Appendix 'A'

QUEST

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Esso Petroleum Company Limited
[redacted]

17 September 1997

Ref: 01/E1072SA.335

For the attention of Phil Henson.

Dear Sirs,

Re: Monitoring well pump testing at Woodlawn Service Station, Hounslow, Middlesex.

The initial investigation of Woodlawn Service Station identified the presence of residual petroleum hydrocarbons in soils and groundwater beneath the site. Additional works during the removal of the underground tanks and sampling from monitoring wells on the site suggested the residual hydrocarbon contaminants to be localised and to present no risk to receptors on or off the site.

Pumping tests were conducted on the monitoring wells to estimate the conductivity of soils and to assess the mobility of the contaminants. The pumping tests have confirmed that conductivity within the soils is very low.

The pumping tests confirm that the residual localised hydrocarbons identified by the initial investigation present no material threat to offsite receptors nor to future commercial activities on the site.

In the light of the investigations and additional testing and assessment, we do not consider that any additional remedial works are justified.

It should however be noted that, while residual contaminants are not considered to present a risk to future residential development of the site, such a change in planning use would be subject to planning permission. During the planning process, planning officers are likely to consult with their Environmental Health Officers and the Environment Agency who may, in the absence of any firm guidelines on acceptable contaminant concentrations, require additional works on the site.

For the above reasons it is recommended that, if a suitable future commercial use for the site is identified, sale for ongoing commercial is advised.

Yours faithfully,

Stefano Alba

For QUEST Environmental Services and Technology Limited

c.c. Joe Simms — Esso Petroleum Company Limited
Bill Cavender — Esso Petroleum Company Limited

QUEST

QUEST

ENVIRONMENTAL SITE ASSESSMENT

Woodlawn Service Station
644 Hanworth Road
Hounslow
Middlesex

for

Esso Petroleum Company Limited

September 1995

Job No. 01/335

Prepared by:

L Eccleston

Reviewed by:

S Curwen

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CONTENTS

1.0 Introduction

QUEST Environmental Services and Technology Limited were retained by Howard Ridgway on behalf of Esso Petroleum Company Limited to conduct an environmental site assessment at Woodlawn Service Station, Hanworth Road, Hounslow, Middlesex.

The environmental site assessment comprised a site investigation and desk study.

The primary objective of the site investigation was to investigate the presence of any residual petroleum hydrocarbons within the soils and any groundwater at the site prior to its divestment.

To complement the site investigation a desk study was conducted to:

- identify any sensitive receptors
- identify pathways linking the site to such receptors
- assess the risks to the receptors from any contamination identified during the site investigation.

The site investigation was conducted on 30th August 1995.

2.0 Summary of findings

The site investigation comprised a borehole construction programme and soil vapour survey. Four boreholes to depths to 3.8 metres below ground level, and 18 soil vapour survey points to 1.2 metres below ground, were constructed. The borehole programme identified the underlying geology to consist of coarse gravel and sand fill to 0.2 metres below ground giving way to fine sands and clays to up to 2.6 metres, which were underlain by coarse sands and dense gravels. Groundwater shows were encountered in one borehole at a depth of approximately 2.1 metres below ground.

Elevated concentrations of volatile petroleum hydrocarbons were found in the soils at borehole locations in the vicinity of an underground kerosene storage tank and in the vicinity of a disused vehicle lubrication ramp. The petroleum hydrocarbons are believed to be associated with a kerosene release at both locations. Lubricating oils were also encountered at a borehole location in the vicinity of the disused vehicle lubrication ramp.

The soil vapour survey recorded elevated concentrations of volatile petroleum hydrocarbons in the soil gas at one sampling point, located to the west of the dispensing forecourt on the site boundary with Hanworth Road.

Hydrocarbon contaminants located by the investigation were not found to be widespread and are not considered to present a threat to off-site receptors nor to continued industrial use of the site.

3.0 Desk study

3.1 Location

Woodlawn Service Station is located on the eastern side of Hanworth Road, approximately 700 metres to the southwest of the junction of Hanworth Road and Wellington Road South in Hounslow, Middlesex. The British Rail Feltham to Twickenham railway runs approximately 100 metres to the north of the site in a cutting. The site location is illustrated in Figure 1.

Land use in the vicinity of the site is given over to shops with flats above, and residential properties with gardens. The site is bordered to the north by a motor factors, and to the south by a post office. Hounslow Cemetery lies due west of the site across Hanworth Road, and to the east the service station is bordered by houses with gardens. The existence of basements in nearby properties is unknown.

The national grid reference of the site is TQ 1280 7380.

3.2 Site history

Woodlawn Service Station is understood to have operated at the site since the 1930s. The present layout of the site is presented in Figure 2.

The underground storage tanks and suction lines at the site reportedly date from 1974. The age of the pump dispensers is uncertain.

Tank, suction line, and pump testing was reportedly conducted during 1994 and did not indicate any leaks.

It was reported that stock reconciliation records have not indicated significant fuel losses, and petroleum hydrocarbon vapours have not been reported in the site buildings.

3.3 Geology

British Geological Survey records for the area indicate that the site overlies approximately 20 metres of Third River Terrace Deposits, comprising coarse sands and gravels, followed by approximately 50 metres of London Clay giving way to Woolwich and Reading Beds with Cretaceous Chalk below.

The borehole investigation conducted on site identified the overburden to consist of up to 0.2 metres of coarse sand and gravel fill beneath the concrete forecourt, giving way to light brown clayey sands and coarse gravels proved to the maximum depth drilled of 3.8 metres below grade. A small amount of groundwater was encountered, in one borehole, at a depth of approximately 2.1 metres.

3.4 Regional hydrogeology

Groundwater

NRA records indicate that the River Terraces underlying the site are a major aquifer, with soils classed as being of high leaching potential in which non-adsorbed diffuse source pollutants and liquid discharges

may be readily transmitted to underlying strata or groundwater therein. The NRA Policy and Practice for the Protection of Groundwater reveals that where they overlie impermeable strata, River Gravels form distinct aquifers where hydraulic continuity between rivers and groundwater is likely, and where the water table is normally high and is thus vulnerable to pollution. Groundwater movement within the gravels is predominantly intergranular, through available soil pore spaces. Available literature suggests River Gravels present water resources of major importance.

A 2 kilometre radial search of current NRA licensed abstractions found two from groundwater sources. These are detailed in Table 1 below, and the locations presented in Figure 1.

Grid Reference	Distance (km)	Direction	Purpose	Source	Type	Volume (m^3 per annum)
TQ 1370 7510	1.6	northeast	office and industrial	chalk	groundwater	270
TQ 1170 7520	1.8	northwest	agriculture	gravel	groundwater	6 137

Table 1: NRA licensed abstractions

The abstraction from the chalk should derive considerable protection from surface sources of contamination due to the presence of relatively impermeable layers of overlying clays, while that from the River Gravels is some distance from the site and is used for agriculture.

Surface water

Ordnance Survey maps of the area reveal the site to lie approximately 200 metres to the northwest of a small unnamed stream which flows towards the River Crane.

The River Crane, which at its closest point to the site is classed as Grade C (Fair) according to the NRA New General Quality Assessment (GQA) Scheme 1990 - 1992, is located 700 metres to the southwest of the site. The river is indicated to have a mean flow rate of approximately 5 cubic metres per second.

Longford River, which is classed as Grade C (Fair), flows approximately 1.7 kilometres to the southwest of the site. The river is indicated to have a mean flow rate of less than 5 cubic metres per second.

The 2 kilometre radial search of current NRA licensed abstractions found none from surface water sources.

4.0 General site survey

The site comprises facilities for the distribution of gasoline, a small kiosk/shop, an indoor car sales building and a garage/workshop building. A disused vehicle lubrication ramp is located towards the rear of the site to the north of the workshop. A small canopy exists at the site. The layout of the site is illustrated in Figure 2.

Product storage is within four off-set filled underground gasoline storage tanks, tanks T1 - T4, located in the main tank farm to the west of the dispensing forecourt, although tanks T1 and T3 are currently unused and are water filled. The off-set fills are housed in a brick-lined underground chamber which shows evidence of surface water ingress and slight product spillage. An historic underground kerosene tank, of unknown capacity, is located to the southeast of the dispensing forecourt. The off-set fill for the kerosene tank was reportedly removed from the site during 1994.

The tank capacities and product types at the site are presented in Table 2 below.

Tank	Capacity (litres)	Fill method	Contents	In use
Tank T1	17 830	off-set	Leaded gasoline	no
Tank T2	9 170	off-set	Premium unleaded gasoline	yes
Tank T3	9 170	off-set	Premium unleaded gasoline	no
Tank T4	17 830	off-set	Leaded gasoline	yes

Table 2: Tank capacities and contents

All the tank lid chambers at the site are brick lined and at the time of the investigation showed evidence of surface water ingress and product spillage.

A three-chamber brick-lined interceptor, located to the southwest of the dispensing forecourt, receives run-off from the dispensing forecourt and approaches, and discharges to the foul sewer. A soakaway, located to the east of the dispensing forecourt, appears to receive surface run-off from the parking area located to the rear of the site, and from the car sales building and garage/workshop rooftops. The site canopy drains to the foul sewer.

Two waste oil tanks, one below ground and one above, are located to the southeast of the dispensing forecourt. The above ground waste oil tank is raised and unbunded and appears in satisfactory condition although at the time of the investigation the surrounding ground indicated evidence of oil spillage. In addition, a small above ground unbunded autodiesel tank is located between the workshop and car sales buildings. The tank appeared in satisfactory condition. An unused above ground storage tank is located to the northeast of the workshop building.

The site dispensing forecourt and ground around the tank farm is laid to concrete which is scarred in places. The forecourt approaches, the access road along the northern perimeter, and the vehicle parking area to the east of the site are laid to asphalt. Ground in the immediate vicinity of the vehicle lubrication ramp is laid to concrete.

5.0 Field investigation

5.1 Aims of the investigation

The field investigation comprised a borehole construction programme to permit the investigation of soils and any groundwater beneath the site. In addition, a soil vapour survey was conducted in order to delineate the areal extent of any volatile contaminant plume present in the sub-surface beneath the dispensing forecourt and in the vicinity of the tank farm.

Petroleum hydrocarbons were considered to be the principal contaminants of concern to the investigation.

Prior to intrusive works, a survey of detectable underground services was conducted by Subscan Technology Limited, to avoid possible damage by drilling operations. The locations of all detected services are presented in Figure 2, and are available as an AutoCAD file.

5.2 Borehole investigation

Four boreholes were drilled to depths of 2.8 to 3.8 metres below ground at the locations indicated in Figure 3. Each borehole was drilled using a percussive window sampler in order to obtain relatively undisturbed soil samples.

Sampling methodology

Soil from each borehole was logged for geology and samples were screened for volatile petroleum hydrocarbons by headspace analysis using an intrinsically safe Photoionisation Detector (PID).

The results of the geological logging and field headspace analyses are presented in the borehole logs, Appendix A.

5.3 Soil vapour survey

Eighteen soil vapour survey points were installed around the site to a depth of 1.2 metres below ground, with a diameter of 20 mm.

Sampling methodology

Once drilled, each vapour survey point was plugged at surface to permit the vapour space within the bore to reach equilibrium. The concentration of volatile hydrocarbons present in the soil gas was then measured using the PID.

The results of the soil vapour survey, expressed in parts of hydrocarbon vapour per million of soil gas sample, are recorded in Table 3 below. The locations and results of the soil vapour survey are presented in Figure 3.

Survey point	PID reading (ppm)	Survey point	PID reading (ppm)
VP1	9	VP10	9
VP2	20	VP11	8
VP3	10	VP12	9
VP4	90	VP13	7
VP5	15	VP14	7
VP6	12	VP15	9
VP7	14	VP16	9
VP8	9	VP17	12
VP9	9	VP18	9

Table 3: Results of soil vapour survey

6.0 Interpretation of results

The results of the borehole logging and field headspace analysis are presented in the borehole logs, Appendix A. The borehole locations are presented in Figure 3.

The results of the soil vapour survey are detailed in Table 3 within Section 5.3 above, and the locations of the soil vapour survey points are presented in Figure 3.

6.1 Soils

The borehole programme identified the underlying geology to consist of coarse gravel and sand fill to approximately 0.2 metres below ground giving way to fine sands and firm brown clays to up to 2.6 metres which were underlain by coarse sands and dense gravels. Borehole BH3 encountered soft, brown, silty clay to a depth of 2.6 metres below ground level, which was underlain by dense gravels.

The findings of the investigation identified localised elevated concentrations of volatile petroleum hydrocarbons in soils in the vicinity of the underground kerosene storage tank located to the southeast of the dispensing forecourt, and in the vicinity of the vehicle lubrication ramp located towards the rear of the site.

The field headspace analysis of soil samples recovered from borehole BH2, located in the vicinity of the vehicle lubrication ramp, recorded elevated concentrations of volatile petroleum hydrocarbons believed to be associated with kerosene and lubricating oils, in a zone between approximately 1.6 and 2.5 metres below ground.

Soil samples recovered from borehole BH4, located in the vicinity of the disused underground kerosene storage tank, also recorded significant concentrations of volatile petroleum hydrocarbons, considered to be associated with kerosene, to the maximum depth drilled of 2.8 metres below ground. Soil sample S4.7, recovered from 2.8 metres below ground, recorded the site maximum concentration of 360 ppm.

Soil samples recovered from boreholes BH3 and BH1, located to the southeast of the dispensing forecourt and to the east of the site soakaway respectively, recorded low concentrations of volatile petroleum hydrocarbons.

The soil vapour survey encountered elevated concentrations of volatile petroleum hydrocarbons present in the sub-surface at sampling point VP4, located to the west of the dispensing forecourt on the site boundary with Hanworth Road, which recorded 90 ppm.

6.2 Groundwater

Groundwater shows were encountered in borehole BH1 at a depth of approximately 2.1 metres below ground. There was insufficient recharge to obtain a groundwater sample.

6.3 Conclusion

The investigation results suggest that hydrocarbon contaminants present, associated with historic vehicle maintenance and fuel distribution activity, are localised and present no major threat to off-site receptors nor to the future industrial use of the site.

References:

British Geological Survey

South London, Sheet 270, Solid and Drift Edition, 1 : 50 000, 1981

National Rivers Authority

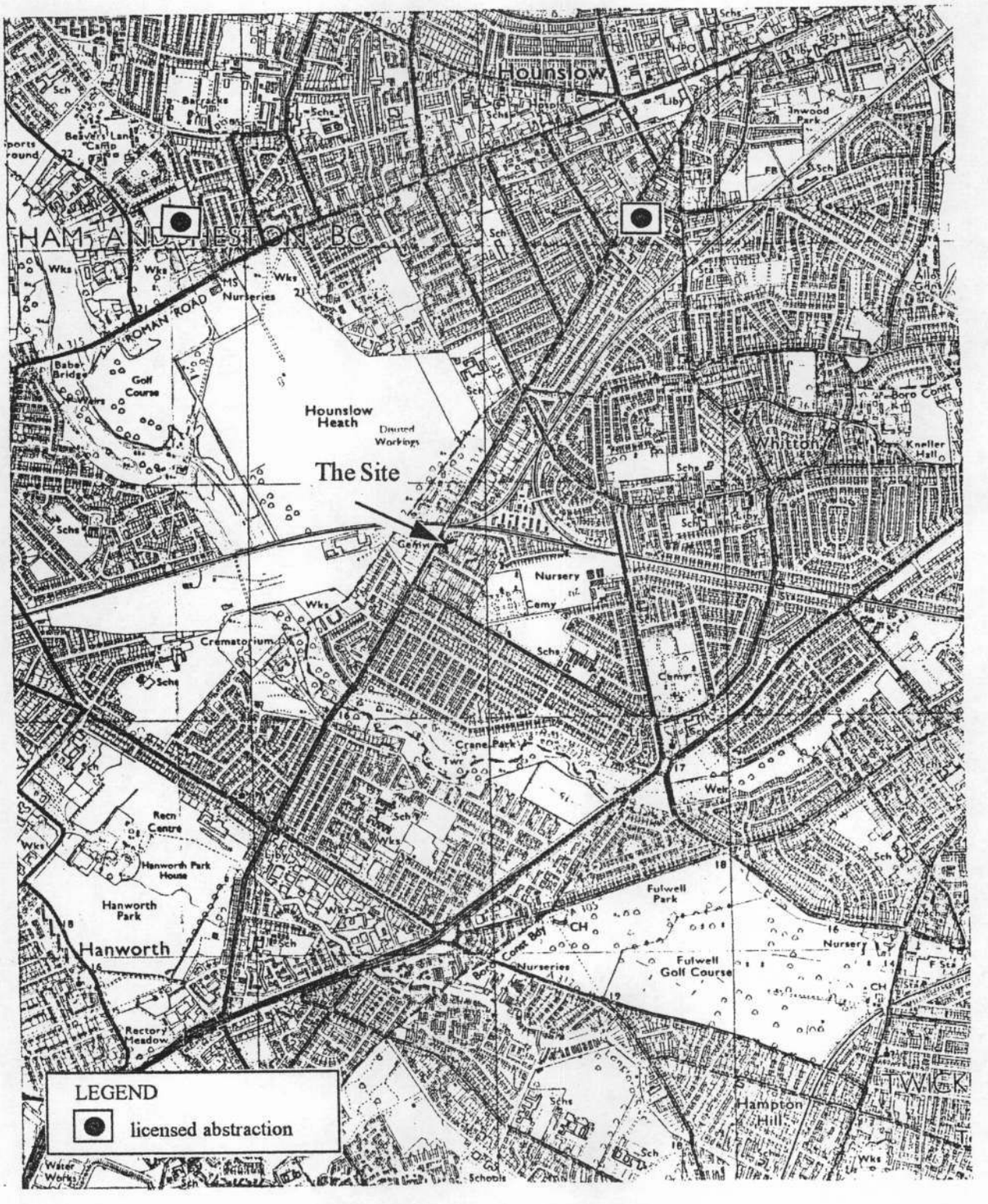
Policy and Practice for the Protection of Groundwater : Groundwater Vulnerability, Sheet 39, West London, 1 : 100 000, 1994

Policy and Practice for the Protection of Groundwater : Regional Appendix, Thames Region

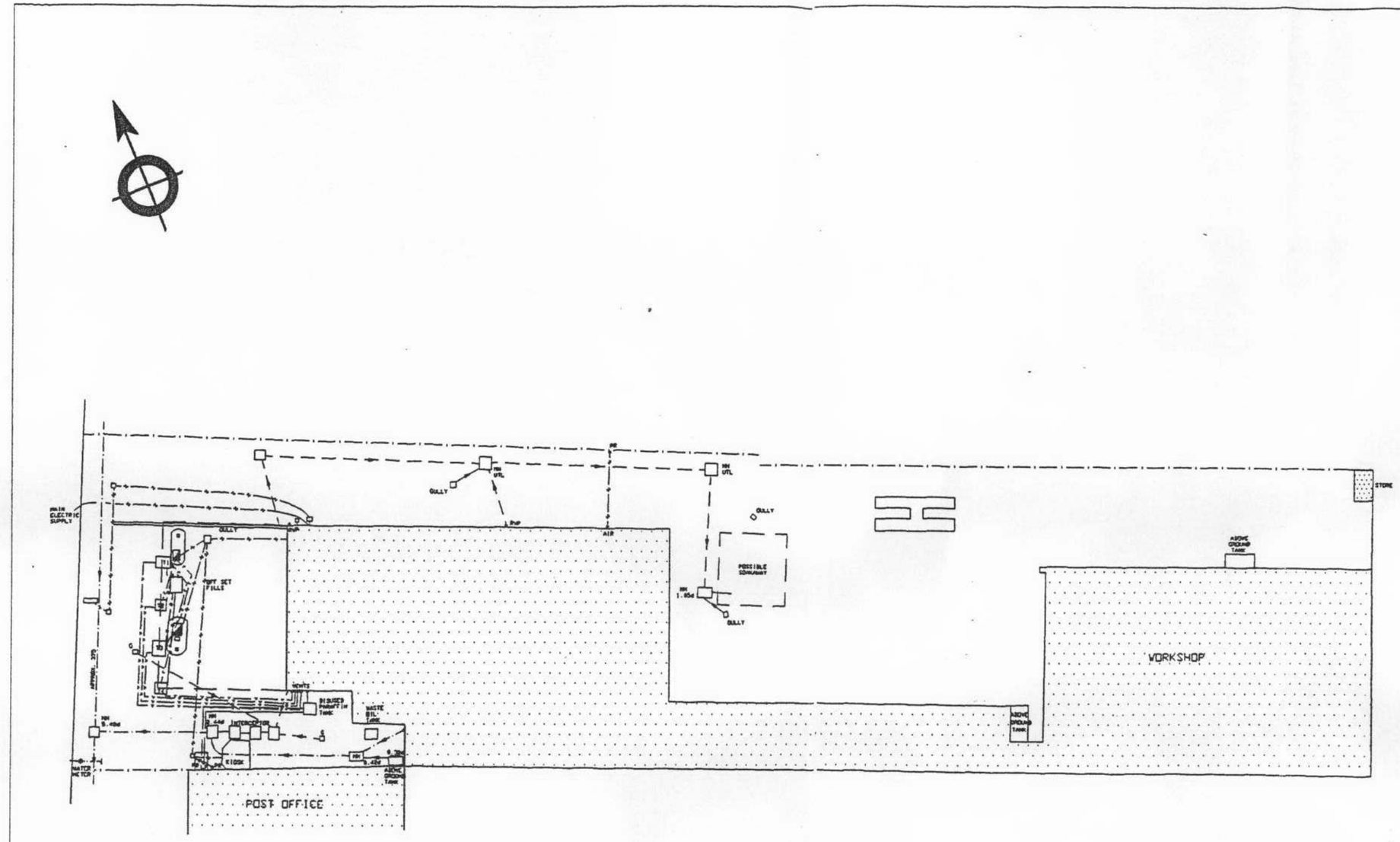
River Quality 1990 - 1992, According to the New General Quality Assessment (GQA) Scheme, 1 : 750 000, 1994

Ordnance Survey

Pathfinder, Sheet 1174 : Staines, Heathrow Airport, and Richmond, 1 : 25 000, 1990



Sept. 1995	**Figure 1: Location of Woodlawn Service Station, Hounslow**	QUEST



SCALE

0 5 10 15 20

METRES

CLIENT

QUEST
ENVIRONMENTAL

TITLE

LOCATION OF UNDERGROUND SERVICES
ESSO SERVICE STATION
644 HAWORTH ROAD
HOUNDSLOW,LONDON

SURVEYED	R.E.P.
DRAWN	A.H.W.
CHECKED	J.B.R.
DATE	AUGUST 1995
SCALE	
DWG.No	2465
FIGURE	2

KEY

- BOREHOLE
- VAPOUR POINT
- PUMP
- PILLAR
- BUILDING
- ROOF CANOPY
- ELECTRIC CABLE
- TELECOM CABLE
- GAS PIPE
- COMPRESSED AIR
- FOUL DRAINAGE
- STORM DRAINAGE
- COMBINED DRAINAGE
- WATER PIPE
- FUEL PIPE
- GAUGE LINE
- VENT PIPE
- UNIDENTIFIED

ABBREVIATIONS

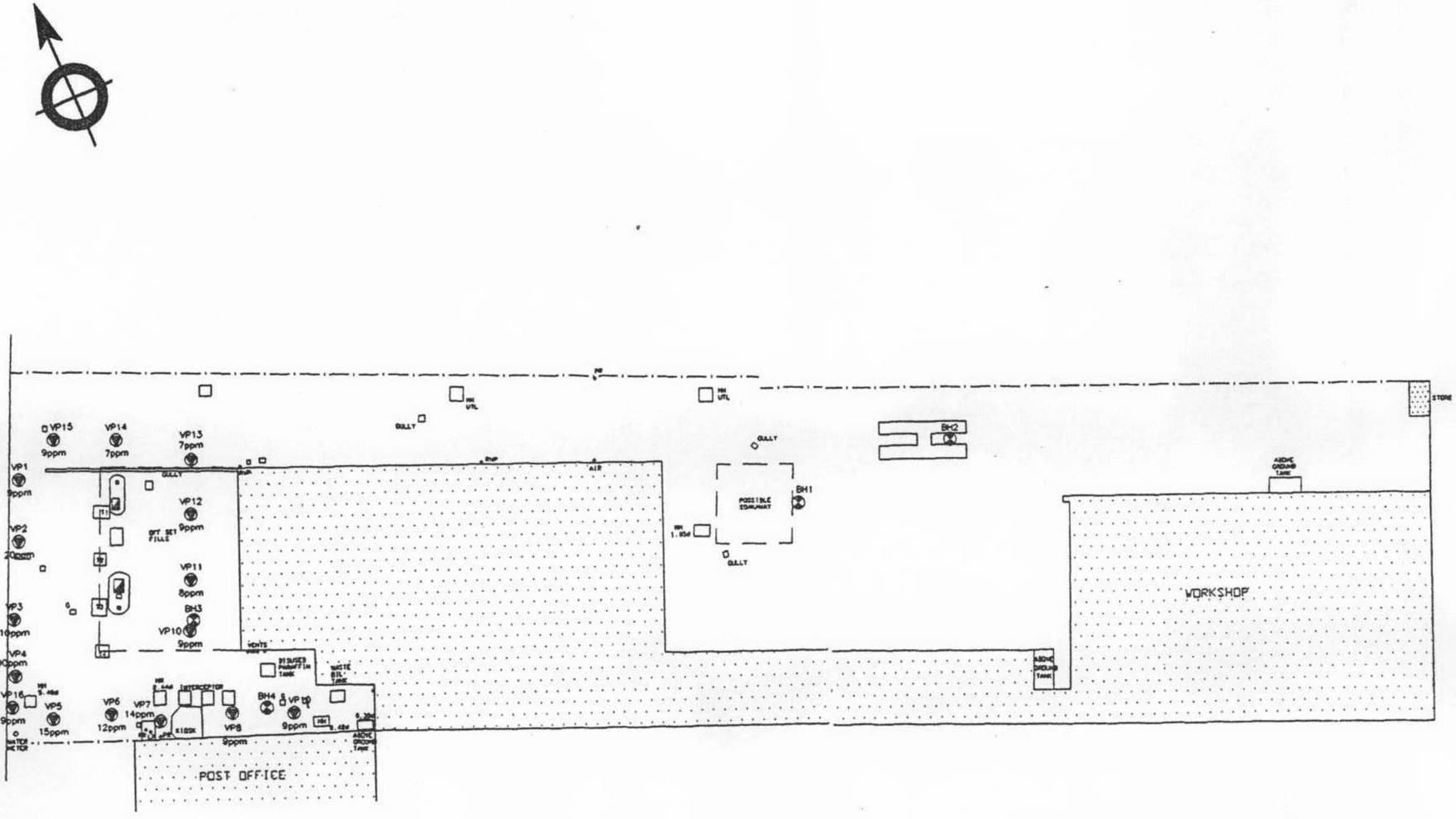
CP	CABLE PIT
CL	COVER LEVEL
CR	CABLE RISER
EP	ELECTRICITY POLE
EoC	EDGE OF CANOPY
FH	FIRE HYDRANT
G	GULLY
GV	GAS VALVE
IC	INSPECTION CHAMBER
IL	INVERT LEVEL
LP	LAMP POST
MH	MANHOLE
PR	PIPE RISER
RE	RODDING EYE
RWP	RAINWATER PIPE
SV	STOP VALVE
TCB	TELEPHONE CALL BOX
TP	TELEGRAPH POLE
UTL	UNABLE TO LIFT
UTS	UNABLE TO SURVEY
WL	WATER LEVEL
WM	WATER METER
WO	WASH OUT VALVE

NOTES:

THE METHODS USED FOR THE CONSTRUCTION OF THIS BASE PLAN WAS BY TAPE MEASURED OFFSETS FROM BUILDINGS. THEREFORE THE BASE PLAN ACCURACY, IN SOME AREAS, CAN NOT BE GUARANTEED

UNDERGROUND UTILITIES LOCATED AND BASE MAP CONSTRUCTED BY...

SubScan Technology Ltd
UNDERGROUND SURVEY SPECIALISTS
55B HIGH ST,HILLMORTON,RUGBY,WARWICKS,CV21 4EG
TEL: 01788 550017 FAX: 01788 551218



CLIENT

QUEST ENVIRONMENTAL

TITLE

VAPOURPOINT LOCATIONS & CONCENTRATIONS & BOREHOLE LOCATIONS

ESSO SERVICE STATION
644 HAWORTH ROAD
HOUNDSLOW,LONDON

SURVEYED	R.E.P.
DRAWN	A.H.W.
CHECKED	J.B.R.
DATE	AUGUST 1995
SCALE	
DWG.No	2465
FIGURE	3

KEY

- BOREHOLE
- VAPOUR POINT
- PUMP
- PILLAR
- BUILDING
- ROOF CANOPY
- ELECTRIC CABLE
- TELECOM CABLE
- GAS PIPE
- COMPRESSED AIR
- FOUL DRAINAGE
- STORM DRAINAGE
- COMBINED DRAINAGE
- WATER PIPE
- FUEL PIPE
- GAUGE LINE
- VENT PIPE
- UNIDENTIFIED

ABBREVIATIONS

CP	CABLE PIT
CL	COVER LEVEL
CR	CABLE RISER
EP	ELECTRICITY POLE
EoC	EDGE OF CANOPY
FH	FIRE HYDRANT
G	GULLY
GV	GAS VALVE
IC	INSPECTION CHAMBER
IL	INVERT LEVEL
LP	LAMP POST
MH	MANHOLE
PR	PIPE RISER
RE	RODDING EYE
RWP	RAINWATER PIPE
SV	STOP VALVE
TCB	TELEPHONE CALL BOX
TP	TELEGRAPH POLE
UTL	UNABLE TO LIFT
UTS	UNABLE TO SURVEY
WL	WATER LEVEL
WM	WATER METER
WO	WASH OUT VALVE

NOTES:

THE METHODS USED FOR THE CONSTRUCTION OF THIS BASE PLAN WAS BY TAPE MEASURED OFFSETS FROM BUILDINGS. THEREFORE THE BASE PLAN ACCURACY, IN SOME AREAS, CAN NOT BE GUARANTEED

UNDERGROUND UTILITIES LOCATED AND BASE MAP CONSTRUCTED BY—

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APPENDIX A
Borehole logs

Job title : Woodlawn S/S **Job number** : 01/335	**Borehole** : BH1 **Date** : 30th August 1995
Location : East of the soakaway	**Boring method** : Percussive window sampler

Depth (m)	Description	Sample number	Sample depth (m)	PID reading (ppm)
0.0 - 0.2	MADE GROUND. Asphalt overlying brown coarse sand, and coarse gravel.			
0.7	Brown, clayey, fine SAND with gravel.	S1.1	0.6	6
3.2	Brown, coarse, SAND with coarse rounded gravel. Sand becoming moist with groundwater at approximately 2.1 metres. Gravels becoming denser below 2.5 metres.	S1.2 S1.3 S1.4 S1.5 S1.6	1.0 1.8 2.0 3.0 3.2	5 6 5 11 6
3.2	End of borehole			

Comments: Window sampler unable to penetrate compacted gravels below 3.2 metres. Slight groundwater strike at approximately 2.1 metres.	**BH1**

Job title : Woodlawn S/S **Job number** : 01/335	**Borehole** : BH2 **Date** : 30th August 1995
Location : East of the vehicle lubrication ramp	**Boring method** : Percussive window sampler

Depth (m)	Description	Sample number	Sample depth (m)	PID reading (ppm)
0.0 - 0.2	MADE GROUND. Concrete overlying coarse brown sand and gravel.			
	Light brown, coarse, clayey SAND with coarse rounded gravel..	S2.1	0.5	6
	Gravels becoming denser below 1.1 metres.	S2.2	1.0	7
	Odour of lubricating oil and kerosene between 1.6 and 2.6 metres.	S2.3	1.6	120
	Distinct zone of lubricating oil saturated sand and gravel between 1.6 and 1.8 metres.	S2.4	2.0	290
	Zone of light brown, fine, alluvial sand between 2.6 and 2.65 metres.	S2.5	2.5	80
3.0		S2.6	3.0	16
3.0	End of borehole			

Comments: Window sampler unable to penetrate gravels below 3.0 metres. No groundwater encountered.	**BH2**

Job title : Woodlawn S/S **Job number** : 01/335	**Borehole** : BH3 **Date** : 30th August 1995
Location : East of the tank farm	**Boring method** : Percussive window sampler

Depth (m)	Description	Sample number	Sample depth (m)	PID reading (ppm)
0.0 - 0.2	MADE GROUND. Concrete overlying brown coarse sand and gravel.			
	Soft, brown, silty CLAY with occasional gravel.	S3.1	0.5	5
		S3.2	1.0	<0.1
	Becoming sandy below 1.2 metres.	S3.3	2.0	5
2.6				
	Light brown, coarse, clayey, SAND with coarse rounded gravel.	S3.4	3.0	6
		S3.5	3.8	7
	Gravels becoming denser, with flints, below approximately 3 metres.			
3.8				
3.8	End of borehole			

Comments: Window sampler unable to penetrate gravels below 3.8 metres. No groundwater encountered.	**BH3**

Job title : Woodlawn S/S **Job number** : 01/335	**Borehole** : BH4 **Date** : 30th August 1995
Location : South of the disused kerosene tank	**Boring method** : Percussive window sampler

Depth (m)	Description	Sample number	Sample depth (m)	PID reading (ppm)
0.0 - 0.2	MADE GROUND. Asphalt overlying brown coarse sand and gravel.			
1.4	Firm, dark brown, sandy CLAY with occasional gravel and flints. Becoming sandy and gravely below 1.4 metres.	S4.1 S4.2	0.5 1.0	6 5
2.8	Brown, coarse SAND with dense, coarse, gravel. Distinct zone of dark discolouration between 1.8 and 2.0 metres. Strong odour of kerosene.	S4.3 S4.4 S4.5 S4.6 S4.7	1.6 1.8 2.0 2.5 2.8	240 330 290 350 360
2.8	End of borehole			

Comments:	**BH4**
Window sampler unable to penetrate gravels below 2.8 metres. No groundwater encountered.	