing them to assess and co-ordinate the implications for project health and safety.

Designer's Risk Assessments

Architect

Designer's Risk Assessments

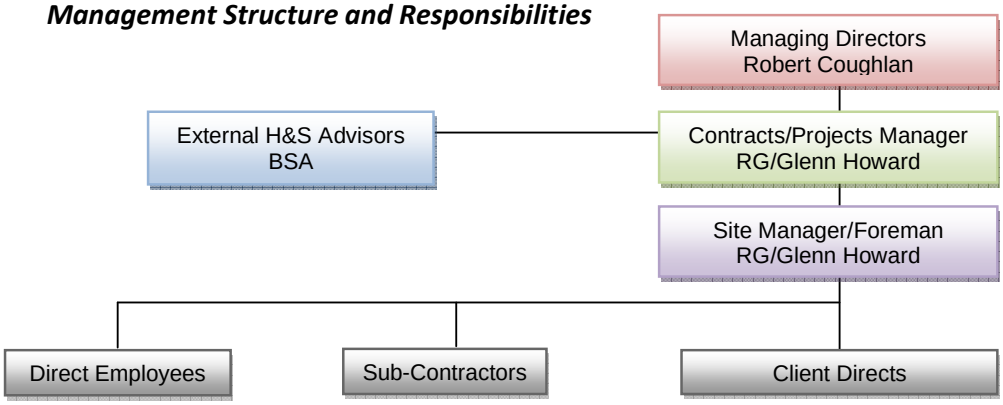
Engineer

Designer's Risk Assessments

M & E

2.0 MANAGEMENT OF THE WORK

(A) Management Structure and Responsibilities



Managing Director / Director Responsible for H & S
Name: Robert Coughlan Telephone Number: 01293 734630

Safety Responsibilities

Has overall responsibility for the health, safety, and welfare of all staff, contractors, and others that may be affected by the project activities. He will ensure that any reasonable request for additional resources, to ensure the health, safety, and welfare of persons and work activities on site, is provided at the request of the Contract Manager.

Contracts Manager/Project Manager
Name: Robert Coughlan Telephone Number: 01293 734630

Safety Responsibilities

The Contracts Manager/Project Manager shall be responsible to the Managing Director/Director Responsible for Health and Safety and ensure all health, safety and welfare issues are planned and managed prior to, and during the construction phase. He will also ensure any reasonable request for additional resources, to ensure the health, safety, and welfare of persons and work activities on site, is provided at the request of the Site Manager.

Site Manager / Site Foreman
Name: Robert Coughlan Telephone Number: 01293 734630

Safety Responsibilities

The Site Manager will be present on site at all times during the construction period to manage health and safety on a day to day basis and ensure health, safety, and welfare of all operatives working on site. He will also be responsible for implementing and monitoring the requirements of the Construction Phase Plan.

Employees and Contractors

Safety Responsibilities

To work in a safe manner that does not create risks to themselves and anyone else, use the correct tools and equipment for the job, work in accordance with company procedures, use correctly any safety equipment supplied and cease work when a hazardous situation is created and to report all hazards to the Site Foreman.

Safety Advisor
Name: Michael Tuck **Telephone Number: 01483 467270**

Role

The provision of competent Health and Safety advice to management and staff at all levels, assist in developing the construction phase plan and other safe systems of work, carry out assessments, inspections and spot checks under direction of the project management team to highlight any deficiencies of which he becomes aware and assisting in actions/strategies to correct them.

(B) Health and Safety Goals

(i) SD Shopfitting Contractors Ltd takes the management of Health & Safety seriously; and in order to reduce the risk of accidents and incidents during each phase of the project, (from site investigation to practical completion), will undertake to ensure that the project is managed in accordance with the relevant Health and Safety Legislation, with due regard being give to the guidance contained within the ACoP to CDM 2007

It is the intention of SD Shopfitting Contractors Ltd to (where possible), eliminate the hazards and risks associated with the demolition/construction process. Where this cannot be done to manage these residual risks in accordance with relevant legislation and sound working practice, SD Shopfitting Contractors Ltd recognize that compliance is best achieved by ensuring good communication and cooperation at all levels of the project, both with the design team and by good liaison and regular meetings with site operatives.

In line with the Client we aim to have zero accidents and no enforcement action taken by the enforcing authorities.

(ii) Arrangements for monitoring and review of H&S Performance

During the life of this contract SD Shopfitting Contractors Ltd will arrange to have 2 no site safety inspections carried out by the safety manager. He will liaise with the site manager on site and be accompanied on site during these visits. He will discuss any issues arising from the inspections and ensure that any necessary remedial action is taken to guarantee compliance with legal responsibilities. He will leave a copy of the safety report on site. He will ensure that any deficiencies are communicated to the construction and contracts managers.

There will be regular performance reviews held on site, (the dates of which will be arranged at a later stage) which will be attended by the safety manager where, amongst other items; health and safety performance will be discussed. Forward planning will feature highly. During design meeting reviews on site the consultant should attend in order to communicate any changes in design to the CDM-C and the implications that this may have for health and safety during the build program.

Sub-contractor meetings will be held on site, (dates to be confirmed) where; when necessary subcontractors performance will be specifically reviewed.

(C) Arrangements for:

(i) Regular liaison between parties on site

This will be undertaken via tool box talks and weekly project / design review meetings. The CDM-C and designers will be encouraged to visit site regularly.

(ii) Consultation with the work force

Upon induction to site the work force will be informed that regular meetings will be arranged for key representatives of all sub-contractors to discuss issues or concerns regarding health and safety. Feedback will be requested from all workers.

(iii) The exchange of design information between Client, designers, CDM-C and contractors on site

Any changes in design which will have significant implications with regards to health and safety will be exchanged via pre arranged meetings with all interested parties attending. Should for example the CDM-C or others not be available; the Contracts Manager from SD Shopfitting Contractors Ltd will ensure that information is communicate promptly to him/her in order for the implications to be reviewed and any changes be made.

Significant risks will be forwarded to the site team and operatives to ensure that the appropriate control measures and any necessary risk assessments and working methods are implemented

(iv) Handling design changes during the project

Changes in design are assessed on their own merits and the health and safety implications communicated to the client. The site manager will keep a record of designs on site, out of date designs to be withdrawn and disposed of.

(v) The selection and control of contractors

SD Shopfitting Contractors Ltd selects the contractors they intend to employ prior to their appointment. We question various aspects of their health and safety arrangements as laid down in appendix 4 of the CDM ACoP. SD Shopfitting Contracts Ltd endeavour to use only those contractors who are already on their “Approved List”

Control. All subcontractors are expected to manage/supervise their own workers in compliance with our site rules for the contract. They must consult, train, supervise and provide applicable health and safety information throughout the contract.

(vi) The exchange of health and safety information between contractors

Issues arising with the project will be discussed with any contractors involved. All those affected will be informed. SD Shopfitting Contractors Ltd will coordinate risks with relevant parties and preventative and control measures communicated, especially where more than one contractor is exposed to the same risk.

(vii) Site security

SD Shopfitting Contractors will be erecting solid hoarding (2m high) around their works in the early hours of the morning. The existing security systems shall be maintained. Where not possible a temporary solution will be provided.
The client will require reasonable access arrangements for his representatives

(viii) Site Induction

SD Shopfitting Contractors Ltd has formulated a site induction to be utilized on all sites and will be adapted to suit local site conditions. **See Appendix D**.

(ix) On site training

Tool box talks onsite training will be arranged, as needed depending on risks / hazards that arise.

(x) Welfare Facilities and first aid

Welfare Facilities. SD Shopfitting Contracts Ltd has assessed the need for the welfare arrangements; the existing facilities shall be used as far as possible. Facilities will be complaint with the CDM Regulations 2007.

First Aid. Adequate first aid facilities will be made available to site with at least one member of the site management team being trained first aiders. All first aid requirements will be in accordance with the current first aid regulations. Facilities will be provided throughout the site.

Nearest A&E Hospital
University College Hospital
235 Euston Road
London
Greater London, NW1 2BU
(1.1 miles)
Tel: 0845 155 5000

(xi) The reporting and investigation of accidents and incidents including near misses:

The Company is required under the Reporting of Injuries, Diseases and Dangerous Occurrences Regulation 1995 (RIDDOR) to have effective systems in place for the recording, investigating and reporting of accidents and dangerous occurrences at work.

All accidents however minor will be recorded on Form B1 510. The Site Manager / Site Foreman will record the details of the accident and countersign each accident statement. First aid treatment will be recorded in the first aid treatment book.

Contractors are to report any notifiable accidents in accordance with RIDDOR. The Site Manager / Site Foreman is to be given a copy of form F2508 for reporting and B1 510, the on-site accident book.

Details of every accident, however minor, will be notified to the Company at Head Office. Such accidents will be investigated by the Company Health & Safety Advisor and will be reviewed at the regular Health & Safety Review Meetings.

Where an accident/incident falls within the scope of RIDDOR 1995 and results in:

Accident/Incident	**Reported by Group H/S Officer**
Fatality	Report immediately to HSE
Over three-day injury	Report within 10 days to HSE
Specified injury	Report immediately to HSE
Notifiable disease	Report immediately to HSE (when diagnosed)
Dangerous occurrence	Report immediately to HSE

Serious body injury or conditions or defined dangerous occurrences need to be notified directly to the Health & Safety Executive. This must occur **immediately by telephone** on 0845 300 9923. Further written details must then be submitted to the Health and Safety Executive to the Incident Contact Centre at Caerphilly Business Park. Caerphilly, CF83 3GG. For internet reports go to www.riddor.gov.uk or www.hse.gov.uk, for email reports go to riddor@natbrit.com and for fax reports call 0845 300 9924.

For these types of accidents / incidents, the Site Manager / Site Foreman will notify the Director responsible for Health and Safety and the CDM-C.
These will require a full accident / incident investigation to include:

- A report from the Site Manager / Site Foreman submitted to the H&S Officer
- Investigation by the H&S Officer, who will report the incident to the HSE.

Copies of all reports will be made available on request to the Client or CDM-C.

The Client / CDM-C shall be informed immediately upon an event happening which creates serious hazards:

- To the Health and Safety of people
- To the safe operation of Client's premises
- Which could result in a major change to the design and / or to the resources required to complete the works

(xii) The production and approval of risk assessments and written systems of work.

SD Shopfitting Contractors Ltd requires that all sub-contractors provide their own work method statements based on site specific risk assessments. SD Shopfitting Contractors Ltd will vet these methods to ensure that they are suitable for the task and all control measures clearly identified to reduce or eliminate risk.

SD Shopfitting Contractors Ltd has produced a number of generic risk assessments that will be available on site. These are incomplete; and the site manager will be expected to formulate an assessment from these and complete to ensure they are suitable for the task. A safe method of work can then be produced.

(D) Site Rules (including drug and alcohol policy)

SD Shopfitting Contractors Ltd will discuss and issue site rules to all operatives working on site during the site induction. Failure to adhere to these rules may result in dismissal from site. See **Appendix E.**

(E) Fire and Emergency Procedures

The Site Manager will display a **Site Layout and Fire Safety Plan** at prominent positions around the work areas – a copy can be found in **Appendix B**. This will be updated as the works progress by the nominated Fire Warden. Arrangements shall be made know to operatives and visitor during induction training.

The Principal Contractor shall endeavour to maintain the existing fire alarms system for as long as possible. Where this cannot be achieved a temporary systems shall be employed and maintained.

The Site Manager is to ensure that:

- Adequate means of escape and access for emergency vehicles is allowed for during all stages of construction.
- Fire emergency exit routes to be established, adequately signed, and kept free of obstructions.
- Emergency procedures follow a logical sequence if more than one incident needs to be tackled at a time.
- Full co-operation is established with other contractors, so that all personnel are aware of the risks, safety zones, access routes etc.
- All work areas are adequately protected against fire hazards by the provision of appropriate fire extinguishers, and compliance with current fire regulations.
- It is the responsibility of any individual who detects a fire to immediately evacuate the building and notify the **emergency services** via telephone.
- If feasible, attack the fire with the appropriate extinguisher, but you should not take any personal risk and the Fire Service must be notified first.
- The following information must be given when reporting a fire:

- Your Name

- Address: ***Starrock Road, Coulsden, Surrey, Cr5 3eh***

- Type of fire i.e. ***Building/waste container/fuel/vehicle etc.***

3.0 ARRANGEMENTS FOR CONTROLLING SIGNIFICANT SITE RISKS

(A) Safety Risks (as detailed in the PCHSI and gleaned from PC past experience), including:

(i) Delivery and removal of materials (including waste) and work equipment taking account of any risks to the public.

Timed deliveries are SD Shopfitting Contractors Ltd preferred method of receiving materials to site based on the "Just in Time" method. This reduces the amount of disruption to both members of the public and the client's delivery schedule.
SD Shopfitting will consider the following measures to reduce the risks of collision with pedestrian and/or other vehicles: -

- Pedestrian Barriers designated crossing points
- Mirrors
- Banksmen

Waste from within the building will be removed via rubbish bins provided by SD Shopfitting Contractors Ltd which will be removed by the labourers on site at regular intervals to the designated disposal location.
Ref: HSG 151Protection of the public your next move.
Ref: HSG 144 Safe use of Vehicles on Construction Sites

(ii) Location of Services. (underground & overhead) including electricity, water, gas etc

There are services within the site demise which will need to be located prior to works

(iii) Accommodating adjacent land use.

The surrounding lands are mainly used for commercial purposes. The subject property is adjoined on both sides. Provision will be made by SD Shopfitting Contractors Ltd to ensure that the adjacent complexes are not impinged upon during the life of the project.

(iv) Stability of structures whilst carrying out construction work, including temporary structures and existing unstable structures.

SD Shopfitting Contractors Ltd will consult with structural engineers should any doubt arise about the buildings stability prior to strip out works or demolition. Any temporary works will be designed by the structural engineer and any risk assessments/method statements detailing the safe systems of work must be approved by the structural engineer before works are executed.

Temporary structures such as the scaffolding for construction purposes will be erected as detailed by the scaffolding designer once appointed.

(v) Preventing Falls.

Due regard will been given to the prevention of falls throughout the construction phase;

All open edges will be guarded. For internal works at high level (as described in the "Work at Height Regulations") podium; and/or tower scaffolding structures are the preferred methods of gaining access to these areas. Only in exceptional circumstances will step ladders be utilized and only after the site manager has conducted a suitable and sufficient risk assessment regarding the work to be undertaken.

It may be necessary to employ fall mitigation equipment such as "Air Bags" or scaffolding. Prior to this process SD Shopfitting Contractors Ltd will require the erecting company to provide their method statements and risk assessments to the PC in order for their proposed methods to be discussed and agreed.

N.B. Where scaffolding (tower or otherwise) is used on site a duly competent person will carry out regular inspections and entries made on to the appropriate forms in **Appendix N**.
Ref: The Work at Height Regulations 2005.

(vi) Work with or near fragile materials.

Certain elements of the structure may be fragile. Prior to work commencing on or near any fragile materials (roof coverings, roof lights, glass partitions, barriers etc) advice will be sought from a competent and suitably qualified person to ensure that a safe method of working is established to prevent harm coming to operatives, visitors etc.

(vii) Control of lifting operations.

Not applicable

(viii) The maintenance of plant and equipment.

Plant hire companies will be required to provide the necessary examination certificates for the machinery being used. They will be required to provide proof of regular checks made to the machinery whilst on site.

Electrical Equipment All portable electrical equipment to be used on site will require proof of inspection/test. Upon site set up, the offices canteen, toilet, drying room will require installation certification to be forwarded to SD Shopfitting Contractors Ltd site management who will keep this on file.

Fire Extinguishers Will be checked on a ***daily*** basis and entries made in a fire log book. Replacements/recharging of any discharged appliances will be made via SD Shopfitting Contractors Ltd suppliers.

Fire Alarms The alarms will be checked on a ***weekly*** basis and entries made in a fire log book.

(ix) Work on excavations and work where there are poor ground conditions.

Not applicable.

(x) Work on Wells, underground earthworks and tunnels.

Not applicable.

(xi) Work on or near water where there is a risk of drowning.
Not applicable.

(xii) Work involving diving.
Not applicable.

(xiii) Work in a caisson or compressed air working.
Not applicable

(xiv) Work involving explosives.
Not applicable.

(xv) Traffic routes and segregation of vehicles and pedestrians.
Traffic in and around the site will be controlled at all times and in accordance with the traffic management plan drawn up by the site manager. The site speed limit will be set at 5mph.

Car parking & pedestrian movement. No car parking will be available for the contractors working at these premises. Pre determined pedestrian routes will be drawn up and shown on the traffic management plan for this contract. SD Shopfitting Contractors policy is to ensure "where reasonably practicable" that all pedestrians are segregated from traffic movements around the site. In areas where this cannot be achieved; crossing points will be provided and clearly marked. The traffic management plan will be explained to workers upon induction.

(xvi) Storage of materials (particularly hazardous materials) and equipment.
Pre determined storage areas will be shown on the site layout plan drawn up by the site manager.

(xvii) Any other significant safety risks.
Lighting. All working areas must have adequate lighting at all times, whether natural or artificial to enable workers to carry out work safely. Any concerns over lighting levels must be discussed with the Site Manager immediately.

(xviii) Demolition / Strip out
SD Shopfitting will describe in the method statements/risk assessments the proposed method of demolition / strip out and will submit them to the structural engineer for approval.

(B) Health risks, including:

(i) Asbestos.
A **type 2** survey has been included in **Appendix O**. This denoted a presence of some ABM's.
The CDM C has been informed that a **Type 3** (refurbishment / demolition) asbestos survey is to be carried out prior to works, when the report is received it will be kept in **Appendix O**.
All operatives are warned during induction to be on the lookout for any ACM's during works.
The Site Manager must be informed immediately if any suspicious materials are uncovered.

(ii) Dealing with contaminated land.
Not applicable.

(iii) Manual Handling.

As a management contractor SD Shopfitting Contractors Ltd require that all sub-contractors provide the company with their manual handling assessments. To minimize the amount of manual handling needed during the life of the project SD Shopfitting Contractors Ltd will arrange for materials to be loaded into wheeled containers and moved to the designated area for disposal.

(iv) Use of hazardous substances (Health monitoring).

SD Shopfitting Contractors Ltd requires that all subcontractors provide the company with their COSHH assessments for all substances that they will use on site. These must be specific to the work being undertaken on this project (only supplying hazard data sheets will not be acceptable). SD Shopfitting Contractors Ltd has been provided with a set of generic (incomplete) COSHH assessments for use on site should the need arise.
See Appendix U/V.

(v) Reducing noise and vibration.

SD Shopfitting Contractors Ltd recognises the need to reduce noise and vibration during construction operations. SD Shopfitting Contractors Ltd will ensure that only properly maintained motorized equipment will be employed on site which will reduce to some extent the amount of noise produced. SD Shopfitting Contractors Ltd will ensure that the most efficient noise reduction systems are used by contractors, and will endeavour to purchase/hire items of plant with the lowest noise emission. Contractors will be required to show how they intend to reduce noise levels on site via method statements.

Vibration Operations on this project do not show any significant risks regarding vibration. Operations such as scabbling will not be undertaken.

(vi) Work with ionizing radiation.

Not applicable.

(vii) Exposure to UV Radiation (from the sun).

SD Shopfitting Contractors Ltd will, upon inducting operatives to the site warn them of the dangers of UV radiation and suggest that they take on board the HSE guidance on this matter.
Ref: IND(G)147(L)

(viii) Any other significant health risks.

Dust: The Principal Contractor shall take such steps to keep dust levels as low as possible. Wet techniques will be employed to aid collection and removal of such.

4.0 HEALTH AND SAFETY FILE

As per the PCHSI, the Health and Safety file, the principal contractor is required to provide the general details of the methods and materials used together with test records for inclusion in the file. And as a general rule the following has been listed below.

Contents of the file

The health and safety file should include information about all the following topics, (where this is may be relevant to the health and safety of any future construction work). The level of detail should be proportionate to the risk likely to be involved in such work.

(a) A description of the work carried out

(b) Residual hazards and how they have been dealt with (for example surveys or other information concerning asbestos, contaminated land, water bearing strata, buried services);

(c) Key structural principles incorporated in the design of the structure (e.g. bracing, sources of substantial stored energy – including pre- or post –tensioned members and safe working loads for floors and roofs, particularly where these may preclude placing scaffolding or heavy machinery there.

(d) Any hazards associated with the materials used (for example hazardous substances, lead paint, special coating which should be burnt off)

(e) Information regarding the removal or dismantling of installed plant and equipment (for example lifting arrangements)

(f) Health and safety information about equipment provided for cleaning or maintain the structure

(g) The nature, location and marking of significant services, including fire-fighting services

(h) Information and as-built drawings of the structure its plant and equipment (e.g., the means of safe access to and from service voids, fire doors and compartmentation.

APPENDIX A

Contract Programme

APPENDIX B

Site Layout and Fire Safety Plan

APPENDIX C

Signing In Register

EMPLOYEES, SUB-CONTRACTORS and VISITORS

DAILY SIGN-IN REGISTER **SITE:** Starrock Road

The undersigned confirm that they have undergone site induction and agree to abide by the Site Rules and Regulations.

DATE	NAME	COMPANY	TRADE or VISITOR	TIME IN	TIME OUT

APPENDIX D

Site Induction Register

HEALTH AND SAFETY INDUCTION STATEMENT

Site: Starrock Road

The following is a check list of items that should be covered as a minimum when inducting people onto site.

No	Subject	Induction Notes
1	Description of site, location of admin, huts & welfare facilities	
2	Statutory Notices, Company Safety policy, Health and Safety Plan, Site Rules Accident Book, First Aid Emergency phone no's	
3	Duties of Contractors under MHSW, & CDM & Regulations	
4	Access and Egress, out of bounds areas, parking restrictions	
5	Isolation of site Electricity and temporary 110v supply - Hazardous operations – permit to work procedures – PPE requirements	
6	Identifying hazards to site – reporting unsafe procedures	
7	Inspections & reports: a) Asbestos report/information b) Plant and equipment c) Scaffold / ladders / towers d) Excavations	
8	Employers RAMS – confirm read and understood by all of team	
9	Fire precautions – fire fighting equipment, escape routes and exits	
10	Site tidiness – end of shift procedure	
Site specific items:		

EMPLOYEES, SUB-CONTRACTORS and VISITORS

SITE INDUCTION REGISTER **SITE: Starrock Road**

The undersigned confirm that they have undergone site induction and agree to abide by the Site Rules and Regulations.

DATE	NAME	COMPANY	TRADE or VISITOR

APPENDIX E

Site Rules

SITE RULES: Site: Starrock Road

1. All operatives and visitors will sign the site register at the beginning and end of each working shift / visit.
2. All operatives and visitors will receive induction training prior to attending / working on this site.
3. All operatives and visitors will utilize high visibility clothing, safety helmets and safety footwear whilst on site (as a minimum)
4. Additional PPE must be worn in accordance with any risk assessments or method statements prepared for that particular task.
5. All working notices / safety signs must be obeyed at all times.
6. It is forbidden to posses or consume alcohol, drugs or other intoxicants on this site or to be under their influence.
7. It is forbidden to indulge in horseplay, fighting or malicious damage. Racial / sexual harassment including wolf whistling which will not be tolerated.
8. All injures, accidents or near misses must be reported to the site manager immediately.
9. Smoking is not permitted on site except in designated areas.
10. Permitted working hours are **08:00 to 17:00 hrs** Monday to Friday. No work outside of these hours will be allowed unless previously arranged with the Site Manager who must be present.
11. Mechanical plant and power tools shall only be operated by competent persons.
12. Any concerns or queries in respect of health and safety should be directed to the site manager as quickly as possible.
13. Emergency exist, doorways and scaffolds will be kept clear.
14. Electrical tools will be 110v or battery powered. All electrical tools and equipment must carry a current PAT notification.
15. **Parking and deliveries** will be agreed with the site manager in advance and detailed on the site layout plan. Goods or deliveries will not be unloaded or deposited upon the public highway.
16. Permits to work will be required for (but not limited to) the following operations. Hot works, electrical works, excavations, confined spaces; work at height and lifting operations.
17. All debris/rubbish will be cleared promptly from the working area and only in conjunction with the agreed system on this contract.
18. Any insufficiencies in temporary lighting should be brought to the attention of the site manager.
19. Site welfare facilities will be kept clean and tidy. All rubbish is to be deposited into the bins provided. Any shortcomings in respect of the facilities will be brought to the attention of the site Manager.
20. **The site is in a public place. Operatives will behave in the correct manner at all times.**
21. Scaffolds shall only be erected, modified and inspected by suitably qualified staff.
22. Radios are not permitted and no personal headphones are allowed.

APPENDIX F

Site Set-up Check List

SUPERVISORS SITE SET-UP CHECK LIST

PROJECT: Starrock Road		
LOCATION : [Location]		
DOCUMENTATION etc. from client	**YES**	**NO : N/A**
COMPLETED FORM 10 POSTED (notification to HSE)		
CONSTRUCTION PHASE HEALTH AND SAFETY PLAN		
SITE INDUCTION GIVEN incl. emergency procedures & numbers		
FIRE PLAN, EXIT ROUTES AND ASSEMBLY POINT		
VISITORS / SIGNING-IN BOOK IN USE		
ARE WORK PERMITS AVAILABLE / USED		
NOMINATED TRAINED FIRST AID PERSON available		
SITE RULES POSTED		
ACCIDENT BOOK LOCATION		
SCAFFOLDING – erected and inspected by competent person(s)		
SCAFFOLD BOOK AVAILABLE and signed		
TRENCH / HOLE PROTECTION if applicable		
SIGNS by Client or Contractor		
NO UNAUTHORISED PERSONS		
P.P.E. such as Hats, Boots, Goggles, etc.		
VISITORS REPORTING INSTRUCTIONS		
FIRE EXTINGUISHERS – in cabins and in workplace		
DANGER – LIVE ELECTRICS		
OTHER:		
WELFARE FACILITIES		
SHARED OR CONTRACTOR'S OWN		
SITE OFFICE		
MESS ACCOMODATION		
WC / WASHING FACILITIES / HOT WATER		
SOAP, detergent, dryers, microwave		
STANDARD OF CLEANLINESS		
SITE SECURITY by Client or Contractor		
UNAUTHORISED ACCESS WARNING LIGHTS, TAPE, etc		
TEMPORARY FENCING AND HOARDING / BOARDING		
OTHER:		
	Cont. page 2	

SITE SET-UP CHECKLIST (cont.)

PROJECT: Starrock Road		
HEALTH & SAFETY EQUIPMENT	**YES**	**NO : N/A**
P.P.E. – to be worn by all employees and contractors		
SPARE PPE for visitors		
FIRST AID BOX		
SPECIAL REQUIREMETS		
NOTICE BOARD		
DOCUMENTATION		
COMPANY HEALTH AND SAFETY POLICY AND DOCUMENTS		
EMPLOYERS LIABILITY INSURANCE CERTIFICATE - copy		
HSE 'YOU AND THE LAW' POSTER		
SITE CONSTRUCTION DRAWINGS AND SPECS (current issue)		
RISK AND METHOD STATEMENTS - from Contractor		
- from Sub-contractors		
NOISE AND / OR COSHH ASSESSMENTS available		
DAILY INSPECTIONS AND SITE DIARY required		
SITE STANDARDS		
DEBRIS REMOVAL		
MATERIAL STACKING		
PROVISION AND LOCATION OF CONTAINER / SKIP		
PLANT AND EQUIPMENT		
STEPS AND LADDERS checked for use		
ELECTRICAL TOOLS certificated for use		
TOOL RE-CHARGING LOCATION IDENTIFIED		
110V TRANSFORMER AND CABLES certificated		
LIGHTING AND CABLES checked for use		
ACCESS TOWERS competent person and instructions available		
MAINS POWER		
LOCKED OFF AND SITE CERTIFIED SAFE FOR ACCESS		
CORRECT SIGN IN PLACE OTHER PRECAUTIONS:		

Signed:_____ Page 2 of 2

APPENDIX G

Site Safety Audit

SUPERVISORS SAFETY AUDIT

Site	Starrock Road				
Site Representative		**Tel No**:		**Contract No:**	
Site Owner/Manager		**Tel No:**		**Report No:**	
Copy To:				**Date of Audit**	

Items Checked

1. Housekeeping / Security	12. Excavations
2. Environment	13. Confined Spaces
3. Surroundings	14. Dismantling & Demolition
4. Welfare	15. Fire
5. Personal Protection	16. Hot Work
6. Signs & Barriers	17. Hazardous Substances
7. Water Systems	18. Tools, Plant & Lifting Gear
8. Electricity	19. Subcontractors
9. Scaffolding	20. Documentation
10. Access equipment	21. Other Hazards
11. Roof work	22. Other Comments

Comments

Item No	Comment	To be Actioned by	Time Scale for Action	Date Actioned & Initials

Hazard notification issued to: Only complete this section where a potentially dangerous situation is identified or exists, which is outside your immediate control. Give a copy of the form to the person who you believe can control the risk.	This notification arises from carrying out our works. The items marked above place health and safety at risk and make it unsafe to carry out further work in the area/on the site until corrective action is taken	**SITE MANAGEMENT MUST MAKE SURE THAT THE RECOMMENDED ACTION IS CARRIED OUT IN THE TIME SCALE THAT IS GIVEN**

Signed: **Date:**

APPENDIX H/I

Local Safety Arrangements

LOCAL SAFETY ARRANGEMENTS ADVICE & INFORMATION

Site Manager / Foreman: Name:
Mobile Number:

Accidents

Works First Aid Equipment is located:
Trained/Qualified First Aiders are:
Person responsible for 1st Aid Box:
Accident Record Book is located:

Local Hospital – 24hr Casualty Department:
University College Hospital
235 Euston Road
London
Greater London, NW1 2BU
(1.1 miles)
Tel: 0845 155 5000

Emergency Phone Number: 999 Ambulance / Police / Fire Brigade

Nearest Police Station
Marylebone Police Station
1-9 Seymour Street
London W1H 7BA

Non-urgent crime can be reported via the internet on www.online.police.uk

General Fire Safety

Fire Plan located in site office and displayed around site.
Name of nominated fire warden(s):
Escape Routes are checked weekly by:
Fire Extinguishers are checked annually by:

Advice and Consultancy

Local HSE Inspectors Office:
Rose Court
2 Southwark Bridge
LONDON
SE1 9HS
Fax: 020 7556 2109

To be displayed at work location

APPENDIX J/K

Form F 10 HSE Notification

HSE

Health and Safety Executive

F10 - Notification of Construction Project
This is an Initial Notification

Site Address:
53-55 New Bond Street
London
W1S 1DG
England

Multiple Site Locations:	No
Geographical Area:	London
Local Authority:	Westminster City of
Type of Project:	Refurbishment - Commercial
Time Allowed by Client:	2 weeks
Start Date:	19/04/2010
Duration:	12 weeks
No of people on site:	20
No of contractors on site:	8

Project Description:
Refurbishment of a three storey retail unit.

CDM Coordinator:
Goddard Consulting
mg@goddardconsulting.co.uk
Crest House
102-104 Church Road
Teddington
Middlesex
TW11 8PY
England
0845 5555 500

Client:
Dolce & Gabbana UK Ltd
6-8 Old Bond Street
London
W1S 4PH
England
020 7742 7787

Designer:
Household Henderson Architects
gary.graham@hharchitects.co.uk
4 Charlecote Mews
Staple Gardens
Winchester
SO23 8SR
England
01962 835500

Designer:
Environmental Engineering Partners
nbowater@eep.co.uk
The Chapel House
High Street
West Wycombe
Buckinghamshire
HP14 3AG
England
01494 464544

Designer:
Oliver Springett Associates
oliver@springett.uk.com
32 Hyde Gardens
Eastbourne
East Sussex
BN21 4PX
England
01323 437404

Name: Marcus Goddard

Declaration Signed: Yes

Declaration Selected:
On behalf of the client, I hereby declare I have made the client aware of their duties under the Construction (Design and Management) Regulations 2007 (S.I. 2007/320).

Date: 19/03/2010

Role: CDM Co-ordinator

Client Signature (Can be used for your own records, ONLY if required)

Declaration

As client for this project, I hereby declare that I am aware of my duties under the Construction Design and Management) Regulations 2007 (S.I. 2007/320).

Name:

Declaration Signature:

Date:

APPENDIX L

Minutes of H & S Meetings

APPENDIX M

Register of Tool Box Talks

REGISTER OF TOOLBOX TALKS

SITE: Starrock Road **DATE: _____**

TITLE of TALK: _____

TALK GIVEN BY: _____

DELIVERED TO (INCLUDE NAME AND COMPANY DETAILS)	SIGNATURE

APPENDIX N

Work Control Procedures

- **Entry to Confined Spaces**
- **Hot Work Permits**
- **Electrical Work Permit**
- **Permits to Dig**
- **Work at Height**
- **Scaffold inspection form**

CONFINED SPACE ENTRY PERMIT

Contract:..... Starrock Road..... Permit No.....

This permit is valid from ..... hours to ..... hours on .....

Date from ..... Date to .....

This permit covers confined space: .....

Location: .....

CONDITION OF RESTRICTED AREA			
DESCRIPTION OF WORK			
	Y/N	**N/A**	**SIGNED**
Atmosphere Tested?			
Training Certificates attached?			
Adequate supply of fresh air?			
Protective clothing to be worn			
Tools and equipment suitable			
Sides of excavation adequately supported or made safe			
Safety belt/lifeline to be worn			
Forced ventilation to be provided			
Breathing apparatus to be worn			
Watchers to be posted			
RAMS Complete on site?			
Any other precautions			

AUTHORISATION

Signed by supervisor..... Time..... Date.....

RECEIPT

I have read this form and understand the special precautions to be taken prior to and upon entry

Signed..... Time..... Date.....

CANCELLATION

Signed..... Time..... Date.....

HOT WORKS PERMIT

Contract:..... Starrock Road..... Permit No .....

This permit is valid from ..... hours to ..... hours on .....Date .....

Date from ..... Date to .....

This permit covers hot works: .....

Location: .....

ISSUE CHECKLIST			
	Y/N	**N/A**	**SIGNED**
Has a Risk Assessment been carried out?			
Have Method Statements been produced?			
Are operatives trained in use of equipment?			
Will non-combustible screens/sheets be erected?			
Is area clear of all combustible materials?			
Will a firewatcher be necessary & provided?			
If yes provide name			
Have the correct type of fire extinguishers been provided?			
Are extinguishers fully charged and inspected?			
Are flashback arrestors fitted to gas cylinders?			
Has a fireproof container been provided for discarded welding rods?			
Has Personal Protective Equipment been provided?			
Additional Precautions			

AUTHORISATION

Signed..... Time..... Date.....

RECEIPT

I have read this form and understand the special precautions to be taken prior to and during hot works

Signed..... Time..... Date.....

CANCELLATION

I have completed the work detailed above and left the site in a safe condition.

Signed..... Time..... Date.....

I have inspected the work area above and cancel this hot work permit.

Signed..... Time..... Date.....

ELECTRIAL WORK PERMIT

PART A		
Permit Number		
Duration of Permit	From	To
I certify that the following apparatus has been made dead, electrically isolated, locked off, earthed if necessary and that all other relevant measures have been taken to ensure that the work and/or test specified below can be performed in a safe manner.		
Plant equipment /System*		
Location		
Work/tests* to be completed		
Location of: isolation		
locks		
Keys held by		
notices		
earthing (if applicable)		
other precautions		
Diagram attached (if required)	Yes ❑ No ❑	
Please indicate if any other permits and/or RAMS are in use (if so, describe and provide reference numbers).		
AUTHORISATION		
Name of person using permit		
Signature		
Time	Date	
RECEIPT		
I hereby acknowledge receipt of this permit having inspected the above safety precautions. I am satisfied that the precautions taken are adequate and I accept responsibility for undertaking the work specified above in a safe manner. I declare that neither myself, nor those persons within my control, will attempt any other task than that specified above.		
Name of competent person undertaking work		
Signature		
Time	Date	
Organisation		

PART B		
Permit Number		
Duration of Permit	From	To
CLEARANCE		
I certify that the work certified above has been **completed/ stopped***, that all personnel, tools and equipment within my control have been removed from the work area and that the above safety measures **may/must not*** be removed.		
Name of competent person undertaking work		
Signature		
Time	Date	
Organisation		
CANCELLATION		
I certify that the above system measures have been removed and that all the plant/equipment/system* is safe to operate and is herby returned to normal service. All copies of this permit to work are hereby cancelled and a master copy will be kept for record purposes.		
Signature of authorised person		
Time	Date	

**Delete as appropriate*

PERMIT TO DIG / ENTER EXCAVATION

Contract:..... Starrock Road..... Permit No .....

This permit is valid from ..... hours to ..... hours on .....Date .....

Date from ..... Date to .....

This permit covers digging/excavation works: .....

Location: .....

WORK TO BE CARRIED OUT AND REASON PERMIT IS REQUIRED:			
SAFETY CHECKLIST:	**YES**	**NO**	**N/A**
Has a risk assessment been carried out for the works?			
Has a daily inspection prior to shift been carried out and recorded?			
Are all underground services marked / isolated / protected?			
Are the operatives competent to carry out the task?			
Has a safe access / egress system been provided?			
Are excavation sides adequately supported or battered back?			
Are measures to keep plant & equipment away from edges in place?			
Is suitable guarding to prevent others falling into excavation in place?			
Are operatives provided with suitable personal protective equipment?			

AUTHORISATION

Signed..... Time..... Date.....

RECEIPT

I have read this form and understand the special precautions to be taken prior to and upon entry.

Signed..... Time..... Date.....

CANCELLATION

I have finished/stopped work in the area stated above and have left the area safe/secure to the public and other workers.

Signed..... Time..... Date.....

I have inspected the work area above and cancel this permit to dig / enter excavation.

Signed..... Time..... Date.....

WORK AT HEIGHT PERMIT

Contract:..... Starrock Road..... Permit No .....

This permit is valid from ..... hours to ..... hours on .....Date .....

Date from ..... Date to .....

This permit covers Work at Height activity: .....

Location: .....

WORK TO BE CARRIED OUT AND REASON PERMIT IS REQUIRED:			
SAFETY CHECKLIST:	**YES**	**NO**	**N/A**
Has the most suitable access equipment been selected and installed?			
Does a safe working platform already exist or has one been provided?			
Are "collective" fall prevention measures in place? (e.g. guard rails)			
Are "collective" fall arrest measures in place? (e.g. nets, air bags)			
Has the equipment been installed / inspected by a competent person?			
Is personal fall protection (PFP) equipment to be used? (restraint / arrest)			
Are operatives trained and competent in the use of PFP equipment?			
Is an emergency rescue / recovery procedure in place?			
Are work exclusion zones established below the works areas?			
Is it safe to start work in the prevailing weather conditions?			

AUTHORISATION

Signed..... Time..... Date.....

RECEIPT

I have read and understand the special precautions to be taken prior to working at height.

Signed..... Time..... Date.....

CANCELLATION

I have finished/stopped work in the area stated above and have left the area safe/secure to the public and other workers.

Signed..... Time..... Date.....

I have inspected the work area above and cancel this permit to work at height.

Signed..... Time..... Date.....

SCAFFOLD INSPECTION CHECK LIST period to be completed not exceeding 7 days, after adverse weather and after scaffold is adjusted

Name of site: Starrock Road Name & position of inspector:	Date: Time:

(circle faults for each item and write location)	**LOCATION/AREA**
FOOTINGS: Soft & uneven/no base plates/no sole boards/undermined	
STANDARDS: Not plumb/joined at the same height/wrong spacing/damaged	
LEDGERS: Not level/joint in same bays/loose/damaged	
PUTLOGS & TRANSOMS: Wrongly spaced/loose/wrongly supported	
COUPLINGS: wrong fitting/loose/damaged/no check couplers	
BRACING FACADE: some missing/loose/wrong fitting	
BRACING LEDGER: some missing/loose/wrong fitting	
PLATFORM: Not wide enough/lapped boards	
TIES: some missing/loose/physical not enough/wrong fitting	
BOARDING: bad boards/trap boards/incomplete/not enough supports	
BRICK GURDS/TOEBOARDS: none/wrong height/loose/missing/wrongly positioned	
HANDRAILS: min 950mm/max gap between intermediate rails 470mm	
LADDERS: damaged/insufficient length/not tied	
SHEETING/DEBRIS NETTING: not enough ties/flapping	
FANS: weak supports/not enough guy wires/some missing boards/no hand rails	
LOADING BAYS: not enough ties/poor operating position/no check fittings/gate damaged	

Is there a handover certificate on site/Scafftags complete?	**YES**	**NO**
Can work be carried out safely	**YES**	**NO**
Persons responsible for repairs.	Informed when? *(date)*	
Details of actions taken and any further action required		completed when?

Making a record of a safe situation is just as important as a record of an unsafe situation

APPENDIX O

Soil Investigation Report

Desk Study

soils LIMITED

Report On a Desk Study

At

16-18 Starrock Road, Coulsdon, Surrey

For

Safran Homes Limited

Soils Limited
Newton House
Cross Road
Tadworth
Surrey KT20 5SR
☎ 01737 814221
01737 812557

REPORT J10616

Desk Study

Job Title: 16-18 Starrock Road, Coulsdon, Surrey

Client: Safran Homes Limited

CONTROL DOCUMENT

SOILS LIMITED DOCUMENT REFERENCE NUMBER:
J10616

DOCUMENT TYPE:
DESK STUDY REPORT

DOCUMENT STATUS: FINAL Revision: 1.00 DATE: 14 April 2008

Note: This is not a valid document for use in the design of the project unless it is titled **Final** in the Document Status box.

	Name	Signature
Prepared by:	R J Foord	
Checked by:	N J Lambert	
	R B Higginson	

Current regulations and good practice were used in the preparation of this report. The recommendations given in this report must be reviewed by an appropriately qualified person at the time of preparation of the scheme design to ensure that any recommendations given remain valid in light of changes in regulation and practice, or additional information obtained regarding the site.

Soils Limited
Newton House
Tadworth
Surrey KT20 5SR
Phone 01737 814221
Fax 01737 812557

soils LIMITED

Report on a Desk Study

At

16-18 Starrock Road, Coulsdon, Surrey

For

Safran Homes Limited

Commission

An invitation to tender for the Desk Study was received from Safran Homes Limited and the scope of the Desk Study was as outlined in Soils Limited subsequent quotation reference Q10554DS, dated 20th February 2008.

This report does not address any issues with respect to geo-hazards within the site or its close environs such as mining or ground stability hazards.

The following sections within this part of the report comprise:

Section 1
Introduction

- Objective of Investigation;
- Location;
- Proposed Redevelopment;
- Legislative Background;
- Limitations and Disclaimers.

Section 2
Desk Study

- Anticipated Geology;
- Hydrogeological Setting;
- Hydrology;

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Soils Limited ref: J10616
Author: Roger Foord
17 April, 2008
☎01737 814221
Email: rf@soilslimited.co.uk

16-18 Starrock Road, Coulsdon, Surrey

- Radon Gas;
- Historic Map Study;
- Dataset Information and Landmark Envirocheck Report;
- Site Walkover;
- Site Sensitivity Maps.

Section 3
Risk Assessment: Phase 1 – Hazard identification and assessment

- Background;
- Potential Contamination Sources;
- Potential Contamination Pathways;
- Potential Receptors;
- Conceptual Site Model.

Appendices

- Appendix A: Historical Maps;
- Appendix B: The results of the Landmark Envirocheck report;
- Appendix C: Site Sensitivity Maps.

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17 April, 2008
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Email: rf@soilslimited.co.uk

Section 1
Introduction

1.1 Objective of the Investigation

The Desk Study was undertaken in order to advise the client on risk factors pertaining to the site with special reference to former and present day potential contaminative uses and their impact on sensitive receptors these being human health, groundwater, buildings, building materials and services.

1.2 Location

The approximate O.S. National Grid Reference at the centre of the site was TQ 289 579. The general site location is given on Figure 1.

1.3 Proposed Redevelopment

The proposed redevelopment is understood to comprise the erection of four detached residential properties with associated infrastructure and car parking areas. The proposed redevelopment is to include areas of soft landscaping comprising domestic gardens.

1.4 Legislative Background

Part IIA of the Environment Act 1995 provides powers in relation to the identification, remediation and apportionment of liability for contaminated land.

Local Authorities are required to identify contaminated land and serve on every person who is an appropriate person a remediation notice setting out what is to be done by way of remediation and the period within which it must be done.

If the person who caused, or knowingly permitted the contaminating substance cannot be found, the owner and/or occupier for the time being of the property can be the appropriate person.

For the first time in the United Kingdom there is a legal meaning to the term Contaminated Land as: -

> *"Land which is in such a condition by reason of substances in, on or under the land that significant harm is being caused or that there is a significant possibility of such harm being caused or that pollution of controlled waters is being, or is likely to be caused".*

Where the Act defines harm as: -

> *"harm to the health of living organisms or other interference with the ecological systems of which they form a part and, in the case of man, includes harm to his property".*

and pollution of controlled waters is defined as: -

> *"the entry into controlled waters of any poisonous, noxious or polluting matter or any solid waste matter".*

With regard to contaminated waters the Environment Act 1995 amends the Water Resources Act 1991 and provides the Environment Agency with the power to force clean-up of historical contamination by issuing a "Works Notice", with remediation paid for by the responsible parties.

In addition, the Groundwater Regulations (1998) state that entry of List 1 substances into groundwater must be prevented and List II substances must be controlled. Petroleum hydrocarbons, pesticides and some herbicides are List I substances.

1.5 Limitations and Disclaimers

The ground is a product of continuing natural and artificial processes. As a result, the ground will exhibit a variety of characteristics that vary from place to place across a site, and also with time. Whilst a ground investigation will mitigate to a greater or lesser degree against the resulting risk from variation, the risks cannot be eliminated.

The investigation, interpretations, and recommendations given in this report were prepared for the sole benefit of the client in accordance with their brief. As such, these do not necessarily address all aspects of ground behaviour at the site.

Current regulations and good practice were used in the preparation of this report. An appropriately qualified person must review the recommendations given in this report at the time of preparation of the scheme design to ensure that any recommendations given remain valid in light of changes in regulation and practice, or additional information obtained regarding the site.

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The conclusions and recommendations relate to land at 16-18 Starrock Road, Coulsdon, Surrey.

There may be other sources of information not included in those listed in Section 1 that hold data relevant to the Desk Study undertaken at the site that could materially affect the conclusions made in this report.

Ownership of land brings with it onerous legal liabilities in respect of harm to the environment. "Contaminated Land" is defined in Section 57 of the Environment Act 1995 as *"Land which is in such a condition by reason of substances in, on or under the land that significant harm is being caused or that there is a significant possibility of such harm being caused or that pollution of controlled waters is being, or is likely to be caused".*

Where a contaminative use is identified in the Desk Study this does not determine whether contamination has actually occurred, or if it has the degree to which it may have taken place. An intrusive investigation(s) and analysis is required to establish the nature and degree of any contamination present.

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Section 2
Desk Study

2.1 Anticipated Geology

The 1:50 000 Geological Survey of Great Britain (England and Wales) sheet number 286 of the Reigate area, showed the site to be located on the Upper Chalk Formation.

2.1.1 Upper Chalk Formation

Upper Chalk Formation is a soft white friable microporous limestone composed of coccolith biomicrites with a varying proportion of larger shell fragments. Flint characterises the Upper Chalk Formation, occurring as nodular courses, tabular beds and linings to fractures.

At various levels clay sized material occurs as marl seams and partings. Close to the surface the upper few metres are invariably discoloured brown, due to leaching from the overlying strata. The interface with any overlying stratum is invariably extremely irregular as a result of localised weathering and general solution. Weathering by frost action may extend to a depth of several metres.

Occasional erosional features, such as pipes, swallow holes and solution cavities, usually in-filled with drift deposits, are found in the chalk within this area. The features sometimes manifesting themselves at the surface as shallow circular depressions. Solution features may be reactivated by the concentrated ingress of water from leaking drains or soakaways. Reactivation may lead to surface collapse.

2.2 Hydrogeological and Hydrological Setting

To assess the vulnerability of groundwater to contamination, consideration must be given to the leaching characteristics of the overlying soils and the characteristics of the strata in the unsaturated zone. Information on the geological strata, such as lithological type and permeability characteristics has been combined with the physical properties of the soil to produce varying degrees of vulnerability.

The 1:100 000 map of Groundwater Vulnerability of the East Sussex area (Sheet 46) showed the site to be located on soil having a Geological Class of a *Major Aquifer* with the Soil Classification of the site being of high leaching potential, (HU).

Major Aquifers are highly porous formations usually with a known or probable presence of significant fracturing. They may be highly productive and able to support large abstractions for public supply and other purposes.

The Soil Classification of the site was high leaching potential, classification (HU). The text relating to the 'H' classification is defined as '*Soils with little ability to attenuate diffuse source pollutants and in which non-adsorbed source pollutants and liquid discharges have the potential to move rapidly to underlying strata or to shallow groundwater*'. 'U' denotes the area to be urban where soil information was less reliable and based on fewer observations than in rural areas and thus the worst case vulnerability has been assumed by the Environment Agency in their classification.

A Minor Aquifer or a Non-Aquifer can be found underlying a Major Aquifer.

Any works or development, which may have an impact on surface water, aquifer or groundwater quality, should be approved by the Environment Agency prior to implementation.

Examination of the Environment Agency records showed that the site was within a Zone I (Inner Protection Zone) as classified in the Policy and Practice for the Protection of Groundwater. This zone is defined as a travel time of 50-days or less from any point at, or below the watertable to the abstraction point. Additionally, the zone has a minimum 50 metre radius. It is based principally on biological decay criteria and is designed to protect against the transmission of toxic chemicals and water.

2.3 Hydrology

The site was located in an area with a general slope down towards the north east and it was anticipated that groundwater flow direction would follow the local topography. The site was located close to the base of a north east draining dry valley and the immediate topography sloped up down towards the east.

The groundwater table was not anticipated at shallow depth and the groundwater flow was expected to follow a north easterly direction, in alignment with the local topography.

No streams or watercourses were noted within close proximity (approximately 1000 metres radius) to the site.

Examination of the Environment Agency records showed that the site was not situated within a floodplain or a flood warning area.

2.4 Radon Gas

The Building Research Establishment report BRE 211 (2007) indicated the site to be situated within an area where *no* protection or risk assessment against the ingress of radon is required.

It is not possible in the course of a survey or inspection to determine whether radon gas is present as the gas is colourless and odourless. Tests can be undertaken to assess the concentration of radon in existing structures. The minimum testing period is three months.

2.5 Historic Map Study

The object of this search was to report on the evidence of site history and redevelopment of the site and its environs from available County Series and Ordnance Survey Maps.

The history of the development of the site was established by examining available County Series and Ordnance Survey Maps dating from the late 19th Century to the present day.

To aid the description of features identified from old maps, reference may be made to features that were identified during the investigation.

Any distances quoted for features remote from the site have been scaled from the maps and are only approximate.

This report is based on the information that was available to Soils Limited at the time of preparation of the report and the interpretation made by Soils Limited of the maps, other data commented on in the report and where applicable knowledge of the site and its environs.

The information reported might not represent all pertinent information that could be obtained.

The interpretation of the maps and/or other data commented on in this report is subjective.

In the following sections dealing with individual maps, only features considered to have a potential contaminative impact on the site and usually within a notional 250 metre radius of the site boundaries are discussed. The north point and approximate extent of the site are indicated on each figure.

16-18 Starrock Road, Coulsdon, Surrey

Maps only represent a "snap shoot" of the site and its environs at the date of the survey. Changes that had occurred either to the site and/or the environs may well not have been recorded on the maps and could represent a hazard to the site.

A précis of the implications, if any, of the maps is given in tabular form below.

Summary Of Data From Maps

Map Date	Scale	Site	Environs
1868	1:2500	No Data	No Data
1868-69	1:2500	Open Land	Open Land
1868-69	1:2500	Open Land	Open Land
1868-69	1:2500	No Data	No Data
1871	1:10560	Open Land	Open Land
1896-97	1:2500	Open Land	Open Land Chalk Pit 120m to NE Old Chalk Pit 250m to N
1897	1:10560	Open Land	Open Land Chalk Pit 120m to NE Old Chalk Pit 250m to N
1912-13	1:2500	Open Land	Open Land Residential to W Old Chalk Pit 250m to N
1914	1:10560	Open Land	Residential Old Chalk Pit 250m to N
1934-38	1:10560	Residential	Open Land Residential to W Old Chalk Pit 250m to N
1935	1:2500	Residential	Residential Old Chalk Pit 250m to N
1958	1:2500	No Data	No data to S Residential Old Chalk Pit 250m to N
1958	1:1250	No Data	No data to S Residential Old Chalk Pit 250m to N
1959-71	1:2500	Residential	Residential Old Chalk Pit 250m to N
1962	1:10560	Residential	Residential Old Chalk Pit 250m to N
1967	1:10560	No Data	No Data
1973	1:1250	No Data	No data to S Residential Old Chalk Pit 250m to N
1974	1:1250	No Data	No data

Continued overpage

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Continued from previous page

Summary Of Data From Maps			
Map Date	**Scale**	**Site**	**Environs**
1975	1:10000	Residential	Residential Old Chalk Pit 250m to N
1975-90	1:10000	Residential	Residential Old Chalk Pit 250m to N
1985-90	1:2500	Residential	Residential No data to N
1992	1:2500	No data	To data N and W Residential to E
1992	1:1250	Residential	No data to SE Residential
1992	1:2500	No data	To data N and W Residential to E
1994	1:2500	No data	To data N and W Residential to E
1999	1:10000	Residential	Residential Old Chalk Pit 250m to N
2005	1:10000	Open Land	Residential Old Chalk Pit 250m to N

A copy of the County Series and Ordnance Survey Maps in chronological order is presented in Appendix A.

2.5.1 On-site Features

Based on the historic maps, the site was shown to be open land and woodland until sometime between 1914 and 1934 when the site was shown to be developed with a residential property within its own grounds and the site has remained unchanged until sometime between 1999 and 2007 when the structure was demolished and the site remained open land.

2.5.2 Off-site Features

The site has been located in a residential area since the 1930s.

A small chalk pit was noted between 1896 and 1897 approximately 120 metres to the north east of the site after which it was no longer indicated and may have been infilled. An old chalk pit was noted 250 metres to the north of the site from at least 1896 and relates to the historical landfill sites recorded 260 metres to the north of the site in the Landmark Envirocheck Report and the Site Sensitivity maps.

2.6 Dataset Information and Landmark Envirocheck Report

A Landmark Envirocheck Report was obtained for the site and a précis of any pertinent points found within the report within a 250 metre search radius is presented below.

Only active sources or those that could have historically impacted the site are discussed.

A copy of the report is presented in Appendix B.

Environmental Significance Of Data Search	
Source	**Nearest Point**
Groundwater protection zone	Zone I on site
Nearest non-potable abstraction point	None
Nearest potable abstraction point	1307m NW
Discharge Consent	None within 250m
Local Authority Pollution Prevention and Control	None within 250m
Local Authority Recorded Landfill sites	None
Registered Landfill site	None within 250m
Registered Waste Transfer site	None within 250m
Registered Waste Treatment/Disposal site	None within 250m
Contemporary Trade Directory Entries (Active status within 250m)	None
Mining Hazards	None
Fuel Station Entries	None
Pollution incidents to controlled waters (Category 2 and above within 250m)	None
Extreme flooding from rivers or sea without defences	None
Flooding from rivers or sea without defences	None

2.7 Site Walkover

The site comprised an approximately rectangular shaped plot of generally flat land with its long axis orientated in a north west to south east direction and with a slight fall towards the north east. The site was bounded to the south by Starrock Road with existing residential properties beyond and by existing residential properties on the remaining three sides.

At the time of the Site Walkover, March 2008, the site was being used for caravan storage, the residential property that had previously occupied the site had already been demolished sometime between 1999 and 2007 as shown on the historical maps.

Mature hedgerows formed the boundaries of the site and mature trees were present across the site and in the adjoining properties.

No on-site or off-site potential sources of contamination or surface expression of any solution features were identified during the Site Walkover.

2.8 Site Sensitivity Maps

The Site Sensitivity Maps presented in Appendix C did not identify any potential sources of contamination within the site boundaries or within close proximity to the site other than those mentioned in the previous sections.

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Section 3
Risk assessment: Phase 1 – Hazard identification and assessment

3.1 Background

The technical assessment of risk associated with contaminated land is the process by which the significance of contamination on a site can be determined with respect to sensitive targets. In the following section consideration is given to sensitive receptors, these being human health, groundwater, buildings, building materials and services.

A hazard is the potential to cause harm; a risk on the other hand is the likelihood of harm (in defined circumstances, and usually qualified by some statement of the severity of the harm).

The relationship between hazard and risk must be treated very cautiously. If all other factors are equal - especially the exposures and the receptors subject to them, then the risk is proportional to the hazard.

For a risk to be considered present there must be a complete linkage of source, viable pollutant pathway and target. If any of these links are removed or blocked then there can be no risk.

The geological map showed the site to be located on the Upper Chalk Formation.

The Desk Study showed the site to be located on soil having a Geological Class of a *Major Aquifer* with the Soil Classification of the site being of high leaching potential, (HU).

Examination of the Environment Agency records showed that the site was within a Zone I (Inner Protection Zone) as classified in the Policy and Practice for the Protection of Groundwater. This zone is defined as a travel time of 50-days or less from any point at, or below the watertable to the abstraction point. Additionally, the zone has a minimum 50 metre radius. It is based principally on biological decay criteria and is designed to protect against the transmission of toxic chemicals and water.

Examination of the Environment Agency records showed that the site was not situated within a floodplain or a flood warning area.

The groundwater table was not anticipated at shallow depth and the groundwater flow was expected to follow a north easterly direction, in alignment with the local topography.

The Building Research Establishment report BRE 211 indicated the site to be situated within an area where *no* protection or risk assessment against the ingress of radon is required.

3.2 Potential Contamination Sources

Potential sources that have been identified from the Desk Study are discussed in the following sections in terms of potential on-site sources and off-site sources.

3.2.1 On-Site Potential Sources

Based on the historic maps, the site was shown to be open land and woodland until sometime between 1914 and 1934 when the site was shown to be developed with a residential property within its own grounds and the site has remained unchanged until sometime between 1999 and 2007 when the structure was demolished and the site remained open land.

No Department of the Environment Industrial Profiles exist for residential developments.

Based on the Site Walkover, there were no potential sources of contamination identified within the site boundaries or within close proximity to the site.

In the absence of any indications of industrial use having taken place on the site, it was considered that the risk exposure of the underlying soils or groundwater could be characterised as negligible. Additional information derived from the second phase of the investigation will assist in order to provide a more conclusive evaluation of the risk exposure of both the soil and groundwater.

3.2.2 Off-Site Potential Sources

The site has been located in a residential area since the 1930s.

A small chalk pit was noted between 1896 and 1897 approximately 120 metres to the north east of the site after which it was no longer indicated and may have been infilled. An old chalk pit was noted 250 metres to the north of the site from at least 1896 and relates to the historical landfill sites recorded 260 metres to the north of the site in the Landmark Envirocheck Report and the Site Sensitivity maps. Both could therefore be a potential source of biogas migration within the site boundaries.

3.3 Potential Contamination Pathways

Anthropogenic (or artificial) pathways for contaminant migration can be present in the form of land drains etc. Leaking sewage supply pipes and site drainage could also provide pathways for potential contaminant migration. Granular backfill to trenches for cables, gas pipes, water pipes etc. can also provide pathways for movement of mobile contaminants and contaminated groundwater.

The geological map showed the site to be located on the Upper Chalk Formation. The Upper Chalk Formation is expected to have medium to high permeability. Therefore, the natural stratum was expected to act as a possible pathway to the underlying soils and/or the groundwater beneath the site. However, it was considered that the groundwater flow, in alignment with the local topography, was anticipated to follow a north easterly direction. Consequently, any potential off-site sources identified in Section 2.5 and in Section 2.6 not located to the south west of the site have been dismissed.

Airborne pathways for particulate contaminants may be present if contaminants are present at the ground surface.

3.4 Potential Receptors

The source-pathway-receptor framework was used to assess potential risks posed by identified plausible pollutant linkages. The sources and pathways were as identified in the Conceptual Site Model whilst the receptors comprised demolition/construction workers, service maintenance workers, future site occupiers, building materials and services and were selected to represent those receptors to which harm could be posed. The potential receptors comprise:

- Site operatives during demolition and redevelopment;
- Maintenance workers;
- Building materials and services;
- End users.

3.5 Conceptual Site Model

In order for any part of this conceptual model to be realised a source, pathway and receptor link must be in place and unbroken. Each likely scenario, whereby source pathway and receptor could become linked, has been considered and summarised overpage.

Conceptual Site Model		
Source	**Pathway**	**Receptor**
1. Biogases generated from landfill site and chalk pit to the north and north east of site.	a. Migration and Inhalation via Upper Chalk Formation	a. Human Health
		b. Buildings and confined spaces

The intrusive investigation may reveal on site sources of contamination (ie Made Ground) that were not established by the Desk Study and Site Walkover that could result in the modification of the Conceptual Site Model.

The following figures and appendices complete this report:

Figure 1	Site Location Plan
Appendix A	Historical Maps
Appendix B	Landmark Envirocheck Report
Appendix C	Site Sensitivity Maps

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Appendix A
County Series and Ordnance Survey Maps

Appendix B
Landmark Envirocheck Report

Appendix C
Site Sensitivity Maps

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Safran Homes Limited
1 Magellan Terrace,
Gatwick Road,
Crawley,
West Sussex
RH10 9PJ
For the attention of Michael Webster

18th August 2009
Our ref: Gas Letter J10616

Dear Sirs

Re: Biogas Risk Assessment – 16-18 Starrock Road, Coulsdon, Surrey

Please find enclosed the completed results of the biogas readings and groundwater levels taken at the above site. The results must be read in conjunction with Soils Limited Report Ref.:J10616 dated April 2008.

Potential Sources for Gas Generation

The Desk Study (Soils Limited Report, ref: J10616 dated April 2008) identified the potential for biogases to affect the proposed redevelopment and in consequence biogas readings were made on the wells installed in three boreholes drilled on the site.

Biogas monitoring has been carried out on six occasions in total and included a range of atmospheric pressure and weather conditions. The results from the monitoring are presented in Table 1 overpage.

Biogas Protection – Background Information

Carbon dioxide is a non-flammable, toxic gas with long-term and short-term exposure limits of 0.5% and 1.5%, respectively, by volume in air and is approximately one and a half times as heavy as normal air.

Methane is a flammable and asphyxiating gas, the flammable range being 5% to 15% under normal atmospheric conditions. If methane, within this range, and atmospheric air are confined and ignited, the gas mixture will explode. Methane is a buoyant gas with a density of approximately two thirds that of atmospheric air.

The background concentrations of both methane and carbon dioxide in natural ground are not zero and they can be found in high concentrations in relatively innocuous environments. Under normal soil conditions the concentration of methane is very low. High concentrations of carbon dioxide can be produced by aerobic decay of organic matter and as a by-product of a reaction between soil and groundwater.

Table 1: Full Set of Biogas Monitoring Results

Date	Atmospheric Pressure Trend	BH	O_2 (%)	CO_2 (%)	CH_4 (%)	LEL (%)	CO (ppm)	H_2S (ppm)	aP (mb)	Flow (l/h)	H_2O (m bgl)
20.03.08	Falling	Atmos	21.4	0.0	0.0	0.0	0.0	0.0	995		
		WS1	Could not find well								
		WS2	Could not find well								
		WS3	20.3	0.2	0.0	0.0	0.0	0.0	995	0.1	Dry
27.03.08	Stable	Atmos	21.5	0.0	0.0	0.0	0.0	0.0	982		
		WS1	20.7	0.1	0.0	0.0	0.0	0.0	982	0.0	Dry
		WS2	20.6	0.2	0.0	0.0	0.0	0.0	982	0.0	Dry
		WS3	20.0	0.3	0.0	0.0	0.0	0.0	982	0.1	Dry
04.04.08	Falling	Atmos	21.3	0.0	0.0	0.0	0.0	0.0	1010		
		WS1	20.0	0.2	0.0	0.0	0.0	0.0	1010	0.0	Dry
		WS2	20.7	0.2	0.0	0.0	0.0	0.0	1010	0.0	Dry
		WS3	20.7	0.1	0.0	0.0	0.0	0.0	1010	0.0	Dry
16.04.08	Falling	Atmos	21.5	0.0	0.0	0.0	0.0	0.0	1004		
		WS1	18.5	1.2	0.0	0.0	0.0	0.0	1004	0.0	Dry
		WS2	20.5	0.3	0.0	0.0	0.0	0.0	1004	0.0	Dry
		WS3	20.3	0.3	0.0	0.0	0.0	0.0	1004	0.0	Dry
20.05.08	Rising	Atmos	20.5	0.0	0.0	0.0	0.0	0.0	999		
		WS1	18.3	2.7	0.0	0.0	0.0	0.0	999	0.0	Dry
		WS2	19.5	0.0	0.0	0.0	0.0	0.0	999	0.0	Dry
		WS3	17.9	0.8	0.0	0.0	0.0	0.0	999	0.0	Dry
16.06.08	Rising	Atmos	21.0	0.0	0.0	0.0	0.0	0.0	992		
		WS1	20.6	0.0	0.0	0.0	0.0	0.0	992	0.0	Dry
		WS2	18.4	1.5	0.0	0.0	0.0	0.0	992	0.0	Dry
		WS3	19.1	1.1	0.0	0.0	0.0	0.0	992	0.0	Dry
		Min:	17.9	0.0	0.0	0.0	0.0	0.0	982	0.0	
		Max:	21.5	2.7	0.0	0.0	0.0	0.0	1010	0.1	

Note: reading of 0 = not detected (below detection limit)
Atmospheric pressure readings taken at Gatwick Airport

Measured Biogas Concentrations

The biogas data presented in Table 1 showed that the maximum concentration of carbon dioxide was recorded as 2.7% by volume in Borehole WS1 on 20.05.08. The oxygen concentrations were generally noted to be close to slightly depleted from their normal atmospheric values.

There were no significant positive flow rates recorded.

The biogas data presented in Table 1 above did not detect any concentrations of methane, hydrogen sulphide or carbon monoxide during any monitoring visits.

Monitoring visits have targeted a range of atmospheric pressure conditions including rising atmospheric pressure, stable atmospheric pressure and falling atmospheric pressure systems.

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Gas Protection Measures

Based on the documentation presented in "BS 8485:2007, Code of practice for the characterization and remediation from ground gas in affected developments", the *hazardous gas flow rate (Q_{hg})* should be calculated using:

$Q_{hg}=C_{hg}/100 * q$

Where:

> C_{hg} is the measured hazardous gas concentration (in percentage volume-by-volume);
>
> q is the flow rate (in litres per hour) of combined gases found by direct measurement. If positive gas borehole flow was not detectable, it should be assumed to be at the detection limit of the equipment used, ie 0.1.

Consequently, the Q_{hg} for carbon dioxide was calculated to be:

Q_{hg} (l/hr) = 2.7 (gas concentration)/100 * 0.1 (borehole flow rate) = 0.027 * 0.1

Q_{hg} for Carbon Dioxide = 0.0027 l/hr

The maximum carbon dioxide concentration was taken as the gas concentration and the maximum gas flow was taken for the borehole flow rate, thus increasing the degree of conservatism adopted.

BS 8485:2007 stipulates that "individual gas measurements obtained from several monitoring locations over a number of visits should be considered collectively to establish a characteristic hazardous gas flow rate for the site as a whole".

The *Site Characteristic hazardous gas flow rate (Q_{hgs})* has been assumed to be the same as the hazardous gas flow rate of **0.0027 l/hr** for carbon dioxide for the site and these would indicate the site to fall into a **Characteristic Gas Situation 1**, where the hazard potential is considered as *'very low'.*

In accordance with "BS 8485:2007, Code of practice for the characterization and remediation from ground gas in affected developments" measures to protect end-users from the migration of Biogas within public buildings (including schools) for a 'Green' site totaling up to a score of 0 should be installed and could include the following:

- Block and beam floor slab

  Score: 0 points - "*It is good practice to install ventilation in all foundation systems to effect pressure relief as a minimum*".

All details for gas protection measures are given in the BRE 414, *Protective Measures for Housing on Gas-Contaminated Land* and all gas protection measures should be installed in accordance with the BRE Report: *Construction of Buildings on Gas Contaminated Land.*

Soils Limited have carried out a data quality review to assess the robustness and reliability of the Biogas data we have collated.

Data Quality

A review was made of the quality of the available data for the site, which can be viewed in Table 2 overpage. CIRIA 665 (2007) and BS 8485:2007 stress the need for risk assessments to be based on good quality data and give guidance as to best practice in this respect.

Table 2: Review of Data Quality

Data Type	Current Situation	UK Practice	Recommendation
Geological and hydro-geological conditions	With regard to landfill gas risk assessment the data from Desk Study and logged trial holes is good.	CIRA 659, Wilson and Card (1999) and BS 8485:2007 recommend that geology and hydrogeology be fully understood.	No further action required
Monitoring period	The monitoring has been undertaken on a total of six occasions over a three month period. Monitoring has been undertaken over a range of seasons and weather conditions including falling and low atmospheric pressures.	CIRIA 659 recommends a minimum of 3 month monitoring over a range of weather conditions. Wilson and Card (1999) recommend that for less than 12 months monitoring the protective measures should be made more conservative.	Monitoring over a three month period has shown maximum carbon dioxide conc. of 2.7% by vol therefore falling within a Characteristic Gas Situation 1 where no protection measures required. No methane, hydrogen sulphide or carbon monoxide detected during monitoring visits. Monitoring visits have targeted worse-case falling atmospheric pressure conditions. No further action required
Gas data sets	Borehole flow velocity has been measured on each monitoring occasion.	Borehole flow velocity and borehole gas volume (carbon dioxide) required for gas flux categorisation. Modified Wilson and Card, Table 8.5 of CIRIA 659 (2006).	No further action required

Data quality was good, covering a wide range of atmospheric pressure trends and measurements of positive flow rates. Geological and hydrogeological conditions have been investigated and fully understood.

Data Categorisation for Site

Based on the documentation presented in "BS 8485:2007, Code of practice for the characterization and remediation from ground gas in affected developments", the Data Category for the site could be characterised as "***Adequate***" as six Biogas readings have been undertaken over a three month period over a range of pressure and weather conditions and a comprehensive Desk Study and Intrusive Investigation were carried out for the site.

A number of the monitoring visits were also undertaken during falling atmospheric pressure conditions, which are considered as giving the worse-case Biogas concentrations.

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Conclusions

A combination of Desk Study, Intrusive Investigation and Biogas monitoring has demonstrated that the site falls within Characteristic Gas Situation 1 in accordance with BS 8485:2007, where **no** gas protection measures are considered necessary. It was however recommended that a block and beam slab is used as it is good practice to install passive ventilation in all foundation systems to effect pressure relief as a minimum.

Given that Biogas monitoring has been carried out over a three month period, including high, falling and low atmospheric pressure systems and a range of weather conditions, our data has allowed for an accurate and robust Biogas risk assessment to be made for the site.

Please do not hesitate to contact us if you have any queries with the enclosed information.

Yours sincerely

Roger J. Foord BA(Hons)., MSc., DIC, FGS.
Senior Geotechnical Engineer
For and on behalf of Soils Limited

soils LIMITED
Geotechnical & Environmental Consultants

Ground Investigation

Soils LIMITED

Geotechnical & Environmental Consultants

Report On A Ground Investigation

At

Starrock Road (Plots 6-8), Coulsdon, Surrey, CR5 3EH

For

Safran Homes Limited

Soils Limited
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REPORT J11443

Ground Investigation Report

Job Title: Starrock Road (Plots 6-8), Coulsdon, Surrey, CR5 3EH

Client: Safran Homes Limited

CONTROL DOCUMENT

SOILS LIMITED DOCUMENT REFERENCE NUMBER:
J11443

DOCUMENT TYPE:
GROUND INVESTIGATION REPORT

DOCUMENT STATUS: FINAL Revision: 1.00 DATE: November 2009

Note: This is not a valid document for use in the design of the project unless it is titled **Final** in the Document Status box.

	Name	Signature
Prepared by:	Nikos Sidiropoulos	
Checked by:	R B Higginson	
	N J Lambert	

Current regulations and good practice were used in the preparation of this report. The recommendations given in this report must be reviewed by an appropriately qualified person at the time of preparation of the scheme design to ensure that any recommendations given remain valid in light of changes in regulation and practice, or additional information obtained regarding the site.

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soils LIMITED
Geotechnical & Environmental Consultants

Report On A Ground Investigation

At

Starrock Road (Plots 6-8), Coulsdon, Surrey, CR5 3EH

For

Safran Homes Limited

Commission

An invitation to tender for the investigation was received from Safran Homes Limited and the scope of the investigation was as outlined in Soils Limited subsequent quotation reference Q11505DS dated 17th August 2009.

A Desk Study, a Ground Investigation (Report ref: J10616, April 2008) and a Biogas Risk Assessment (Report ref: J10616, August 2009) were undertaken on the adjoining site by Soils Limited. Soils Limited has relied on these documents in designing the intrusive investigation and chemical laboratory testing undertaken and discussed in this report.

This report comprises the intrusive phase of the investigation and incorporates the results, discussion and conclusions to the Intrusive Investigation.

The following sections make up the report made on the investigation and comprise:

Section 1
Introduction

- Objective of the Investigation;
- Location;
- Proposed Redevelopment;
- Limitations and Disclaimers.

Section 2
Site Works

- Proposed Works;
- Anticipated Geology;
- Ground Conditions;

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- Roots;
- Groundwater;
- Site Description.

Section 3
Discussion of Geotechnical In-Situ and Laboratory Testing

- Dynamic Probe Tests;
- Natural and Saturated Moisture Content Determination and Density Tests;
- Atterberg Limit Test;
- Sulphate and pH Tests.

Section 4
Foundation Design

- General;
- Foundation Scheme;
- Subsurface Concrete;
- Excavations;
- Soakaways;
- Roads and Hardstanding.

Section 5
Conceptual Site Model and Chemical Analysis of Soil Samples

- Site Characterisation and Conceptual Site Model;
- Soil Sampling;
- Determination of Contaminants of Concern.

Section 6
Qualitative Risk Assessment

- Assessment Criteria;
- Representative Contamination Concentration;
- Tier 1 Quantitative Risk Assessment.

Section 7
Risk Assessment and Remediation Strategy

- Risk Evaluation/Estimation;
- Remedial Objective;
- Duty of Care;
- Excavated Material;
- Imported Material;
- Discovery Strategy.

Appendices

- Appendix A: A description of the fieldwork and the trial hole logs;
- Appendix B: The results of geotechnical laboratory tests carried out on soil samples obtained from the trial holes;
- Appendix C: The results of chemical laboratory analyses conducted on a number of soil samples obtained from the trial holes;
- Appendix D: Soil Guideline Values and General Assessment Criteria.

The site works were performed in accordance with the methods given in BS 5930:1999 and BS 1377:1990 Part 9. There was no British Standard applicable to the window sampler drilling method at the time of the preparation of this report.

The geotechnical laboratory testing was performed by K4 Soils Laboratories in accordance with methods given in BS 1377:1990 Parts 1 to 8 and their UKAS accreditation.

The chemical analyses were undertaken by i2 Analytical Ltd in accordance with their UKAS and MCERTS accredited test methods or their documented in-house testing procedures. This investigation did not comprise an environmental audit of the site or its environs.

Trial hole is a generic term used to describe a method of direct investigation. The term trial pit, borehole or window sample borehole implies the specific technique used to produce a trial hole.

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Section 1
Introduction

1.1 Objective of the Investigation

The overall objective was understood to be to supply the client with information regarding ground conditions, to assist them in preparing a scheme for redevelopment that was appropriate to the conditions present on the site and safe for end-users and for workers during the redevelopment phase.

The investigation was to be undertaken to provide parameters for the design of foundations by means of in-situ testing and geotechnical laboratory testing undertaken on soil samples taken from the boreholes.

Soil samples were taken for chemical laboratory testing to enable recommendations for the safe redevelopment of the site and the protection of site workers, end-users and the public from any contamination identified as dictated by the Conceptual Site Model in the Desk Study undertaken on the adjoining site by Soils Limited (Report ref: J10616, April 2008) and the Conceptual Site Model presented in Section 5.1 in this report.

1.2 Location

The approximate O.S. National Grid Reference at the centre of the site was TQ 289 589. An aerial photo of the site is presented on Figure 1.

1.3 Proposed Redevelopment

The proposed redevelopment was understood to comprise the erection of three detached residential properties together with associated infrastructure. The proposed redevelopment was to include areas of soft landscaping comprising domestic gardens.

At the time of the reporting the imposed loads of the proposed structure were unknown to Soils Limited.

1.4 Limitations and Disclaimers

The ground is a product of continuing natural and artificial processes. As a result, the ground will exhibit a variety of characteristics that vary from place to place across a site, and also with time. Whilst a ground investigation will mitigate to a greater or lesser degree against the resulting risk from variation, the risks cannot be eliminated.

The investigation, interpretations, and recommendations given in this report were prepared for the sole benefit of the client in accordance with their brief. As such these do not necessarily address all aspects of ground behaviour at the site.

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Current regulations and good practice were used in the preparation of this report. An appropriately qualified person must review the recommendations given in this report at the time of preparation of the scheme design to ensure that any recommendations given remain valid in light of changes in regulation and practice, or additional information obtained regarding the site.

The conclusions and recommendations relate to land at Starrock Road, Coulsdon, Surry, CR5 3EH.

The depth to roots and/or of desiccation may vary from that found during the investigation. The client is responsible for establishing the depth to roots and/or of desiccation on a plot-by-plot basis prior to the construction of foundations.

Where trees are mentioned in the text this means existing trees, recently removed trees (approximately 15 years to full recovery on cohesive soils) and those planned as part of the site landscaping.

Ownership of land brings with it onerous legal liabilities in respect of harm to the environment. "Contaminated Land" is defined in Section 57 of the Environment Act 1995 as *"Land which is in such a condition by reason of substances in, on or under the land that significant harm is being caused or that there is a significant possibility of such harm being caused or that pollution of controlled waters is being, or is likely to be caused".*

The investigation, analysis or recommendations in respect of contamination are made solely in respect of the prevention of harm to vulnerable receptors, using where possible best practice at the date of preparation of the report. The investigation and report do not address, define or make recommendations in respect of environmental liabilities. A separate environmental audit and liaison with statutory authorities is required to address these issues.

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Section 2
Site Works

2.1 Proposed Works

The works to be undertaken on the site comprised the following items:

- The drilling of a series of window sampler boreholes;
- The driving of a number of dynamic probe holes, using a 'Heavy' Dynamic Probe (DPH), adjacent to the boreholes;
- Logging, sampling and *in-situ* testing as appropriate to the ground conditions encountered in the trial holes.

2.2 Anticipated Geology

The 1:50 000 Geological Survey of Great Britain (England and Wales) sheet number 286 of the Reigate area, showed the site to be located on the Upper Chalk Formation.

2.2.1 Upper Chalk Formation

The Upper Chalk Formation is a soft white friable microporous limestone composed of coccolith biomicrites with a varying proportion of larger shell fragments. Flint characterises the Upper Chalk Formation, occurring as nodular courses, tabular beds and linings to fractures.

At various levels clay sized material occurs as marl seams and partings. Close to the surface the upper few metres are invariably discoloured brown, due to leaching from the overlying strata. The interface with any overlying stratum is invariably extremely irregular as a result of localised weathering and general solution. Weathering by frost action may extend to a depth of several metres.

Occasional erosional features, such as pipes, swallow holes and solution cavities, usually in-filled with drift deposits, are found in the chalk within this area. The features sometimes manifesting themselves at the surface as shallow circular depressions. Solution features may be reactivated by the concentrated ingress of water from leaking drains or soakaways. Reactivation may lead to surface collapse.

2.3 Ground Conditions

Fieldwork was undertaken on 29th October 2009 and comprised the drilling of three window sampler boreholes (WS1-WS3) at locations within the site, where no live services were identified, to a maximum depth of 3.7 metres below ground level (bgl) in Borehole WS2. The drilled depth in Borehole WS1 was limited to 1.0 metres bgl due to

the granular (possibly a band of flints or individual coarse flints) soils of the Upper Chalk Formation encountered at this depth that could not be penetrated.

Heavy Dynamic Probing (HDP) was undertaken adjacent to the boreholes (DP1-DP3) to a maximum depth of 6.0m bgl in DP1.

The approximate location of the trial holes is presented on Figure 2.

The soil conditions encountered were recorded and soil sampling commensurate with the purposes of the investigation was carried out. The depths given on the trial hole logs and quoted in this report were measured from ground level directly adjacent to the individual borehole.

The soils encountered from immediately below ground surface have been described in the following manner. Where the soil incorporated an organic content such as either decomposing leaf litter or roots, or has been identified as part of the *in-situ* weathering profile, it has been described as Topsoil both on the logs and within this report. Where the soil has, in general, been found to have the same composition as the 'Topsoil' but also incorporated a minor constituent, e.g. less than an estimated 5%, of possibly non-naturally occurring material, or is of uncertain origin, the soil has been described as Topsoil/Made Ground both on the logs and within this report. Where man has clearly either placed the soil, or the composition altered with say greater than an estimated 5% of a non-natural constituent, it has been referred to as Made Ground both on the log and within this report.

For more complete information about the soils encountered within the general area of the site reference should be made to the detailed records given within Appendix A, but for the purposes of discussion the succession of conditions encountered in the boreholes in descending order can be summarised as follows below:

Made Ground
Head (not encountered in WS1)
Upper Chalk Formation

2.3.1 Made Ground

Made Ground was found from surface in each of the boreholes and comprised brown silty clay with brick, ash, chalk traces and roots to depths ranging between 0.10 metre bgl in WS3 and 0.9 metre bgl in WS1.

2.3.2 Head

The soils of the Head were only found in boreholes WS2 and WS3 directly beneath the Made Ground and comprised brown silty CLAY with occasional to abundant chalk fragments with occasional ferruginous stains and very occasional flint gravel. The soils of the Head were proved to depths ranging between and 0.3 metre in WS3 and 1.9 metres bgl in WS2.

2.3.3 Upper Chalk Formation

The soils of the Upper Chalk Formation were found directly beneath the Made Ground or the Head and comprised off-white structureless CHALK composed of gravelly SILT/silty GRAVEL with occasional fine to coarse flints. Based on visual observation of disturbed soil samples recovered during the site investigation, the chalk was classified as **Grade Dm** (structureless with comminuted chalk matrix >35%).

Based on the geotechnical results of the Natural and Saturated Moisture Content Determination and Density Tests, the chalk samples that were considered suitable for testing were of **low to medium** density as defined by CIRIA Publication C574 2002.

2.4 Roots

Roots were observed in each of the trial holes. Records of the roots are presented in tabular form below.

Root Records	
Trial Hole	**Root Depth (m bgl)**
WS1	Roots observed to 0.9
WS2	Roots observed to 1.9
WS3	Roots observed to 0.6

It must be emphasised that the probability of determining the maximum depth of roots from a narrow diameter borehole is low. A direct observation such as from within a trial pit is necessary to gain a better indication of the maximum root depth.

Roots may be found at other locations on the site particularly close to trees and/or trees that have been removed both within the site and its close environs.

2.5 Groundwater

Groundwater was not encountered in the boreholes during the site investigation.

Changes in groundwater level do occur for a number of reasons including seasonal effects and variations in drainage.

The investigation was conducted in October (2009), when groundwater levels should be at or close to their annual minimum (i.e. lowest) elevation. The long-term groundwater elevation may increase at some time in the future.

Groundwater equilibrium conditions may only be conclusively established by means of a series of measurements made in a standpipe, or piezometer installed in the ground after completion of site works.

Any groundwater or surface water ingress must be prevented from entering foundation or service trenches. The possible effect of groundwater on the proposed redevelopment and the foundations will be discussed later in the report.

2.6 Site Description

At the time of the Site Walkover, in October 2009, the site comprised an approximately rectangular shaped plot of sloping land with a steep fall in a north-easterly direction. The area approximately half way along the northern site boundary was noted to have been terraced out on the existing slope.

The site was currently open land and was understood to formerly comprise the domestic gardens of the residential properties to the immediate north. The site was predominantly grass covered with hedges running in a north to south direction with mature trees, hedges and fencing (approximately 6ft high) around its perimeter.

The site was surrounded on all sides by detached residential properties.

No obvious sources of contamination were noted either within the site or its close environs.

An aerial photo of the site is presented on Figure 1.

Section 3
Discussion of Geotechnical In-Situ and Laboratory Testing

3.1 Dynamic Probe Tests

Heavy Dynamic Probing (HDP) was undertaken adjacent to the boreholes (DP1-DP3) to a maximum depth of 6.0m bgl in DP1.

Probing involves the driving of a metal cone into the ground via a series of steel rods. These rods are driven from the surface by a hammer system that lifts and drops a 50kg hammer onto the top of the rods through a set height, thus ensuring a consistent energy input. The number of hammer blows that are required to drive the cone down by each 100mm increment are recorded. These blow counts then provide a comparative assessment from which correlations have been published that permit engineering parameters to be generated.

The dynamic probe results were converted (where applicable) to equivalent SPT "N" values based on dynamic energy.

The inferred cohesion of the soils within the Head was based on the equivalent SPT "N" blow counts, derived from the dynamic probe tests, in the table below and was based on the relationship suggested by Stroud (1974) *(ref: Stroud, M. A. 1974, "The Standard Penetration Test – its application and interpretation", Proc. ICE Conf. on Penetration Testing in the UK, Birmingham. Thomas Telford, London.).*

The deposits have been classified based on the relationship given below.

Classification	Undrained Cohesive Strength (KPa)
Very Soft	0 – 20
Soft	20 – 40
Firm	40 – 75
Stiff	75 – 150
Very Stiff	150 – 300
Hard	> 300

(Ref: Table L3 – Identification and Description of Soils – BS5930:1999.)

An interpretation of the equivalent SPT 'N' blow counts is given in the following table overpage.

Inferred SPT 'N' Blow Counts				
Strata	Equivalent SPT "N" Blow Counts	Soil Type		Borehole
		Cohesive	Granular	
Head (0.15m – 1.90m bgl)	2 - 40	Very soft to stiff and occasional very stiff	-	DP2
Head (0.10m – 0.30m bgl)	4	Very soft	-	DP3
Upper Chalk Formation (0.90 – 6.00m bgl)	8 - 80	Interpretation not applicable to chalk but blow counts generally increasing with depth. Occasional elevated blows possibly due to flint bands. No spots of very soft/loose soils found that could indicate the possible existence of solution features		DP1
Upper Chalk Formation (1.90 – 5.00m bgl)	8 - 14			DP2
Upper Chalk Formation (0.30 – 5.00m bgl)	4 - 18			DP3

(The Dynamic Probe 'Heavy' (DPH) Tests were conducted in accordance with BS 1377;1990; Part 9, Clause 3.2).

The test results are presented in Appendix A.

3.2 Natural and Saturated Moisture Content Determination and Density Tests

Natural and Saturated Moisture Content Determination and Density Tests were made on disturbed samples of the Upper Chalk Formation. The samples that were suitable for testing were shown to be of **low to medium** density as defined by CIRIA Publication C574 2002.

(The Natural and Saturated Moisture Content Determination and Density Tests were made in accordance with BS 1377:Part 2:1990 Clauses 3.2 and 3.3).

The test results are given in Appendix B.

3.3 Atterberg Limit Test

The result of an Atterberg Limit Test made on a sample of the Head is given in the table below.

Atterberg Limit Test Result					
Moisture Content (%)	Modified PI (%)	Passing 425 µm sieve (%)	Soil Class	Volume Change Potential	
				BRE	NHBC
31	37	62	CE	Medium	Medium

NB: BRE Volume Change Potential refers to BRE Digest 240 (based on Atterberg results)

NHBC Volume Change Potential refers to NHBC Standards Chapter 4.2 (based on Atterberg results)
Soil Classification based on British Soil Classification System.

The most common use of the term clay is to describe a soil that contains enough clay-sized material or clay minerals to exhibit cohesive properties. The fraction of clay-sized material required varies, but can be as low as 15%. Unless stated otherwise, this is the sense used in Digest 240.

The term can be used to denote the clay minerals. These are specific, naturally occurring chemical compounds, predominately silicates. The term is often used as a particle size descriptor. Soil particles that have a nominal diameter of less than 2 μm are normally considered to be of clay size, but they are not necessarily clay minerals. Some clay minerals are larger than 2 μm and some particles, 'rock flour' for example, can be finer than 2 μm but are not clay minerals.

The test result is given in Appendix B.

(The Atterberg Limit Test was undertaken in accordance with BS 1377:Part 2:1990 Tests 4 and 5).

3.4 Sulphate and pH Tests

The significance of the Sulphate and pH Test results are discussed within Section 4.3.

(The Sulphate and pH Tests were undertaken made in accordance with BS 1377:Part 3:1990 Clause 5).

The test results are given in Appendix B and within the contamination results presented in Appendix C.

Section 4
Foundation Design

4.1 General

An engineering appraisal of the soil types encountered during the site investigation and likely to be encountered during the redevelopment of this site is presented below and overpage.

4.1.1 Topsoil or Made Ground

The terms *Fill* and *Made Ground* are used to describe material, which has been placed by man either for a particular purpose e.g. to form an embankment, or to dispose of unwanted material. For the former use, the Fill and/or Made Ground may well have been selected for the purpose and placed and compacted in a controlled manner. With the latter, great variations in material type, thickness and degree of compaction invariably occur and there can be deleterious or harmful matter, as well as potentially methanogenic organic material.

The BSI Code of Practice for Foundations, BS 8004:1986, Clause 2.2.2.3.5 Made Ground and Fill, includes the caveat that *'all made ground should be treated as suspect, because of the likelihood of extreme variability'.*

A result of the inherent variability, particularly of uncontrolled Fill and/or Made Ground, is that it is usually unpredictable in terms of bearing capacity and settlement characteristics. Foundations should, therefore, be taken through any Fill and/or Made Ground and either into, or onto a suitable underlying natural stratum of adequate bearing characteristics.

Made Ground was found from surface in each of the boreholes and comprised brown silty clay with brick, ash, chalk traces and roots to depths ranging between 0.10 metre bgl in WS3 and 0.9 metre bgl in WS1.

Made Ground might be present to similar or greater depths elsewhere on the site including service trenches, infilled ground and the like.

4.1.2 Head

The soils of the Head were only found in boreholes WS2 and WS3 directly beneath the Made Ground and comprised brown silty CLAY with occasional to abundant chalk fragments with occasional ferruginous stains and very occasional flint gravel. The soils of the Head were proved to depths ranging between and 0.3 metre in WS3 and 1.9 metres bgl in WS2.

The result of the Atterberg Limit test indicated that the sample of the Head tested, fell into the NHBC Standards Chapter and the BRE Digest 240 ***medium volume change potential*** classification.

The soils of the Head are generally normally consolidated soils and as such have low bearing and high settlement characteristics and should not be considered as a bearing stratum for the proposed redevelopment.

4.1.3 Upper Chalk Formation

The soils of the Upper Chalk Formation were found directly beneath the Made Ground or the Head and comprised off-white structureless CHALK composed of gravelly SILT/silty GRAVEL with occasional fine to coarse flints. Based on visual observation of disturbed soil samples recovered during the site investigation, the chalk was classified as **Grade Dm** (structureless with comminuted chalk matrix >35%).

Based on the geotechnical results of the Natural and Saturated Moisture Content Determination and Density Tests, the chalk samples that were considered suitable for testing were of **low to medium** density as defined by CIRIA Publication C574 2002.

Whilst the interface between the superficial deposits and underlying Upper Chalk Formation is invariably irregular, marked variations over short distances may indicate the presence of solution features.

The Upper Chalk Formation is a weak rock and is considered to have moderate to high bearing and low settlement characteristics. As such the Upper Chalk Formation was considered suitable for use as a bearing stratum for the proposed redevelopment using either strip/pad foundations.

4.2 Foundation Scheme

The proposed redevelopment was understood to comprise the erection of three detached residential properties together with associated infrastructure. The proposed redevelopment was to include areas of soft landscaping comprising domestic gardens.

At the time of the reporting the imposed loads of the proposed structure were unknown to Soils Limited.

4.2.1 Guidance on Shrinkable Soils

The Building Research Establishment (BRE) Digests 240, 241 and 242 provide guidance on 'best practice' for the design and construction of foundations on shrinkable soils.

The BRE Digest 241 states: *"An increasingly common, potentially damaging situation is where trees or hedges have been cut down prior to building. The subsequent long-term swelling of the zone of clay desiccated by the roots, as moisture slowly returns to the ground, can be substantial. The rate at which the ground recovers is very difficult to predict and if there is*

any doubt that recovery is complete then bored pile foundations with suspended beams and floors should be used".

The stated intention of the NHBC is to ensure that shrinkage and swelling of plastic soils does not adversely affect the structural integrity of foundations to such a degree that remedial works would be required to restore the serviceability of the building.

It must be borne in mind that adherence to the NHBC tables and design recommendations may not, in all cases, totally prevent foundation movement and cracking of brickwork might occur.

The BRE Digest 240 sets out best practise in respect of the design of foundations taken into shrinkable soils and advises that a piled foundation must be used if there is any doubt regarding completion of soil moisture content following any tree removal. In predominantly clayey soils, moisture content recovery can take in excess of 15 years to complete.

The result of the Atterberg Limit test indicated that the sample of the Head tested, fell into the NHBC Standards Chapter and the BRE Digest 240 ***medium volume change potential*** classification.

Ground beams, foundations or slabs passing through the clayey soils of the Head should be designed in accordance with the NHBC Standards Chapter 4.2 and the BRE Digest 240 ***medium volume change potential.***

However, the underlying soils of the Upper Chalk Formation **do not** have volume change potential.

4.2.2 Conclusions and Recommendations

Foundations must not be founded within any Made Ground due to the likely variability and potential for large load induced total and differential settlements.

In addition, foundations must not be placed within any live root penetrated or desiccated cohesive soils. Should the foundation excavations reveal such materials, the excavations must be extended to greater depth in order to bypass these unsuitable soils.

The soils of the Head are generally normally consolidated soils and as such have low bearing and high settlement characteristics and should not be considered as a bearing stratum for the proposed redevelopment. Furthermore, the soils of the Head were not considered suitable for the proposed redevelopment due to their lack of consistency in terms of thickness across the site.

The soils of the Upper Chalk Formation were considered suitable for use as a bearing stratum for the proposed redevelopment using strip or pad foundations, with the foundations taken through any Made Ground or Head and desiccated ground, below any roots and into or onto the soils of the Upper Chalk Formation such that sufficient bearing capacity was achieved. An advantage of founding onto the Upper Chalk Formation is that solution features would be exposed if present and could be dealt with accordingly.

The design of shallow foundations in chalk is generally settlement dependant, as the behaviour of chalk has been shown to be such that above a yield stress q_y, settlements increase rapidly. To limit settlements it is recommended that the stress applied by the foundations should not exceed q_y.

Based on visual observation of disturbed soil samples recovered during the site investigation, the chalk was classified as **Grade Dm** (structureless with comminuted chalk matrix >35%).

Appropriate allowable bearing pressures for low density – Grade Dc chalks would be 225kN/m^2 but for Grade Dm chalks there are too few results for definitive conclusions to be drawn as described in "CIRIA Publication C574 2002".

Based on the geotechnical results of the Natural and Saturated Moisture Content Determination and Density Tests the chalk samples that were considered suitable for testing were of **low to medium** density as defined by CIRIA Publication C574 2002.

Consequently, assuming a low-density chalk that constitutes a conservative approach, **an allowable bearing value of 150kPa** could be adopted for a one-metre wide strip or one-metre square pad foundations taken into soils of the Upper Chalk Formation.

For the allowable bearing value given, settlements should not exceed 25mm provided that excavation bases are carefully bottomed out and blinded, or concreted as soon after excavation as is possible.

The distance between isolated pad foundations must be kept to a minimum of 1.5 times the maximum pad foundation width to avoid interaction of stress bulbs.

Any groundwater or surface water ingress must be prevented from entering foundation trenches. It was considered unlikely that the groundwater could present a hazard or cause instability problems during the construction of pad/strip foundations.

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Failure to protect the base of excavations if they are to be left open prior to constructing foundations could result in markedly higher settlements.

Foundations must not be less than 450mm in width.

Foundations must not be cast over foundations of former structures and/or other hard spots.

It must be mentioned that unlike WS1 and WS3 where the soils of the Upper Chalk Formation were found at shallow depth (<1.0m bgl), in WS2 the soils of the Upper Chalk Formation were encountered at a significant depth (1.9m bgl), being overlain by the soils of the Head. Where there is any indication of possible erosional feature (e.g localised increase in depth to competent chalk or drift deposit infilled pockets and/or pipes) then advice of a Geotechnical Engineer must be sought. It was therefore recommended that a suitably qualified person inspects all foundation excavation prior to placing of any concrete or reinforcement.

4.3 Subsurface Concrete

Sulphate concentration measured in 2:1 water/soil extracts fell into Class DS-1 of the BRE Special Digest 1, 2005, *'Concrete in Aggressive Ground'.* Table C1 of the Digest indicated an ACEC (Aggressive Chemical Environment for Concrete) site classification of AC-1s. For the classification given above, the "static" case was adopted as no groundwater was encountered during the site investigation. The pH of the soil was recorded at 7.9.

Concrete to be placed in contact with soil or groundwater must be designed in accordance with the recommendations of Building Research Establishment Special Digest 1, 2005, *'Concrete in Aggressive Ground'* taking into account the pH of the soils.

4.4 Excavations

Following information supplied by the client, the proposed redevelopment is to include earthworks aiming at creating internal (non-weathered underfloor void) and external (covered in vegetation) chalk terraces on the existing natural slope in order to minimise the requirement for retaining structures.

The CIRIA C574 "Engineering in Chalk" gives a range of angle of frictions between 31-33 and 37-38 for "unstructured" (fines content > 35%) and "structured" (fines content < 35%) chalks respectively.

Given the relatively limited scale of the proposed earthworks (limited height of the order of 2.0-3.0m), an angle of 40-45 for the proposed internal and external banks would be adequate provided that precaution measures i.e against frost susceptibility are taken especially for the external banks; however we recommend that an