



Phase I Desk Study

at

**Market Parade, Havant,
Hampshire PO9 1PY**

for

Hampshire and Regional Property Group

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This is not a valid document for use in the design of the project unless it is titled Final in the document status box.

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.



Commission

Soils Limited was commissioned by Hampshire and Regional Property Group to undertake a Phase I Desk Study on the land at the Market Parade, Havant, Hampshire, PO9 1PY. The scope of the investigation was outlined in the Soils Limited quotation reference Q16352 dated 20th April 2015.

Caveat

Whilst reasonable skill and care has been taken to determine the site history and the environmental setting within the time constraints applied by the project, it should be appreciated that uncertainties may occur owing to the natural variability of soil material within a defined area or as a result of unknowns that are associated with contaminated land assessment in general. The site conditions may be different from that indicated by this desk study, particularly on a site with a history of past development. No responsibility can be accepted should such conditions alter the recommendations made in this report.

Contents

	Section 1 Introduction	1
1.1	Objective	1
1.2	Location	1
1.3	Proposed Development	1
1.4	Legislation and Liability	1
1.5	Limitations and Disclaimers	2
	Section 2 Site Conditions	4
2.1	Site Walkover	4
2.2	Site Drainage	4
2.3	Site Photographs	4
	Section 3 Geology, Hydrogeology, Hydrology and Radon	5
3.1	Anticipated Geology	5
3.1.1	Head	5
3.1.2	River Terrace Deposits (Undifferentiated)	5
3.1.3	Bognor Sand Member	5
3.1.4	London Clay Formation	5
3.1.5	Lambeth Group	5
3.2	Hydrogeology	6
3.3	Hydrology	6
3.4	Radon Gas	7
	Section 4 Site History	8
4.1	Historic Map Study	8
	Section 5 Environmental Records and Consultation	10
5.1	Dataset Information	10
5.2	Site Sensitivity Maps	10
5.3	Soil Geochemistry	12
	Section 6 Discussion and Conclusions	13
6.1	General	13
	Section 7 Preliminary Conceptual Site Model	15
7.1	General	15
7.2	Sources of Contamination	15
7.2.1	Onsite Potential Contamination Sources	15
7.2.2	Offsite Potential Contamination Sources	15
7.2.3	Potential Contamination	16
7.3	Potential Pathways	17

7.4	Potential Receptors.....	19
7.5	Preliminary Risk Assessment.....	19
7.6	Preliminary Conceptual Site Model	20
	Section 8 Recommendations	23
8.1	General.....	23
8.2	Impact of Construction Activities on Controlled Water and Site Neighbours	23
8.3	Proposed Further Site Works.....	23
8.3.1	Phase II Intrusive Investigation	23
8.3.2	Geotechnical Site Investigation.....	23
8.4	Discovery Strategy.....	24

List of Figures

Figure 1	Site Location Plan	27
Figure 2	Proposed Development Plan	28

List of Tables

Table 2.1	Site Walkover Record (On-site).....	4
Table 2.2	Site Walkover Record (Off-Site)	4
Table 3.1	Hydrogeological Assessment	6
Table 3.2	Hydrogeological Assessment	7
Table 4.1	Potential Sources of Pollution Indicated from Historic Maps.....	8
Table 4.2	Historic Development of the Site	9
Table 5.1	Environmental Significance of Data.....	10
Table 5.2	Contemporary Trade Directory	11
Table 5.3	Geological Hazards.....	11
Table 5.4	Soil Geochemistry	12
Table 6.1	Summary of Potential Contamination Sources	13
Table 7.1	Onsite Potential Contamination Sources	15
Table 7.2	Offsite Potential Contamination Sources	15
Table 7.3	Potential Contaminants or Properties.....	16
Table 7.4	Potential Soil Migration Pathways	17
Table 7.5	On-site Sources, Pathways and Potential Receptors	18
Table 7.6	Off-site Potential Pathways	19
Table 7.7	Potential Receptors	19
Table 7.8	Risk Assessment.....	20
Table 7.9	Preliminary Conceptual Site Model and Risk Assessment Methodology	21

Table 7.10 Reasoning Behind Risk Assessment.....	22
Table 8.1 Proposed Further Works	24

List of Appendices

Appendix A Country Series and Ordnance Survey Maps
Appendix B Landmark Envirocheck Report
Appendix C Site Sensitivity Maps
Appendix D Site Photographs
Appendix E Risk Assessment Criteria

Section I Introduction

I.1 Objective

The Phase I Desk Study was undertaken to advise the client on the risk pertaining to the site, with special reference to former and present day potential contaminative uses. This also included their impact on sensitive receptors, such as, human health, controlled waters, ecological features, building structures and services.

I.2 Location

The site was located on the Market Parade, Havant, Hampshire PO9 1PY at O.S Land Ranger Grid Reference of SU 717 065. The site location map is presented in Figure 1 and the full Site Walkover discussed in Section 3.1 of this report.

I.3 Proposed Development

At the time of reporting, June 2014, the proposed development comprised the demolition of the existing mixed commercial and residential buildings, and the erection of a 7-13 storey mixed level commercial and residential building. The development included hard landscaping such as access roads driveways and pavements and soft landscaping such as public open amenity space. No domestic gardens were proposed.

In compiling this report reliance was placed on drawing number 13.077.111, dated November 2014 and was prepared by HGP Architects. Any change or deviation from the scheme outlined in the drawing could invalidate the recommendations presented within this report. Soils Limited must be notified about any such changes.

The proposed development plan has been provided in Figure 2.

I.4 Legislation and Liability

The primary legislative mechanism for contaminated land management in the UK is Part 2A of the Environmental Protection Act, 1990 (EPA). Part 2A was introduced into the EPA under Section 57 of the Environment Act 1995 to help deal with the substantial legacy of land contamination. The legislation provides powers in relation to the identification, remediation and apportionment of liability for contaminated land. Part 2A applies where there is unacceptable risk, assessed on the basis of the current use and the relevant circumstances of the land. It is not directed to assessing risks in relation to a future use of the land that would require a specific grant of planning permission.

Under Part IIA of the Environment Act 1995, 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.

Under the legislation, Contaminated Land is defined 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.'

In addition, The Radioactive Contaminated Land (Modification of Enactments) (England) Regulations 2006 introduced the supplementary definition of harm to include: lasting exposure to any person resulting from the after-effects of a radiological emergency, past practice or past work activity.

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.

The Groundwater Regulations (1998) stated that entry of List 1 substances into groundwater must be prevented, and List II substances must be controlled.

I.5 Limitations and Disclaimers

This Phase I Desk Study Report relates to the site located at Market Parade, Havant, Hampshire PO9 1PY and was prepared for the sole benefit of Hampshire and Regional Property Group (The "Client") for the brief described in the Commission of this report.

Soils Limited disclaims any responsibility to the Client and others in respect of any matters outside the scope of the above.

This report has been prepared by Soils Limited, with all reasonable skill, care and diligence within the terms of the contract with the Client, incorporation of our General Conditions of Contract of Business and taking into account the resources devoted to us by agreement with the Client.

The report is personal and confidential to the Client and Soils Limited accept no responsibility of whatever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report wholly at its own risk.

The Client may not assign the benefit of the report or any part to any third party without the written consent of Soils Limited.

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.

There may be other sources of information not included in those listed that hold data relevant to the Phase I 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 presented in section 2.4 of this report.

Where a contaminative use is identified in the Phase I 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 Site Conditions

2.1 Site Walkover

A site walkover was undertaken in June 2015, the notes are presented in Table 2.1.

Table 2.1 Site Walkover Record (On-site)

On-site	Use of site	Commercial and residential buildings to west and south. Open land associated with demolished buildings to NE. Carpark to centre of site.
	Structures	Three storey commercial building to south of site. Three storey residential building to west of site – with commercial to ground floor level.
	Site topography	Generally flat and level.
	Site covering	Building footprint to S and W - predominantly commercial to south and residential to west. Concrete carpark to centre of site. Concrete and overgrown weeds to NE area.
	Vegetation	Shrubbery and weeds to N and NE area.
	Potential Contamination Sources	Demolition material – Made Ground to NE.
	Odour	None noted.
	Drainage	Drainage runs noted to central car park, leading to the south onto Market Parade.

Table 2.2 Site Walkover Record (Off-Site)

Off-Site	Use of Land	Residential and recreation ground to W. Havant Railway Station and railway to N. North Street to immediate east, with mixed commercial and residential beyond. Market Parade to immediate south, with mixed commercial and residential beyond.
	Area topography	Very gently sloped down to the south-west
	Vegetation	Scattered mature trees and shrubbery
	Potential Contamination Sources	Railway line to north.

2.2 Site Drainage

Drainage runs noted to central car park, leading to the south onto Market Parade.

2.3 Site Photographs

The site photographs have been included within Appendix D.

Section 3 Geology, Hydrogeology, Hydrology and Radon

3.1 Anticipated Geology

The 1:50,000 BGS Geology map showed the site to be situated on the bedrock of the London Clay Formation with the superficial deposits of the Head overlying.

Approximately 250m north-west and south-east of site the bedrock was noted as London Clay Formation with superficial River Terrace Deposits (undifferentiated).

Approximately 50m north of site the underlying geology was bedrock of the Bognor Sand Member, overlain by Head deposits. Approximately 50m south of site the bedrock was noted to be the Lambeth Group, overlain by Head deposits.

3.1.1 Head

Head typically comprises gravel, sand and clay depending on upslope source and distance from source. Poorly sorted and poorly stratified deposits formed mostly by solifluction, hillwash and soil creep. Essentially comprises sand and gravel, locally with lenses of silt, clay or peat and organic material.

3.1.2 River Terrace Deposits (Undifferentiated)

The rivers of Hampshire have deposited extensive spreads of River Terrace Deposits in the Southampton area, representative of ancient floodplains. In total, eleven terraces have been recorded. The River Terrace Deposits consist predominantly of gravels made up of subangular to subrounded flints with a significant sand component locally with lenses of silt, clay or peat.

The five highest terraces have appreciable clay content. Poorly sorted, clayey and sandy silts and silty clays overlie the 1st, 3rd, 5th and 6th terraces and locally at above terrace gravels.

3.1.3 Bognor Sand Member

The Bognor Sand Member comprises glauconitic bioturbated or cross-bedded fine- and medium-grained sands, partially cemented.

3.1.4 London Clay Formation

The London Clay Formation in the Hampshire region comprises silty and sandy clay, clayey and sandy silt, silty sand; sporadic claystones and thin beds of flint pebbles. The formation includes the Whitecliff Sand, Durley Sand, Portsmouth Sand and Nursling Sand Members. Crystals of gypsum (Selenite) are often found within the weathered part of the London Clay, and precautions against sulphate attack to concrete are sometimes required. The lowest part of the London Clay Formation rests on the Reading Formation.

3.1.5 Lambeth Group

The Lambeth Group (formerly known as the Woolwich and Reading Beds) are a sedimentary complex comprising a basal bed (the Bottom Bed) composed of

glaucinitic sand, sandy clay and gravel, with laterally variable sand and clay above. In the eastern part of the area the basal bed is mostly overlain by a shelly grey sandy clay or silty sand. Lignite, or brown coal, a carbonaceous rock composed of plant remains which has not been subject to the same intensity of heat and pressure as has ordinary coal, is occasionally found within the Lambeth Group, as are individual logs and groups of logs indicating the position of a former log jam, which was covered by sand and clay at the time of deposition.

3.2 Hydrogeology

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. Table 3.1 presents the hydrogeological data that is relevant to the site.

Table 3.1 Hydrogeological Assessment

Hydrogeological Data		Comment	Risk Likely	
			Yes	No
On-site Aquifers	Superficial	Secondary A Aquifer ¹	✓	
	Bedrock	Unproductive Strata ²		✓
Groundwater Vulnerability		High (U) leaching potential ³	✓	
Source Protection Zones (SPZ)		SPZ 1c ⁴	✓	
Abstraction	Potable	764m W – potable supply direct	✓	
	Non-potable	None noted		✓
Sensitive land uses		Nitrate vulnerable zone	✓	
Surface Water Features		58m SE	✓	
Flood Risk from Rivers or Seas		None onsite		✓

Note:

¹ Secondary A Aquifers are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifer

² Unproductive Strata are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

³ Soil information for restored mineral workings and urban areas is based on fewer observations than elsewhere. A worst case vulnerability classification (H) assumed, until proved otherwise.

⁴ Zone 1c (Inner Protection Zone): Travel time of 50 days or less to the groundwater source - subsurface activity only.

A Secondary A Aquifer designation and SPZ1c were noted on site therefore, controlled water is considered vulnerable to potential contaminants that may be present.

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

3.3 Hydrology

The approximate elevation of the site was ~10.0 m AOD (Above Ordnance Datum). The

anticipated groundwater flow direction is given in Table 3.2.

Table 3.2 Hydrogeological Assessment

Type	Direction	Notes
Surface water	SW	In line with local topography
Groundwater	W	In line with SPZ abstraction well to the west

3.4 Radon Gas

The site **was not situated** within an area where protection or risk assessment against the ingress of radon was required. Radon protection measures **will not be required** within the proposed new development. 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.

Section 4 Site History

4.1 Historic Map Study

The object of this study 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 dating from the mid to late 19th Century to the present day as downloaded from Landmark Environmental.

Maps only represent a “snap shot” 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.

Any distances quoted for features remote from the site have been scaled from the maps and are only approximate. Where dates have been noted in brackets, these are the actual dates applicable to the map editions.

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 250m radius are discussed. The north point and approximate extent of the site are indicated on each figure. The historic maps referred to are appended to this report (Appendix A).

Table 4.1 Potential Sources of Pollution Indicated from Historic Maps

Environ	Direction	Distance ¹ (m)	Date Range	
			From	To
Railway line, station and goods yard	N	50	1867	2015
Stone Yard	S	70	1867	1867
Cattle market	Onsite	0	1867	1867
Hospital & allotment gardens	W	250	1897	1932
Allotment gardens	NW	100-250	1897	1932
Cattle market	SE	90	1909	1932
Laundry	E	140	1953	1953
Warehouses	NE	50-100	1960-1962	2015
Telephone Exchange	NW	210	1965-1973	2015

Notes: ¹ Approximate distance to the site boundary.

Table 4.2 Historic Development of the Site

Site Development	Date Range	
	To	From
Open land with building noted along eastern boundary	1867	1897
Site noted as Cattle Market with buildings to eastern boundary including a public house.	1897	1897
Cattle Market no longer noted. Several large buildings noted along eastern boundary	1909	1953
As previous maps. Further development to NE of site and northern boundary of site. Open land to remainder of site.	1953	1961-1964
As previous maps. Buildings noted along west and southern boundaries.	1965-1973	2015

Section 5 Environmental Records and Consultation

5.1 Dataset Information

A Landmark Envirocheck Report was obtained for the site by Soils Limited. A copy of the report is appended to this report (Appendix B) and a summary is given in Tables 5.1 and 5.2.

5.2 Site Sensitivity Maps

No other significant potential sources of contamination were shown on the Landmark Envirocheck Site Sensitivity Maps, which have not been listed in Tables 5.1 and 5.2, and copies of which are appended to this report (Appendix C).

Table 5.1 Environmental Significance of Data

Source	Direction	Distance (m)	Maximum Radius (m)
Contaminated Land Register Entries and Notices	-	-	250
Discharge Consents	NE	167	250
	SW	207	
	SW	207	
Integrated Pollution Prevention and Control	-	-	250
Local Authority Pollution Prevention and Controls	SW	64	250
Local Authority Pollution Prevention and Control Enforcements	-	-	250
Nearest Surface Water Feature	SE	58	250
Pollution Incidents to Controlled Waters (Significant Incidents only)	E	139	250
	NE	164	
	NE	167	
Prosecutions Relating to Authorized Processes	-	-	250
Registered Radioactive Substances	-	-	250
Substantiated Pollution Incident Register	-	-	250
Nearest potable abstraction point	-	-	250
Nearest non-potable abstraction point	-	-	250
Water Industry Act Referrals	-	-	250
Source Protection Zones	-	-	250
Extreme Flooding from Rivers or Sea without Defenses	N	27	250
Flooding from rivers or sea without defenses	N	28	250
Areas benefiting from flood defenses	-	-	250
Flood Water Storage Areas	-	-	250
Flood Defenses	-	-	250
BGS Recorded Landfill Sites	-	-	250
Historical Landfill Sites	-	-	250
Licensed Waste Management Facilities	-	-	250
Local Authority Recorded Landfill Sites	-	-	250
Registered Landfill Sites	-	-	250
Registered Waste Transfer Sites	-	-	250
Registered Waste Treatment or Disposal Sites	-	-	250
Control of Major Accident Hazards Sites (COMAH)	-	-	250

Source	Direction	Distance (m)	Maximum Radius (m)
Notification of Installations Handling Hazardous Substances	-	-	250
Planning Hazardous Substance Consents	-	-	250

Table 5.2 Contemporary Trade Directory

Contemporary Trade Directory within 250m ¹	Direction	Distance (m)	Status
Electrical Goods Sales, Manufacturers & Wholesalers	NW	0	Inactive
Fireplaces & Mantelpieces	W	28	Inactive
Laundry & Dry Cleaning Supplies	S	21	Active
Laundries & Launderettes	S	21	Inactive
Electrical Goods Sales, Manufacturers & Wholesalers	S	21	Inactive
Electrical Engineers	SW	59	Active
Cleaning Services - Domestic	S	69	Inactive
Printers	S	133	Inactive
Engineers - General	NW	136	Inactive
Pub & Restaurant Supplies/Janitorial Equipment - Servicing & Repairs	E	163	Inactive
Robert Dyas Ltd -Hardware Store	E	152	Inactive
Wilkinson - Hardware Store	S	152	Active
Engine Rebuilding & Reconditioning	S	193	Inactive
Gearboxes	S	194	Inactive
Electrical Goods Sales, Manufacturers & Wholesalers	S	234	Inactive
Dry Cleaners	SW	244	Inactive

Note: ¹ Those likely to impact the underlying soil and/or groundwater, date not supplied. Most of these activities either (i) operate according to environmental guidance (i.e. environmental permitting or IPPC) therefore may not be considered as source of contamination, (ii) are remote from the site or (iii) are not located up gradient of the site therefore have not direct impact on identified receptors.

Table 5.3 Geological Hazards

Source	Nearest Distance from Site/Type
Non Coal Mining Affected Areas	Unlikely
Mining Instability	None noted
Natural and Mining Cavities	None noted
Potential For Collapsible Ground Stability Hazards	Onsite; Very low
Potential For Compressible Ground Stability Hazards	Onsite; No hazard
Potential For Ground Dissolution Stability Hazards	Onsite; No hazard
Potential For Landslide Ground Stability Hazards	Onsite; Very low
Potential For Running Sand Ground Stability Hazards	Onsite, No hazard
Potential For Shrinking or Swelling Ground Stability Hazards	Onsite; Very low
Shallow Mining Hazards	None noted

5.3 Soil Geochemistry

Potential levels of metals including lead, arsenic, cadmium, chrome and nickel as contoured on the Landmark Environmental check report (Appendix B) were assessed against the appropriate environmental quality standards (e.g. SGV) for the sites purposed end use. The results are indicated in Table 5.4. The results show no significant risk to identified receptors for contaminants presented. Should the proposed land use change then the recommendations given in the report would be likely to change.

Table 5.4 Soil Geochemistry

Determinand	Most Sensitive Proposed Land Use	Indicated Soil Geochemistry (mg kg ⁻¹)	Soil Guideline For Residential (mg kg ⁻¹)	Potential Hazard	
				Yes	No
Lead	Residential ²	<150	200		✓
Arsenic		<15	37		✓
Cadmium		<1.8	26		✓
Chromium		60-90	3000		✓
Nickel		15-30	130		✓

Notes: ¹ Soil guideline value for 1% and 6% SOM respectively. Other soils guidelines presented in the table are based on soils with 6% SOM.

²Proposed redevelopment was a mixed commercial and residential development. Residential soil guidelines have been used as the most at risk future end users.

Please note that there are only a limited number of land uses for which data on determinands have been published or can be readily determined.

Section 6 Discussion and Conclusions

6.1 General

The findings of the Phase I Desk Study are summarised below:

1. The 1:50,000 BGS Geology map showed the site to be situated on the bedrock of the London Clay Formation with the superficial deposits of the Head overlying.
2. The Environment Agency Hydrogeological Maps showed that the bedrock London Clay Formation had an Unproductive Strata designation and the superficial Head had a Secondary A Aquifer designation. The overall groundwater vulnerability was soils of high leaching potential (HU), soils which can possibly transmit a wide range of pollutants.
3. Surface water flow was expected to flow down to the south-west in line with local topography. Groundwater was anticipated to flow down to the west as governed by the SPZ abstraction well associated with the on-site SPZ.
4. Environment Agency records showed that the site was not at risk of flooding from rivers or seas.
5. Enquiries were made to Portsmouth County Council in regard to contaminated land records for the site and its environs, as well as any UXO information. At the time of reporting, June 2015, no response had been received.
6. Any suspicious ground conditions encountered during groundworks must be reported to a competent person for further inspection.
7. Summary of potential on-site contamination sources identified during the study of the historic maps, the Dataset Information and Landmark Envirocheck Report and the Site Walkover are outlined in Table 6.1.

Table 6.1 Summary of Potential Contamination Sources

	Sources/Environmental Impact	Direction ¹	Distance (m)	Date Range		Source
				From	To	
On Site	Demolition material – Made Ground to NE.	Onsite	-	-	2015	SW
	Electrical Goods Sales, Manufacturers & Wholesalers	NW	0	-	2015	DS
	Cattle market	Onsite	0	1867	1867	HM
Off-Site	Railway line, station and goods yard	N	50	1867	2015	SW / HM
	Stone Yard	S	70	1867	1867	HM
	Hospital & allotment gardens	W	250	1897	1932	HM
	Allotment gardens	NW	100-250	1897	1932	HM
	Cattle market	SE	90	1909	1932	HM

Sources/Environmental Impact	Direction ¹	Distance (m)	Date Range		Source
			From	To	
Laundry	E	140	1953	1953	HM
Warehouses	NE	50-100	1960-1962	2015	HM
Telephone Exchange	NW	210	1965-1973	2015	HM
Fireplaces & Mantelpieces	W	28	-	2015	DS
Laundry & Dry Cleaning Supplies	S	21	-	2015	DS
Laundries & Launderettes	S	21	-	2015	DS
Electrical Goods Sales, Manufacturers & Wholesalers	S	21	-	2015	DS
Electrical Engineers	SW	59	-	2015	DS
Cleaning Services - Domestic	S	69	-	2015	DS
Printers	S	133	-	2015	DS
Engineers - General	NW	136	-	2015	DS
Pub & Restaurant Supplies/Janitorial Equipment - Servicing & Repairs	E	163	-	2015	DS
Robert Dyas Ltd -Hardware Store	E	152	-	2015	DS
Wilkinson - Hardware Store	S	152	-	2015	DS
Engine Rebuilding & Reconditioning	S	193	-	2015	DS
Gearboxes	S	194	-	2015	DS
Electrical Goods Sales, Manufacturers & Wholesalers	S	234	-	2015	DS
Dry Cleaners	SW	244	-	2015	DS

Notes: SW – Site walkover
 HM – Historic Maps
 DS – Datasheet

Section 7 Preliminary Conceptual Site Model

7.1 General

Environment Agency guidance provided in CLR11 indicates the Conceptual Site Model should identify those contaminants, pathways and receptors which are 'likely' to represent an 'unacceptable' risk either to human health or the surrounding environment. The following sections present potential contaminants and receptors based on this desktop study. Pathways have been established on reasonable scientific knowledge of the behaviour of the contaminants in the ground.

7.2 Sources of Contamination

From the study of the Landmark Envirocheck Report and Site Walkover the Phase I Desk Study has assessed and outlined potential contaminative sources (Table 6.1). Initial assessment of the likelihood each contaminative source poses a hazard to the site are considered in Sections 7.2.1 – 7.2.3.

7.2.1 Onsite Potential Contamination Sources

Map evidence, study of Landmark Envirocheck Report and Site Walkover showed the following potentially contaminative sources, given in Table 7.1.

Table 7.1 Onsite Potential Contamination Sources

Sources	Likelihood	
	Likely	Unlikely ¹
Demolition material – Made Ground to NE.	✓	
Electrical Goods Sales, Manufacturers & Wholesalers		✓
Cattle market		✓

Notes: ¹ Sources are marked as 'Unlikely' if the hazard to the site was considered negligible. These considerations are based on type of contamination, age of source and anticipated significance.

7.2.2 Offsite Potential Contamination Sources

Map evidence, study of Landmark Envirocheck Report and Site Walkover showed the following potentially contaminative sources, given in Table 7.2.

Table 7.2 Offsite Potential Contamination Sources

Sources	Direction	Distance (m)	Likelihood		Reasoning
			Likely	Unlikely ¹	
Railway line, station and goods yard	N	50	✓		Due to proximity to site, and alignment W-E across north of environs.
Stone Yard	S	70		✓	Due to time passed since last activity, activity and distance from site.
Hospital & allotment gardens	W	250		✓	Due to distance from site and up-hydraulic gradient of site.

Sources	Direction	Distance (m)	Likelihood		Reasoning
			Likely	Unlikely ¹	
Allotment gardens	NW	100-250		✓	
Cattle market	SE	90		✓	
Laundry	E	140		✓	Due to distance from site.
Warehouses	NE	50-100		✓	Due to distance from site and up-hydraulic gradient of site.
Telephone Exchange	NW	210		✓	
Fireplaces & Mantelpiece	W	28		✓	Source not located up hydraulic gradient of site.
Laundry & Dry Cleaning Supplies	S	21		✓	
Laundries & Launderette	S	21		✓	
Electrical Goods Sales, Manufacturers & Wholes	S	21		✓	
Electrical Engineers	SW	59		✓	
Cleaning Services - Domestic	S	69		✓	
Printers	S	133		✓	
Engineers - General	NW	136		✓	
Pub & Restaurant	E	163		✓	
Supplies/Janitorial Equipment Servicing & Repairs					Due to distance from site.
Robert Dyas Ltd -Hardware Store	E	152		✓	
Wilkinson - Hardware Store	S	152		✓	
Engine Rebuilding & Reconditioning	S	193		✓	
Gearboxes	S	194		✓	Due to distance from site and up-hydraulic gradient of site.
Electrical Goods Sales, Manufacturers & Wholes	S	234		✓	
Dry Cleaners	SW	244		✓	

7.2.3 Potential Contamination

From the Risk Assessment in Tables 7.1 and 7.2, the main groups of contaminants are presented in Table 7.3.

Table 7.3 Potential Contaminants or Properties

Contaminants/Chemical Properties For Testing ¹		Potential Contaminative Sources	Hazard
P1	Ammonia	None	
P2	Asbestos	None	
P3	De-icing agents, fire-fighting chemical	None	
P4	Pesticides	None	
P5	Metals and semi-metals (e.g. arsenic, chromium)	Made Ground, Railway	✓
P6	Non-chlorinated solvents	None	
P7	Organic compounds (e.g. PAHs and TPHs)	Railway	✓
P8	Organic solvents (e.g. chlorinated solvents)	None	
P9	Polychlorinated Biphenyl (PCBs)	Railway	✓
P10	Sulphate	None	
P11	Pathogens	None	

Contaminants/Chemical Properties For Testing ¹		Potential Contaminative Sources	Hazard
PI2	Radioactive	None	
PI3	Soil gas	None	
Note: ¹ Based on DOE industrial profiles or on knowledge of the processes involved in the activity carried out on site. P=Properties			

7.3 Potential Pathways

A pathway is a route or routes by which a receptor is exposed to a contamination source. Pathways can also determine the likelihood of the contamination source contacting a receptor.

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 potential geological pathways are given in Table 7.4.

Table 7.4 Potential Soil Migration Pathways

Strata	Pathway	Non- Pathway
Superficial Deposits	✓	
Bedrock		✓

Only sources onsite or up hydraulic gradient to the site were considered to pose a risk to site.

Table 7.5 On-site Sources, Pathways and Potential Receptors

Type of Attack	Standard Exposure Pathways	Factors	Site Assessment		Risk To Potential Receptors				
			Likely	Unlikely	HH	BS	EF	Controlled water (SW, GW, SPZ & A)	
Oral	Direct soil and dust ingestion	Contaminants & Soft landscaping areas	✓		✓				
	Consumption of home-grown produce	Contaminants & Gardens areas	✓		✓				
Dermal	Dermal contact	Contaminants & Soft landscaping areas	✓		✓				
Inhalation	Inhalation of dust (indoor and outdoor)	Contaminants & Soft landscaping areas	✓		✓				
	Inhalation of vapours (indoor and outdoor)	Volatile compounds & Soft landscaping areas	✓		✓				
	Inhalation of soil gases	Soil gases (e.g. CH ₄ and CO ₂ -VOC) within 0-250m		✓					
Physical	Fire and explosion ¹	UXO (e.g. Bombs or projectile sites) (0-250m) ²		✓					
		Combustible material in soil		✓					
		Soil gases (VOC) within 0-250m		✓					
		Contaminants & Trenches or drainage onsite	✓		✓	✓			
	Others physical pathways ³	Degradation of fills, blast... etc...	✓		✓		✓		
		Hydrocarbons & Pipes	✓				✓		
	Direct contact of concrete with concrete aggressive soils	Sulphate, Acids & Concrete	✓				✓		
Chemical	Location of service supply pipes in contaminated soils	Hydrocarbons & Pipes	✓				✓		
	Direct contact of concrete with concrete aggressive soils	Sulphate, Acids & Concrete	✓				✓		
Others	Irradiation ⁴	Radon		✓					
		Radioactive materials		✓					
		UXO within 0-250m		✓					
	Via surface water runoff	Contaminants & Gradient (Area)	✓		✓	✓	✓	✓	✓
	Migration downwards via granular soils	Contaminants & Drift: Principal/secondary	✓		✓	✓	✓	✓	✓
	Migration downwards via permeable soils and bedrock	Contaminants & Bedrock: Principal/secondary		✓					
		Contaminants & Groundwater vulnerability: Principal/secondary	✓		✓	✓	✓	✓	✓
		Plant uptake and phytotoxicity ⁵	✓				✓		
	Plant uptake and ecotoxicological effects ⁶	Metallic contaminants	✓						
		Soil gases within 0-250m		✓					

Notes: BS= Building Structures & services. EF= Ecological Features, Controlled water (SW= Surface Water, GW=Groundwater, SPZ=Source Protection Zone and A= Abstractions within 250m to the site), HH=Human Health, ✓ = Likely and x=Unlikely.

¹ Both underground fires and biodegradable may produce toxic or flammable gases;

² UXO= Unexploded Ordnance: Although risk is generally low in the UK, a risk assessment (i.e. using Find map for example) may be needed if an UXO is found onsite,;

³ Blast-furnace and steel-making slag may expand. Degradation of fills may cause settlement and voids in buried tanks and drums may collapse as corrosion occurs or under loading;

⁴ Radioactive materials emitting gamma rays that can be inhaled and absorbed through the skin and also cause a radiation response;

⁵ Prevention or inhibition of plant growth;

⁶ Contaminants in soil may affect microbial, animal and plant populations. Ecosystems or individual species on the site, in surface waters or areas affected by migration from the site may be indirectly affected.

Table 7.6 Off-site Potential Pathways

Receptors	Off-Site Potential Pathways	Likely	Unlikely
Human Health Building Materials	Migration via surface water runoff (Surface flow)		✓
Human Health Building Materials	Migration via air	✓	
Groundwater Human Health Building Materials	Migration via groundwater flows	✓	

7.4 Potential Receptors

With respect to land contamination, potential receptors include human health, ecological features, controlled waters, and buildings and materials.

The presence of potential receptors has been evaluated from our understanding of the current and planned land use of the site, an assessment of surrounding land uses and currently available information pertaining to the site.

The assessment for potential receptors at the site is shown in Table 7.7.

Table 7.7 Potential Receptors

Potential Receptor		Present	
		Likely	Unlikely
Human Health	Future users of the site	✓	
	Visitors to the site	✓	
	Construction workers on site	✓	
	Service and maintenance workers	✓	
	Site neighbours and wider public	✓	
Groundwater/Controlled Waters	Groundwater/Future Potable Water Supply	✓	
	Surface Water		✓
Buildings & Materials	Construction materials	✓	
	Buildings and confined spaces	✓	
Ecosystems	Flora and fauna in surface water	✓	

7.5 Preliminary Risk Assessment

A preliminary risk assessment has been undertaken relating to the potential proposed development based on a qualitative assessment of the likely presence of a pollutant linkage. A pollutant linkage is the relationship between a contaminant source, a pathway and a receptor. Unless all three elements of a pollutant linkage are present, a risk is not considered to exist. Each of the three elements was considered in Sections 7.2, 7.3 and 7.4.

The approach adopted was to screen the site based on assigning a risk category. The preliminary risk assessment is presented in Table 8.7 with the risk assessment criteria attached to this report (Appendix E).

Table 7.8 Risk Assessment

Environs	Direction	Distance (m)¹	Pathway	Receptor	Risk
Made Ground	Onsite	0	✓	✓	Low
Railway	N	50	✓	✓	Low

Notes: ¹ Approximately from boundary of the site.

The classification tables are presented in Appendix E are modified from, 'Contaminated land risk assessment: A guide to good practice, 2001, CIRIA C552'.

7.6 Preliminary Conceptual Site Model

The preliminary conceptual site model, including linkages that require further actions, is presented in Table 7.8 and the reasoning behind the decision taken shown in Table 7.9.

Table 7.9 Preliminary Conceptual Site Model and Risk Assessment Methodology

[illegible]

Table 7.10 Reasoning Behind Risk Assessment

Linkage No	Receptor	Reasoning
1	Ecological features (i.e. Flora and Fauna)	No sensitive land uses noted within 250m site.
2	Building structures/services	Proposed foundations and services pipes to be used.
3	Human health residents Human Health workers	Residential development Workers and the general public should follow regulation on health and safety during development (HSE, 1991)
4	Surface Water	Superficial Secondary A Aquifer designation – Head Deposits. Site situated on SPZ1c for shallow aquifer designation – therefore groundwater is considered at risk of leaching.
5	Groundwater	Bedrock Non Aquifer designation – London Clay Formation.
6	Human and Building Structures: Possible soil gas/VOCs	No landfill noted within 250m of site. No VOC or landfill gases noted. Made Ground was noted in respect to demolition waste on site, and not putrescible landfill material.

The intrusive investigation may reveal on site sources of contamination that were not established by the Phase I Desk Study and Site Walkover that could modify the Conceptual Site Model.

Section 8 Recommendations

8.1 General

Based on the information obtained during the desk study and the preliminary conceptual site model derived for the site, an intrusive contaminated land investigation may be required. The geotechnical intrusive investigation may reveal on-site sources of contamination that were not established by the Phase I Desk Study and Site Walkover, and thus require modification of the conceptual model.

8.2 Impact of Construction Activities on Controlled Water and Site Neighbours

A construction risk assessment must be undertaken and appropriate measures taken to mitigate against mobilisation and to monitor impact to groundwater and surface waters.

8.3 Proposed Further Site Works

The proposal is a combined environmental and geotechnical Intrusive Site Investigation (Table 8.1) in order to obtain further information about the site conditions.

8.3.1 Phase II Intrusive Investigation

The Preliminary CSM allows for the identification of the test parameters relevant to the investigation, though this may require modification or addition from the findings of the intrusive investigation. Phase II intrusive site investigation will be carried out in order to investigate and assess pollutant linkages identified in the preliminary Conceptual Site Model presented in Table 7.9.

The works to be undertaken on the site would comprise (i) soil sampling that is appropriate to the potential sources and (ii) testing for the potential contaminants given in the CSM or other sources identified during the intrusive investigation.

8.3.2 Geotechnical Site Investigation

The purpose of the geotechnical investigation will be to obtain data regarding engineering properties of the soils to enable the design of foundations, concrete, pavements and drainage.

The works to be undertaken on the site would comprise (i) soil sampling, (ii) drilling boreholes with window sampler and at selected locations within the site and (iii) probing using either DPH or DPSH and/or a cable percussion drilling rig to establish foundation design parameters.

Table 8.1 Proposed Further Works

Further works	Environmental Phase II Intrusive Site Investigation	Geotechnical Site Investigation	General Purpose
Soil sampling	✓	✓	To enable laboratory testing on samples collected
In situ or laboratory soils testing	✓		Determine the nature and extent of contamination across the site
		✓	Engineering parameters for foundation design
Generic and/ or site specific risk assessment	✓	✓	Assess pollutant Linkage 6 (Table 7.8) based on current contaminated land guidance
Drilling boreholes with window sampler across the site	✓	✓	Determine the nature of the ground
Borehole well installation		✓	If groundwater is encountered on site and requires monitoring.
Remediation			
Soils testing for validation	✓		If remediation was carried out on site
Probing using either DPH or DPSH		✓	Establish foundation design and engineering parameters for foundation design

8.4 Discovery Strategy

There may be areas of contamination not identified during the course of the investigation. Such occurrences may also be discovered during the demolition and construction phases for the redevelopment of the site.

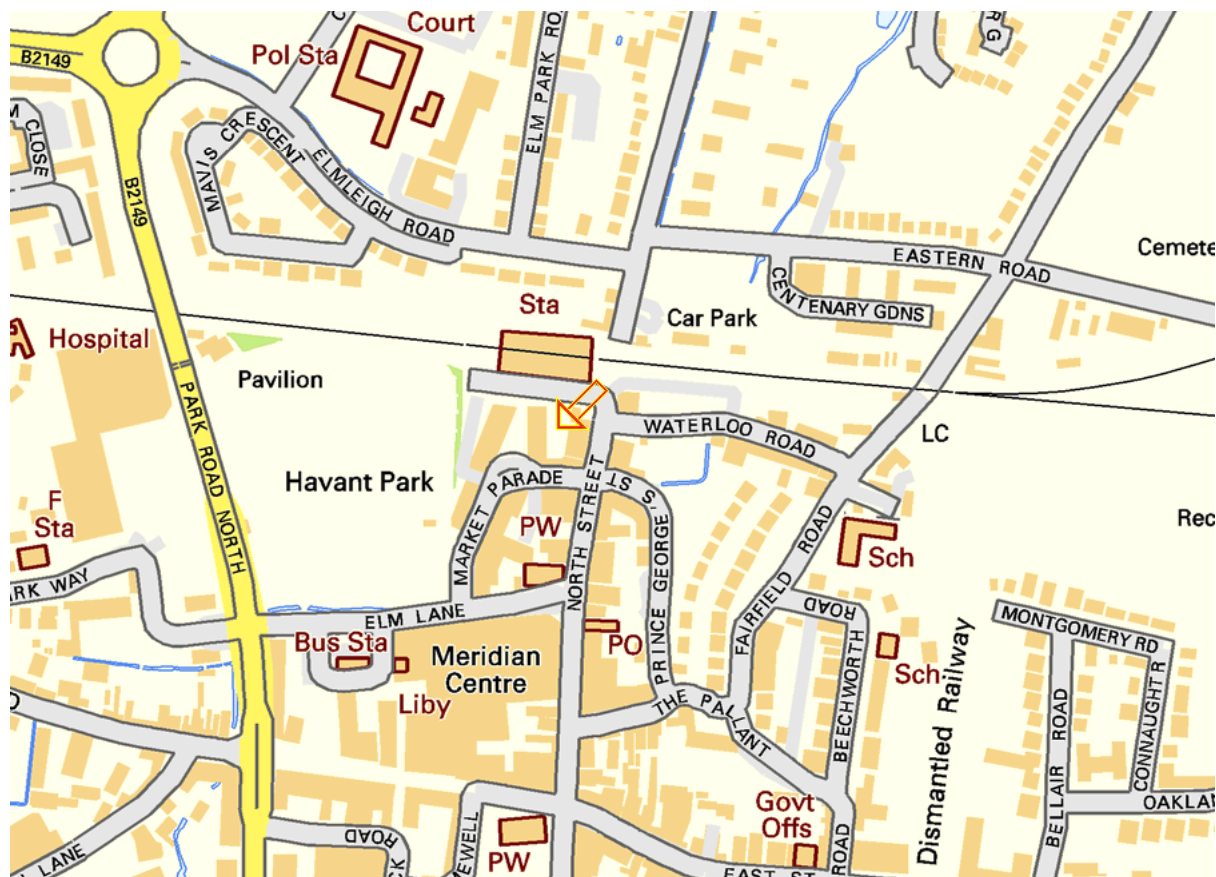
Care should be taken during excavation works especially to investigate any soils, which appear by eye (e.g. such as fibrous materials, large amounts of ash and unusual discolouration), odour (e.g. fuel, oil and chemical type odours or unusual odours such as sweet odours or fishy odours) or wellbeing (e.g. light headedness and/or nausea, burning of nasal passages and blistering or reddening of skin due to contact with soil) to be contaminated or of unusual and/or different character to standard soils or those analysed.

In the event of any discovery of potentially contaminated soils or materials, this discovery should be quarantined and reported to the most senior member of site staff or the designated responsible person at the site for action. The location, type and quantity must be recorded and the Local Authority, a competent and appropriate third party Engineer/Environmental consultant notified immediately. An approval from the Local authority must be sought prior to implementing any proposed mitigation action.

The discovery strategy must remain on site at all times and must demonstrate a clear

allocation of responsibility for reporting and dealing with contamination. A copy of the strategy must be placed on the health and safety notice board and /or displayed in a prominent area where all site staff are able to take note of and consult the document at any time. Any member of the workforce entering the site to undertake any excavation must be made aware of the potential to discover contamination and the discovery strategy.

Scale: NTS

**Figure number**

1

Title

Site Location Map

Project

Market Parade, Havant, Hampshire, PO9 1PY

Date

June 2015

Client

Hampshire and Regional Property Group

Reference

14981



Figure number

2

Project

Market Parade, Havant,
Hampshire, PO9 1PY

Client

Hampshire and Regional Property
Group

Title

Proposed Development

Date

June 2015

Job Number

14981