



WorleyParsons

resources & energy

EcoNomics™

NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON

ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT

Arriva Bus Depot, Tottenham, London

51576-00

2 April 2013

Infrastructure & Environment Division

3-8 Redcliffe Parade West
Bristol, BS1 6SP
United Kingdom
Tel: +44 (0) 117 925 1304
Fax: + 44 (0) 117 9105 139
www.worleyparsons.com

© Copyright 2013 WorleyParsons Europe Limited



**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

PROJECT 51576-00 - ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT

**FILE LOC.: H:\CONTAMINATED SITES\PROJECTS\51576 TOTTENHAM nget si\report
si\draft\factual\text\tottenham nget_factual_draft 2013_03_25 mp.docm**

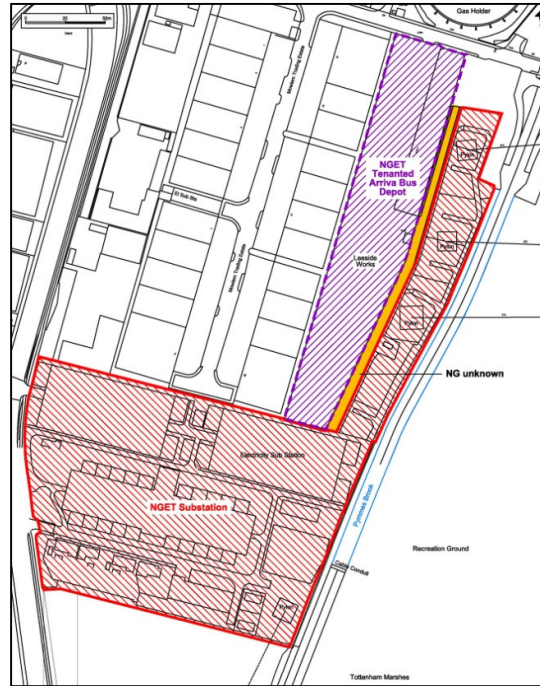
CONTROLLED COPY NUMBER:

REV	DESCRIPTION	AUTHOR	REVIEW	WORLEY- PARSONS APPROVAL	DATE
A	Draft	<u>H.Murdoch</u>	<u>S. Whittall</u>	<u>M.Pearce</u>	2/4/13
		<u> </u>	<u> </u>	<u> </u>	
		<u> </u>	<u> </u>	<u> </u>	
		<u> </u>	<u> </u>	<u> </u>	



**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

Reporting Insert



Study area for current report hashed in purple.

Site Address:	Arriva Bus Depot, Leaside Road, Tottenham, London, N17 0SG	NGP Document Tracking Code	
Report Title	ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT		
Report Type	Contamination	Retention Period	Indefinitely
Site Code	NA	Author (Company)	WorleyParsons
Report Date	2 April 2013	Factual/Interpretative	Factual
Draft/Final	Draft	H & S File?	No
Work Stage*	Site Investigation		
Brief description of contents	Summary of current site status, geology, hydrogeology and site history. Site investigation activities and summary of laboratory data.		
Access Permitted	NGPH Land Regeneration Team	NGPH Contact	Frank Evans



**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

Disclaimer

WorleyParsons has exercised reasonable skill, care and diligence to assess the information acquired during the preparation of this report, but makes no guarantees or warranties as to the accuracy or completeness of information provided by third parties. The information contained in this report is based upon, and limited by, the circumstances and conditions acknowledged herein, and upon information available at the time of its preparation. The information provided by others is believed to be accurate but cannot be guaranteed.

WorleyParsons does not accept any responsibility for the use of this report for any purpose other than that stated herein, and does not accept responsibility to any third party other than those identified in the Term Deed of Appointment dated 2012 for the use in whole or in part of the contents of this report. Any alternative use, including that by a third party, or any reliance on, or decisions based on this document, are the responsibility of the alternative user or third party.

Copying this report without the permission of NATIONAL GRID PROPERTY HOLDINGS or WorleyParsons is not permitted.



**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

EXECUTIVE SUMMARY

Site Location/ Description and Current Site Status	The study area is the National Grid Electricity Transmission (NGET) site located at Leaside Road, Tottenham, London, N17 0SG which is currently leased to Arriva for use as a bus depot, encompassing a driver training centre, bus repair garages, a bus wash, fuelling station, parking areas and administration buildings.
Site History	The site was formerly operated as Leaside Works a civil engineering plant depot, which appeared on maps from 1967. Several ponds, were also located on the southern portion of the site. The artificial pond was later labelled as a sludge pit. By 1991 the site was labelled only as Leaside Works. In addition the ponds were no longer present, presumably they had been filled and the building locations were changed to their current layout.
Geology and Contaminant Observations	Geology at site comprises made ground (1.2-4.0 m thick), alluvium (base at 3.8 to 5.5 mbgl), Kempton Park Gravels or River Terrace Deposits (base at 5.7 to 6.5 mbgl) and the London Clay (base depth unknown). Made ground is made up of gravelly sands, with some silt. Gravels comprised stone, concrete, brick, chalk (foul lime) and sandstone. Glass, wood, slag and clinker fragments were also observed. Tar staining, hydrocarbon odours and possible asbestos containing material were also noted. The alluvium comprised brown/grey silts and clays, with some sand and gravel. Frequent observations of tar within fissures and strong hydrocarbon odours were noted. The Kempton Park gravel consisted of grey and brown sandy gravel with some silt. Gravels are fine to coarse, angular to rounded and poorly sorted. Hydrocarbon odours and black staining were observed at some locations. London clay was stiff to soft, fissured, grey brown clay.
Hydrogeology and Contaminant Observations	Two groundwater-bearing zones were encountered at the site; one perched within the made ground and the other confined within the Kempton Park Gravel. The depth to groundwater in the made ground ranged from 8.61 to 9.37 mAOD and 6.87 and 8.37 mAOD within the Kempton Park Gravels. The groundwater flow direction in both aquifers is northward. The Kempton Park Gravel deposits are classified as a Secondary A aquifer. DNAPLs were observed in wells at the south of the site (BH12-01, BH12-02D, BH12-03 and WS12-01).
Hydrology	Three river courses are present within 250 m of the site, all located to east, including Pymmes Brook, the River Lea Navigation Channel and



**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

the River Lea. The water courses are all lined adjacent to the site,
however the River Lea ceases to be lined south east of the site.



**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

CONTENTS

1.	INTRODUCTION	1
1.1	Objectives	1
1.2	Report Format	1
1.3	Information Sources	2
2.	SITE INFORMATION.....	3
2.1	Surrounding Land Uses.....	3
2.2	Site Boundaries and Security	3
2.3	Site Topography	4
2.4	Ground Cover	4
2.5	Services	4
2.6	Plant and Equipment	5
2.7	Site Walkover Inspection.....	5
3.	GEOLOGICAL SETTING.....	7
3.1	Geology	7
3.2	Hydrogeology	7
3.3	Hydrology	8
3.4	Abstractions.....	8
3.5	Surface Water Discharges	9
3.6	Flood Risk.....	9
4.	ENVIRONMENTAL SETTING	10
4.1	General	10
4.2	Landfills	10
4.3	Licensed Waste Management Facilities (WMF).....	10
4.4	Permits.....	11
4.5	Health, Safety and Environment Reports	11
4.6	Registered Radioactive Sites	11
4.7	Sensitive Land Uses.....	11



**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

4.8	National Monuments and Archaeological Information.....	12
5.	SITE HISTORY	13
5.1	Site History - On and Surrounding the Site	13
5.2	Historical Structures and Plant	13
5.3	Pollution Incidents	14
5.4	Previous Site Investigations or Remediation Works	14
5.5	Possible Contaminants.....	14
6.	SITE INVESTIGATION METHODOLOGY	16
6.1	Site Investigation Works.....	16
6.1.1	Site Management	16
6.1.2	Underground Service Locations.....	16
6.1.3	Borehole Drilling and Monitoring Well Installations.....	16
6.1.4	Surveying	17
6.1.5	Chemical Analysis of Samples.....	17
6.2	Field and Laboratory QA/QC.....	18
7.	SITE INVESTIGATION FINDINGS.....	19
7.1	GROUND CONDITIONS.....	19
7.1.1	Visual and Olfactory Indications of Contamination	20
7.1.2	Chemical Analysis	21
7.1.3	Asbestos Analysis	21
7.2	Groundwater Observations	21
7.3	Surface Water Observations	22
8.	REFERENCES AND SOURCES OF INFORMATION	23
8.1	References	23
8.2	Contacts	24

Tables (in text)

TABLE A: SURROUNDING ENVIRONMENT	3
TABLE B: BOUNDARY INFORMATION – ARRIVA BUS DEPOT	4



**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

TABLE C: GROUND COVER (%).....	4
TABLE D: SERVICES	4
TABLE E: HYDROGEOLOGICAL SETTING	7
TABLE F: HYDROLOGICAL FEATURES.....	8
TABLE G: ABSTRACTIONS	9
TABLE H: WASTE	10
TABLE I: SENSITIVE LAND USES	11
TABLE J: POTENTIALLY CONTAMINATED LAND USES	14
TABLE K: POSSIBLE CONTAMINANT GROUPS – ON SITE.....	14
TABLE L: POSSIBLE CONTAMINANT GROUPS – OFF SITE	15
TABLE M: SUMMARY OF GROUND CONDITIONS	19
TABLE N: SURFACE WATER ELEVATIONS	22

Figures

FIGURE 1	SITE LOCATION PLAN SHOWING SURFACE WATER LOCATIONS
FIGURE 2	SITE LAYOUT AND SERVICES
FIGURE 3	HISTORICAL STRUCTURES
FIGURE 4	SITE INVESTIGATION LOCATIONS
FIGURE 5	SCHEMATIC GEOLOGICAL CROSS-SECTION A-A'

Tables (outside text)

TABLE 1	MONITORING WELL AND GROUNDWATER DATA
TABLE 2	GROUNDWATER FIELD PARAMETER DATA
TABLE 3	SOIL ANALYTICAL DATA: - PARTICLE SIZE DISTRIBUTION
TABLE 4	SOIL ANALYTICAL DATA - NATIONAL GRID SUITE
TABLE 5	SOIL ANALYTICAL DATA - ASBESTOS
TABLE 6	SOIL ANALYTICAL DATA - VOLATILE ORGANIC COMPOUNDS
TABLE 7	GROUNDWATER ANALYTICAL DATA
TABLE 8	NAPL ANALYTICAL DATA



**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

Plates

PLATE 1	SOIL ARISING FROM BH12-01
PLATE 2	DRILLING SET UP
PLATE 3	SOIL ARISING FROM BH12-04
PLATE 4	AREA BEHIND WORKSHOP
PLATE 5	UN-BUNDED TANKS BEHIND WORKSHOP
PLATE 6	FOOTBRIDGE OVER PYMMES BROOK
PLATE 7	FOOTBRIDGE OVER RIVER LEA NAVIGATION CANAL
PLATE 8	SOIL ARISING FROM WS12-02

Appendices

APPENDIX I	LANDMARK ENVIROCHECK REPORT
APPENDIX II	SERVICE PLANS
APPENDIX III	BOREHOLE LOGS AND MONITORING WELL INSTALLATION DETAILS
APPENDIX IV	TOPOGRAPHIC SURVEY
APPENDIX V	LABORATORY DATA
APPENDIX VI	QUALITY ASSURANCE AND QUALITY CONTROL



**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

1. INTRODUCTION

WorleyParsons was retained by National Grid Property Holdings Ltd (NGPH) on behalf of National Grid Electricity Transmission (NGET) to conduct an environmental assessment of the NGET owned land at Leaside Road, Tottenham, London, N17 0SG which is currently leased to Arriva for use as a bus depot. The site location is shown on Figure 1.

The site is currently used as a bus depot by Arriva, encompassing a driver training centre, bus repair garages, a bus wash, fuelling station, parking areas and administration buildings.

The site was formerly operated as Leaside Works a civil engineering plant depot, which appeared on maps from 1967. Several ponds, which appear both natural and artificial, were also located on the southern portion of the site. The artificial pond was later labelled as a sludge pit. By 1991 the site was labelled only as Leaside Works. In addition the ponds were no longer present, presumably they had been filled and the building locations were changed to their current layout.

1.1 Objectives

The site was recently acquired by NGET for future redeveloped to support overhead line upgrades in the area associated with the current transmission substation located to the south of the site. Therefore the focus of this investigation was to provide information as to the current environmental risks from contaminated soil and groundwater at the site and to assist in the development of a remediation program, if required.

The assessment has been carried out in accordance with NGPH Assessment and Remediation Core Specification (NGPH, February 2012), 'Model Procedures for the Management of Land Contamination', CLR 11 and WorleyParsons' proposal dated 30 September 2012 (WorleyParsons, 2012).

1.2 Report Format

The report is subdivided as follows:

Section 1	Introduction
Section 2	Site information – location, current use, ground conditions etc
Section 3	Summary of regional geological, hydrogeological and hydrological conditions
Section 4	Environmental setting – summarises surrounding land uses and potentially contaminative or sensitive sites.
Section 5	Site history – Relating to the sites former land use, former site investigations and environmental incidents.
Section 6	Site investigation methodology – investigative techniques and



**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

analytical analysis.

Section 7

Site investigation findings – observations and laboratory analysis

Section 8

References and contacts.

Supporting information is included in Figures, Plates, Tables and Appendices following the main text of the report.

1.3 Information Sources

No previous environmental investigations are known to have been completed at the site, as no reports were made available to WorleyParsons during the Desk Study portion of this assessment. During the present site investigation however, several historical sampling points were identified at the site. It is unknown when these were completed and for what purpose.

A Landmark™ survey was completed to collect relevant environmental information related to the site and surrounding areas. This information is presented in Appendix I and also summarised within this report where appropriate.

Additional information used in the compilation of this report (with contacts, where applicable), is listed in Section 8.



**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

2. SITE INFORMATION

The site forms an approximately rectangular parcel of land located approximately 480 m from Northumberland Avenue Station northeast of Tottenham Town Centre. The site is located at Leaside Road, Tottenham, London, N17 0SG. The National Grid Reference is 535337,191410 and the site has an approximate area of 1.21 ha.

The site is leased by Arriva and used as a bus depot, encompassing a driver training centre, bus repair garages, a bus wash, fuelling station, parking areas and administration buildings. A wine merchant and privately run cafe are also present at the site.

The site comprises a long rectangular two storey brick warehouse and office building along the north eastern boundary, a bus repair garage just south of this building, a bus wash on the west side of the site and a fuelling station just north of the bus wash. The remainder of the site is used for car parking with southern areas used for parking buses and bus driver training.

The location of the site and the site layout are shown on Figures 1 and 2, respectively.

2.1 Surrounding Land Uses

Table A below provides information on the area surrounding the site.

Table A: Surrounding Environment

Land use to the North	Immediately north of the site is IKEA Superstore and the Leaside Road gasholder site owned by NGG. Further north are various retail parks and trading estates and the A406 north circular road.
Land use to the South	Tottenham Marsh Electricity Transformer Station operated by NGET and Tottenham Marshes park.
Land use to the East	The NGET transmission station borders the site to the east and immediately beyond is Pymme's Book, Tottenham Marshes parkland, the River Lee, River Lee Flood Relief Channel and Banbury Reservoir.
Land use to the West	Commercial/industrial units at Mowlem Trading Estate along Watermead Way.

2.2 Site Boundaries and Security

Table B below details the boundaries surrounding the Bus Depot land.



**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

Table B: Boundary Information – Arriva Bus Depot

	North	South	East	West
Type	Palisade fencing and gate access	Palisade fencing	Palisade fencing	Palisade fencing
Approx. Height (m)	2.5 m	2.5 m	2.5 m	2.5 m
Approx. Length (m)	45 m	35 m	245 m	240 m

2.3 Site Topography

The site is generally level at an average elevation of approximately 10 mAOD with a very slight incline to the south.

2.4 Ground Cover

Table C below summarises the surface cover at the site. The site is entirely covered with hardcover and or buildings, no areas of permeable surface cover were observed.

Table C: Ground Cover (%)

Hard Cover	Gravel	Vegetation	Buildings	Bare Ground
80%	0%	0%	20%	0%

2.5 Services

The location of underground site services as shown on plans provided by the statutory undertakers, are provided in Figure 2. Service plans provided by individual suppliers are available in Appendix II. A summary of identified services is provided below in Table D.

Table D: Services

Gas	Low pressure gas mains are present north of the site along Leaside Road and to the west of the site along the access road in Mowlem Trading Estate. It is presumed that gas pipes also feed the administration building on site, however it is not known where these enter the site.
Electricity	Several high voltage overhead and underground lines are present east of the site within the substation boundary and to the east.



**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

Water	Water mains are present to the north of the site along Leaside Road. Water mains are also present along the access road to Mowlem Trading Estate located to the west of the site.
Foul Sewer	Foul/combined sewers are present north of the site along Leaside Road.
Surface Drainage	There are several surface drains across the site, but many of them are blocked. Surface drainage on-site is not well managed as many areas have frequent water pooling. A site drainage plan was not available.
Telecom	Telecommunication lines enter the site at the north entrance and are located parallel to the administration building then cross the site and follow the west fence line until they exit at the southwest corner of the site. Telecommunication lines are also present along Leaside Road and within the adjacent Mowlem Trading Estate.

2.6 Plant and Equipment

The bus depot contains a refuelling station adjacent to the bus wash located along the western boundary of the site. Barrel storage for various automotive fluids used for bus maintenance and repair is also present in this area. No secondary containment was observed in this area. No other active above plant or equipment is known to be located at the site.

2.7 Site Walkover Inspection

A site walkover was carried out in conjunction with the site investigation works. Photographs are provided in the Plates section. The following indications of potential sources were noted, in addition to the plant listed in Section 2.6:

- Minor evidence of oil and hydrocarbon staining was prevalent across the site, typically from bus repairs being completed in the yard or derelict buses being left in place for extended periods of time.
- Moderate evidence of oil and hydrocarbon staining was observed around the bus wash, barrel storage and the garage, while the most noticeable staining was observed behind the garage (Plate 5). Waste oil drums are stored behind the garage and are frequently left uncovered. During periods of rainfall spillage from these waste containers is likely.
- No apparent remedial measures have been completed to mitigate or clean up any spills.

Potential receptors observed during the site visit included:

- Numerous workers and visitors are present at the site during regular working hours. Jobs vary from working outside in the yard, work completed in the garage and office based positions in the administration/training building.



**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

- Commercial and light industrial land is located adjacent to the site, with a trading estate to the west, presumably utilised by workers within the adjacent buildings.
- Three water courses are located down-gradient of the site, Pymmes Brooks, the River Lea Navigation Canal and the River Lea in order of increasing distance from the site. All of these water courses were observed to be channelised east of the site, however south of the site the River Lea was not channelised.



**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

3. GEOLOGICAL SETTING

3.1 Geology

The sites geological setting has been reviewed with reference to the Envirocheck Landmark Report and digital British Geological Society (BGS) mapping tools

<http://mapapps.bgs.ac.uk/geologyofbritain/home.html> and <http://www.environment-agency.gov.uk/>.

The anticipated geological sequence comprises made ground, alluvium, Kempton Park Gravels or River Terrace Deposits and the London Clay. A very shallow thickness of alluvium is anticipated below any made ground, particularly across eastern areas in proximity to the River Lea. This would typically comprise soft to firm consolidated, compressible silty clay, but can contain layers of silt, sand, peat and basal gravel. The anticipated thickness of this unit is 1 to 2 m where present. The Kempton Park Gravel comprises variable sands and gravel, locally with lenses of silt clay or peat and is expected to range in thickness from 2 to 3 m. The London Clay formation is typically a grey fine sandy, silty clay/clayey silt. It is Glauconitic at its base with weathered brown upper horizons. Anticipation depth to the top of the formation is 7 mbgl.

3.2 Coal Mining and Mineral Workings

The Envirocheck identifies that the site is not in a coal mining or mineral mining affected area. A BGS mineral site is located approximately 562 m from the site that status is 'ceased'. The commodity was identified as sand and gravel.

3.3 Hydrogeology

Table E below summarises the hydrogeological setting and aquifer status of the site:

Table E: Hydrogeological Setting

Formation	EA Aquifer Classification	Aquifer Vulnerability	Flow Direction
Superficial Deposits (Enfield Silt & Kempton Park Gravels)	Secondary A Aquifer	Soils of high leaching potential, high vulnerability	Likely to be east to southeast towards River Lea
London Clay Formation	Unproductive Strata	N/A	N/A

The site is located within an inner zone 1 groundwater Source Protection Zone (SPZ). The site also falls within a Nitrate Vulnerable Zone.



**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

3.4 Hydrology

The Envirocheck Report identifies several surface water features within 1 km of the site. Table F below provides a summary of the identified hydrological features:

Table F: Hydrological Features

Water Feature	Distance From Site (m)	GQA Classification	Comments
Pymme's Brook	25	River Quality D	Flow less than 0.31 cumecs. The water course is channelised. Pymmes Brook discharges to the River Lea.
River Lea Flood Relief Channel (River Lea Navigation Canal)	240	River Quality D	Flow less than 2.5 cumecs. Monitoring point at Kings weir – Tottenham Lock. The water course is channelised.
River Lea	250	River Quality A	Flow less than 5 cumecs. Monitoring point at Kings weir – Tottenham Lock. The water course is channelised adjacent to the site.
Banbury Reservoir	360	-	East of site
Lockwood Reservoir	530	-	South of site

The three river courses were observed to be channelised perpendicular to the site during the site visit, however south of the site the River Lea was not channelised.

London averages a total precipitation of 557.4 mm of rain a year with average monthly precipitation ranging from 61.1 mm (October) to 34.6 mm (July) (Met Office, <http://www.metoffice.gov.uk/public/weather/climate/?tab=climateTables>).

3.5 Abstractions

The Envirocheck report identifies eight groundwater abstractions within 500 m radius of the site. Three entries relate to the groundwater remediation undertaken at the adjacent Willoughby Lane former gasworks site and four entries relate to the North London Artificial Recharge Scheme (NLAR).

Table G below summarises the identified abstractions:



**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

Table G: Abstractions

Direction From Site	Source of Abstraction	Distance from Site (m)	Abstraction Rate (m³.day⁻¹)	Use of Abstraction
West	Groundwater	322	Not Identified	Laundry Use
Northwest	Groundwater – Kempton Park Gravels	456	Not Identified	42 boreholes. Pump & Treat: Pollution Remediation. No longer active
Southwest	Groundwater - Chalk	494	275,000 (figure for 1995 subsequent years not provided. It is assumed this figure is for the array of wells in the area not a single well)	NLAR Park Well Point 26. Potable Water Supply – Direct.

3.6 Surface Water Discharges

The Envirocheck Report identifies one discharge consent located within 500 m of the site. This relates to a revoked sewage discharge to land consent 488 m northwest of the site.

3.7 Flood Risk

The site is identified in an area classified as Zone 2 – Extreme flooding from rivers or sea without defenses.

The chance of flooding each year is greater than 1.3 % (1 in 75) (EA, 2012).



**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

4. ENVIRONMENTAL SETTING

4.1 General

Details of the site's environmental setting including potentially contaminative surrounding land use are provided below. Information has been taken from the Landmark Envirocheck plan where applicable.

4.2 Landfills

The Envirocheck report did not identify any known operating or historical landfills within 500 m of the site.

4.3 Licenced Waste Management Facilities (WMF)

The Envirocheck Report 2012 has identified 20 licenced waste management facilities within 1 km of the site. Table H below summarises the identified waste management facilities within 500 m of the site.

Table H: Waste

Facility or Site Name/Owner	Distance From Site (m)	Type of Waste (Site Category)	Dates of Operation
London Restoration (Civil Engineering) Ltd, Leaside Road.	11 northeast	Household, Commercial and Industrial Transfer Stations	1992 – 2008
Deery Construction, Leaside Road.	30 northeast	Physical Treatment Facilities	1993 – unknown
V H E Construction Plc, Leaside Road	30 northeast	Physical Treatment Facilities	1993 – 2005
Hales Waste Control Ltd, 81 Garman Road	219 northwest	Household, Commercial and Industrial Transfer Stations	1992 – unknown
Biffa Waste Services Ltd, 81 Garman Road	219 northwest	Household, Commercial and Industrial Transfer Stations	1992 – unknown
Environmental Tyre Disposal Ltd, Phoenix Warf	454 northeast	Transfer Stations Taking Non-biodegradable Waste	1996 – 2004
Environmental Tyre Disposals Ltd, Phoenix Warf	493 northeast	Physical Treatment Facilities	2004 – unknown



**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

4.4 Permits

The Envirocheck report identified no Integrated Pollution Controls (IPC) and Integrated Pollution Prevention and Control (IPPC) sites within 500 m of the site. The closest IPPC permit is located 657 m northeast of the site and is registered to Pure Fuels Limited.

4.5 Health, Safety and Environment Reports

The Envirocheck report identifies two Control of Major Accident Hazards sites (COMAH) within 500 m of the site boundary. The closest COMAH site is the gasholder site located 44 m north and registered to National Grid Gas Plc.

4.6 Registered Radioactive Sites

The Envirocheck report does not identify any registered radioactive sites within 500 m of the site.

4.7 Sensitive Land Uses

There are five sites of ecological sensitivity located within a 500 m radius of the site. Table I summarises the areas deemed sensitive below:

Table I: Sensitive Land Uses

Authority / Source	Distance From Site (m)	Direction From Site	Type of Sensitivity (Site Category)
London Borough of Haringey	24 m	Southeast	Areas of Adapted Green Belt
London Borough of Waltham Forest	286 m	East	Areas of Adapted Green Belt
London Borough of Enfield	292 m	East	Areas of Adapted Green Belt
Department of Environment, Food, and Rural Affairs	-	-	Nitrate Vulnerable Zone, aquifer underlying the site
Natural England	469 m	South	Lea Valley – Ramsar Site, Site of Special Scientific Interest, Special Protection Areas

Following the site walkover no additional ecological receptors (besides those discussed above), as defined in Part IIa of the Environmental Protection Act (1990), were identified within the vicinity of the site.



**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

4.8 National Monuments and Archaeological Information

A review of available information provided in the National Monuments Archive has identified no national monuments or identified archaeological sites, on or with 250 m of the site boundary.



**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

5. SITE HISTORY

A review of the site's historical development has been conducted based on historical Ordnance Survey (OS) plans contained within the Envirocheck included in Appendix I. A summary of historical structures identified at the site is provided in Figure 3.

5.1 Site History - On and Surrounding the Site

The historical maps available from circa 1868 to 1920 show the site and surrounding area to be undeveloped open fields. A drainage ditch bisects the site itself. Pymme's Brook is shown to run adjacent to the eastern edge of the site.

The 1935 map shows the first appearance of the gasholder located directly north of the site. A small pond is present on the southern end of the site in the maps and aerial photographs from 1935 through 1967.

An aerial photograph from circa 1945-1950 shows possible aboveground storage tanks at the adjacent land to the northeast. Several subsequent maps through to 1991 label this area as 'tanks'.

The 1956 map, shows an area to the northwest of the site labelled as 'Leeside Depot'. Significant change to this area does not occur until 1967 when the depot appears to expand along the entire western edge of the site.

The 1967 map also shows the site itself divided into two distinct north-south areas. The northern section of the site is labelled 'Leeside Works'. Two ponds make up the southern portion of the site. An 'Electricity Transfer Station' is present adjacent to the southern boundary.

The southern of the two ponds is no longer identified on the 1974 map and the more northern of the two ponds is now labelled as a 'Sludge Pit'.

The 1991 map shows a number of rectangular buildings within the site boundaries. The building located in the north eastern corner of the site in the 1991 map is also noted in the 2006 and 2012 1:10,000 maps. The 1:10,000 maps from 2006 and 2012 show the current long rectangular building in the north eastern corner. A very small square building located just south of the rectangular building is the only other noted feature on site in these maps.

5.2 Historical Structures and Plant

The site itself has been a depot and civil engineering works for a significant portion of the twentieth century. Furthermore there is potential for infilled ground from the former onsite pond, sludge lagoon and drainage ditch.

The site is located in a current and historically industrial area, with former gasworks, chemical works and electricity transfer station located off site to the north, northwest and southeast, respectively. Above ground storage tanks may also have been present on the adjacent site to the northwest. A site plan provided by National Grid identified a tank on-site adjacent to the eastern site boundary and located south of the current bus garage.



**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

A summary of historical structures or features on site with the potential to cause significant ground contamination is provided in Table J.

Table J: Potentially Contaminated Land Uses

Description	Years Observed		Location
	From:	To:	
Infilled Pond	1956	1967	South
Pond (Later Sludge Pit)	1967	1974	Central
Works (Civil Engineering Depot)	1967	1977	North half of site
Bus Garage	1991	Present	Northeast
Fuel tank	1991	Present	West central
Former tank (see below)	unknown	unknown	East central

Very little information is known about the former tank onsite, as it is only identified on a figure dated 21 August 2012 supplied by National Grid. Based on the figure supplied the probable dimensions of the tank were 6 m by 4 m. The period it was present on site and possible contents are unknown.

5.3 Pollution Incidents

The Envirocheck report identifies five recorded pollution incidents within 500 m of the site boundary.

The closest incident was located 77 m north-east of the site and occurred in 1989. This related to a miscellaneous pollutant and was classed as a minor category 3 incident.

5.4 Previous Site Investigations or Remediation Works

No previous environmental investigations are known to have been completed at the site, as no reports were made available to WorleyParsons during the Desk Study portion of this assessment. During the present site investigation however, several historical sampling points were located at the site. It is unknown when these were completed and for what purpose.

5.5 Possible Contaminants

Table K summarises potential contaminant groups based on previous and current on-site activities:

Table K: Possible Contaminant Groups – On Site

Source	Possible Contaminant Groups
Sludge Pit	The sludge pit may have been infilled with a variety of materials from industrial sites within the local area. If the pit was associated with sewage sludge metals and ground gases are likely to be the primary



**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

contaminants.

Common contaminants include metals, total petroleum hydrocarbons (TPH), poly aromatic hydrocarbons (PAH) and asbestos.

Garage /
Workshop/Fuel Tank TPH, PAH, volatile organic hydrocarbons (VOCs) and asbestos.

Table L summarises potential contaminant groups based on previous and current off site activities:

Table L: Possible Contaminant Groups – Off Site

Source	Location	Possible Contaminant Groups
Gasworks and chemical works	North of site	TPH, PAHs, phenols, metals, cyanides, sulphates
Electricity Transfer Station	South of site	TPH, PCBs, metals
'Depot' Land	West of site	TPH, metals



**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

6. SITE INVESTIGATION METHODOLOGY

6.1 Site Investigation Works

6.1.1 Site Management

Suitably experienced WorleyParsons staff, using approved sub-contractors, supervised the investigation. The investigation was carried out in accordance with Construction (Design and Management) Regulations, 2007. A site and task-specific health and safety plan was prepared and used, and incident response measures were formulated and implemented.

WorleyParsons undertook the main investigation between 7 January and 22 January 2013. A topographic survey was completed on 23 January 2013. The first and second rounds of groundwater monitoring were completed on 14 February and 27 and 28 February 2013, respectively. Site investigation locations were agreed with Arriva staff, and where required were relocated to work around site operations.

6.1.2 Underground Service Locations

Prior to the commencement of intrusive works, utility service clearance was undertaken across the site. Underground services were located using utility plans supplied by the respective utility supply companies and by visual inspection of manholes and scanning using signal generators and detectors. Where a signal was detected the locator marked the route using spray paint. The utility clearance plans were put onto a compositional figure.

In addition to the utility service clearance a further service check was undertaken prior to the intrusive works. A cable avoidance tool (and signal generator, where appropriate) was used, by suitably qualified personnel, to clear each borehole location. Starter pits were excavated by hand to a minimum of 1.2 m below ground level (m bgl).

Utility service locations are shown in Figure 2, and the original drawings provided by the utility companies are provided in Appendix II.

6.1.3 Borehole Drilling and Monitoring Well Installations

Fourteen boreholes were drilled as part of the investigation. Twelve of these boreholes were converted to groundwater monitoring wells. Six were installed within the Kempton Park Gravels and were identified as BH12-01, BH12-02D, BH12-03, BH12-04, BH12-05 and BH12-06. The remaining six were installed within the made ground and identified as WS12-01, WS12-02, WS12-03, WS12-06, WS12-07 and WS12-08. WS12-04 and WS12-05 were drilled as shallow boreholes only. Several attempts (BH12-02, BH12-02A, BH12-02B and BH12-02C) at BH12-02D were completed before its successful advancement to depth. These initial attempts encountered obstructions and/or asbestos and were therefore relocated.

Intrusive drilling works were carried out by CC Ground Investigations Ltd. using a combined percussive sampling/rotary coring rig and dynamic window sampler.



**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

During drilling, the geology was logged from returned cores, in accordance with BS5930:2011 and BS EN ISO 14688, and any evidence of contamination was recorded. Monitoring well logs are included in Appendix III. Drilling equipment was jet-washed between each borehole as required.

Each groundwater monitoring well was completed using 50 mm internal diameter, 0.75 mm slotted, high density polyethylene (HDPE) screen. The slotted well screen was surrounded with 1-3 mm gravel. A hydraulic seal of hydrated bentonite pellets was placed above the gravel pack. This prevents the well annulus acting as a conduit for potential surface contamination migrating into deeper strata. The monitoring wells were capped at surface using flush steel covers. Completion details for monitoring wells installed are shown in Table 1.

After a minimum wait of 48 hours the wells were then developed by purging six volumes of the screened well.

The wells were sampled on two occasions; 14 February 2013 and repeated on the 27 and 28 February 2013. Low flow sampling method was used. Water quality parameters were taken during the purging and after sampling to ensure that a representative sample was collected (Table 2). Wastewater generated during the purging and sampling was decanted into IBCs.

6.1.4 Surveying

Following the completion of the intrusive works, John Vincent Surveys Limited surveyed all site investigation locations. Nearby water courses were also surveyed to obtain location and water elevation data for comparison with shallow groundwater elevations observed at the site. The surveyed locations of the monitoring wells and boreholes are provided in Figure 4. Surface water features surveyed are shown on Figure 1. Survey data is provided in Appendix IV.

6.1.5 Chemical Analysis of Samples

Soil and groundwater samples were sent to Jones Environmental for chemical analysis, a UKAS and MCERTs accredited laboratory. The laboratory is audited and approved by WorleyParsons. Details concerning the analytical methods and analyses requested are given in Appendix V.

Fifty soil samples were collected from the boreholes (including duplicates) and were scheduled for laboratory analysis.

The sampled soils were scheduled for a combination of the following contaminants:

- National Grid Property Holdings Suite on 39 samples (including duplicates);
- speciated Total Petroleum Hydrocarbons (TPH CWG) on 20 samples including aromatic/aliphatic banding;
- asbestos screen on 18 samples;
- asbestos characterisation on 11 samples;
- particle size analysis on three samples;



**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

- volatile organic carbon on six samples; and
- fraction of organic carbon (FOC) on 10 samples.

Twenty-three groundwater samples (including duplicates and a trip blank) were collected from installed monitoring wells across two monitoring rounds. Groundwater samples were scheduled for the following contaminants:

- National Grid Property Holdings Suite on 15 samples (including duplicates);
- speciated Total Petroleum Hydrocarbons (TPH CWG) including aromatic / aliphatic banding;
- hardness, and;
- volatile organic compounds (VOCs).

Insufficient sample was collected from WS12-08 during the second round of monitoring, thus the analytical schedule only included BTEX, TPH CWG and hardness.

Non-aqueous phase liquids (NAPLs) were also sampled from two wells (BH12-01 and BH12-03) and submitted for product analysis.

6.2 Field and Laboratory QA/QC

QA/QC analysis has been performed on duplicate samples taken during the investigation. All data relating to this can be found in Appendix VI.



**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

7. SITE INVESTIGATION FINDINGS

7.1 GROUND CONDITIONS

Observed soils and geology has been logged in accordance with the requirements of BS5930:2011 and BS EN ISO 14688 Part 1. Borehole logs can be found in Appendix III. A summary of the ground conditions identified during the investigation is given below.

The WorleyParsons site investigation encountered the following geological succession beneath the site. The superficial deposits comprised alluvium (clays and silts) and River Terrace Deposits (sands and gravels). The bedrock was London Clay (fine clay).

The observed ground conditions are summarised below in Table M.

Table M: Summary of Ground Conditions

Description of Stratum	Thickness (m)	Depth to Base (m bgl)
MADE GROUND: gravelly sands, with some silt. Gravels were fine to coarse grained and ranged from sub-angular to sub-rounded. Gravels comprised stone, concrete, brick, chalk (foul lime) and sandstone. Glass, wood, slag and clinker fragments were also observed. Concrete obstructions were encountered in several locations within the made ground. Tar staining, hydrocarbon odours and possible asbestos containing material were also noted.	1.2 to 4.0	1.2 to 4.0
ALLUVIUM: brown/grey silts and clays, with some sand and gravel. Silts and clays ranged from soft to very stiff. Gravel content tended to increase with depth where present. Frequent observations of tar within fissures and strong hydrocarbon odours were noted. Gastropod shells and roots/stems (organic material) were also observed in some locations within the alluvium.	1.4 to 3.7	3.8 to 5.5
KEMPTON PARK GRAVELS (RIVER TERRACE DEPOSITS): grey and brown sandy gravel with some silt. Gravels are fine to coarse, angular to rounded and poorly sorted. The gravel is made up of fragments of flint, quartz and sandstone. Sandy matrix is medium to coarse grained. Hydrocarbon odours and black staining were observed at some locations.	0.95 to 2.25	5.7 to 6.55



**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

Description of Stratum	Thickness (m)	Depth to Base (m bgl)
LONDON CLAY: stiff to soft, fissured, grey brown clay.	>0.65	Unknown

A cross-section along the site, running north-south is shown in Figure 5. The thickness of the made ground is variable across the site and typically is thinner near the centre of the site (1.2 – 1.4 m) and thicker towards the north and south ends of the site (up to 4.0 m thick). The base of the made ground profile in the southern portion of the site correlates well with historical ponds in the area which were likely in-filled.

The top profile of the Kempton Park Gravels and base of the alluvium has some variation across the site as shown in Figure 5. The top of the London Clay is fairly consistent across the site, generally varying 0.5 m with no consistent dip observed.

Particle size distribution analysis was completed on three samples from the site; one from the alluvium and two from the Kempton Park Gravels. The analysis of BH12-05 (5.5 m) and WS12-02 (4.3 m) found that the samples contained 82.5 % and 90.8 % gravel, respectively. Both of these samples were collected from the Kempton Park Gravels. The sample collected from the alluvium, BH12-05 (2.8 m) comprised 47.8 % silt and 48.3 % clay. Results can be found in Table 3.

Fraction of organic carbon was analysed in several samples with variable results. Variably was due to differing soil types, as samples were collected from made ground, alluvium and the London Clay. The highest values were reported within the made ground, then the alluvium, then the London Clay. Results can be found in Table 4.

7.1.1 Visual and Olfactory Indications of Contamination

Several boreholes completed in the southern area of the site (BH12-01, BH12-02D, BH12-03, WS12-01 and WS12-02) had observed hydrocarbon odours and staining specifically within made ground, the alluvium and the Kempton Park Gravels. Contaminants noted in the made ground were observed either through the entire section of made ground or localised to the base of the made ground. Contaminants were observed through the whole of the alluvium and in some cases extended down into the Kempton Park Gravels. Free phase hydrocarbons were observed within the fissured alluvium with associated strong hydrocarbon odours.

Visual and olfactory evidence of hydrocarbon contaminants were also observed at the boreholes completed south of the service garage and workshop, in the vicinity of the potential former tank (BH12-04 and WS12-06). Similarly contamination in the form of black staining and hydrocarbon odours was noted within made ground and the fissured alluvium in these locations.

No evidence of contamination was observed at boreholes BH12-05 and WS12-08, located along the western side of the site directly west from the workshop and office buildings.

The two borehole locations completed at the north end of the site (BH12-06 and WS12-07) exhibited evidence of hydrocarbon contaminants, with a sickly sweet hydrocarbon odour and



**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

staining observed within the made ground, alluvium and upper sections of the Kempton Park Gravels.

7.1.2 Chemical Analysis

Results from laboratory analysis of soils at the site are provided in Appendix V and summarised in Tables 3 to 6. Due to the high concentrations of contaminants encountered at the site several analysis could not be completed under United Kingdom Accreditation Service (UKAS) or could not be completed at all. This was due to several factors, including asbestos containing material being present in the sample and results coming in outside of calibration range due to high concentrations and requirements for significant dilutions. The full laboratory reports are available in Appendix V where these samples are identified.

7.1.3 Asbestos Analysis

Eighteen soil samples were submitted for asbestos screening analysis by Jones Analytical Laboratories (Table 5). Chrysotile fibres were reported in 13 of the samples. The remaining five samples did not have asbestos detections. Of the 13 samples confirmed to contain asbestos 11 were then run for asbestos characterisation and found to contain primarily amosite asbestos with one sample containing anthophyllite asbestos.

During the site investigation, possible asbestos containing material was noted in BH12-02B and BH12-02C while completing the hand pits. These locations were backfilled and abandon to prevent unnecessary exposure to the potential asbestos containing material.

7.2 Groundwater Observations

Monitoring wells were screened in the made ground or Kempton Park Gravels. Groundwater elevation data is presented in Table 1. The groundwater elevation in the made ground ranged between 8.61 and 9.37 mAOD and 6.87 and 8.37 mAOD in the Kempton Park Gravels.

Based on the groundwater elevations there were two groundwater zones observed at the site. The water in the made ground is perched above the underlying alluvium, which is also acting to confine the groundwater in the Kempton Park Gravels.

Several groundwater monitoring wells had observed NAPLs across the site. A significant portion of NAPLs observed were dense-NAPLs (DNAPLs). Some light-NAPLs (LNAPLs) as well as intermediate-NAPLs were also observed. Generally NAPLS observed were highly viscous, and dark brown to black. DNAPLs were found in wells at the south of the site (BH12-01, BH12-02D, BH12-03, WS12-01). During the second round of monitoring approximately 40 cm of DNAPL was observed in BH12-03, equating to approximately 25 cm of DNAPL within the Kempton Park Gravels (based on the completion of the well). Similarly BH12-01 had approximately 1.5 m of DNAPL during the second round of monitoring; however the NAPL was not continuous. Based on the completion of this monitoring well, that would mean approximately 1.2 m of DANPL was present within the Kempton Park Gravels at this location. Only trace NAPL were observed in BH12-02D and WS12-01,



**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

BH12-01 (second round) was not sampled due to the presence of NAPL. NAPL samples were collected from BH12-01 (first round) and BH12-03 and analysed for the probable NAPL type (Table 8). The NAPL type was reported as coal tar PAHs in each case.

Due to the shape of the site and the groundwater well alignment putting all locations along a single line, clear triangulation of a groundwater direction was not possible. Generally groundwater elevations were found to be highest at the south of the site and lowest at the north, therefore groundwater flow is likely in some northward (north, north-west or north-east) direction.

7.3 Surface Water Observations

Three surface water receptors are present east of the site; Pymmes Brook, the River Lea Navigation Canal and the River Lea. The water levels were measured as part of the topographic survey and are summarized below in Table N:

Table N: Surface Water Elevations

Location	Surface Water Elevation (mAOD)
Pymmes Brook	7.35
River Lea Navigation Canal	10.07
River Lea	7.00

Each location surveyed is shown in Figure 1. The three surface water bodies are all channelised. The River Lea becomes un-channelised south of the site. Groundwater surface elevations are at a similar depth as those measured in Pymmes Brook and the River Lea. The water courses all flow south toward the River Thames.



**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

8. REFERENCES AND SOURCES OF INFORMATION

8.1 References

British Geological Society	2012	http://mapapps.bgs.ac.uk/geologyofbritain/home.html and http://www.environment-agency.gov.uk/
Environment Agency	2012	What's in my Backyard? Flood Risk: http://maps.environment-agency.gov.uk/wiyby/wiybyController?x=533500.0&y=190500.0&topic=floodmap&ep=map&scale=9&location=Tottenham,Haringey&lang=_e&layerGroups=default&distance=&texonly=off
Landmark Information Group	2012	Envirocheck Report [Order number 42109772]
Met Office	2012	(data from Greenwich weather station; http://www.metoffice.gov.uk/public/weather/climate/?tab=climateTables
National Grid Property Holdings Ltd.	2012	Assessment and Remediation Core Specification (Version 2.0).
WorleyParsons	2012	Tottenham – Arriva Bus Depot Proposal 20 September 2012
UK Government	1990	Environmental Protection Act
UK Government	2007	Construction Regulations



**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

8.2 Contacts

Site Location	Arriva Bus Depot Leeside Road, Tottenham London, N17 0SG	
Client	National Grid Property Holdings National Grid House Warwick Technology Park Gallows Hill, Warwick, CV34 6DA	Contact name: Charles Humphries (Frank Evans) Charles.Humphries@nationalgrid.co.uk Mobile: 07500 868 623 Contact name: Amanda Pritchard (NGET) Mobile: 07836 667 360
Consultant / Principal Contractor	WorleyParsons First Floor Parkview, Great West Road Brentford, Middlesex, TW8 9AZ	Project Manager: Sam Thrupp Telephone: 0208 121 1892 Mobile: 07917 335 021 Site Supervisor: Sam Martin Mobile: 07979500938 HSSE Advisor: Phil Harrison Telephone: 0208 231 7342 Mobile: 07766 164 654
CDM Co-ordinator	RSK Anerley Court, Half Moon Lane, Hildenborough, Tonbridge, Kent, TN11 9HU	Contact name: John Robinson Mobile: 07802828667
Public Relations	JPB Public Relations	Contact name: Kirsty Anderson Telephone: 0117 907 3400 Mobile: 07702 384 985 Contact name: Nicola Beach Telephone: 0117 907 3400 Mobile: 0117 907 6513



**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

Plant Protection	National Grid	Contact name: John Reynolds Mobile: 07970674142
Electricity Transmission overhead lines (Plant Protection)	National Grid	Contact name: Elon Stuart Mobile: 07798 742220
Plant Hire Service Tracing and Equipment	CC Ground Investigations Unit A2, Innsworth Technology Park, Innsworth Lane Gloucester GL3 1DL	Contact name: Jim Constantine Telephone: 01452 739165
Sample Analysis (soils and groundwater)	Jones Environmental Unit 3 Deeside Point Zone 3 Deeside Industrial Park Deeside CH5 2UA	Contact name: Dale Ankers Telephone: 01244 833780
Equipment	Pollution Control Technologies 3 – 8 Redcliffe Parade West Bristol BS1 6SP	Contact name: Caroline Morgan Telephone: 0117 925 1304
Solid & Liquid Waste Disposal	ChemTech Waste Management Limited Alchemy House Coppice Side Industrial Park Brownhills WS8 7EU	Contact name: Laura Grice Telephone: 0870 608 8840 Current waste registration number: CB/LM3388FY
Tenant Contacts	Arriva	Contact name: Danny Collins Telephone: 07774 220 991



WorleyParsons

resources & energy

EcoNomics™

**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

Figures



WorleyParsons

resources & energy

EcoNomics™

**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

Plates



WorleyParsons

resources & energy

EcoNomics™

**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

Tables



WorleyParsons

resources & energy

EcoNomics™

**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**



WorleyParsons

resources & energy

EcoNomics™

**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

Appendix I Landmark Envirocheck Report



WorleyParsons

resources & energy

EcoNomics™

**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**



WorleyParsons

resources & energy

EcoNomics™

**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

Appendix II Service Plans



WorleyParsons

resources & energy

EcoNomics™

**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**



WorleyParsons

resources & energy

EcoNomics™

**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

Appendix III Borehole Logs and Monitoring Well Installation Details



WorleyParsons

resources & energy

EcoNomics™

**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**



WorleyParsons

resources & energy

EcoNomics™

**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

Appendix IV Topographic Survey



WorleyParsons

resources & energy

EcoNomics™

**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**



WorleyParsons

resources & energy

EcoNomics™

**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

Appendix V Laboratory Data



WorleyParsons

resources & energy

EcoNomics™

**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**



WorleyParsons

resources & energy

EcoNomics™

**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**

Appendix VI Quality Assurance and Quality Control



WorleyParsons

resources & energy

EcoNomics™

**NATIONAL GRID PROPERTY HOLDINGS
ENVIRONMENTAL ASSESSMENT, FACTUAL SITE INVESTIGATION REPORT
ARRIVA BUS DEPOT, TOTTENHAM, LONDON**
