Villiers Road

Desk Study Report

South London Waste Partnership – Waste PFI Contract

January 2011

Produced For

Viridor

Prepared by

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The brief includes an assessment of the previous site usage by review of the sources identified in this report. These effectively provide snapshots of the site through time and although a consistent sequence of site usage has been deduced from these records, the possibility of some activity carried out on the site not being identified on these records cannot be excluded.

New information, changed practices or new legislation may necessitate revised interpretation of the report after the date of its submission

EXECUTIVE SUMMARY

The South London Waste Partnership has been created to develop a sustainable long term strategy for the management of waste within the boroughs of Croydon, Kingston, Merton and Sutton. In line with this plan, Viridor are proposing a new Energy Recovery Facility at Villiers Road.

The site has an existing waste management history, with a Waste Transfer Station and Household Waste Recycling Centre currently occupying the site but was historically a landfill site receiving ash fill

Made Ground is expected across the site due to the previous land use as a landfill site. The depth of made ground is unknown however previous reports for the site have estimated a depth of 5m.

Kempton Park Gravel underlies the Made Ground and is likely to comprise medium dense to dense sandy and clayey gravel. The stratum is expected to extend to up to 10m in depth below the ground surface.

The London Clay Formation underlies the gravel deposits and will comprise firm to very stiff silty clay. The London Clay Formation is likely to extend to over 80m thickness.

The Kempton Park Gravel is likely to have suitable bearing capacity for strip foundations however if the proposed loads are high, piled foundations into the London Clay would be suitable.

An environmental assessment was carried out on site in 1997 and indicated low levels of contamination within the landfill area however this does not appear to have migrated into the underlying Kempton Gravel or London Clay.

The only receptor considered to be at risk from this contamination is construction workers during the works however the risk can be minimised by appropriate control measures

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1 Introduction

1.1 Terms of Reference

The South London Waste Partnership (SLWP) which covers the London boroughs of Croydon, Kingston, Merton and Sutton administers the procurement of operations to manage the disposal of residual waste within the borough's area.

Viridor Limited propose to construct an Energy Recovery Facility at Villiers Road (on behalf of the SLWP) and have appointed Mouchel Limited to provide a geotechnical and geo-environmental desk study assessment in relation to the proposed works at Villiers Road:

1.2 Development Proposals/Legislative Context

The South London Waste Partnership intend to develop a sustainable long term strategy for the management of waste within the boroughs of Croydon, Kingston, Merton and Sutton in line with international, national and regional planning and waste policy objectives.

Villiers Road has an existing waste management history, currently the location of a Waste Transfer Station and Household Recycling Centre.

1.3 Previous Studies

A number of documents have been made available in relation to the site where the Energy Recovery Facility is proposed. The documents are:

SLR Consulting Ltd (2009) Flood risk assessment report in relation to a planning application for a storage facility.

CNIM / Lagan (2010) SLWP Villiers Road Energy Recovery Facility Detailed Solution (drawings missing).

Entec (2010) Villiers Road Engineering Constraints (drawings missing)

Gifford (2010) South London EFW – Villiers Road site, Design Statement – Structural Design (ISDS Stage)

A site investigation referenced within these documents has not been made available during this desk study.

1.4 Objectives and Scope

Mouchel Limited is to undertake a desk study to establish the geotechnical and geo-environmental constraints and potential risks associates with the site for the proposed works. This will involve sourcing and reviewing all available historic information relating to the site.

2 Desk Study Research

2.1 Sources of Information

Sources of information used in the preparation of this desk study are as follows:

Historical/topographical information

(obtained from Landmark Envirocheck report, see Appendix A)

- Current OS mapping
- 1:10,000 scale Historical Mapping
- 1:2,500 scale Historical Mapping
- 1:250 000 Groundwater Vulnerability Map
- Local trade current directories
- Flood Map

Information obtained in addition to Envirocheck report:

- Services Plan

Geological/geotechnical information

- British Geological Survey 1:50 000 scale South London Sheet 270 Solid and Drift Edition.
- British Geological Survey memoirs, Geology of London, 1st Edition, 2004.
- British Geological Survey Borehole Database.

Environmental information

- Environment Agency: pollution incidents, discharge consents, water abstractions, waste transfer and treatment sites, landfill sites (obtained from Landmark *Envirocheck* report, see Appendix A)

2.2 Site Location

The Villiers Road site is within the Borough of Kingston upon Thames. The proposed development is approximately 2.1ha in size and is accessed via Chapel Mill Road off Villiers Road (Figure 2-1). The national grid reference for the proposed site is 519000, 168500.

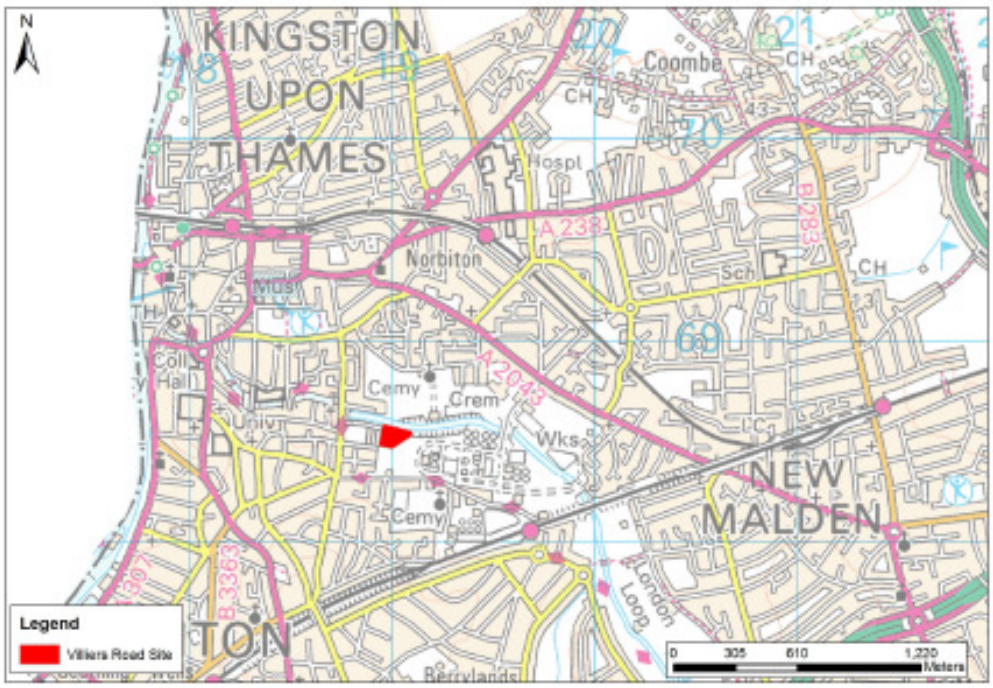


Figure 2-1: Location Map of Proposed Scheme (Crown Copyright 2010, Licence No. 0100031673)

2.3 Site Setting and Description

The site has an existing waste management history, with a Waste Transfer Station and Household Waste Recycling Centre currently occupying the site that Viridor are proposing to develop.

2.4 Adjacent Land Use

The Villiers Road site is bordered to the north by Hogsmill River and to the east by a Sewage Treatment Works. To the south of the site, the land which was historically part of the landfill site remains undeveloped. The site is bordered to the west by a Business Park.

2.5 Environmental Designations and Ecology

There are no natural nature reserves, sites of special scientific interest, special conservation areas or RAMSAR sites within 500m of the site (Magic, 2011).

2.6 Site History

Historical Maps were obtained as part of the Landmark Envirocheck Report (Envirocheck, 2010) and are presented in Appendix A. These show the historical development of the site since 1868 which is summarised below.

In 1868 the site was a field with deciduous trees along the field boundaries. By 1913, a refuse destructor is located adjacent to the north-western corner of the site.

By 1934 the majority of the site remained undeveloped with a number of small buildings of unknown use encroaching on the south-western corner of the site. Allotment gardens are present to the east of the proposed site.

By 1955 the ground within the site has been significantly reworked with a series of large stockpiles which are considered to be ash waste from the adjacent refuse destructor. The eastern half of the site is now allotment gardens. Between 1934 and 1955 the Hogsmill River which is located north of the site has been straightened and becomes the northern boundary of the proposed site.

By 1967 the refuse destructor has been removed and the western half of the site is a refuse depot. The eastern half of the site remains as allotment gardens. A sewage treatment works is present to the east of the site with sludge beds bordering the eastern edge of the site. An ambulance station is present adjacent to the south-western corner of the site.

Between 1967 and 1999 there is little change to land use on the site. Gifford (2010) note a highways depot was built on site in 1999. The building is located to the west of the Waste Transfer Station.

By 2006 the Waste Transfer Station is present on the historical mapping which remains as the primary use for the site today.

2.7 Archaeology

An archaeology survey has not been undertaken on site.

The National Monuments Records notes an Anglo Saxon spearhead was found "on the allotments near Hogsmill River" which they believe are the allotments within the proposed site. Therefore the site may be of archaeological interest.

2.8 Geology

The published geological map (Sheet 270 (1:50,000) – South London, Solid and Drift, 1998) shows the site is underlain by sand and gravel of Kempton Park Gravel, beneath which is the London Clay Formation. The map notes the site is an area of worked ground and made ground.

No historic boreholes have been carried out within the proposed site and those available within 500m of the site are within areas where the geology as identified on the 1:50,000 map is different from that anticipated at the proposed site.

Based on the published geology for the area the existing ground conditions at the site are considered to comprise of the following:

Made Ground is expected across the site due to the previous land use as a landfill site. The depth of made ground is unknown however previous reports for the site have estimated a depth of 5m.

Kempton Park Gravel underlies the Made Ground and is likely to comprise medium dense to dense sandy and clayey gravel. The stratum is expected to extend to up to 10m in depth below the ground surface.

The London Clay Formation underlies the gravel deposits and will comprise firm to very stiff silty clay. The London Clay Formation is likely to extend to over 80m thickness.

Beneath the London Clay, Chalk is expected.

2.9 Hydrology

The proposed site lies within the Thames River Basin District. The nearest watercourse is the Hogsmill River, situated immediately to the north of the site.

According to the Environment Agency website, data is not available from monitoring of the Hogsmill River upstream of the site. A monitoring site located to the west of the site where the Hogsmill River meets the River Thames indicates the river has very good ecological quality.

The site is adjacent to the Hogsmill River and therefore based on the EA Flood Map (included within the Envirocheck Report in Appendix A), the site is at risk of extreme flooding from rivers (Zone 2).

2.10 Hydrogeology

The Kempton Park gravels is a water bearing stratum and is classified as a minor aquifer of high vulnerability. Soils with high vulnerability are those with little ability to attenuate pollutants which can therefore move rapidly to underlying strata or shallow groundwater.

The Chalk is a highly permeable limestone and is a major aquifer supporting large regionally important groundwater abstractions.

There are no Source Protection Zones within 100m of the site. The closest water abstraction borehole is 1521m west of the site in Kingston for pollution remediation.

There are no known buried rivers on or near the site.

The site is within a nitrate vulnerable zone

2.11 Soil and Groundwater Chemistry

Based on the historic land uses of the site, the principal source of contamination is considered to be associated with the former landfill. The current land use as a Waste Transfer Station is undertaken on concrete hardstanding therefore any contamination entering the ground as a result of the operations should be minimal.

2.12 Ground Gas and Radon

The Radon Atlas of England and Wales (Health Protection Agency, 2007) indicates that this area is only slightly affected by radon with 0 to 1% of houses at or above the action level. With reference to BR211 Map 5 (BRE, 1999) no protection is required against radon in new buildings for the area where the proposed site is located.

Without site investigation data the presence of ground gas is unknown. It is possible due to the history of the site that gases may be locked within the made ground or underlying soil.

2.13 Services Information

A Services Plan for the site provided within Entec (2010) is shown on Drawing 3. Within the vicinity of the Waste Transfer building is storm water drainage which goes to an outfall situated in the northeast corner of the site. To the west of the Waste Transfer building are low voltage underground electricity lines and water supply pipes.

2.14 Other Information

The existing Waste Transfer building on site is founded on reinforced concrete slabs which sit on a number of pile caps arranged along the perimeter, standing on one to three piles (Gifford, 2010).

The Highways Depot in the west of the site comprises reinforced slab foundation supported by twelve piles (Gifford, 2010)

Foundations for the old MRF building comprise two pile caps, each supported by one or two piles (Gifford, 2010).

There are a number of fuel storage tanks located on site inclduing two above ground tanks storing diesel which are located to the south of the site and sit on concrete bases. Surface staining and run-off was noted by Entec (2010). A waste oil tank is located in the east of the site and a former fuel tank is situated in the west of the site at the Highways Depot.

3 Preliminary Assessment

3.1 Ground Model

Much of the site is currently covered in handstanding. The conceptual ground model consists of the following:

Table 3-1: Ground Model

Strata	Thickness	Assessed Properties	Groundwater
Made Ground	Unknown (estimated 5m)	Variable permeability	Not encountered
Kempton Park Gravel	~ 5m	High permeability	Present
London Clay – firm to stiff silty clay	~ 80m	Low permeability	None
Chalk	>50m	High permeability	Present

The ground across the whole site has previously been reworked with half the site used as allotment gardens and half as a landfill. Therefore made ground is expected which may be highly compressible. Groundwater is expected to be present within the River Terrace Gravels.

The London Clay will form a barrier between the minor aquifer within the River Terrace Gravels and the underlying major aquifer in the Chalk.

The quantity of water flowing through the made ground will be governed by infiltration through the hardstanding and is likely to be very low.

3.2 Geotechnical Assessment

There are a number of geotechnical constraints to site development:

- The depth and composition of the made ground within the proposed site has not been confirmed. This material will be variable and may be highly compressible therefore it will not be suitable for founding upon. As the site was previously a landfill site, the made ground may not be suitable for reuse on site and may be classified as hazardous waste.

- There are a number of existing foundations within the ground, including piled foundations for the Waste Transfer Facility, Highways Depot and the old MRF building.

- The density of the Kempton Park Gravels may obstruct the placement of piles during construction.

- Dewatering or sheet piling may be required during construction as a result of the presence of groundwater within the Kempton Park Gravels.

3.3 Potential Pollutant Linkages

3.3.1 Sources

Based on the requirements of CLR11 Model Procedures for the Management of Land Contamination, 2006, the potential sources, receptors and pathways of contamination are identified. Unless all three of these are present, there can be no risk to human health.

From the site history, the area was used as a landfill until 1999 when the site was redeveloped. At the present time the site is occupied by a Waste Transfer Facility which is housed within a building with exterior concrete hardstanding.

The principal source of contamination is considered to be associated with the ash fill. The DOE Industry profile for Landfills and Other Waste Sites (DOE, 1995) lists the key pollutants associated with the furnace ash as heavy metals and organic compounds such as PAHs. Fly ash is likely to contain higher levels of heavy metals, dioxins and furans. The composition of the waste within the landfill is unknown therefore the landfill site may contain a wide range of contaminants including PAHs, cyanides, sulphates and metals. Given the age of the landfill it is likely to be relatively stable, however more soluble organic and inorganic compounds may continue to be leached out by infiltrating water.

As part of the design process for the Waste Transfer Station, an investigation into chemical contamination was undertaken in 1997. The actual results for this investigation are not available however it is noted in Entec (2010) that the investigation found the presence of heavy metal and PAH contamination which is likely to be associated with the ash fill. The levels of contamination are considered to be low as it is noted that it would be acceptable to reuse the material on site provided a hard surface is used.

The likely sources of contaminants on the proposed site are shown in Table 3-2.

Table 3-2: Source of contamination

Ref	Primary source	Expected distribution	Likely contaminants
S1	Ash Waste Deposition	Within former landfill	Heavy metals, PAHs
S2	Landfill	Within former landfill	Heavy metals, PAHs, sulphates, cyanides
S3	Fuel Storage	Potential localised 'hot spots' around tanks	Hydrocarbons
S4	Oil/fuel spills form vehicles in car park and general site traffic	Potential localised 'hot spots'	Hydrocarbons

3.3.2 Receptors

The likely receptors to contaminants on the proposed site are shown in Table 3-3.

Table 3-3: Receptors

Ref	Receptor	Description
R1	Human	Construction Workers Staff Visitors
R2	Ground Water	Hackney Gravels are a minor aquifer
R3	Watercourse	Hogsmill River is adjacent to the site

3.3.3 *Pathways creating pollutant linkages*

Contamination sources can only pose a risk to receptors if a pathway is present. Table 3-4: Pathways details site specific pollution linkages between the sources and receptors. These pathways are predominantly concerned with activities during construction when the made ground is being worked. The site is currently predominantly covered by concrete hardstanding therefore only pathway P6 exists.

On completion of the proposed works, the ground will again be sealed beneath an impermeable surface, hence long term only pathway P6 exits.

Table 3-4: Pathways

Ref	Pathway	Description
P1	Ingestion	Construction workers handling spoil may ingest contaminants (via smoking/eating/touching face/mouth). This is a highly likely pathway.
P2	Dermatological uptake	Construction workers coming into direct contact with Made Ground. This is a highly likely pathway.
P3	Inhalation (gas)	Contaminants may form ground gas which could be inhaled directly.
P4	Inhalation (dust)	During construction (especially during hot dry weather) contaminated dust may be generated. This could be inhaled by any human receptor within range. This is a medium risk.
P5	Migration to watercourse	Contaminated run-off during construction may migrate into adjacent Hogsmill River
P6	Leaching into Groundwater (and then ingestion)	If contaminants leach into groundwater there is the potential that extracted water will become contaminated. Given the minor nature of the aquifer this is not considered to be a particularly strong pathway.

3.4 Risk Evaluation

The potential pollutant linkages identified have been used to produce an evaluation of the risk that each pollutant linkage poses, in general accordance with CIRIA guidance document C552, 2001. The evaluation and the resultant actions identified are based on the available information presented within this report.

It has been assumed that at no point will the site decrease in hardstanding coverage, providing a pathway between staff and visitors associated with the new waste site and any contaminated soils.

The results of the risk evaluation are presented in Table 3-5.

Table 3-5: Risk Evaluation of Potential Pollutant Linkages

1. Hazard Identification		2. Hazard Assessment				3. Risk Estimation		4. Risk Evaluation	5. Managing the Risk
Contaminant Source		Pathway		Receptor		Consequence of risk being realised	Probability of risk being realised	Classification	Action required
Table 3-2: Sources		Table 3-4: Pathways		Table 3-3: Receptors					
S1	Ash Waste	P1	Ingestion	R1	Construction Worker	Minor to Mild, depending on levels of soil ingested	Likely	Moderate/Low	Maintain good standard of hygiene on site – no smoking/drinking/eating without first washing. PPE to include gloves.
S1	Ash Waste	P2	Dermatological uptake	R1	Construction worker	Minor to Mild, depending on level	Likely	Moderate/Low	Maintain good standard of hygiene on site – provide washing facilities with hot water and soap. Consider provision of showers. PPE to include gloves.
S1	Ash Waste	P3	Inhalation (gas)	R1	Human	Minor to Severe	Low	Very low to Moderate	Monitor ground gas levels and type
S1	Ash Waste	P4	Inhalation (dust)	R1	Human	Minor to Mild	Unlikely	Very Low	This should be covered under a general dust suppression strategy for the site.

S1	Ash Waste	P5	Migration to watercourse	R2	Hogsmill River	Mild to Severe	Likely	Very Low	Ensure that site works do not encourage contaminants to be washed into river.
S1	Ash Waste	P5	Leaching to Groundwater	R2	Ground Water	Mild	Unlikely	Very Low	Investigate levels of contaminants in ground water. Ensure that site works do not encourage contaminants to enter ground water.
S2	Landfill	P1	Ingestion	R1	Construction Worker	Minor to Mild, depending on levels of soil ingested	Likely	Moderate/Low	Maintain good standard of hygiene on site – no smoking/drinking/eating without first washing. PPE to include gloves.
S2	Landfill	P2	Dermatological uptake	R1	Construction worker	Minor to Mild, depending on level	Likely	Moderate/Low	Maintain good standard of hygiene on site – provide washing facilities with hot water and soap. Consider provision of showers. PPE to include gloves.
S2	Landfill	P3	Inhalation (gas)	R1	Human	Minor to Severe	Low	Very low to Moderate	Monitor ground gas levels and type
S2	Landfill	P4	Inhalation (dust)	R1	Human	Minor to Mild	Unlikely	Very Low	This should be covered under a general dust suppression strategy for the site.

S2	Landfill	P5	Migration to watercourse	R2	Hogsmill River	Mild to Severe	Likely	Very Low	Ensure that site works do not encourage waste / contaminants to be washed into river.
S2	Landfill	P5	Leaching to Groundwater	R2	Ground Water	Mild	Unlikely	Very Low	Investigate levels of contaminants in ground water. Ensure that site works do not encourage contaminants to enter ground water.
S3	Fuel Storage	P1	Ingestion	R1	Human	Minor to Mild, depending on level ingested	Likely	Moderate/Low	Maintain good standard of hygiene on site – no smoking/drinking/eating without first washing. PPE to include gloves.
S3	Fuel Storage	P2	Dermatological uptake	R1	Human	Minor to Mild, depending on level	Likely	Moderate/Low	Maintain good standard of hygiene on site – provide washing facilities with hot water and soap. PPE to include gloves.
S4	Oil/fuel spill	P1	Ingestion	R1	Human	Minor to Mild, depending on level ingested	Likely	Moderate/Low	Maintain good standard of hygiene on site – no smoking/drinking/eating without first washing. PPE to include gloves.
S4	Oil/fuel spill	P2	Dermatological uptake	R1	Human	Minor to Mild, depending on	Likely	Moderate/Low	Maintain good standard of hygiene on site – provide

						level			washing facilities with hot water and soap. PPE to include gloves.

3.5 Potential Waste and Sustainability Considerations

Material may be required to be moved off site as part of the development. At this stage there is no site specific information regarding the quality of the soil therefore an assessment against the waste acceptance criteria cannot be made.

If low levels of contamination are found within the made ground, it may be allowed to be retained on site following agreement by the Environment Agency.

3.6 Safety, Health and Environment Considerations

As construction workers are likely to come into contact with contaminated land control measures as detailed in Table 3-5 should be implemented.

4 Conclusions

4.1 Key Findings

It is concluded, based on the limited information available, that contamination is likely to be present in the made ground in the west of the site where a former landfill was situated. The level of contamination is expected to be low, perhaps with higher levels of arsenic from the ash. In the east of the site where garden allotments were previously located, no soil contamination is suspected.

It is likely the contamination is confined to the made ground which is separated from the underlying major aquifer by the London Clay.

During the future usage of the site the protection of the ground and groundwater receptors can best be achieved by good housekeeping and good maintenance of hardstanding areas and drainage network.

4.2 Implications for the Proposed Development

There are a number of existing buildings on the site which have piled foundations. As the proposed development is to include underground bunkers, the exact location of these foundations needs to be confirmed.

The main risk on site is migration of contaminants into the groundwater however as the contaminated material will be covered for end use, filtration will be low therefore it is considered that the risk would be low. The main receptor to the contamination will be construction workers with a low risk to contaminating groundwater.

Higher levels of arsenic may be present within the ash fill (based on previous experiences with ash fill) however the arsenic will not be highly mobile. Consultation will be required with the Environment Agency to agree if remediation / removal of the ash is required.

An archaeological assessment may be required before the ground investigation can be undertaken.

5 Recommendations

5.1 Ground Investigation

A site specific ground investigation will be necessary for the purposes of risk assessment. The investigation will assess the ground conditions and any contamination present on the proposed site to confirm suitable foundations for the proposed works and to assess the contaminated soil in relation to the waste acceptance criteria for the removal of soil off site. . The main objectives of the ground investigation will be:

- To determine the depth of made ground
- To determine the depth of Kempton Park Gravel
- To confirm the location of existing foundations
- To determine the composition and levels of contamination present in the ground.

5.2 Further Studies

A number of historical records are outstanding. These should be sourced and reviewed as soon as they become available to Mouchel to complete the desk study and prior to any ground investigation being carried out on site. The records are:

- Historical ground and contamination reports held by Kingston Borough Council.
- Contamination investigation carried out by Wimpey Laboratories in 1997.

5.3 Urgent Actions

There are no risks at the site requiring immediate attention.

An archaeological assessment may be required before the ground investigation can be undertaken.

References

BRE (1999) Radon: guidance on protective measures for new dwellings, BR211, Construction Research Publications Ltd, London.

C552 (2001) Contaminated Land Risk Assessment, A Guide to Good Practice, CIRIA/DETR.

DOE (1995) Department of the Environment Industry profile for Sewage Works and Sewage Farms, Building Research Establishment.

Environment Agency website www.environment-agency.gov.uk

Health Protection Agency (2007) Indicative Atlas of Radon for England and Wales,

Envirocheck (2010) Landmark Envirocheck Report No. 33344212_1_1

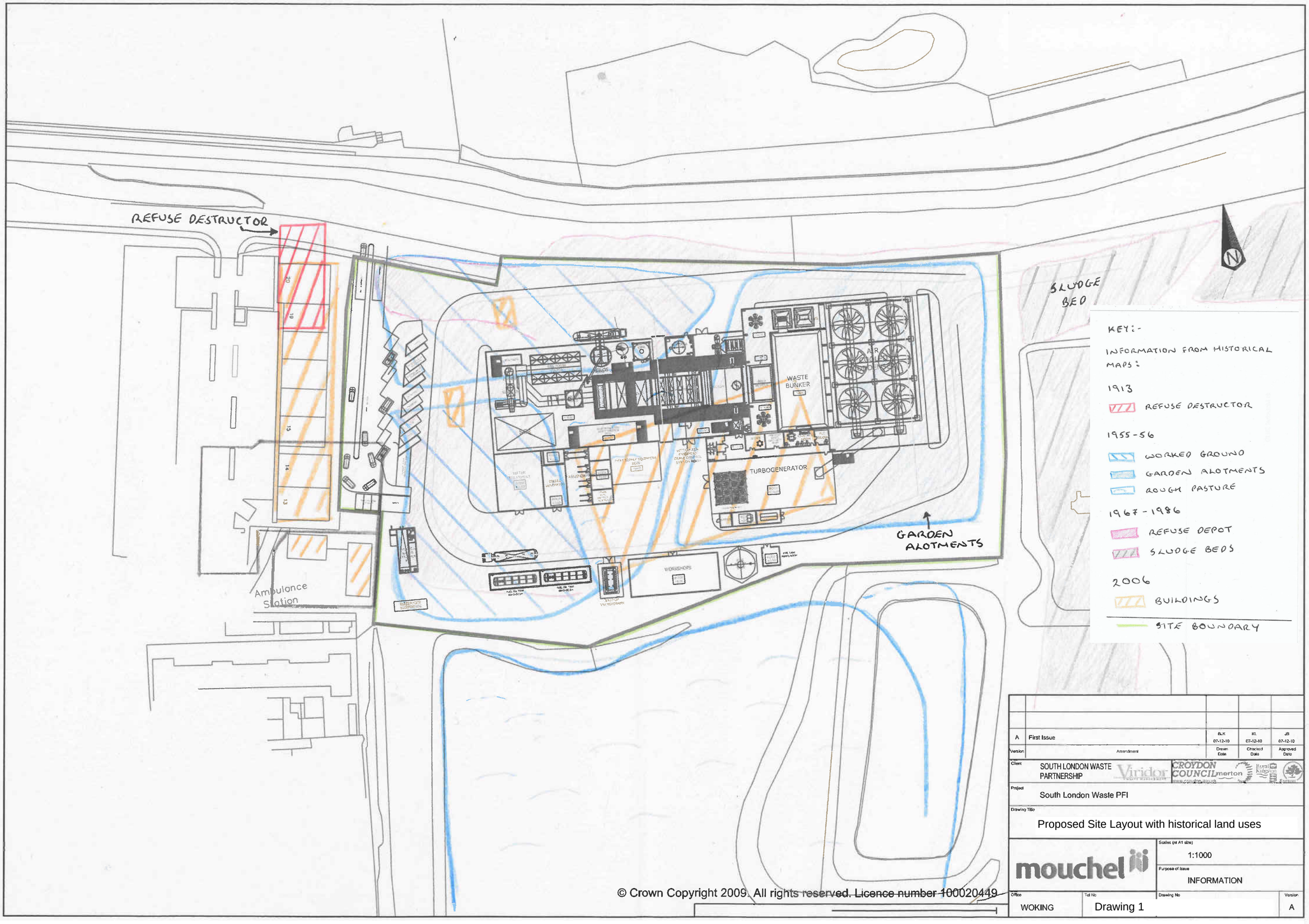
Magic (2011) www. magic.gov.uk

National Monuments Records www.pastscape.org.uk

SLR Consulting Limited (2010)

Appendix A Envirocheck Report

Appendix B Drawings



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A	First Issue	BJK 07-12-10	KL 07-12-10	JB 07-12-10

Client: SOUTH LONDON WASTE PARTNERSHIP

Project: South London Waste PFI

Drawing Title: Proposed Site Layout with historical land uses

mouchel

Scales (at A1 size): 1:1000

Purpose of Issue: INFORMATION

Office: WOKING

Tel No:

Drawing No: Drawing 1

Version: A

KEY:

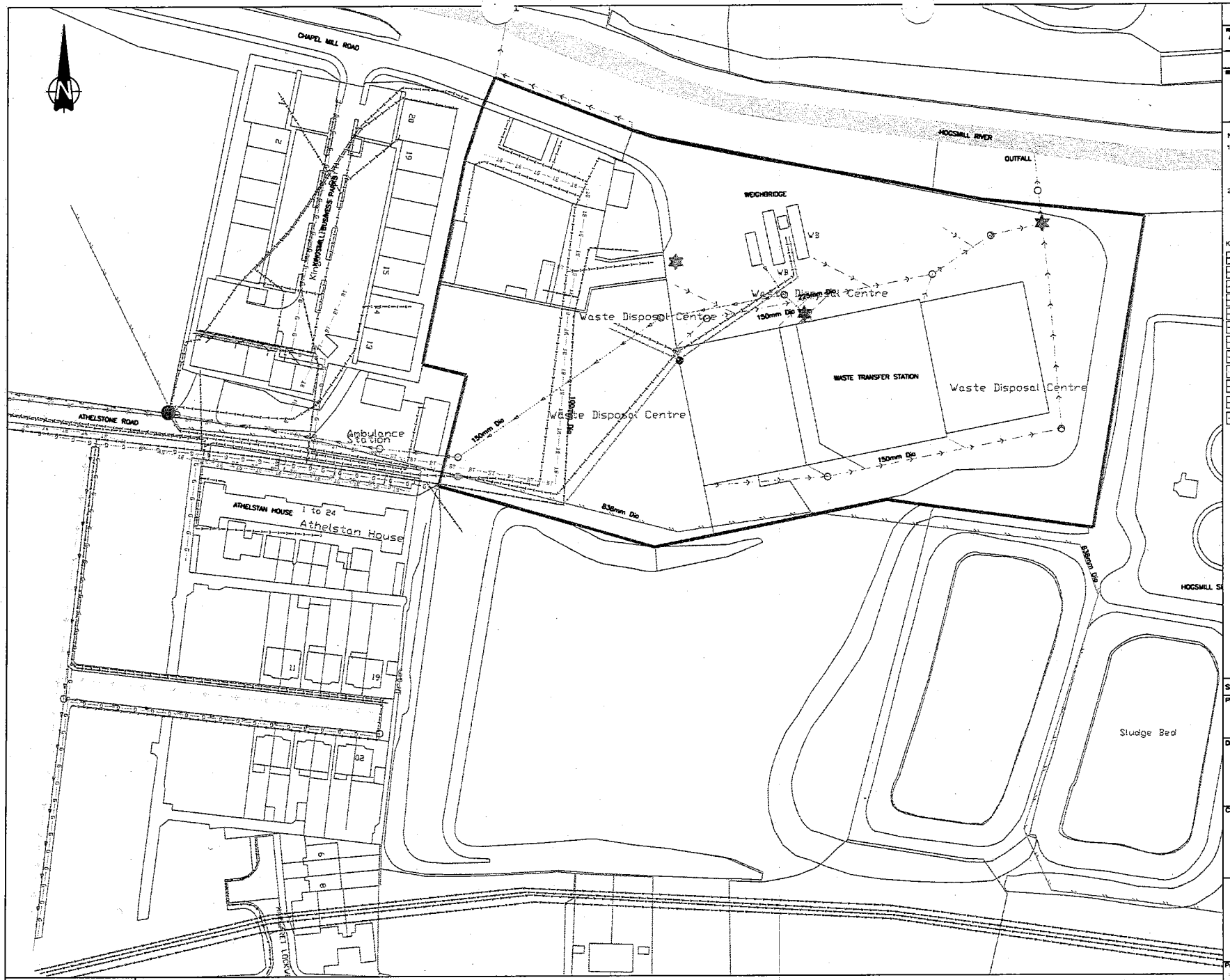
SITE BOUNDARY

LANDFILL

BUILDINGS

Drawing 2

Geotechnical Issues



DESCRIPTION

REV	DATE		DWN	CHK	APP
A	Jan 2009	FIRST ISSUE	KH	MP	DK

REVISIONS

REV	DATE		DWN	CHK	APP

NOTES

1. Details shown on this drawing have been provided in good faith and should be used for information purposes only. No liability of any kind is accepted by the operator, its agents or servants for any error or omission. It is given without obligation, or warranty, the accuracy thereof cannot be guaranteed.
2. The location of all existing services shown should be verified before any excavation or site works is undertaken.

KEY

- Site Boundary
- Gas Pipeline (Low Pressure)
- Sludge Main
- Telecommunications
- LV Electricity (Taken from EDF Records)
- LV Electricity (Underground - Assumed alignment)
- Foul Water Drainage (Taken from Thames Water records)
- Foul Combined Rising Main
- Storm Water Drainage
- Storm Water (Assumed alignment)
- Water Supply
- Water Supply (Assumed alignment)
- Petrol Interceptor
- Fuel Bund
- Soakaway
- Catchpit
- Substation
- Incoming electricity point
- Incoming water supply point

SCALES: 1:500

PROJECT TITLE: SLWP Waste PFI

DRAWING TITLE: VILLIERS ROAD EXISTING UTILITIES

CLIENT: SLWP

CLIENT REF:

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Project Ref. | DRAWING No. | Revision No.

Original Drawing Size - A1

Drawing 3