

Teddington Riverside, Teddington

TW11 9BE

Geoenvironmental Desk Study



For

Haymarket Media Group

Project No:

11477

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Campbell Reith Hill LLP
Friars Bridge Court
41-45 Blackfriars Road
London
SE1 8NZ

Tel: 020 7340 1700
Fax: 020 7340 1777
www.campbellreith.com

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EXECUTIVE SUMMARY

<p>SITE LOCATION</p>	<p>The site is located in Teddington in the London Borough of Richmond, and is centred on an approximate National Grid reference of 516800E, 171340N.</p> <p>The proposed development involves:</p> <ul style="list-style-type: none"> • Demolition of the existing buildings in Teddington studios with the exception of Weir Cottage; • The erection of part four/part five/part six/part seven storey buildings to provide flats; • Erection of 12 three storey houses to Broom Road frontage and use of Weir Cottage for residential purposes; • Provision of car parking spaces at basement and ground level, closure of existing access and provision of two new accesses from Broom Road; and, • Provision of publically accessible riverside walk together with cycle parking and landscaping. <p>The proposed development is classified as Geotechnical Design Category 2 and the end user sensitivity is considered Medium-High.</p>
<p>ENVIRONMENTAL SETTING</p>	<p>The geological sequence at the site comprises Made Ground over River Terrace Deposits which are underlain by London Clay. It is possible that Alluvium may be present between the Made Ground and River Terrace Deposits, especially in the north of the site. The overall environmental sensitivity of the site is considered to be:</p> <ul style="list-style-type: none"> • Hydrogeology (Medium to High): The site is situated on Alluvium and River Terrace Deposits which comprise a Principal Superficial Aquifer over bedrock of unproductive strata (London Clay). • Hydrology (Medium to High): The nearest surface water is the River Thames on the Northern site boundary. • Radon (Low): The site is not situated in an area where radon protective measures are required. • Sensitive Land Uses (Low): There is a local Nature Reserve 135m north of the site and a Nitrate vulnerable zone 120m from the site.
<p>CURRENT USE AND HISTORY</p>	<p>The site and central building comprises studios (audio, photographic and television). A building in the north east of the site comprises offices and the building along the eastern site boundary comprises multi-storey car parking and further office space to the south. Surface car parking areas are situated in the north and west of the site.</p> <p>Historically the site has been a film studio from 1959 and its use has not changed substantially except when it was marked as 'television studios' in the 1978 historic maps. A Low-Medium UXO risk is indicated from a Preliminary Risk Assessment (and further assessment is recommended).</p>
<p>GEOTECHNICAL HAZARDS</p>	<p>A number of possible geotechnical hazards exist at the site which will require further investigation:</p> <ul style="list-style-type: none"> • High anticipated structural loads; • A riverside wall adjacent to the north (with possible tiebacks); • Made Ground and obstructions; • Compressible soils (Alluvium), in the north of the site; • Soils aggressive to buried concrete; and • A potentially shallow groundwater level.
<p>CONTAMINATION ISSUES</p>	<p>A number of potential contamination sources have been established on the site including:</p> <ul style="list-style-type: none"> • Car Parking on-site; • Substation on site; • Diesel fuel storage tank; • Gas/oil tank;

	<ul style="list-style-type: none"> • Generator and unlabelled tank; • Below ground sewage tank; • Chemical storeroom; • Recycling area; and any • Areas of backfilling and Made Ground from historical demolition. <p>There is considered to be a Low-Medium risk of contamination at the site. A degree of localised contamination may exist but this is not likely to be widespread.</p>
RECOMMENDATIONS	<p>A site investigation is required in accordance with BS 10175 and BS5930 (+A2:2010), reported in accordance with current technical guidance. This should provide information on the general ground conditions and also target the identified potential pollutant linkages (in accordance with CLR11 and associated guidance). In addition it should consider geotechnical elements in accordance with Eurocode 7 and could also potentially consider elements such as soils reuse and waste classification.</p> <p>Given the proposed development, a piled solution is likely to be required. Specific consideration should be given to the potential interaction of the proposed basement and the river wall.</p> <p>Land quality assessment is an iterative process and likely to be a condition of planning consent for the redevelopment. It is recommended that this report is submitted for Local Authority Consultation as part of the planning process.</p>

1.0 INTRODUCTION

- 1.1 This report has been produced by Campbell Reith Hill LLP (CampbellReith) on behalf of the Haymarket Media Group ('the Client') to summarise environmental and geotechnical information relating to a site known as Teddington Riverside, Teddington (hereafter referred to as the site). The references and limitations associated with this report follow the main text. Figures showing the location of the site, the site boundary, and the development proposals are presented in Appendix A.
- 1.2 The report has been produced in general accordance with the procedures for site investigation, interpretation and reporting set out in DEFRA Contaminated Land Report (CLR) 11, BS 5930 (as amended) and BS EN 1997 (Eurocode 7). The objective of the report is to collate and interpret Phase 1 Desk Study information in order to provide:
- a) an overview of the site area including a description of the site's environmental setting;
 - b) a review of the site's historical and industrial development;
 - c) a preliminary and qualitative environmental risk assessment and conceptual site model;
 - d) a discussion on potential geotechnical constraints and development considerations; and,
 - e) recommendations for further surveys and reporting.
- 1.3 The Tier 1 contamination appraisal is intended to identify the likely presence of source-pathway-receptor pollutant linkages and provides a qualitative indication of the level of risk posed by potential ground contamination at the site. Further to this assessment, recommended actions are listed which are considered necessary to permit the redevelopment of the site.
- 1.4 This assessment considers the objectives of the National Planning Policy Framework (NPPF) which requires information to demonstrate that a site is suitable for its new use (taking account of ground conditions and land instability) and not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990 (after remediation). The NPPF requires adequate site investigation, prepared by a competent person, with the minimum requirement comprising a desk study and site reconnaissance.
- 1.5 The desk study information is presented in Appendix B. A geo-environmental site walkover has been carried out and consultations with the regulatory agencies have been completed (as listed in Section 4.0).

2.0 SITE DESCRIPTION

Site Location

- 2.1 The site location is presented in Figure 2.1. The site is located in Teddington, between Broom Road and the River Thames in the London Borough of Richmond, TW11. It is centred on an approximate National Grid reference of 516800E, 171340N.
- 2.2 The site is bound to the north by the River Thames, to the south by Broom Road, to the east by the Lensbury club and sports ground and to the west by the Angler's Public House.

Site Layout

- 2.3 An annotated site layout plan is presented in Figure 2.2 and site photographs in Appendix A. A site walkover was undertaken by a CampbellReith engineer on 1st October 2013, which forms the basis of the following description.
- 2.4 The site comprises an irregular shaped plot of land which covers an area of approximately 1.8 Ha and is generally at a level between 5 and 6m AOD.
- 2.5 The site is currently occupied by Teddington studios which has a main central building split into Haymarket and Pinewood areas. The Haymarket area comprises 'listening rooms' for testing of audio equipment and a photographic studio, main reception area and coffee shop at ground floor level, with offices above. The Pinewood area of the main building comprises television studios. A building in the north east of the site comprises offices which are currently being refurbished (this was a former restaurant and has not been used for a number of years). The building along the eastern site boundary comprises multi-storey car parking and further office space to the south. Surface car parking areas are situated in the north and west of the site.
- 2.6 A number of trees are present on site along the western site boundary and in the north of the site. A number of trees are located within the car park on the studio grounds. The tallest is about 20m high located approximately 10m west of the Haymarket studios building.
- 2.7 The northern site boundary is retained by an existing riverside wall which appears to be of sheet pile construction and, at the time of the site walkover, was noted to be in good condition. There is also a retaining wall approximately 0.5m in height retaining the car park to the west.

Surrounding Land-Use

- 2.8 Surrounding land use generally comprises a mix of residential and recreational.

Site After-Use Proposal

- 2.9 The proposed development involves the demolition of the existing buildings in Teddington studios with the exception of Weir Cottage and the erection of part four/part five/part six/part seven storey buildings to provide flats, erection of 12 three storey houses to Broom Road frontage, use of Weir Cottage for residential purposes, provision of car parking spaces at basement and ground level, closure of existing access and provision of two new accesses from Broom Road, provision of publically accessible riverside walk together with cycle parking and landscaping. The outline of the proposed development and basement footprint are shown on Figure 2.2.
- 2.10 The proposed development is classified as Geotechnical Design Category 2 and the end user sensitivity is considered **Medium-High**.

3.0 ENVIRONMENTAL SETTING

Geology

- 3.1 Given the history of development at the site, it is likely that the natural geological materials are overlain by a thickness of Made Ground. The geological sheet for the area [1] indicates that the site geology comprises River Terrace Deposits over London Clay. However, this plan indicates the presence of Alluvium close to or just within the northern corner of the site and that the boundary for this geological unit is imprecise. Therefore, for the part of the site closest to the River Thames, the possibility of alluvial soils being present between the Made Ground and the River Terrace Deposits should be recognised.

TABLE 3.1: SUMMARY OF ANTICIPATED GEOLOGY

Strata	Depth to Base (m bgl)	Depth to base (m AOD)	Thickness (m)	Typical Description
Made Ground	1 to 2 ^b	4 to 5	1 to 2 ^b	A mixture of cohesive and granular man-made soils associated with historic development of the site.
Alluvium ^a	2 to 3 ^b	4 to 3	1 to 2 ^b	Soft clay and silt, with bands of loose sand, gravel. Often contains bands of soft organic rich clay and peat.
River Terrace Deposits	5 to 6	1	3	Kempton Park Gravel (Medium dense gravel and sand. Can be clayey in part)
London Clay	65	-60	60	Stiff fissured grey clay, becoming very stiff at depth. Weathers near surface to an orange-brown colour and firm consistency.

a where present

b based on historic SI, held in CampbellReith GIS system, and located 300m to the north of the site. Actual values may vary.

- 3.2 With respect to the site, the Envirocheck Report [2] indicated no, very low or low potential for ground instability hazards in relation to landslides, collapsible instability ground and ground dissolution. The site is not indicated to be in an area affected by coal mining or shallow mining for other mineral types. The nearest recorded BGS mineral site is located at approximately 375m to the north.

- 3.3 The Envirocheck report identifies a moderate potential for a compressible ground stability hazard in the north of the site. This is likely to relate to possible presence of alluvial soils as discussed above.
- 3.4 The Envirocheck report is also indicates a moderate potential of a stability hazard associated with soil volume change (shrinking or swelling clay) stability in the western part of the site. However, as the site is anticipated to be underlain by a substantial thickness of water bearing soil, based on current data, CampbellReith are of the opinion that there is a low potential for this hazard.
- 3.5 The London Clay and Alluvium can contain naturally elevated concentrations of minerals potentially aggressive to buried concrete.
- 3.6 As discussed in Section 4, the site has been historically occupied by a number of buildings. These are likely to have had foundations and may have had basements, leading to the possibility of buried obstructions and increased thicknesses of Made Ground. In addition the presence of the riverside wall (sheet piled) may also place geotechnical constraints to the development, especially if it was constructed with anchor blocks and tendons within the site.

Hydrogeology

- 3.7 The site hydrogeology is summarised in Table 3.2 and the associated references listed at the rear of the report. In the extreme north of the site is Superficial Secondary (undifferentiated) aquifer. This is likely to relate to the Alluvium. The rest of the site is indicated to be underlain by a Superficial Principal Aquifer, likely to relate to the River Terrace Deposits, and likely to be present beneath the Alluvium. The bedrock (London Clay) has been designated as unproductive strata.
- 3.8 The groundwater in the Alluvium and River Terrace Deposits is likely to be in hydraulic continuity with the River Thames is likely to be tidally influenced.

TABLE 3.2: SUMMARY OF HYDROGEOLOGY

Type	Distance	Description	Reference
Superficial Principal Aquifer	On site	Soils with high inter-granular permeability which can provide a high level of water storage and may support water supply and/or river base flow on a strategic scale.	2 & 3
Soil Leaching Potential	On site	Due to the urban setting of the site, the Environment Agency suggests that an assumed high soil leaching potential.	2
Source Protection Zone	>2km	N/A	2 & 3
Groundwater	75-95m SW	In the Envirocheck Report there a multiple	2

Type	Distance	Description	Reference
Abstractions	160-180m E	references to Boreholes A and B associated with the 'Lensbury Club' discussed below. None of these relate to potable supply – they relate to use in spray irrigation at sporting facilities.	
Rising groundwater	N/A	With respect to foundations and basements, the site is remote from any 'critical areas' associated with the potential for rising groundwater.	4

- 3.9 In the Envirocheck Report there are seven abstraction licences relating to 'Borehole A' and 'Borehole B' associated with the Lensbury Club. The report suggests that Borehole A is located around 75 to 95m to the southwest of the site. Borehole B is recorded as being present around 160 to 180m to the east of the site. The aquifer relating to these abstractions is not stated. All of the abstractions relate to 'direct' spray irrigation of sports grounds and golf clubs. Only two of the entries provide information on the rate of abstraction: 91m³ daily and 6000m³ annually.
- 3.10 The licensees for Borehole A have included 'The Catholic Education Service' and 'The Trustees of the Lensbury Club'. The two entries regarding the Catholic Education Service appear to be duplicates of each other. The permit start dates range from 1995 to 2005. The permit end dates are not given. The licensees for Borehole B have included 'Lensbury Limited' and 'The Trustees of the Lensbury Club'. The permit start dates range from 1995 to 2013. The permit end dates are not given.
- 3.11 The next nearest groundwater abstractions are located 1.6km to the north east and relate to spray irrigation at a golf course. The hydrogeological sensitivity of the site is considered to be **Medium-High** associated with the presence of a Superficial Principal Aquifer.

Hydrology

- 3.12 The site hydrology is summarised in Table 3.3 and the associated references listed at the rear of the report.

TABLE 3.3: SUMMARY OF HYDROLOGY

Type	Distance	Description	Reference
Surface Waters	0	The River Thames is adjacent to the north of the site. The Hogsmill-Teddington Stretch of the River Thames indicated to have GQA grade of B 'good'.	2
Surface Water Abstractions	>1km	N/A	2

- 3.13 Data contained in the Envirocheck report indicates that water quality of the Hogsmill-Teddington stretch of the River Thames has progressively improved with time, with a Chemistry GQA grade of C 'fair' recorded from 1990 to 1998 and A 'very good' between 2003 to 2007. The hydrological sensitivity of the site is considered to be **Medium-High**. Whilst the River Thames is present to the north, this is separated from the site by a river wall.

Radon

- 3.14 Reference to the National Radiological Protection Board (NRPB) Atlas [7] and BRE 211 document [9] has shown that the site does not fall within an area where basic or full radon protection measures are considered necessary for domestic dwellings, nor is it in an area requiring a geological assessment for such measures. As such, a **Low** risk is adjudged in relation to radon.

Sensitive Land-Uses

- 3.15 The Envirocheck Report indicates that there is a Local Nature Reserve and Nitrate Vulnerable zones at 135m and 120m from the site respectively.

4.0 SITE HISTORY AND INDUSTRIAL SETTING

Site History

- 4.1 Information relating to the site history has been obtained by reference to the historical maps contained within the Envirocheck Report.

TABLE 4.1: SITE HISTORY

Date	Development
1850	The site generally comprises open land.
1865	Buildings denoted 'The Weir' (later 'Weir House') are indicated. The remainder of the site is landscaped. A well and two pumps are indicated to be present in the western quadrant of the site.
1894	The buildings have been extended. The well and pump are no longer shown.
1896	Another pump is shown in the south western quadrant of the site. A boat house exists on the north western corner of the site.
1934	New buildings in addition to 'Weir House' are shown. These new buildings are indicated to house film studios.
1948	At some time between 1940 and 1948 the buildings at the site were demolished and replaced by new structures.
1959	The 1959 plan indicates the construction of additional new buildings. 'Tanks' are recorded in the north east and south east of the site. The site is now indicated to be the 'Teddington Film Studios'. The boat house is no longer evident.
1978	At some time between 1975 and 1978 most of the buildings at the site were demolished and replaced with new structures. The tanks are no longer shown. An electricity substation is present in the north of the site and the site is now indicated to be a 'Television Studio'.
2013	The plans consulted do not indicate significant changes from 1978 to 2013.

TABLE 4.2: ADJACENT LAND HISTORY

Date	Development
1850	Surrounding land use generally comprises open land.
1865	A graveyard is present approximately 120m west of the site. The River Thames is present adjacent to the north.
1896	Pumps are indicated 10m south west of the site, 20m south of the site and 170m away from the southern quadrant of the site.
1915	Tramway now present around 85m to the south west.
1920	Tramway not shown.
1933	On the other side of the Thames, at a location about 200m north of the site, a possible excavation associated with 'sand and ballast works' is indicated.
1948	The building layout to Lansbury House, 30m South East had notably changed.
1959	A small 'works' building is noted 60m to the north west.
1966	Excavation for ballast to the north no longer shown.

Date	Development
1978	'Works' building to the north west shown. A substation is also indicated about 100m to the south east of the site boundary.
1991	A swimming pool is indicated about 20m from the east of the site.
1993-1994	The substation about 100m to the south east of the site boundary is still shown.
1994-2013	The plans consulted show the addition of sports and leisure centres in the area through the years plus more residential developments and schools.

Unexploded Ordnance (UXO)

- 4.2 A preliminary review has been made of the UXO risk presented by the site based upon CIRIA C681 ('Unexploded Ordnance (UXO) – A guide for the construction industry') [7] and the assessment matrices presented in Tables 5.1-5.3 therein.
- 4.3 The post-war historical maps and aerial photographs do not identify any ruins on site or in the surrounding area. They indicate the nearest possible war time assets to be a sand and ballast works 200m to the north and a 'motor works' 650m to the east.
- 4.4 The maps however indicate radical alteration of the layout of structures at and to the east of the site, possibly indication war time damage and reconstruction.
- 4.5 The Building Control department of the London Borough of Richmond upon Thames has no record of UXOs having been encountered during previous construction works; however a mapping of the World War II Blitz [6] indicates that a few high explosive bombs fell in the area. The first three are recorded to the north of the site on the Thames, the closest one about 30m north of the site and two are recorded at approximately 50m north and 60m north east of the site respectively. The final one is indicated at approximately 150m north east of the site and a plan showing these locations is shown on Figure 3.1.
- 4.6 By reference to Table 5.1 of CIRIA C681 there is a low to medium potential for ordnance having been delivered aurally on site. Whilst redevelopment of the site between 1940 and 1948 may be suggestive of wartime damage, conversely it is possible that any UXOs could have been encountered at the time. Therefore, the potential for such features to remain is reduced.
- 4.7 Given the above, the risk of encountering UXOs is considered to be **Low** in relation to ground investigations, piling operations and excavation for facilities and services. However, a **Low-Medium** potential is suggested for basement excavations.

Tunnels and Infrastructure

- 4.8 Based on readily available information, CampbellReith is not aware of any recorded London Underground or Network Rail assets, deep electricity cable tunnels or National Grid tunnels within proximity of the site. In addition, the site is not within the vicinity of either of the two proposed Crossrail routes or the proposed High Speed Rail Two route.

Current Industrial Setting

- 4.9 Reference to the Envirocheck Report has identified three active Contemporary Trade Directories within 250m of the site. These comprise ultrasonic equipment manufacturers on Broom Road in the south western part of the site, marine equipment & supplies (70m north west) and a soft furnishings manufacturer (250m north west). Other Inactive entries within 250m of the site comprise car dealers which is indicated to be present in the south western part of the site and boat builders and repairers on Ferry road (70m north west) at the location of the current marine equipment and supplies.
- 4.10 Table 4.3 summarises identified industrial features within 250m of the site, which may present a potential source of contamination to the site based upon the Envirocheck Report [2].

TABLE 4.3: INDUSTRIAL SETTING

Type	Distance	Description
Discharge Consents	210m NW	Relates to discharge to land/soakaway for final/treated effluent for a single domestic property approved by the Environment Agency.
Pollution Incidents to Controlled Waters	0m N	[Category 3:minor incident] Pollutant: unknown sewage Date: 11th June 1997 Ref: HSE1997032324.
	0m N	[Category 3:minor incident] Pollutant: Oils unknown Date: 2nd February 1996.Ref: SE960075.
	0m N	[Category 3:minor incident] Pollutant: Oils unknown Date: 26th July 1991 Ref: SE910214.
	0m N	[Category 3:minor incident] Pollutants: Oils-unknown Date: 6 th October 1990 .Ref: SE900292.
	45m N	[Category 3:minor incident-no pollution was found] Pollutants: Miscellaneous-Natural.Date:17 th November 1998.Ref: THSE1998041140.
	85m N	[Category 3:minor incident] Pollutants: Oils-unknown Date: 27 th March 1996.Ref: SE960135.
	100m NW	[Category 3: minor incident].Pollutants: Chemicals-unknown.Date:10 th May 1990.Ref: SE900141.
	110 E	[Category 3:minor incident] Pollutants: Oils-unknown Date: 17th July 1992.Ref: SE920227.
	130m E	[Category 3:minor incident] Pollutant: unknown sewage. Date:

Type	Distance	Description
		19 th September 1989 Ref: S1890460.
	155m NE	[Category 3:minor incident] Pollutant: Miscellaneous-natural.Date:30 th April 1999 .Ref: THSE1999042983.
	160m NE	[Category 3:minor incident] Teddington. Pollutant: Oils-unknown.Date:15 th October 1990.Ref: SE900296.
	175m NW	[Category 3:minor incident] Teddington. Pollutant: Oils-unknown.Date:22 nd September 1990.Ref: SE900286.
	185m N	[Category 3:minor incident] Pollutant: Oils-unknown. Date: not supplied. Ref: SE950308.
	205m E	[Category 3:minor incident] Pollutant: Oils-unknown. Date:7 th August 1989.Ref: N1890418.
	210m N	[Category 3:minor incident] Pollutants: Oils-unknown. Date:25 th May 1993.Ref: SE930143.
Substantiated pollution incident register	150m N	[Water impact: Category 2-significant.Land and air impact: Category 4-no impact] Pollutants: Oils-diesel (including agricultural).Date:11 th March 2002.Ref:63255.

4.11 Given the geology associated with the site there is assumed to be hydraulic connectivity beneath the site and the surrounding area. However, there is considered to be a low risk from any potential contamination that may be associated with the current industrial features and trades identified above due to their scale an intervening distance. Possible exceptions could be the 'tanks' recorded in the northeast and southeast of the site in the 1959 plans and an electricity substation recorded in the 1978 plans (see table 4.1).

4.12 Research did not establish the presence of any of the following at or within 250m of the site:

- Entries on the contaminated land register;
- Enforcement and prohibition notices;
- Integrated pollution controls;
- Integrated pollution prevention and controls;
- Local authority integrated pollution prevention and controls;
- Local authority pollution prevention and controls or associated enforcements;
- Prosecutions relating to authorised processes and controlled waters;
- Water Industry Act Referrals;
- Registered radioactive substances;
- BGS recorded landfill sites;
- Historical landfill sites;
- Integrated pollution control registered waste sites;
- Licensed waste management facilities (landfill boundaries or locations);
- Local authority recorded landfill sites;

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- Registered landfill sites;
 - Registered waste treatment or disposal sites;
 - Registered Waste Transfer Sites;
 - Control of Major Accident Hazard Sites (COMAH);
 - Explosive sites;
 - Notification of Installations Handling Hazardous Substances (NIHHS);
 - Planning hazardous substances consents;
 - Planning hazardous substances enforcements; or
 - Fuel Station Entries.

Consultation with Building Control

- 4.12 The Building Control Department of The London Borough Of Richmond upon Thames were contacted [10]. They indicated that, in the area of the site alluvial clay is typically encountered close to the River Thames, whereas closer to Broom Road, river terrace deposits are typically encountered. They did not have specific records of any substantial thicknesses of made ground at the site, however, they did note the presence of a gravel pit on the opposite side of the River Thames (which has since presumably been backfilled). This is the only evidence of mining or mineral extraction in the area that the officer consulted was aware of.
- 4.13 The Officer noted that close to the River Thames piled foundations are generally adopted (presumably due to the presence of the alluvial clay) but elsewhere (as Broom Road is approached) strip footings a generally adopted (presumably due to the presence of river terrace deposits).
- 4.14 The Officer had no record of UXOs having been encountered during construction works in the area over the last thirty years.

Consultation with Contaminated land/ Environmental Services

- 4.15 The Contaminated Land Department at The London Borough of Richmond upon Thames were contacted [11] and they indicated that the site is within 100m of their Borough boundary, with the rest within the Royal Borough of Kingston.
- 4.16 The Scientific Officer indicated that they did not hold records of any current or former landfill sites within 500m of the site and confirms as stated earlier in the report that a degree of Made Ground is likely to be present in view of the history and redevelopment of the site.

- 4.17 They are not aware of any specific issues or hold any records relating to gas emissions or contamination either on or adjacent to the site.
- 4.18 The Officer has no record of pollution or contaminated incidents having occurred either on or adjacent to the site as well as authorised processes on or near the site. They also did not hold any records of private water abstractions.
- 4.19 The Officer holds records of above ground storage tanks located on site as well as an electricity substation.
- 4.20 The Officer has record of 'Film Production Works' located adjacent to the south east of the site between approximately 1930 and 1950 but notes that there have currently not been any designations as 'Special Sites'.
- 4.21 The Officer is not aware of any problems with asbestos/radon/radioactivity on the site but notes that in view of the age of the buildings on site it is likely that asbestos is present on site.

London Fire and Emergency Planning Authority

- 4.22 The LFEPA were contacted [12] but hold no relevant records for the site.

5.0 CONCEPTUAL MODEL

- 5.1 Current practice for land contamination evaluation involves appraisal of contaminant source-pathway-receptor pollutant linkages. These are summarised below, considering the desk study information obtained. This information should be utilised to design the site investigation considering the proposed end use.

Potential Sources of Contamination

- 5.2 Table 5.1 summarises the potential contamination sources that have been identified on or near the site. The potential contaminant types associated with these is then given based upon a review of CLR 11, industry profiles and anecdotal information.

TABLE 5.1: POTENTIAL SOURCES OF CONTAMINATION

Feature on or near site	Potential Contaminant
Areas of backfilling and Made Ground resulting from historical demolition of the site and surrounding area	Metals and hydrocarbons, particularly PAHs. In addition, Asbestos Containing Materials (ACM) may be present associated with backfilled demolition arisings from historical development. Deleterious constituents of the Made Ground or organic deposits within the Alluvium may also give rise to elevated levels of hazardous ground gases (carbon dioxide and methane).
Former car dealers	If painting was done on site possible contaminants could be solvents and fuel oils together with inorganic compounds. Asbestos Containing Materials may be present from waste disposal/storage from the vehicle parts.
Sub-station on site	Poly-chlorinated biphenyls (PCBs), hydrocarbons and volatile organic compounds (VOCs).
Existing and historic tanks in former film studio grounds	Hydrocarbons and VOCs.
Below ground sewage tank (east of the site which is used to store sewage pumped from the building prior to being pumped off-site)	Metals, Inorganic chemicals and organic chemicals.
Above ground fuel storage tank (north-east of the site) ^a	Hydrocarbons and VOCs.
Gas/oil tank and unknown tanks in the car parking area in the south west of the site ^b	Hydrocarbons and VOCs.
Generators in the south west of the site.	Hydrocarbons, VOCs and PCBs.
Recycling areas including mercury recycling	Miscellaneous, including mercury.
Chemical storage area	Hydrocarbons, VOCs and SVOCs.

^a On-site personnel have confirmed that the tank is double skinned and contains red-diesel to power a generator.

b No obvious signs of leakages were noted during the site walkover.

Pathways

5.3 In the context of the proposed site use, the potential pathways presented in Table 5.2 are considered applicable and have been appraised.

TABLE 5.2: EXPOSURE PATHWAYS

Pathway		Phase
Ingestion of soil / dust	Outdoor	C, O
	Indoor	O
Inhalation of soil / dust	Outdoor	C, O
	Indoor	O
Inhalation of vapour from soil / dust / water	Outdoor	C, O
	Indoor	O
Dermal contact with soil / dust / water	Outdoor	C, O
	Indoor	O
Migration of soil gases to confined spaces / structures	Indoor	C, O, B
	Outdoor	O
Migration of water borne contaminants	On site	C, E, O
	Off site	E
Leaching of contamination from Made Ground	On site	C, E, O
	Off site	E
Movement of contaminants to engineered structures (e.g. water pipes)	On site	C, O, B
Notes: C – Construction. O – Occupation. E – Environmental effect off site. B – Buildings and services.		

Receptors

5.4 In the context of the above the following potential receptors have been identified:

TABLE 5.3: POTENTIAL RECEPTORS

Receptor	Description	Sensitivity
Site end users	Residential end users.	Medium-High
Construction and Maintenance Workers	Construction and maintenance workers are likely to be exposed in the short term only.	Medium
Controlled Waters (Hydrogeological)	Assumed hydraulic continuity between the groundwater in the alluvium and river terrace deposits with the River Thames	Medium-High
Controlled Waters (Hydrological)	The site is located on the banks of the River Thames.	Medium-High
Buildings and Service Infrastructure	Water supply pipework may be installed as part of the development.	Medium
Adjacent End Users	Residential and commercial end users are situated in the surrounding area.	Low-Medium

Preliminary Risk Assessment

5.5 Tables 5.4 - 5.8 provide a preliminary risk assessment for the site as a whole. The risk assessment matrix assesses each of the viable pollutant linkages and particular receptors. For the purpose of this assessment, the following descriptions of risk have been utilised, which take into account the magnitude of the source contamination identified, likelihood of exposure via a pathway and significance of harm likely to result on the given receptor¹:

- **High Risk:** Pollutant linkage is likely to exist and be causing significant harm.
- **Medium Risk:** Pollutant linkage is likely to exist but significant harm is unlikely.
- **Low Risk:** Pollutant linkage may exist but any harm is likely to be mild.

TABLE 5.4: CONSTRUCTION AND MAINTAINANCE WORKERS (ASSUMING BASIC PPE)*

PATHWAY	RISK	COMMENT
Ingestion of soil / dust	Low - Medium	The potential for impacted soils has been identified.
Inhalation of soil / dust	Low - Medium	
Inhalation of vapour from soil / dust / water	Low - Medium	Redevelopment or maintenance of the site may involve ground workers coming into contact with the underlying soils and water.
Dermal contact with soil / dust / water	Low - Medium	
Migration of soil gases to confined spaces	Low - Medium	Intrusive investigation, monitoring and sampling to include soil, groundwater and gas is required to provide general site coverage and to target potential point sources of contamination.
Migration of water borne contaminants	Low - Medium	
Leaching of contamination from Made Ground	Medium	

* Separate assessments are required in relation to asbestos risk

¹ IEH 'Guidelines for Environmental Risk Assessment and Management' and CIRIA 552 'Contaminated Land Risk Assessment, Guide to Good Practice'. Section 6 of CIRIA 552 presents matrices for risk assessment. These have been simplified herein.

TABLE 5.5: SITE END USERS DURING OCCUPATION

PATHWAY	RISK	COMMENT
Inhalation of vapour from soil / dust / water	Low-Medium	The desk study has identified historical and current activities on and in proximity to the site with the potential to cause localised ground contamination.
Ingestion of soil / dust	Low-Medium	
Inhalation of soil / dust	Low-Medium	
Dermal contact with soil / dust / water	Low-Medium	The potential for Made Ground to be present at the site has been noted. Ground gas monitoring should be completed.
Migration of soil gases to confined spaces	Low-Medium	
Migration of water borne or mobile contaminants	Medium	Intrusive investigation, monitoring and sampling, to include soil, groundwater and gas is required to provide general site coverage and also to target potential point sources of contamination.
Leaching of contamination from Made Ground	Medium	
Movement of contaminants to engineered structures (e.g. water pipes)	Medium	

TABLE 5.6: CONTROLLED WATERS

PATHWAY	RISK	COMMENT
Migration of water borne or mobile contaminants	Medium	Desk Study research has identified sources of contamination at the site which may involve the use of mobile forms of hydrocarbons with the potential to cause contamination to controlled waters.
Leaching of contamination from Made Ground	Medium	The probable hydraulic conductivity across the site and/or surrounding area will increase potential off site migration. Intrusive investigation, monitoring and sampling, to include soil and groundwater is required to provide general site coverage and also to target potential point sources of contamination.

TABLE 5.7: BUILDINGS AND INFRASTRUCTURE

PATHWAY	RISK	COMMENT
Leaching of contamination from Made Ground	Medium	Made Ground is likely to be present which may contain both inorganic and organic components.
Movement of contaminants to engineered structures (e.g. water pipes)	Medium	
Accumulation of potentially flammable soil gases.	Medium	The ground gas regime at the site will require assessment.

TABLE 5.8: ADJACENT SITE USERS

PATHWAY	RISK	COMMENT
Dermal contact with soil / dust / water	Low - Medium	Desk Study research has identified sources of contamination at the site which may involve the use of mobile forms of hydrocarbons, with the potential to migrate off site and possibly impact adjacent sites. The probable hydraulic conductivity across the site and/or surrounding area will potentially increase off site migration.
Ingestion of soil / dust / water	Low - Medium	
Inhalation of vapour from soil / dust / water	Low - Medium	
Migration of soil gases to confined spaces / structures	Low - Medium	
Migration of water borne contaminants	Medium	
Movement of contaminants to engineered structures (e.g. water pipes)	Medium	

Targeted Pollutant Linkages

- 5.6 A ground investigation is required in order to appraise the potential issues of land contamination and geotechnical matters. This should target the particular potential pollutant linkages identified, as detailed in Table 5.9.

TABLE 5.9: TARGETED POLLUTANT LINKAGES

Issue	Exploration
Contamination of shallow soils from historical site activities.	General site coverage required. Soil samples to be obtained in all holes within the upper 1.0m. The particular features such as tanks, listed in Table 5.1 and Figure 2.2 should be individually targeted.
Contamination of shallow groundwater from current and historical site activities.	Groundwater monitoring installations required to give general site coverage and to consider off-site sources of contamination.
Ground gas generation from Made Ground.	Ground gas monitoring installations required to give general site coverage.
Car park.	Soil sample regime to ensure that samples are obtained at suitable spatial intervals in this area.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Site Setting

- 6.1 The site is considered to have a **Medium-High** sensitivity with respect to hydrogeology (due to the underlying Alluvium and River Terrace Gravels strata) and a **Medium-High** hydrological sensitivity (due to the proximity of the River Thames). The proposed end use (residential) is of **Medium- High** sensitivity.

Site History and Redevelopment Proposals

- 6.2 The site and central building comprises a series of studios. A building in the north east of the site comprises offices which are currently being refurbished. The building along the eastern site boundary comprises multi-storey car parking and further office space to the south. Surface car parking areas are situated in the north and west of the site.
- 6.3 Historically the site has been a film and television studio. In addition there is an anecdotal record of a 'car dealership' on the site (based on Envirocheck Records, noting that these are sometimes poorly geo-located).
- 6.4 It is proposed to redevelop Teddington Studios with the demolition of the existing buildings with the exception of Weir Cottage and the erection of part four/part five/part six/part seven storey buildings to provide flats, erection of 12 three storey houses to Broom Road frontage, use of Weir Cottage for residential purposes, provision of car parking spaces at basement and ground level, closure of existing access and provision of two new accesses from Broom Road, provision of publically accessible riverside walk together with cycle parking and landscaping.

Geotechnical Conclusions and Recommendations

- 6.5 The site is underlain by Made Ground over Alluvium, River Terrace Gravels and London Clay. An intrusive ground investigation with geotechnical testing is required to confirm the underlying geology, groundwater regime and the engineering properties of the underlying soil. The ground investigation should be designed based on the requirements of Eurocode 7 Part 2 (and the associated national annex) and BS5930+A2. The investigation should be tailored so as to ensure the geotechnical hazards discussed below are addressed.

6.6 The anticipated geotechnical hazards are summarised in Table 6.1.

TABLE 6.1: SUMMARY OF GEOTECHNICAL HAZARDS

Hazard	Distance	Description
Made Ground and Obstructions	On site	There is the potential for a significant thickness of Made Ground and obstructions to be present on site. Relic foundations and basements may be present associated with historical development.
Compressible ground stability hazard	On site	Alluvial soils may be present on the site, particularly in the north (close to the river). Such soils tend to be associated an increased risk of settlements occurring due to their compressibility. Neither Made Ground nor Alluvium are likely to be suitable founding strata for structures.
Buried Concrete	On site	The London Clay, Alluvium, and materials derived from them, can naturally contain elevated concentrations of minerals that can be aggressive to buried concrete.
Riverside Wall	On site	The existing riverside wall is of sheet pile construction. The presence of this feature may act as a constraint to future development both in terms of subterranean structures (especially if it involves anchors that extend into the site) and also ownership. The nature and ownership of this structure should be investigated. It will also be necessary to consider the effect of the development on the river wall structure.
Groundwater	On site	As the site is adjacent to the River Thames, it is possible that the groundwater level may be at a comparatively shallow, which could have implication for basement design and construction.

6.7 The Made Ground and Alluvium are not considered suitable founding strata. In view of this and in view of the significant anticipated loads associated with the multi-storey nature of the development, it is likely that a piled foundation solution will be required.

6.8 It should be established as to who owns and/or is responsible for the up-keep of the riverside (sheet pile) wall. Such parties and (given the presence of the adjacent River Thames, the Environment Agency) should be consulted with respect to the proposed development so as to establish any associated constraints and requirements. In relation to such matters it is recommended that further research is undertaken to establish the design and construction of this wall. Of particular relevance here is establishing the risk of any anchor/tie back rods extending in to the site. Subject to such research, the need to establish such features may require consideration in the ground investigation works.

6.9 Should the proposed development be reliant on the existing riverside wall then it is recommended that it is subject to a structural inspection. Likewise the modest retaining wall on the western site boundary.

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- 6.10 The proposals involve the excavation and construction of a basement. As the site is close to the River Thames, a shallow groundwater level may be present. It is recommended that the groundwater levels at the site are monitored as part of future ground investigation works so as to enable what engineering measures may be required to (i) facilitate the basement excavation and (ii) address any associated hydrostatic pressures in relation to the basement structure. Such a monitoring programme should consider the potential for the groundwater to be tidally influenced.
- 6.11 A Basement Impact Assessment may be required and this should be confirmed.
- 6.12 Where surrounding existing buildings or infrastructure are within $4d$ of a basement excavation (where d is the depth of excavation), consideration should be given to the potential for these features to undergo ground movements as a result of such excavation. This may in turn have implications for the design, installation and support (both temporary and permanent) for the proposed basement walls. Such matters should be given due consideration as the design is developed.
- 6.13 It is probable that underground obstructions will be encountered, which will require removal within the proposed buildings footprint so as not to hinder foundation construction. It is recommended that trial pits are undertaken to establish relic foundations and basements.
- 6.14 In any proposed excavations, the stability of the Made Ground, Alluvium and River Terrace Deposits cannot be relied upon, even in the short term. It should be assumed that excavations into a significant depth of such strata materials will require support or the excavation battered back to suitable safe angle of repose. In relation to this it is noted that the proposed basement excavation is relatively close to the eastern site boundary. In this area the formation of suitable batter may not be possible. Again, such matters should be reviewed as the design is developed.
- 6.15 The presence of Made Ground and the possible presence of Alluvium are likely to require road pavements to be based on a low CBR values and the use of flexible materials. If present, Alluvium may require additional measures, such a geogrids to be considered in design and may have implications for the design of services so as to ensure that they can cope with settlements arising from the compressible nature of such soils. A ground investigation is required so as to enable such matters to be better understood.
- 6.16 The presence of hard standing across the site and possible historic foundations provides the potential for re-use of demolition materials as engineering fill during construction, provided any deleterious materials are removed.

UXO Conclusions and Recommendations

- 6.17 On the basis of the preliminary UXO risk assessment the risk of encountering unexploded ordnance is considered to be **Low** for most of the construction activities proposed. However, UXO hazards should be included as part of the health and safety briefings and toolbox talks.
- 6.18 The possible exception to the above is the excavation of the sizable proposed basement. Given the considerable volume of ground disturbed by the excavation, the preliminary UXO risk assessment indicates that of such an encounter is increased to **Low-Medium**. Consequently it is recommended that a detailed UXO risk assessment is undertaken, in accordance with CIRIA C681, by a suitably qualified and experienced UXO specialist so as to enable this risk to be better understood.
- 6.19 A Geotechnical Design Report should be prepared, in accordance with Eurocode 7, once the ground investigation has been completed and final scheme details are known.

Environmental Conclusions and Recommendations

- 6.20 There are a number of potential sources of contamination at the site. Those identified comprise:
- Car parking on site;
 - Sub-station on site;
 - Fuel Tanks in former film studio grounds;
 - Below ground sewage tank (east of the site);
 - Above ground diesel fuel storage tank (north east of the site);
 - Gas/oil tank and unknown tanks in the car parking area in the south west of the site;
 - Generators in the south west of the site;
 - Areas of backfilling and Made Ground from historical demolition; and
 - Recycling Areas.

These present the potential for localised ground contamination which could require either localised treatment or removal from site. Each source should be individually investigated in line with a specified ground investigation.

- 6.21 Given the development history, and proposed end use, the site is considered to present a **Low-Medium** risk in relation to the potential presence of contamination issues.
- 6.22 A ground investigation is required in order to appraise the potential land contamination identified. This should be designed by a 'competent person' in accordance with BS 10175. The

investigation should provide general site coverage, target the potential sources of identified contamination and assess the underlying soil quality, groundwater quality and ground gas conditions. Ground gas monitoring should be undertaken in accordance with CIRIA Publication C665 with the provision for 3 to 6 monitoring visits. The Alluvium which may be present may contain organic material the presents elevated gas readings.

- 6.23 It is also recommended that the investigation considers waste issues as these can affect the development costs and options for soil recycling at the site. In view of the substantial basement proposed the opportunities to remove these soils in a sustainable and cost effective manner for the scheme should be considered at an early stage. Several options exist for soils recycling in this regard.
- 6.24 This Desk Study is considered sufficient to satisfy planning conditions relating to former site uses and provision of a preliminary risk assessment. It is likely that site investigation and reporting will be required in order to satisfy further planning condition(s) relating to land contamination.
- 6.25 The results of the further investigation should be reported within a Land Quality Statement for the site considering the requirements of current technical guidance (publications by the Environment Agency, NHBC and Eurocode 7) and the requirements of the NPPF or associated Planning Conditions. This report should include: a Generic Quantitative (Tier 2) Environmental Risk Assessment; revised Conceptual Site Model; recommendations for further assessments (if required); and, outline remedial and geotechnical recommendations. Land quality assessment is a phased process and it should be noted that further investigation, assessment and reporting may be required, dependent upon the findings of the Land Quality Statement.

APPENDIX**TECHNICAL REFERENCES**

Reference	Reference Title	Type
1	Geological Sheet 270 South London, Geological Survey of England and Wales (1:50,000)	Geological Map
2	Report Reference: 48975075_1_1	Envirocheck Report
3	Environment Agency Website [www.environment-agency.gov.uk]	EA Website
4	CIRIA Special Publication SP69: The Engineering Implications of Rising Groundwater Levels in the Deep Aquifer Beneath London.	CIRIA Report
5	HPA NRPB R920. Radon Atlas of England, 1996.	NRPB Radon Atlas
6	Bomb Sight Website [www.bombsight.org]	Bomb sight Website
7	CIRIA C681: UXO. A Guide for the Construction Industry. 2009.	CIRIA Publication
8	The Lost Rivers of London, N.J. Barton, 1982	Publication
9	Radon: Guidance on Protective Measures for New Buildings 2007. BRE Publication BR 211 BRE Publication BR 211.	BRE Publication
10	Consultation with the Building Control Officer of the London Borough of Richmond upon Thames.	Telephone conversation
11	Contaminated Land enquiry from the Scientific Officer of the London Borough of Richmond upon Thames.	Email
12	Petroleum search request from the London Fire and Emergency Planning Authority	Email

LIMITATIONS
Environmental & Geotechnical Interpretative Reports

1. This report provides available factual data for the site obtained only from the sources described in the text and related to the site on the basis of the location information provided by the client.
2. Where any data or information supplied by the client or other external source, including that from previous studies, has been used, it has been assumed that the information is correct. No responsibility can be accepted by CampbellReith for inaccuracies within this data or information. In relation to historic maps the accuracy of maps cannot be guaranteed and it should be recognized that different conditions on site may have existed between and subsequent to the various map surveys.
3. This report is limited to those aspects of historical land use and enquiries related to environmental matters reported on and no liability is accepted for any other aspects. The opinions expressed cannot be absolute due to the limit of time and resources implicit within the agreed brief and the possibility of unrecorded previous uses of the site and adjacent land.
4. The material encountered and samples obtained during on-site investigations represent only a small proportion of the materials present on the site. There may be other conditions prevailing at the site which have not been revealed and which have therefore not been taken into account in this report. These risks can be minimised and reduced by additional investigations. If significant variations become evident, additional specialist advice should be sought to assess the implications of these few findings.
5. The generalised soil conditions described in the text are intended to convey trends in subsurface conditions. The boundaries between strata are approximate and have been developed on interpretations of the exploration locations and samples collected.
6. Water level and gas readings have been taken at times and under conditions stated on the exploration logs. It must be noted that fluctuations in the level of groundwater or gas may occur due to a variety of factors which may differ from those prevailing at the time the measurements were taken.
7. Please note that CampbellReith cannot accept any liability for observations or opinions expressed regarding the absence or presence of asbestos or on any product or waste that may contain asbestos. We recommend that an asbestos specialist, with appropriate professional indemnity insurance, is employed directly by the client in every case where asbestos may be present on the site or within the buildings or installations. Any comments made in this report with respect to asbestos, or asbestos containing materials, are only included to assist the client with the initial appraisal of the project and should not be relied upon in any way.
8. The findings and opinions expressed are relevant to those dates of the reported site work and should not be relied upon to represent conditions at substantially later dates.
9. This report is produced solely for the benefit of the client, and no liability is accepted for any reliance placed upon it by any other party unless specifically agreed in writing.

APPENDIX A: FIGURES

Figure 2.1: Site Location Plan

Figure 2.2: Annotated Site Layout

Figure 2.3: Bomb Sight Plan

Site Photographs



Teddington Riverside

Client: Haymarket Media Group

Figure 2.1:
Site Location

1:20000@A4

Scale: 1:20000@A4
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 Job Number: 11477
 Drawn by - Checked by: KM - FD
 Drg No - Status/Revision: GIS001 - b
 File location: N:\11250 - 11499\11477 - Teddington Riverside\Workspaces (pdf in Outputs)
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 LONDON 020 7340 1700
 REDHILL 01737 784 500
 BRISTOL 0117 916 1066
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